Environmental History 7

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Environmental History in the Making

Volume II: Acting

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Introduction

Environmental History in the Making contains selected contributions from the 2nd World Conference on Environmental History, held in Guimarães, Portugal, 8–12 July 2014.

It is quite clear that environmental history has been established as a discipline. However, the works presented went far beyond that driver of discussion. Researchers from the five continents presented new problems and further information, and they also formulated new hypotheses and discussed the corresponding results.

A sample of scientific responses within their historical contexts that explain past and present uses of the planet is presented in this book, together with possible proposals or solutions for forthcoming action.

Looking at the complete set of articles, it emerges quite clearly that historical data can be a fundamental tool to plan forthcoming environmental interventions.

As a matter of fact, the underlying theme of this manuscript is about *knowing the past, understanding the present and planning the future*. In other words, *Environmental History in the Making* gives, in practice, environmental historical information about the past and suggests a conceivable better future.

These views are in line with the prevalent interpretation of the *environment*. Despite cultural, economic, political or religious differences, an evolving planetary solution is needed to reverse ecological loss. This new paradigm tempers political and cultural divisions with total respect for cultural diversity. It emerges as the ground for a worldwide future, while religion, capitalism or socialism ceases to be recognised as a possible universal socio-economic-cultural paradigm.

This new paradigm goes far beyond models of resolutions built in the aftermath of the Second World War. Those were conceived under the legitimation of the UN institutions that was framed by the colonial background and thereafter by the Cold War. The environmental paradigm is a quest for the common good, defending human rights and access to basics such as nutrition or medical care. It argues for sharing resources instead of basic monopolistic control on water or power sources.

The articles integrating this book substantiate this new paradigm. The organisation in parts, “Explaining” and “Acting”, intends to stress the resourcefulness of environmental history and its vision towards the future.

Thus, in Part I of the book, "Explaining", the main focus of organisation is about how to think in order to do and how to test cross-data analyses to propose and present new data and stories:

1. Approaches – Social bondage to mathematics, arts or socio-biology
2. Proposing – Concepts, sources and methodologies
3. Clarifying results – Interchange of psychosocial with natural and analytical
4. Resetting data – Information upon classic subjects crossing methodologies and producing new interpretations
5. Blurring all – New interpretations, old themes and different outcomes. How multi- and interdisciplinarity allow a confrontation of data proposing quite different interpretations on the same object

In Part II, the main driver of the organisation is about "acting", offering new insights on new outcomes of classic themes or new interpretations of past uses of resources or changed landscapes. It is also our intention to stress how the awareness of the past helps to promote civic and political agency in the present.

Part II comprises:

6. Using resources – Narratives of resource exploitation in time and its evolution in the long run
7. Transforming in situ – Manipulating, changing and evolving landscapes, waterscapes, airscapes (classical approach of territorial changes, causes, actors and consequences)
8. Transferring (migrations) – Resource exploitation and trade, local to global (native sources, new case studies and transcontinental approaches!)
9. Spreading (aliens, exotics) – Reinterpreting evil to evolving with both positive and negative impacts
10. Conscience of loss and improving – Present awareness of how we have arrived where we are, undoing inappropriate territorial policies with environmental impact
11. Civic and political agency – History as memory of social process, knowing the past and planning the future

A few main ideas emerge when one reads the entire spread of contributions published here.

This book moves ahead from a framework looking for guilt and for whom to blame in the past for ecological loss to a framework of understanding the processes leading to current environmental circumstances and characteristics. This is achieved by analysing the mutual shaping of natural and social factors.

In the long run, natural and human action together gave rise to a wide range of resource uses, displacement, transfer and distribution. The transformations were implemented either intentionally or randomly. The corresponding multiplicity of shaped ecosystems, occupied by a wide diversity of animal, botanic and human populations generating different cultures, offers a transcultural and transdisciplinary set of approaches.

Researching past actions and consequences helps us to understand the present behaviour of nature and the emergence of new landscapes. Understanding past interactions between the human and natural spheres and its results at the local and global levels, it is possible to gain a better understanding and predictive power of how nature behaves. Consequently, hazards may be prevented (or its impacts minimised) and ecosystems managed in order to care for the common good without harming cultural, psychological or anthropological heritage and identity.

Following the universal status that "the environment" has acquired a solution for life as we know it on the planet, some of the papers presented here clearly launch the knowledge of the past as an operative tool to project actions in our own time. They point to actions that might reverse economic, political, social and cultural environmentally unfriendly drivers. The understanding of the negative results of past interactions between humans and nature might allow the shaping of positive results in the future.

Yet, there is no spark of any intention to disguise the consolidated processes that contributed to damaging many areas of the planet. The research here confirms and unveils stories of ecologically harmful political actions towards mastering the exploitation of natural resources. These policies, in many instances, were accompanied by the monopoly of social control over the populations of, for instance, India, Rhodesia (Zimbabwe), Uganda or Bolivia and Brazil.

There is an ongoing debate to explain why prior analysis, which does not combine historical analysis with all the other sources of data, may lead to misperceptions and the diffusion of history that is actually wrong. Such is the case of the papers analysing themes from pollen distribution to iconography. In addition, there is a wide presence of papers that provide the historical context to explain why conclusions drawn from outside conjunctures and cultural frameworks may lead to a misunderstood history and incorrect interpretations, including how this tension can be resolved.

The insights of psychology, sociology, anthropology and the arts by way of performances and tradition propose new avenues for interpreting bondages to landscape and rooted cultural behaviours, which in turn explain the resistance or acceptance of human changes to landscapes.

These approaches might constitute the DNA of human historical processes which in turn translate into a useful grid to read how humans have interacted with the environment and provide a basis to formulate future policies to regulate the relationship between humans and the environment.

Before interfering with deep-rooted cultural heritage, problems of historical origin can explain present conflicts between the biosphere and the human sphere. In addition, a historical context can provide a grid to read the degree of acceptance of territorial change. These changes can be rooted in traditions and can relate to the extraction, use, diffusion and trade of natural resources in different cultures. Finally, the historical context is key to understanding how delicate environmental management can be in different parts of the world, particularly when it comes to unhealed historical wounds.

New insights are then brought to light in environmental history by the stepping in of environmental humanities, social sciences, arts, anthropology and sociology, together with the contributions of natural sciences.

Indeed, this book presents mature analyses combining current problems and historical contexts to address environmental issues when inquiring into the past. There is a very clear attitude of not trying to find "ecological blame" or "indisputable ecological criminals" at any cost. In various stages, both present concerns and then perspectives, actors and limitations of knowledge within given spatial and time coordinates and so avoid misguided interpretations.

Albeit coming across with horizons of hope as much as of fear about the future, the analyses focus on positive and negative impacts resulting from past undertakings, performing studies both on the bad and good environmental management of former periods. Studies that progressively got thicker in this direction balance perspectives by paying attention not only to the crucial space-time contexts but also crossing methodologies and sources of many origins.

The texts stress the pressing need to access local data, translated to more diffused languages in the publishing sphere. Indeed, one of the most important contributions for a wider understanding of transfers of species and natural resources around the world, in the long run, intentionally or unexpectedly, is local information on the historical ground.

Indeed its diffusion and conclusion can change the course of given discussions in international forums, for example, concerning the stories and versions of resource transfers from Russia and China to Portugal, diverting from Dutch, English or French syntheses produced so far, as analysed in some of the papers in this volume.

Examples of new interpretations and reinterpretations of classic theories can be observed in this book concerning, for example, the introduction of botanic and animal species from India and Africa in Brazil; sugar plantations in Formosa Island (Taiwan) by the Chinese in the fourteenth century before the arrival of the Dutch in the sixteenth century; pets transferred as sacred or exotic like apes from India to Europe and America; the mining extraction in Brazil much earlier than the Portuguese "discovery" of Minas Gerais; the mining and trade of metallic resources between Japan and Korea; the fisheries on whales in the Northern Sea by the Russians and the Portuguese as steady but not depleting industries could be drawn, with processes so far unknown and now disclosed; or the importance of arts in stating and producing historical records or using representation to explore meanings of the same subjects and objects in different cultures.

The information unveiled in native languages also provides a new insight on the role of public health calamities and the diffusion of parasites in wet environments, as well as the launching of urban planning, for instance, in Russia.

The story of the abomination of resource depletion analysed as an ongoing horror since "ever" in opinion-making produced in the twentieth and twenty-first centuries becomes quite different when putting the same action in former periods attending to demography and scale of collection. In addition, the records on health

and medicine linked to parasite diffusion suggest causes for social displacement and urban projection as what happened in Russia.

Historical analysis is also bringing to light reinterpretation of species transfers and migrations and deals with the positive as well as negative consequences of this process. Insufficient mono-disciplinary historical data was considered to result in misleading conclusions concerning this topic. In this book, a paper on *cannabis* circulation in the world takes this perspective.

Moreover the analysis of botanic or fauna distribution across spaces (solid and water, air) and time also provides information on climate behaviour and natural or manmade shaping of new landscapes through time. This is clear, for example, in the nineteenth-century scientific narrative about Argentina and Australia.

Decisions based on one side of science applied universally to different parts of the world, during colonial administrations for instance, were not only ecologically harmful in regions of India, the Middle East and North Africa, but, at the same, the decision making which disregarded cultural heritage led to huge conflicts in India, the low parts of Eastern Europe surrounding the Black Sea, Maghreb, Central Africa and Latin America, as well as in the USA and Canada.

Regardless of the disciplinary field from where the research starts off, interdisciplinarity, multidisciplinarity and transdisciplinarity are applied no longer as an adventure of attempts, an uncertainty of results or a justification of the disciplinary field to make it more scientific but are integrated by their respective methodologies. This perspective allows the crossing of perspectives and sources seeking for better knowledge of the past, of local and collective memory and of the possibilities and limitations of actors to manage territories, ecosystems, religion, politics, power, war and economics.

Multidisciplinary, interdisciplinary and transdisciplinary approaches are almost "taken for granted" while concepts themselves are not. They are carefully posed as the drivers of the approaches from eco-fusion to psychological bondage with nature proposing sustainable approaches.

As a matter of fact, attitudes towards conceptualisation have altered. There is an intention of merging existing or creating new concepts in the framework of an already existing environmental history. There seems to have been a shift from trying to explain what environmental history is to how it is being shaped. It is explained how environmental history uses, copes with and accepts concepts from other sciences, instead of "adjusting" them from other disciplines or fields of work (as in many books/conferences before) to find a rough way of making them usable in historical analyses as also a way to make the discipline (environmental history) credible.

Objects as subjects became free from a dependent mono-disciplinary heritage coming either from natural or social sciences. This programme offers a very good combination of nature and natural "heroes" as main characters of the narratives; indeed themes like aliens, invasive species, naturalisation, degradation and depletion are also put in historical context, even when destruction occurred.

There is, in the papers presented here, considerable clarification of how, when and why action and impacts occurred while looking at several perspectives. There is

a shift from “green imperialism” to species transfer before jumping into conclusion of finding the blame on the human side. There is an almost general concern in stressing mutual interaction between natural and human factors about keeping, changing, transforming and shaping landscapes, waterscapes and “airscapes”.

Such development can be quite efficient to produce new data and confirm or deny results of former resources and interpretations moving forward on knowing more and better about historical ground as to inform possibilities of environmental history as applied science for political and civic agency.

Thus *Environmental History in the Making* presents material for a syntheses of tendencies in the making of environmental history bringing light onto the past as a useful intellectual tool for present and future political agenda.

Part I
Using Resources – Stories of Resources Exploitation in Time and Its Evolving in the Long Run

Chapter 1
Agriculture and Livestock in Wetlands in the Bogota Plateau (Colombia), Eighteenth Century. Land Use and Wetland Management

Katherinne Giselle Mora Pacheco

Abstract Colombia's agrarian history has traditionally been focused on land tenure and relations of production. However, little is known about farming practices, land use and management, and the transformation of ecosystems. This paper addresses these issues in the Bogota Plateau, a region dominated by the Bogota River. The period being analyzed spans the eighteenth century and the first decades of the nineteenth century; an era defined by the gradual disappearance of indigenous reservations (in Spanish, *resguardos*) and the dominance of haciendas. The key primary sources are the reports of European travelers in the region, and the documentary collections of the *Archivo General de la Nación* (Bogota, Colombia). This paper examines livestock specialization and hydraulic modifications that farmers made spontaneously and informally in order to increase production. This paper also describes farming practices characteristic of the region, including white landowners engaged in farming across micro-climates, an agricultural practice that has been traditionally defined as Indigenous. Agriculturalists also engaged in more typical Spanish agriculture, including the temporary grazing of herds coming from long distances and lower altitudes. Farmers in the Bogota Plateau were involved in the expansion of the pastures as the main land cover and the land use for livestock in the wetlands, and the construction of trenches and ditches for saving the water during droughts, draining of wetlands and diverting the river's course.

This research was financed with funds of the *Instituto Colombiano de Antropología e Historia* of Colombia and the international project Sustainable Farm Systems supported by the Social Science and Humanities Research Council of Canada. An extended version of this research, entitled "Agricultores y ganaderos de la Sabana de Bogotá frente a las fluctuaciones climáticas del siglo XVIII" was published for first time in *Fronteras de la Historia* Vol.20 (1), 2015.

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1.1 Introduction

Colombia's agrarian history has traditionally been focused on land tenure and relations of production. However, little is known about farming practices, land use and management, and the transformation of ecosystems. This research addresses these issues in the Bogota Plateau, a region dominated by the Bogota River. The period being analyzed spans the eighteenth century and the first decades of the nineteenth century; an era defined by the gradual disappearance of indigenous reservations (in Spanish, *resguardos*) and the dominance of haciendas. The key primary sources are the reports of European travelers in the region, and the documentary collections of the *Archivo General de la Nación* (Bogota, Colombia), where it is possible to find records about meat supplies, disputes over the land and water, infrastructure demands (trenches, ditches, channels, and bridges), inventories of Jesuit haciendas expropriated, visits to the *resguardos*, letters between the majordomos and the landowners, and maps. The analysis highlights the unique land use and management decisions that characterized agriculture in the Bogota Plateau. This research examines livestock specialization and hydraulic modifications that farmers made spontaneously and informally in order to increase production. Also, it describes farming practices characteristic of the region, including white landowners engaged in farming across micro-climates, an agricultural practice that has been traditionally defined as Indigenous. Agriculturalists also engaged in more typical Spanish agriculture, including the temporary grazing of herds coming from long distances and lower altitudes. Farmers in the Bogota Plateau were involved in the expansion of the pastures as the main land cover and the land use for livestock in the wetlands, and the construction of trenches and ditches for saving the water during droughts, draining of wetlands and diverting the river's course. Using the socio-ecological metabolism approach, this research emphasizes the importance of understanding the human appropriations of ecosystems and the limits of this process. Results contribute to the understanding of traditional farm system dynamics and offer lessons for more sustainable agrarian production in the region today.

1.2 The Region

The Bogota Plateau is in the center of Colombia, between 04°30′ y 05°15′N and 73°45′ y 74°30′W. It is a part of the Cundiboyacense High Plateau, one of the high plateaus in the Eastern Andes of Colombia (Fig. 1.1). The average altitude of the Bogota Plateau is 2600 m above sea level, but the mountains around reach 4000 m (Guhl 1970, 141). The Plateau was originated by fluvial (Bogota Basin) and lacustrine sedimentation because the lake that was over this land 10,000 years ago disappeared. Today, there are still many relicts of this ancient lake on the Plateau. For example, the lagoons *La Herrera*, *La Florida*, *Juan Amarillo*, or the swamps *La Conejera*, *El Burro*, *La Vaca*, *Capellanía* y *Jaboque* (Pérez Preciado 2000, 27).

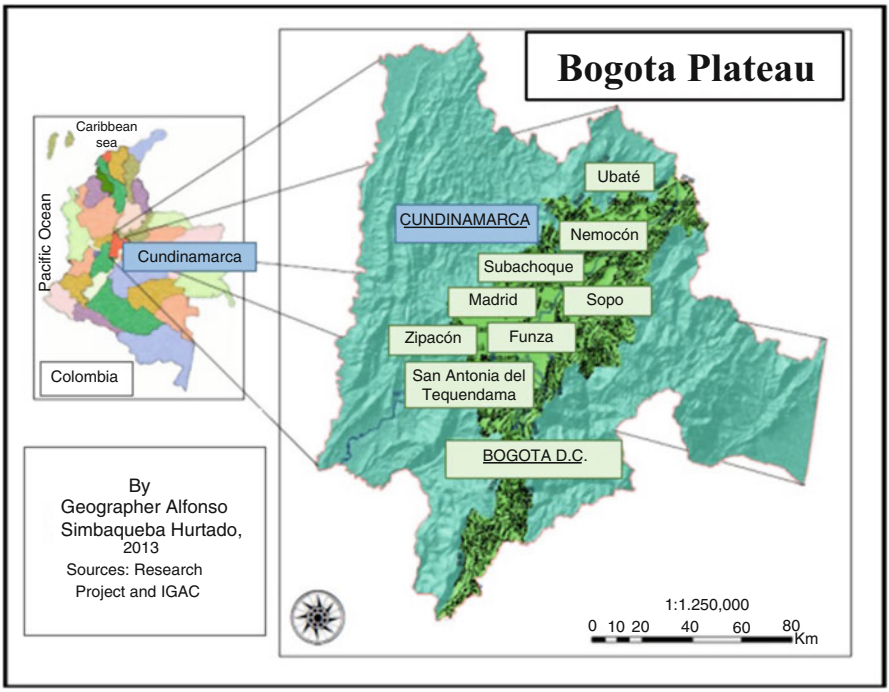

Fig. 1.1 Bogota Plateau location

The Bogota Plateau is characterized by a bimodal precipitation regime, with two annual rain periods (March-May and October-November) and two annual dry periods (December-February and June-August). The annual precipitation in the Plateau oscillates between 2000 mm in the East and 600–900 in the West, the driest area in the Plateau (IGAC 1996, 4:1950). In the flat area of the Plateau, the annual average temperature is 14 °C and its variation is less than 1 °C (IGAC 1996, 4:1949). The dry season, especially between December and January, is favorable to the phenomenon of frost, because the absent of clouds and winds induces, during the night and the early morning, the formation of an air layer thin on the lands, with temperatures below 0 °C, under another warmer air layer (Montañéz 1992, 82).

For this research, I selected the west of the Plateau. First, the precipitation in this area is far less than in the rest of the Plateau, ranging between 600 and 900 mm. However, the area is still much more vulnerable to flooding because of its mild inclination which directs rainwater to this zone and the overflows of the rivers, lagoons, and swamps. Second, this is the best documented area of the Plateau, with existing studies on the grasslands of Bogota, the Jesuit hacienda *La Chamicera* and five reservations (in Spanish, *resguardos*) called *Bogota*, *Bojacá*, *Bosa*, *Fontibón y Engativá*. Third, the selection is consistent with the cultural construction of the concept *Sabana de Bogotá* (is not a savanna ecosystem, but this name was given to the region in colonial times based on its flat appearance), used until the nineteenth century for name

the flat zone in the West near of *Funza*, the ancient Indian town named *Bogotá* (Rueda Vargas 1946, 10). Currently, the name *Sabana* is used for entire Plateau.

The current floods that periodically take place in the Plateau, especially in the years of La Niña, have frequently devastated cattle herds, potatoes and flowers crops. However, these are not the point of reference for analyzing the floods of 200–300 years ago. The channeling, drainage, and damming works since the half of twentieth century in the Bogota Basin, have changed the conditions of the rivers. The deforestation, the drainage and filling of wetlands, the spread of covered greenhouses used for growing flowers, and the paving of the capital city (that prevents infiltration of the rain into aquifers and promotes the runoff to the west of the Plateau), are the factors that increase the dimensions of floods. Apparently, before the nineteenth century, the overflows of the Funza or Bogota River, were not a great problem. On the contrary, these floods left silt behind which favored agriculture and livestock (Cordovez Moure 1893; Pardo Umaña 1946). The interest about the drainage of the wetlands in the Plateau started in the middle of the nineteenth century, with the introduction of eucalypt and myrtaceae, and due to a growing need for land agriculture (Pardo Umaña 1946; Pérez Arbeláez 1990; Palacio 2008). Before this process, how were used the wetlands of the Plateau by the farmers? What were the ways to deal the floods?

1.3 Specialization

The topographical obstacles and lack of resources to tackle distances to facilitate exchange, forced agrarian societies before the Transportation Revolution (during the nineteenth century with the steamboat and train) to ensure the supply with the crop diversity, the livestock and the fishing. In many cases, this strategy was useful to deal the fluctuation of the prices or the climate variability. In the case of the Bogotá Plateau in colonial times, several authors have described haciendas where corn, wheat, barley, and tubers (especially potatoes) were grown. Additionally, animals were raised on grasses and meat, milk, leather, sebum and wool was extracted from them. Those raw materials also were used for the manufacture of cheese, butter, candles, soaps, furniture, and tentacles of link, to sell in the local markets and, in this way, to increase the income (Gutiérrez Ramos 1998, 72, 75; Tovar Pinzón 1988, 194). Many of the beasts, were used for the plow and other agriculture functions because most cattle ranchers were also farmers (AGN, Policía, T.10, f.450v.).

However, this varied landscape implies the possibility of cultivating and raising everything that the altitude allowed, regardless the biophysical differences in specific areas in the precipitations levels or the wetlands location, which were known by the farmers of the colonial times due to tradition and the experience. At the same time, the description of highly diversified and self-sufficient haciendas is synonymous of autarkic economic, characterized by the absence of trade that, indeed and despite obstacles on the ways, existed.

Regarding these considerations, is possible to question, in the first place, the importance of cereal cultivation, especially wheat, in the center-west of Bogota Plateau. The

wheat production in the region was limited by the wheat cultivated in Tunja or imported from colonies of England, and by the environmental conditions, because the cloudiness and humidity, of the soil and the atmosphere, were an obstacle to harvesting grains with the quality proper of a native cereal of the dry lands in the Mediterranean Basin (Trujillo Peralta et al. 1990, 19, 38). In the Bogota Plateau commercial wheat production only was possible in the haciendas of *Canoas*, *Tequendama* and *Molinos* (Pardo Umaña 1946, 139, 182; Trujillo Peralta et al. 1990, 30, 60; Hamilton 1955, I:93). These areas were less susceptible to flooding of the Bogota River and its basin due to a little difference of altitude. The hacienda *El Novillero* or *Dehesa de Bogotá*, clearly for livestock purpose, although there was some land for cultivation of barley, corn and wheat for consumption in the same hacienda They also had a flour mill, but wheat was brought from the hacienda *El Tintal* in the opposite bank of the river (AGN, Miscelánea, T.141, f.100r.). In the *resguardos* inside the research area, the sources consulted show that only in *Bosa* the cereal cultivation was the first, while others like *Fontibón*, *Funza* and *Serrezuela*, had the livestock as the principal activity, even though cultivated subsistence crops (AGN, Caciques e Indios, T.63, ff.149r., 154r.; AGN, Visitas Cundinamarca, T.7, ff.1082v., 1083v., 1084v., 1086v.).

In general, the wetlands and the flooding areas in the Bogota Basin were lands characterized by livestock as principal use land. The feeding and rearing of pigs were easy when farmers lacked space or pastures, and this was the best option for the owners of floodplains. For example, in the swamps of hacienda *El Novillero* were raised more than 2,000 pigs per year (Gutiérrez Ramos 1998, 40, 41). However, the apparent difficulty of Bogota floods and the swamps, at the same time were a profitable option for the fattening cattle because the ranchers could find water sources and pastures enriched by silt. Even, were given conflicts between landowners and tenants or herdsman. The price of the land was more expensive where there were swamps, because the rancher thought that in the nearby areas were the best pastures and the cattle fattened more (AGN, Abastos, T.2, ff. 145, 146 y 150, 311r.).

Summarizing, it is possible to establish that, although the agricultural land use was a part of the subsistence for the people of the center-west area of Bogota Plateau, the climatic and pedological limitations for the crops, especially wheat, were reasons for an agriculture in the second place and concentrated in specialized areas where the floods were less frequents and the precipitation was lower. At the same time, the floods caused by the overflow of the Bogota River, the water runoff from the East of the Plateau and the multiplicity of wetlands in the region, stimulate the cattle ranching and, in general, the livestock, due to the food quality for the animals in pastures replenished by the silt, and the guaranty of a water source for the animals in the times of drought.

1.4 Altitudes Control

The control of the farmers of lands at different altitudes in the Andes has been an agriculture practice highlighted by several authors writing about pre-Hispanic times (Chonchol 1994; Murra 1972). The access in one or two working days to different

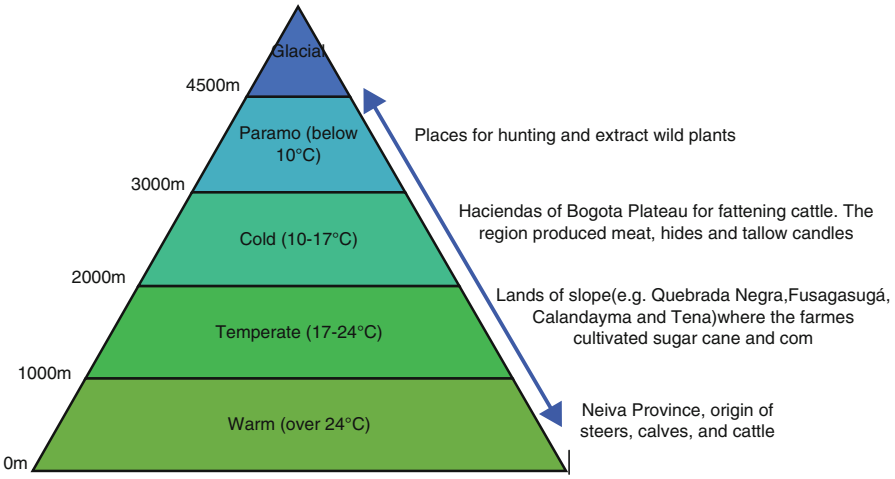

Fig. 1.2 Scheme of production and exchange between altitudes (Source: the author)

micro-climates, caused by altitude, was a guaranty of the varied diet. Controlling lands at different altitudes was a way to avoid shortages caused by hails, frosts,[1] droughts, floods or plagues (Fig. 1.2). Both mestizo and white landowners adopted this form of land management during the colonial era, as an alternative to commercial trade between 'cold land' and 'hot land'. The exchange not only occurred between the Plateau and hotter lands, but also with paramo[2] zones (over the 2,800 m, approximately), where the people hunted foxes and deer, obtained plants to making tools, and bred oxen (Rueda Vargas 1946, 12).

Some landowners in the Plateau, had properties in the hot lands, dedicated to livestock or cultivation of corn and sugar cane (to make molasses, *panela,*[3] and *guarapo*[4]). For example, Fernando Rodríguez, owner of *Las Canoas* hacienda, where he had 552 horses, 160 mules, 124 donkeys, 777 cattle and 2,117 sheep, and owner of *Quebrada Negra* (near *Las Canoas* but in lower and warmer lands), where he had a sugar cane mill and cultivated corn for consumption of his two properties (Tovar Pinzón 1988, 133, 134). Another case was *El Novillero* or *Dehesa de Bogotá*, the place of recovering and fattening for cattle of the warm and temperate lands that were used to the supply of Santafé[5] (Gutiérrez Ramos 1998, 72, 88). The final fat-

[1] In the Bogota Plateau, the frosts before sunrise are common during the dry season of December and January. The temperatures below 0 °C burn the grasses and crops. The frost are very strange bellow 2000 m. For this reason, who had lands in different altitude, had a kind of insurance to face frosts.

[2] Ecosystem of the inter-tropical mountains like the Colombian Andes. Its temperature is under 10 °C, its soils are acid and the more characteristic plant is the *Frailejón* (*Espeletia*).

[3] Solid block made of the juice of sugar cane.

[4] Fermented beverage.

[5] During the eighteenth century, was the capital of the Viceroyalty of New Kingdom of Granada. Currently its name is Bogota, the capital city of Colombia.

tening in the Plateau increased the earnings, important measure against loss caused by the transfer of the animals between lands with different temperature (AGN, Policía, T.10, f.445r.). This was a practice consolidated in late seventeenth century. In the years of the prolonged drought, 1694 and 1696, due to the insufficient cattle in the Plateau, agreements were signed with the ranchers of the Neiva Province (Magdalena River Valley, under 500 m), provide annually to the *Dehesa de Bogotá*, with 4,500 steers (AGN, Abastos, T.2, f.328). This demand remained throughout the eighteenth century and implied fines for those who evaded.

Fattening cattle in the pastures of the Bogota Plateau was a generalized practice which allowed landowners to take advantage of the difference of grasses, soils, temperatures and atmospheric humidity, practice in which the Jesuits were noted for their organization. The *Fute* and *Chamicera* haciendas, proprieties of the Jesuits until 1767, were used to feed the cattle from three of their haciendas in lowlands and increase the weight before of the selling in the butchers (Colmenares 1969, 77, 105).

In other cases, the control of different altitudes was possible inside the same property and the possession of separate allotments was not necessary for the owner. An example was the *Calandayma* hacienda, located on the western slope of the Eastern Colombian Andes, 60 km from south-west of Bogota, approximately, property of *Colegio Mayor de Nuestra Señora del Rosario* during seventeenth and eighteenth centuries. Apparently, *Calandayma* hacienda was not only in the temperate slope but also in a little portion of the Bogota Plateau. It is possible to suppose this extension because the hacienda produced sugar cane, a typical crop of the temperate level below 2000 m (Fig. 1.2), and its mills obtained 75,000–100,000 lb of sugar per year. At the same time, in the hacienda was possible to cultivate more than 800 ha of wheat and obtained 300 l of grain, approximately (Luque Torres 2009, 190).

The advantages of the altitude for the people of Eastern Andes and the Bogota Plateau were described by Gaspard Théodore Mollien, traveler who visited the center of Colombia in 1823. About his journey from Fusagasugá[6] to Bogotá (before Santafé), he highlighted the cornfields, sugar cane crops and coffee trees that he saw at 6 am, the shadows and mist in the middle of a Peruvian barks at 9 am, the incessant rain in the top of the mountains at 11 am, his slight decrease at 3 pm where he observed the fields cover with barley and pastures, and the long way of swamps to arrive in Bogota at midnight (Mollien 1992, 105).

1.5 Hydraulic Infrastructure

Public works were frequently undertaken in the Santafé region with the goal of incentivizing trade and improve transportation in a region prone to flooding. In addition, farmers and ranchers built structures to protect their investments against both the shortage and abundance of water. For example, when *Fute* hacienda was

[6] Village of Cundinamarca, located 60 km from south-west of Bogota.

sold after the expulsion of Jesuits in 1767, during the drought season of 1768–1769 its value increased because of the presence of wells, roads to cattle and zanhas (Tovar Pinzón 1988). The limits between *Chamicera* and *Bosa* and *tierras de Montes*, were marked by ditches (AGN, Tierras de Cundinamarca, T.27, ff. 5v., 6r., 7). In *El Novillero* there were some ditches canalizing water to the lands away to the wetlands and rivers, and at the same time allowed the movement of the mill (Gutiérrez Ramos 1998, 99). About one of those irrigation ditches and the *Cuatro Esquinas* ditches, during the drought of 1778, authorities ordered the Indians to build a derivation to conduct water to the reservation of Bogota (AGN, Visitas de Cundinamarca, T.7, ff.1085v.-1087r., 1094r.). Additionally, the Indians of Bogota had a dispute with the owners of *El Novillero* because they needed the water supply of the irrigation ditch called *Toma de San Patricio*. The conflict was resolved in favor of the Indians during the first years of the nineteenth century (Martínez Rico 1945).

Often, the construction of dykes, ditches, canals and reservoirs, was undertaken by personnel with minimal qualification. For this reason, the effective flood control was difficult and even the works multiplying the impacts. An example was the problem presented in the west of the Plateau during the floods occurred between 1775 and 1781. In several sectors, there were ditches functioning as fences, obstacles to the alien cattle or irrigation or drainage system, according to the season or the main economic activity (AGN, Mejoras Materiales, T.23, ff.2, 5, 10–17). However, this infrastructure that favored the agricultural production of some, harmed others because the floods and construction blocked roads used by traders and by passers. Although the authorities also confirmed that deteriorating roads were caused by the traffic of carriages and lumber transportation, in 1781 the Real Audience banned these spontaneous constructions.

However, based on the documentation available, it is possible to conclude that the measure was ineffective. An example of this occurred between 1798 and 1808 due to river Bojacá diversion that was constructed by the owner of *Fute* hacienda. Through the construction of palisades, he impeded that the Bojacá River discharged into the Serrezuela River, and its waters spilled into the swamp. The unauthorized work was unnoticed until the atypical rainy season of 1806 when the damming of the waters caused an unusual flood. The flow destroyed a bridge, and due to the aquatic plants, it completely covered the trenches that were used by evacuated the excess in the haciendas, and caused damages that affected the transport and the productivity of the *Dehesa* (AGN, Mejoras Materiales, T.9, ff.983r., 985r, 989, 1001–1004). Unfortunately, I have not yet found any information on the reversal of the river to its, but the course returned to normal (natural or anthropic way) because at present the Bojacá River flows into the Subachoque River (called Serrezuela too).

In synthesis, is possible confirm that the hydraulic infrastructure for agricultural purposes was constituted by ditches that allowed irrigation and supply of people and animals, both temporally (during a drought) and on a permanent basis in some locations. Ditches were also used to channel excess water in rainy season or decrease water levels in the swamp for the use of vegetation by livestock, ditches were constructed. The channeling of rivers by landowners was common in the west of the Plateau and

often profits generated in a property, were harmful not only to neighbors but also to transit to Santafé. The technical capacity to overcome water obstacles in the west of the Plateau was a constant problem faced by authorities and traders but was not the main concern of ranchers because they intentionally used flood areas.

1.6 Final Considerations

The success of those strategies, however, was limited when the months passed and the unfavorable meteorological conditions (especially prolonged rains that provoked floods) did not change. Lack or excess of water in areas and seasons were solved with the construction of ditches and canals, but it was an individual solution and was not a strategic plan and could harm others. The spontaneous works, the lack of infrastructure resistant to river floods, or the wasteful procedure each time that maintenance was necessary, were problems by a region that was not self-sufficient. The farmers also had the challenge of a high demand for meat in Santafé and its environs because it was the main food for all social strata. The supplies of meat, in part, depended on imports to replenish cattle stocks. The cattle from Neiva were without quality standards and the quantity was not according to requirements, despite sanctions. The main economic activity was, again in this case, a fundamental factor, since the lack of gold mining in the Plateau made it less attractive by its prices compared with Quito and Popayan Provinces and the efforts of the authorities to control the evasion to the supply of Santafé, in many cases were in vain. However, as far as the resources evident, those limits were not a cause of agricultural crisis. This is demonstrated by the lack of reports about famines or not need to build *Reales Alhóndigas* (public depositories of grain), a common practice in other viceroyalties, especially in New Spain (today Mexico). Raising livestock was the main driver of land use during the period studied and even today. This suggests that it has been a fairly stable economic activity which ranchers and farmers have been able to depend on.

There are questions to resolve by new researches with another temporal and special limits. For example, is relevant the inquiry about the impact of the climate variability in the areas obliged to supply Santafé and thus demanded a higher productivity. Currently, we still do not fully understand the relationship between Independence and agricultural production, nor how this may have been connected to food scarcity and inflation. Also, if the swamps were important for cattle ranching, what effect did fragmentation of the *Dehesa*, the *mayorazgos* (right of the firstborn to inherit the whole land), the lands of the Catholic religious orders, and the dissolution of reservations (*resguardos*) after Independence have on land use? The access to the zones of water reserves and to the crops in other altitudes could have been limited by the excessive fracturing of land rights. If so, how did farmers react to inclement weather? If the creole cattle were adapted to the wetlands in the Plateau, why were replaced in the second half of the nineteenth century by selected breeds imported from Europe? Those and other questions are waiting for future research of the Environmental History.

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Chapter 2
Modern Urban Development and Revolution in Mexico: Hydraulic Infrastructure in Chihuahua City During the Porfiriato (1892–1911)

Jaime R. Ruiz

The committee arrived at the dam…all members of the Municipal Council and the state governor received the President followed by the rest of the committee, who walked on the edge of the gigantic public work, hearing attentively an explanation about its construction given by Mr. Creel, who was very pleased about commander in chief's visit. ("Visita a la Presa," in El Gobierno del Estado de Chihuahua y la Junta Porfirista, Álbum de Chihuahua: Visita a Chihuahua del Señor Presidente, General Don Porfirio Díaz, Octubre de 1909 (Chihuahua, Chih.: Ayuntamiento de Chihuahua, Programa Editorial del Ayuntamiento de Chihuahua, 1993), 40, second section)

Excerpt of the review of President Porfirio Díaz's visit to the Chuvíscar Dam during his visit to Chihuahua City in October of 1909

Abstract This paper examines the development of urban infrastructure in the Northern Mexican city of Chihuahua during a period known as the Porfiriato (1876–1911), especifically on the administrations of Colonel Miguel Ahumada and Enrique C. Creel.

The main objective of this essay is to show how urban infrastructure in Chihuahua City not only benefited economic and political elites more than the population at large due to the cronyism present during its construction, but also generated significant debt prior to the outbreak of the Mexican Revolution. What began as

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projects for the modernization of the capital of the state of Chihuahua eventually became cursed. It was part of a difficult scenario that unfolded in this region years prior to the popular uprising, which included drought, economic crisis, and lack of funds from the state government to function according to its economic commitments to its citizens.

This paper highlights the need to analyze other parts of Mexico, especially the ones that received the benefit of modern infrastructure, and more importantly to examine whether this was another ingredient of the Revolution in the county as a whole. The sources for this essay include correspondence between state and local governments and citizens, as well as government reports of the state of Chihuahua, anti-government periodicals, ordinances, and unique books and manuscripts from this period.

2.1 Introduction

This paper examines the development of hydraulic infrastructure created between 1892 and 1911 in the city of Chihuahua during the regime of Porfirio Díaz, known as the Porfiriato (1876–1911). In Chihuahua, as in other strategically and economically important Mexican cities, like Mexico City, Guadalajara, Puebla, and Veracruz, among others, local authorities undertook a series of urban improvements, especially during the decades of the 1890s and 1900s. Specifically these improvements were related to water and sewer systems, the construction of hospitals, dams, parks, and the implementation of several health measures, like vaccination campaigns, control of prostitution, garbage disposal, and tree planting, to name a few. All of this was done as part of Porfirian policy to "modernize and urbanize" parts of the country.[1]

By focusing on what occurred in this northern Mexican city, this research will put into perspective the particular dynamics of this region compared to other parts of the country, helping to correct the fact that the area of Mexican urban history for this historical period has centered mostly on the experience of Mexico City. Specifically, it will focus on the hydraulic infrastructure created during the administrations of governors Colonel Miguel Ahumada (1892–1896, 1896–1900, 1900–1904, and 1911) and Enrique C. Creel (1904–1906 and 1907–1911), specifically the creation of the water and sewer systems, the construction of the Chuvíscar Dam, and the installation of filters to provide drinking water.[2] This essay shows how urbanization not only benefited elites rather than the population at large, but also generated significant public debt, which left the state government's coffers in a criti-

[1] Priscilla Connolly, *El contratista de don Porfirio*: *Obras públicas*, *deuda y desarrollo desigual* (México, D.F. y Zamora, Mich.: Colegio de Michoacán; Universidad Autónoma Metropolitana; Fondo de Cultura Económica, 1997), 22, 93–99, 104–105.

[2] Francisco R. Almada, *Diccionario de Historia*, *Geografía y Biografía Chihuahuenses*, tomo I (Chihuahua, Chih.: Ediciones del Azar A. C., 2008), 28–29, 181–182.

cal situation prior to the Mexican Revolution, which started in 1910 and overthrew the Díaz government.

This paper is part of the author's dissertation, which analyses other sanitary infrastructure and health measures applied in the city of Chihuahua, and in which he uses GIS and focuses on variables of class, gender, and climate, to better understand the creation of public works and the application of health measures in this part of Mexico. To better understand the modern hydraulic infrastructure created in Chihuahua City during the Porfiriato, the following section will briefly give background of this kind of infrastructure, which dates back to the Colonial period.

2.2 Origins of the Hydraulic Infrastructure in Chihuahua City

The origins of the city of Chihuahua date back to the latter part of 1709, when its first inhabitant, Juan Antonio de Trasviña y Retes, established his estate in the south part of town and built a smelter on the right side of the Chuvíscar River to process ore from nearby mines.[3] He also built an irrigation canal or *acequia* of limestone for his household and orchard needs, which also went across town to share water with the orchard of the Jesuit Order in the north, which was part of a compound that included a church and a school. This religious group was the town's moneylender during that time. It is important to point out that another section of the *acequia* went to his smelter which directed its contaminated flow in to the Chuvíscar River, where the majority of the town's population obtained its water. This situation continued for several decades, until 1747, when the authorities realized that the water in that part of the river was too contaminated and that there was a need to create adequate infrastructure for drinking water.[4] 1751 marked the beginning of the construction of an aqueduct to provide water to the city. After several years of raising enough funds for the continuation of this improvement, in 1768 the aqueduct reached the outskirts of town. It was not until 1778 that the water arrived at the town, specifically to the *Alameda Vieja*, or old city center grove, where it was distributed to the population through the first public fountain.[5]

The aqueduct was completed in 1854, but later in the century a series of improvements and expansions took place. A communal irrigation canal or *acequia* was built to provide water to the inhabitants of Chihuahua City through intermediate fountains and, at the same time, a network of canals was implemented, which ended up

[3] Almada, *Diccionario de Historia*, tomo II, 345 and Chantal Cramaussel, "La villa de San Felipe el Real de Chihuahua en el siglo XVIII. El plano de 1722 y la conducción del agua", in Jesús Vargas Valdés, coord., *Chihuahua horizontes de su historia y su cultura*, tomo I (México, D. F.: Grupo Editorial Milenio, 2010), 64–65.

[4] Cramaussel, "La Villa de San Felipe el Real," 65–67.

[5] Francisco R. Almada, *Guía Histórica de la Ciudad de Chihuahua* (Chihuahua, Chih.: Gobierno del Estado de Chihuahua, 1984), 358–359.

at well-established public fountains. In the early Porfiriato in the 1880s, metal pipes started to be installed, although it is not clear if this was the origin of water piping in the city. It is said that slowly the auxiliary canals and fountains started to disappear, but in the case of the latter this was not the case, as we will see later in the section related to the infrastructure built during Governor Creel's administration.[6]

2.3 Infrastructure by Governor Ahumada

From 1894 to 1910, during the terms of governors Ahumada and Creel a series of hydraulic projects established the basis of the city of Chihuahua's modern infrastructure. Governor Miguel Ahumada was part of a group of political figures closely allied to President Díaz during the time that political stability, economic development, and centralization and professionalization of government functions were sought in places like the northern state of Chihuahua. Ahumada was good at administering the state government, progressive, and a promoter of urban infrastructure and education in this part of the country.[7]

One of the most important public works projects during his term was the implementation of the water system in Chihuahua City. The initial idea for this improvement dated back to the early 1880s and it was completed in 1898.[8] Governor Ahumada justified such improvement for the following reason: "The water, as is well known, flowed through an open and narrow canal [*acequia*] in its entirety, exposed to the elements, where the animals drank water and the laundry was still practiced, so it was common that germs of various diseases were dragged into its current. For this reason, and to avoid the loss or reduced flow of those waters, especially in the strong summer season, the executive decided to pipe them."[9]

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[6] Ibid., 360–362 and Jesús Roberto Durán G., *Chihuahua*: *El vital líquido a través de los tiempos* (Chihuahua, Chih.: Universidad Autónoma de Chihuahua, 1995), 70–71.

[7] Carlos González, Chantal Cramaussel and Salvador Álvarez, *Miguel Ahumada*: *el gobernador porfirista*. Serie Chihuahua: las épocas y los hombres (Chihuahua y Ciudad Juárez, México: Gobierno del Estado de Chihuahua; Universidad Autónoma de Ciudad Juárez; Meridiano 107 Editores, 1992), 7, 46, 54. For further biographical information about Ahumada consult Francisco R. Almada, *Gobernadores del estado de Chihuahua* (México, D.F.: Imprenta de la Honorable Cámara de Diputados, 1950) and Ulises Irigoyen, *Miguel Ahumada*: *gobernante educador* (Chihuahua, Chih.: Secretaría de Educación y Cultura del Gobierno del Estado de Chihuahua, 2001).

[8] Miguel Ahumada, *Memoria de la Administración Pública del Estado de Chihuahua presentada a la legislatura del mismo el 4 de octubre de 1900 por el Gobernador Constitucional* (Chihuahua, Chih.: Oficina Tipográfica del Gobierno, 1900), 7.

[9] Gobierno del Estado de Chihuahua, *Memoria de la Administración Pública del Estado de Chihuahua presentada a la legislatura del mismo por el Gobernador Coronel Miguel Ahumada* (Chihuahua, Chih.: Imprenta del Gobierno en Palacio, 1896), 15–16.

Before this improvement, Chihuahua City suffered more health risks, and its inhabitants had to rely on boiling or distilling the water.[10] After piping the water only few people received the benefit of this kind of infrastructure, and the majority had to get its water from public fountains in the city, which was even more likely to be contaminated because the fountain itself was exposed to many people, animals, and the elements, and it was said that they were a source of spreading diseases among people in cities and villages.[11] Moreover, for the period analyzed in this essay, Chihuahua City received most of the benefits of infrastructure in the state of Chihuahua. Governor Ahumada justified such actions by arguing that the state capital concentrated the majority of the population of the region and therefore the greatest risk from the spread of diseases.[12]

The impact of the implementation of the water system can be seen in various aspects. Analyzing the Code for the Use and Distribution of Water of 1894 we see a "strict control" of various issues, such as the installation, specific materials, and the thickness of pipes in and outside of houses and other buildings, and at the same time the requirement that these installations be done by licensed professional plumbers, and the time of the day in which people could use water and the price for this service.[13] At the same time, this code stated that first of all the needs of water tenants would be covered – that is, the needs of owners of houses/estates and commercial properties. After covering those needs, the rest would be used to irrigate orchards, many of them with water concessions previous to this code.[14]

Despite the intentions to regulate various aspects of this service there were several problems in the water system. It became well known that there was a water availability problem in some parts of the city, and this had to do with the fact that public and private gardens (located in downtown), orchards or cultivated lands, and commercial and industrial establishments (specifically a carbonated water factory, a brewery, hotels and boarding houses) were consuming excessive amounts of water affecting home/estate owners who did not have enough water to cover their needs.[15]

Water scarcity also occurred with the majority of the citizens, especially of the lower classes. It is know that in 1907 only two public fountains were in service for poor people and they were far from where they lived. In some cases part of this segment of the population had to get water from *acequias* in which they had to rely on

[10] Durán G., *El vital líquido*, 72.

[11] *El Correo de Chihuahua*, December 23, 1903, 3, citing *El Contemporáneo* newspaper from San Luis Potosí.

[12] Ahumada, *Memoria de la Administración Pública* (1900), 7.

[13] Gobierno del Estado, *Memoria de la Administración Pública* (1896), 125–127.

[14] Ibid., 128.

[15] *El Correo de Chihuahua*, May 20, 1902 and June 8, 1908,1. There was even reports that the water scarcity affected a school, the *Escuela Modelo*, having no water to drink and for flushing toilets.

its availability depending on the owners of the orchards willingness to release enough water for their consumption. There was also information that lower class people also got access to water from the aqueduct on the outskirts of the city.[16] On some instances, tenement houses or *vecindades*, were many people lived had access to water for an hour or half an hour per day, in which they were only allowed to gather one or two buckets per family for their basic needs, that not included their hygienic needs and only gave them time to flush toilets.[17] Also, at the end of the Porfiriato there are accounts that densely populated neighborhood *del Pacífico*, near downtown, had problems of water availability in the summer even though it had a water system and its inhabitants had beg for water from houses in other parts of the city to fulfill their basic needs of cooking and drinking.[18]

Furthermore, from the implementation of the new water system until the end of the Porfiriato, it was common to have water leaks because of the poor installation of pipes both in and outside of the properties that enjoyed this public service. In 1911, the new revolutionary local authorities came into the conclusion that there was water scarcity especially during the summer and they related this to problems in the installation and the connection of pipes since they noticed that there was still great water consumption during the nighttime.[19] This might had to do with the existence of a number of plumbers not trained to perform the installations. The problem was exacerbated by immoderate water use by homeowners and malfunctioning toilets, in addition that many installations did not meet the specifications of the thickness of the pipes and the existence of illegal/clandestine water service connections throughout the city.[20] Putting into perspective the types of problems encountered in Chihuahua City with this public service, it is known that in U.S. cities of that time, a series of measures were carefully calculated when designing the water and sewer systems, which this does not mean that they might have had these same challenges. It is also important to mention that modern urban infrastructure was in a lot of ways a process of trial and error in many cities throughout the world.[21]

Who really benefited from this service? The Code for Use and Distribution of Water of 1894 gives us some insight on it. First the water system customer had to pay fixed amounts in advance. There were three types of fees according to the value of the properties: A (first class estates whose value was $4,000 pesos and up): $4.00; B (second class estates, worth between $2,000 and $3,999.99 pesos): $ 3.00; C (third class estates, whose value would not reach $2,000 pesos): $2.00; and D (Hotels, lodging houses, baths, boarding houses, horse boarding places, and indus-

[16] *El Correo de Chihuahua*, September 28, 1907, 1 and March 27, 1908, 1.

[17] *El Correo de Chihuahua*, June 4, 1907, 1 and April 22, 1908, 2.

[18] *El Correo de Chihuahua*, June 8, 1908, 1.

[19] *El Correo de Chihuahua*, August 4, 1911, 1.

[20] *El Correo de Chihuahua*, August 14, 1911, 1; June 6, 1908; and Archivo Histórico Municipal de Chihuahua, Fondo Porfiriato y Terracismo, Sección Tesorería (1906), Caja 122, Expediente 12.

[21] Consult Martin V. Melosi, *The Sanitary City*: *Urban Infrastructure in America from Colonial Times to the Present* (Baltimore, MD: Johns Hopkins University Press, 2000).

trial and manufacturing establishments): $ 0.25 per thousand liters.[22] On October of 1902 these rates were lowered with the intention that more people had access to this service a $1.00 less on the type A, B, and C properties. There were new categories: 30 cents per month per room on *vecindades* and *presidios* with one or two faucets; houses under construction, hotels, baths, lodging houses, horse boarding places, and industrial and manufacturing establishments would have to install at their own cost water meters and per 15 cents per ten thousand liters; and gardens that did not exceed 400 m^2 will have to add also water meters and pay 10 cents per thousand liters.[23]

Analyzing this information, it is evident that only a certain sector of the population could afford to pay for water. According to a governmental report of 1890 the public fountains were the main source where the majority of the inhabitants of Chihuahua City obtained their water, and like it was mentioned before, on 1907 only two fountains were functioning so the lower classes also got their water from *acequias* and the aqueduct on the outskirts of the city.[24] From the end of the 1880s no new public fountains were built, until the last Governor Creel's administration, from 1908 to 1910, during which 11 public fountains were implemented, along with several hydrants to extinguish fires and other devices to water public gardens.[25] The majority of the population of the city had to rely for a long time on the existing public fountains, despite the numerous improvements made during the last two decades of the Porfiriato. A state government publication of 1910 stated that of the 7,669 houses in the city, only 1,265, or 16.5 %, had piped water and 685, or 9 %, had sewer. Complementing this information the report mentioned that only "the main ones (houses), the largest, were the ones that had these services," verifying one of this essay's main argument that a certain class of people benefited from this kind of infrastructure.[26]

It is also important to point out that this modern water system and the sewer system covered what was considered at that time the most important part of the city, that is, the houses/estates and businesses of the elite families that were located mostly in downtown, that later were expanded during Governor Creel's administra-

[22] Gobierno del Estado, *Memoria de la Administración Pública* (1896), 126.

[23] *El Correo de Chihuahua*, August 26, 1902, 1.

[24] Durán G., *El vital líquido*, 73.

[25] Gobierno del Estado, *Informes que los gobernadores del estado de Chihuahua han presentado ante el Congreso del mismo, desde el año de 1849 hasta el de 1906* (Chihuahua, Chihuahua: Imprenta del Gobierno, 1911), 38, informe del Gobernador Creel del 1 de junio de 1909 and various files from the Archivo Histórico Municipal de Chihuahua, Fondo Porfiriato y Terracismo, Sección Tesorería from the years 1905–1909, and from this same archive Fondo Revolución, Sección Tesorería, from the years 1910–1911.

[26] "La Presa del Chuvíscar" in El Gobierno del Estado y la Junta Porfirista, *Álbum de Chihuahua: Visita a Chihuahua del Señor Presidente, General Don Porfirio Díaz, Octubre de 1909* (Chihuahua, Chih.: Ayuntamiento de Chihuahua, Programa Editorial del Ayuntamiento de Chihuahua, 1993), 81, first section. It is not clear if this statistical information is before or after the last projects of water and sewer expansion done the last years of the Governor Creel's administration.

tion. Moreover, a specific file demonstrated that Governor Ahumada's private residence was granted an exemption from paying for water service for as long as he remained the owner of this property, demonstrating the existence of privileges among powerful members of Chihuahua City's society.[27] Later when water charges were changed from fixed rates to mandatory ones according to water meters on all properties especially after the construction of the Chuvíscar Dam in 1908, with the argument that the city would increase its income and also by that way there would be a more precise charge for this public service, privileges continued during the last years of Governor Creel's government since it was known that not all the houses had water meters and at the same time the political chief's house had this device but it was not in use.[28]

Two other important improvements were implemented during Governor Ahumada's administration, the sewer system (1898) and a filtration plant, which according to a state government report was the first of its kind in the country and was capable of purifying 1 million gallons of water daily, eliminating 90 % of "bacteriological substances."[29] These kinds of benefits that the state capital received reduced diseases significantly, especially during summer.[30] Latter it was known that the city's water was a cause of gastrointestinal among its population especially affecting the lower classes. When the water rose during the rainy season, the Chuvíscar River, that provided water to the city, it was common that dirt/soil was present on the water system being blamed for the health effects on the citizens. There were other reports that sediment of "organic matter" was present in the aqueduct, the filters, and the piping system. At the same time, there was information that the water filters were not functioning properly or they were not enough to stop this problem since the houses were getting "a blackish liquid" during the morning, and those who could afford to have their own house filters available at that time, might have been less prone this problem or health risks compared to the majority of the city's inhabitants.[31]

Finally, another infrastructure benefit for the state capital was the new Porfirio Díaz public hospital inaugurated in 1907. Governor Ahumada's expenditure on hydraulic and sanitary infrastructure, including the public hospital, was at the

[27] Archivo Histórico Municipal de Chihuahua, Fondo Porfiriato y Terracismo, Sección Tesorería (1903), Caja 98, Expediente 9.

[28] *El Correo de Chihuahua*, April 14, 1908, 2, October 6, 1909, 1–2, and March 3, 1911, 1, 4. After the outbreak of the Revolution, the use of water meters was cancelled, because it was not considered fair for the users. It became known that before that there were houses that had fixed rates and other ones were charged according to water meters, violating the ordinance that made mandatory to pay according to the reading on the water meters.

[29] Ahumada, *Memoria de la Administración Pública* (1900), 7.

[30] Ibid., 100.

[31] *El Correo de Chihuahua*, December 12, 1903, 1; September 9, 1904, 1; April 19, 1905, 1; June 26, 1905,1; July 28, 1905, 1; September 20, 1905, 1; and October 3, 1905, 1.

amount of $354,000. During that same period a lavish $656,000 theater was built.[32] So analyzing these expenditures, we see that the state government started to invest large sums of money on infrastructure that was not necessarily intended for the basic needs the population of the city as a whole. The water and sewer systems of the city of Chihuahua were not expanded much during Governor Creel's administration, although there was a state government discourse more less a decade after their creation that they needed to be expanded, especially after the construction of the Chuvíscar Dam, which increased the water availability to the city's citizens. The second part of this essay will focus on this and other urban improvements.

2.4 Infrastructure by Governor Creel

Enrique Cuilty Creel was the son-in-law of Luis Terrazas, the latter the most important chieftain or *cacique* and landowner in the state of Chihuahua. He came to power as interim governor from 1904 to 1906, and as absentee governor from 1907 to 1911, since he was assigned to key overseas positions by President Díaz. He is portrayed as orderly and methodical in his personal duties and in government, a self-taught, "self-made" man, and skillful in finances. Creel is known for having implemented in Chihuahua a series of laws and codes, for the construction of public works, and for emphasizing public education.[33]

Undoubtedly the most important infrastructure project during his administration was Chuvíscar Dam, which initially was the idea of Governor Ahumada. In 1909 it was mentioned that many of the public infrastructure done during the Creel administration were the continuation of some that were planned the during the time Ahumada was governor, which they were not finished on time or because lack of sufficient funds that needed to be assigned to finish other ones. According to a state government publication the dam was built with the intention to fulfill the needs of a growing population and hygiene, for which there was a need for a bigger water reservoir to meet the demand.[34] The dam was constructed by McQuatters and Shepherd at a cost of nearly $900,000 pesos, almost three times more than budgeted. The governor justified the cost overrun by indicating that when the construction started they encountered that the dam was located in a large sand deposit, so the foundation had to be constructed from concrete. Governor Creel argued that this dam would be enough to supply water to 80,000 people, approximately double the

[32] Ahumada, *Memoria de la Administración Pública* (1900), 21–22, 107; Gobierno del Estado, *Informes que los gobernadores del estado de Chihuahua*, 420, informe del Gobernador Ahumada del 16 de septiembre de 1901 and Almada, *Diccionario de Historia*, tomo II, 318–319.

[33] Almada, *Gobernadores del Estado de Chihuahua*, 438–439, 441 and Un amigo de la verdad, *Don Enrique C. Creel*, *el hombre y el estadista*, 1907, 9–11, located in Archivos y Colecciones Especiales (Sala Chihuahua) of the Instituto Chihuahuense de la Cultura in Chihuahua City.

[34] "La Presa del Chuvíscar," 79 and *El Correo de Chihuahua*, August 21, 1909, 2.

population of the city at that time, for household and public hygiene purposes, and also to water parks, gardens, and to clean streets. He acknowledged that the city's water system was not extensive enough for the amount of water that this dam could provide, so he considered it necessary to change this situation.[35]

Before the dam started to be constructed, specifically in 1903, in the brief term of governor Luis Terrazas, it was mentioned that this improvement would not involve raising taxes and savings would be sought as much as possible with a cost of $500,000 pesos plus compensations for owners of land and structures were the dam was going to be built. Going along these lines, during that same time, the original $300,000 cost was raised by $200,000 because there was a need to build auxiliary dams and improvements to be implemented to the aqueduct. In 1905 the Federal government sent an engineer to evaluate the costs of the dam and he calculated that it could build with a minimum of $160,000 and a maximum $300,000 pesos. In 1906 the engineer William A. Bird was given the first contract to construct the dam, but that same year with no clear reasons he was compensated for costs he incurred, and the project was awarded to McQuatters and Shepherd with the already mentioned increase of 300 % to what it was originally estimated.[36]

Also, before its construction, specifically in 1903 and 1904, the site was said not to be adequate for the project because of health concerns related to the risk of organic matter from live and animals that died from droughts or hail storms which would end up in the dam reservoir basin. Closely related to this was another problem that was foreseen as a result of the rise of river waters during the months of August to October that might surpass the 5 million cubic meters of the planed reservoir of the dam that could well have end up in a disaster. It was also argued that the sedimentation caused by the accumulation sand and vegetation on the bottom of the dam, would eventually become a major problem with an annual cost between $60,000 and $87,500 to combat this situation that would increase expenditures as time passed, eventually surpassing the total cost of construction of the dam. So that being said, this public project was condemned to be a failure.[37]

The Chuvíscar Dam was inaugurated on September 15, 1908 and on the summer 1909 and years after that it was providing the city with bad quality water. There

[35] Gobierno del Estado de Chihuahua, *Informe del Gobernador Constitucional de Chihuahua*, *C. Enrique C. Creel*, *al H. Congreso del Estado*, *16 de septiembre de 1908* (Chihuahua, Chih.: Imprenta del Gobierno, 1908), 12–14; Gobierno del Estado, *Informes que los gobernadores del estado de Chihuahua*, 12–14, informe del Gobernador Creel del 16 de septiembre de 1908; and "La Presa del Chuvíscar," 82.

[36] *El Correo de Chihuahua*, October 14, 1903, 2; January 10, 1909, 1; December, 20, 1908, 1; and August 21, 1909, 2. This seemed to be a common practice during Governor Creel's administration, since it was reported that the Central Police Station's cost was 500 % more than it was originally estimated and this also happened new Municipal Palace. In both of them the cost of doors and ceilings were not budgeted in the original estimate.

[37] *El Correo de Chihuahua*, January 30, 1904, 2; November 5, 1903, 2; November 18, 1903, 2; November 29, 1; and December 6, 1903, 2.

were reports that the city was getting smelly, muddy, and contaminated water that could not be filtered, as a result of a "floating animal cemetery," animal waste from nearby estates that milked cows, and trash that accumulated on the dam's reservoir basin like it was adverted on previous years. This water was also causing intestinal illness to the city's population.[38] The authorities said the presence of suspended particles in the city's water was possibly from "aquatic plants." Information not available publicly indicates that the state government authorized the spread of "chemical materials," specifically copper sulphate according to a newspaper article, to combat this problem. Governor Creel also ordered an increase from 4 to 10 in the number of filters required for water purification and the installation of sediment tanks to solve this situation, but still with these measures it did not solve the problem.[39]

Because of this situation drastic measures had to be taken to clean the dam. The dam's reservoir basin was emptied and cleaned per the orders of the State's Health Department. As a result, water had obtained from water holes of the Chuvíscar, wells, and using water wheels on the site of *del Mortero* with the objective of fulfilling the needs of the population and be sent to the aqueduct and from there to city's water system. This department also ordered that the water from the dam would be used for the sole purpose of maintaining a clean sewer system and cancelled all watering of orchards with the water from the dam. It also gave the authority to the political chief to open or close the dam's floodgates with the purpose of having control of the water quality after having raising waters during heavy rains.[40]

These measures did not solve the problem having the most impact on people that were not connected to the water system, and the ones that were connected, some of them had the inconvenience of paying for the service and the *aguadores* or the people that had the occupation of transporting water. The State Health Department's engineers in a desperate attempt to solve the water quality situation ordered to cut down 300 trees near the Chuvíscar Dam, with the justification that "the vegetation was the source of bad water quality." After measure was taken local media informed this situation and governor and political chief ordered to stop the tree cutting on both riverbanks. During this time it was well known that the water from the dam was not potable and it only could be used to keep a clean sewer system.[41]

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[38] Almada, *Diccionario de Historia*, tomo II, 201 and *El Correo de Chihuahua*, June 18, 1909, 1, 4; June 19, 1909, 1; June 20, 1909, 1; June 22, 1909, 1; and June 24, 1909. 1.

[39] Archivo Histórico Municipal de Chihuahua, Fondo Porfiriato y Terracismo, Sección Tesorería (1909), Caja 132, Expediente 7; Gobierno del Estado de Chihuahua, *Informe leído por el C. Gobernador Constitucional del Estado*, *Enrique C. Creel*, *el 16 de septiembre de 1909*, *en la inauguración de sesiones de la XXVII Legislatura* (Chihuahua, Chih.: Imprenta del Gobierno, 1909), 8; *El Correo de Chihuahua*, June 18, 1909, 1,4, and June 22, 1, 4.

[40] *El Correo de Chihuahua*, June 26, 1909, 1.

[41] *El Correo de Chihuahua*, August 8, 1909,1; October 6, 1909, 1, 2; October 29, 1909, 1.

It is not clear how the inhabitants of Chihuahua City managed to deal with this water quality problem, still there were reports that it continued well after the revolutionary uprising of 1910. Specifically on the summer of 1911 it is mentioned that there were some days that some parts of the city only had between 1 and 2 h of service, in which the "muddy water" could only be used for cleaning purposes and not for drinking. Moreover it was argued that since the construction of the dam the city was condemned to have lack of water and intestinal illnesses. During the time of the first interim state government after the outbreak of the revolution, it was mentioned that with the great demand of water that existed during this period there was a need of complementary infrastructure in the dam and filters to better deal with the water quality situation. Meanwhile the problem was confronted with the cleaning of the aqueduct and the tanks that stored the water, and by opening and closing the dam's gates depending of the rise of the waters during the rainy season.[42] The problems encountered by the Chuvíscar Dam might have had to do with the fact that it was not properly planned or built, since at that time there was not much experience in the construction of this kind of improvements, although in this same period this kind of infrastructure was being built in the United States and other parts of Mexico.[43]

The last improvements during Creel's administration were the expansion of the water and sewer systems on the densely populated neighborhoods of *Santa Rosa* and *del Pacífico*, and the paving of some streets, all of them near downtown, which cost $600,000, putting more pressure on the working budget of the state.[44] There were also reports during this time that the sewer system suffered from problems of clogging and overflowing in which the population was exposed to health risks because it sometimes flowed to several adjacent streets and even there are reports of getting to the city's main plaza were there was a large concentration of people, so constantly had to be cleaned and unclogged. This problem continued after the revolution of 1910.[45]

During the last years of the Creel administration there were citizens willing to pay part of the infrastructure expansion, but according to government responses, not even with the citizens' contributions could the state treasury afford it since there was

[42] *El Correo de Chihuahua*, June 24, 1911, 1 and July 1, 1911, 1.

[43] Martin V. Melosi, *Precious Commodity*: *Providing Water to America*'*s Cities* (Pittsburgh, PA: University of Pittsburgh Press, 2011), 78–109.

[44] Gobierno del Estado de Chihuahua, *Informe leído por el C. Gobernador* (16 de septiembre de 1909), 19.

[45] *El Correo de Chihuahua*, November 11, 1907, 1; January 18, 1908 1; August 25, 1911, 1; and November 26, 1909, 1. As an interesting note, it was said that in 1909 when the city sewer system was being expanded it was known that company that got the contract, it was not paying laborers as it was agreed and there were no clear instructions on who the work should be done, being said that that might have had future repercussions on the quality of this infrastructure.

no money left in the budget.[46] The majority of the urban improvements were inaugurated to mark the Centennial Celebration of Mexico's Independence and together they cost $1,290,000, with the exception of the Chuvíscar Dam.[47] To put this kind of spending into perspective, the state government's revenue via taxes was between $950,000 and $1,500,000 from 1904 to 1909, so we can imagine what kind of pressure this type of expenditure put on the treasury, since it amounted to a whole year of working budget for the State of Chihuahua.[48]

Despite the poor economic conditions in Chihuahua that started with the global economic crisis of 1907, the state government continued to acquire debt for urban improvements and other public works largely undertaken in the state capital. Governor Creel justified them by claiming that "they were a great help for the worker and commerce of this city … during the height of the economic crisis."[49] Finally it appears that Creel's personal and political commitments resulted in this great indebtedness in the state of Chihuahua, an amount that was approximately $900,000 pesos at the start of his administration and at the end of his term had more than tripled.[50]

During the 1890s the Creel-Terrazas family banks owned half of Chihuahua state's debt, and from 1903 to 1910 these banks financed the loans for some of the public works discussed above. During the short governorship of Luis Terrazas in 1903–1904 and then later Creel's two stints in office, the state government requested most of its loans from the *Banco Minero de Chihuahua*, an entity in which Creel was founder, general manager, and shareholder. This could be said to be a conflict of interest, although he resigned from this position when he became governor in 1904 when he replaced Terrazas.[51] In the months right after the revolutionary upris-

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[46] Archivo Histórico Municipal de Chihuahua, Fondo Revolución, Sección Secretaría (1910), Caja 4, Expediente 16.

[47] Gobierno del Estado, *Informe del Gobernador Interino Constitucional*, *C. José María Sánchez*, *al H. Congreso del Estado* [16 de septiembre de 1910] (Chihuahua, Chih.: Imprenta del Gobierno, 1910), 19.

[48] Gobierno del Estado, *Informe leído por el Gobernador Constitucional del Estado*, *C. Enrique C. Creel*, *el día 1 de junio de 1909*, *en la apertura del 2° periodo de sesiones ordinarias de la XXVIa. Legislatura*, *correspondiente al último año de ejercicio* (Chihuahua, Chih.: Imprenta del Gobierno, 1909), 23 and Gobierno del Estado, *Informe leído por el Gobernador Interino Señor José María Sánchez*, *el día 1 de junio de 1910*, *en la apertura del 2° periodo de sesiones ordinarias de la XXVIIa. Legislatura* (Chihuahua, Chih.: Imprenta del Gobierno, 1910), 25.

[49] Gobierno del Estado de Chihuahua, *Informe del Gobernador Constitucional* (16 de septiembre de 1908), 15 and Gobierno del Estado de Chihuahua, *Informe leído por el C. Gobernador Constitucional* (16 de septiembre de 1909), 18–19.

[50] Almada, *Gobernadores de Chihuahua*, 443.

[51] Gobierno del Estado, *Informe leído por el Gobernador Interino* (1 de junio de 1910), 26; Gobierno del Estado, *Informe del Gobernador Interino Constitucional* (16 de septiembre de 1910), 19; Gobierno del Estado, *Informe del Gobernador Interino Constitucional*, *C. Coronel Miguel Ahumada*, *al H. Congreso del Estado. 1 de junio de 1911* (Chihuahua, Chih.: Imprenta del Gobierno, 1911), 3; Almada, *Diccionario de Historia*, tomo I, 181 and tomo II, 332; *El Correo de*

ing in Chihuahua it was informed by the local media that it was priority for the different municipalities around the state to pay the interests of the debts they had with the *Banco Minero*, even if it meant sacrificing the salaries of the municipal employees. It was also mentioned that the majority of the debt acquired during the Creel administration was with this bank and Luis Terrazas, with interests of 8–10 %.[52] In the summer of 1911 the specifics of the state's debt were almost half a million pesos owed to the *Banco Minero*, and the same amount on subsidies to railroads, specifically to the *Chihuahua al Pacífico* railroad. Another considerable amount of debt was the one represented by the money owed by the municipalities of Chihuahua, Hidalgo del Parral, and Ciudad Juárez, an amount of almost $1,700,000 pesos.[53]

2.5 Conclusion

Summarizing the impact of the modern hydraulic infrastructure in the city of Chihuahua we saw that it had many limitations. The water system experienced problems by not providing water to all parts of the city. The sewer system had problems of clogging and overflowing. Neither system was sufficient for the needs of all of the city's citizens. Furthermore, water quality was not adequate for drinking before and after the construction of the Chuvíscar Dam, despite the fact of the existence of water filters and chemical substances were spread in the dam.

That being said, I do not downplay the creation of the modern hydraulic infrastructure for the state capital of Chihuahua by the two governors that I analyzed for this essay. What I question is who really benefited from this infrastructure. It is evident that investment in the water and sewer system, and dam were not justified, given that from the beginning the city did not have the infrastructure to deliver its benefits to the majority of its citizens on equal terms. At the same time, I want draw attention to state municipalities' contributions for these kinds of projects for the benefit of Chihuahua City via taxes/contributions and eventually other areas of the state did not receive infrastructure that compared to that of the state capital, which it is evident on the state government reports from 1892 to 1911.[54]

It will be important to further analyze as part of the continuation of this essay what was the plan of the economic and political elite of the state of Chihuahua for portraying its capital as a modern, clean, and disease free city, taking in to consid-

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Chihuahua, April 5, 1905, 1, 4; and Mark Wasserman, *Capitalistas*, *caciques y revolución*: *la familia Terrazas de Chihuahua*, *1854–1911* (México, D.F.: Editorial Grijalbo, S.A., 1987), 121–122. According to this last source the interest that came from the loans to the government of the state of Chihuahua permitted that the banks from the Creel-Terrazas family to survive the world economic depression from 1907 to 1909.

[52] *El Correo de Chihuahua*, March 17, 1911, 1; June 8, 1911. 2, 3; and July, 17, 1911, 1.

[53] *El Correo de Chihuahua*, June 8, 1911, 2–3.

[54] For specific information about this issue consult Gobierno del Estado, *Informes que los gobernadores del estado de Chihuahua*.

eration that by 1908 the American Guggenheim family established one of its most important smelters near Chihuahua City, known as *Fundición de Ávalos*.[55] Further research will demonstrate if the Chihuahuan oligarchy was trying to attract more foreign investment and immigration to the state.

At the end what started as a group of projects for the modernization of Chihuahua City eventually became a burden for the state coffers. This was only part of a more difficult scenario that started to unfold in the state of Chihuahua. External factors like drought and the world economic crisis also had a role in limiting the ability of the state government to fulfill its commitments to its citizens. In any event, the state treasury might not have the money or will to ameliorate the hunger and misery that hit the masses prior to the outbreak of the Mexican Revolution. Also, a tax increase in 1908 was another factor that contributed to the popular discontent especially among the middle class years prior to the armed conflict in this region. This tax increase was related to property taxes which specifically affected homeowners and merchants who had to pay three or four times more. The other tax increase ranged from 3 % to 1,000 % on an array of things. These measures caused criticism since it was well known that important companies received tax exemptions from 5 to 40 years and at the same time the upper classes contributed minimally via taxes.[56] This last government measure might have been a desperate attempt to balance the Chihuahua state's treasury.

Governor Ahumada returned as interim governor in January 1911, after the outbreak of the Mexican Revolution in Chihuahua.[57] He reported that the state had a budget of around $1,700, and "justified this situation," arguing that it was a result of the cost of the war and the decrease in revenue via taxes or other contributions because the revolutionaries were in control of many of the state's municipalities.[58] The budget problems that this infrastructure brought to Chihuahua City highlight the need to analyze other parts of Mexico, especially the ones that received the benefit of this modern infrastructure and to consider whether this was another ingredient of the Mexican Revolution in the country as a whole.

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[55] Almada, *Diccionario de Historia*, tomo I, 74.

[56] *El Correo de Chihuahua*, October 17, 1908, 1and December 20, 1908, 1. These measures caused more criticism since it was well known that important companies received tax exemptions from 5 to 40 years and at the same time people from the upper classes contributed minimally via taxes.

[57] Almada, *Diccionario de Historia*, tomo I, 29.

[58] *Gobierno del Estado. Informe del Gobernador Interino Constitucional* (1 de junio de 1911), 3,5.

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Chapter 3
Digging into Our Whaling Past: Addressing the Portuguese Influence in the Early Modern Exploitation of Whales in the Atlantic

Cristina Brito, Nina Vieira, Vera Jordão, and António Teixeira

Abstract Portugal, together with the Basque Country, was an important whaling location where a whale culture developed since the Middle Age. Whaling and the ways of using stranded whales spread with the Portuguese expansion in the South Atlantic in the fifteenth century. In fact, organized whaling and development of related techniques did follow the Portuguese and Spanish expansion in the Atlantic. In the medieval and early modern Portugal, whaling had been an important economic activity. Nevertheless, reliable information for the period roughly spanning from the thirteenth to the eighteenth centuries is still scarce. Based on historical descriptions our investigation addresses the information available about the techniques used, the species exploited and the transfer of an activity across different Atlantic regions. In the fifteenth and sixteenth centuries whale use migrated from the Portuguese shores in Iberia to the Atlantic Islands (Azores, Madeira, Cape Verde) and to the new overseas territories, particularly to Brazil. Whalers did use small open boats and hand harpoons to reach and kill the whales. The Basque shore-based model was imported by several Atlantic regions but with significant impact on Brazilian coasts. This is relevant in a context of globalization of techniques and ways of handling whales and their products. Once the activity became established in Brazil, in the early seventeenth century, the Iberian Crowns started a shore whaling business and a Basque crew was hired for the first seasons. So, the beginning of whaling in these new regions was mostly supported upon Basque expertise. For the next couple of centuries, a structured shore based whaling enterprise developed in the coastal waters of Brazil, mainly dedicated to the hunting of right whales (Balaenidae) during the calving season. After the depletion of these the whalers turned to humpback whales. Local whalers in Brazil always stood with a land-based

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type of whaling in contrary to the Basques who conducted offshore whaling when moving into the North Atlantic and away from their Iberian shores. Basques and Portuguese whalers, and their Crowns played a significant role in the transfer of knowledge and techniques of whaling across the Atlantic in the early modern period.

3.1 Introduction

[in the Atlantic] you shall find many whales (…) and porpoises and many small calves[1]

Since time immemorial humans have been fascinated by whales and over the years an entire whale mythology grew up, inspired by the mystery surrounding these creatures. The shared history of whales and people is however a bitter one, as the animals have long been hunted for their valuable oil, meat, bones and baleen. Whaling is a time-honored pursuit of mankind that has been carried out for centuries in many regions worldwide. The techniques necessary to kill and process the whales were developed over time by humans from different cultures and ethnical groups.

Historical whaling has often emerged wherever human beings encountered whales. Unrelated parties of skilled whaling people in distant geographic areas did come up with imaginative, yet diverse, ways to overcome the difficulties they faced while going about their activity. The first western people to hunt large whales in an organized and intentional manner were the Basques and they became the paradigm of early Atlantic whaling, establishing the way the industry would be characterized in the following hundreds of years (Ellis 2002; Fontaine 2007). For the Iberian shores of Portugal early references to marine mammals are available since the twelfth century, through stranding records or whaling related activities registered in several coastal regions (Brito 2011). By the middle fifteenth century the Portuguese navigators were already exploiting several species of marine mammals in the newly discovered archipelagos of Madeira and Azores, and also along the western shores of Africa.

Shore-based whaling occurred in the Atlantic for many centuries conducted by the Basques and the Portuguese, and later they were followed by several other European nations (Clapham and Link 2006). For centuries, the chase was dangerous and romantic, sending mariners and whalers on perilous voyages in search of profit and adventure. For these reasons the history of whaling has always been a subject of interest, and references in the historiography can be found at least since the early twentieth century (e.g. Jenkins 1921) to the present day (e.g. Reeves and Smith 2006). As part of this interest, a comprehensive approach to the historical aspects of this activity based on the Portuguese historiography is just beginning to be constructed (e.g. Brito and Sousa 2011; Brito 2012). Portuguese sources on this

[1] In the Portuguese reports of the *Carreira da India*, sixteenth century, Anonymous (1940).

topic are still being studied and the chronology of events is not yet fully understood.[2] Recent research has shown what seems to be an unexplained interregnum of the hunting activity in some regions, such as the Portuguese mainland (e.g. Teixeira et al. 2014; Brito and Jordão 2014) and in the Cape Verde Islands. Was it due to environmental collapse and subsequent changes in the populations of whales? Was it due to social and economic constraints in Portugal as a result of the maritime expansion and the onset of new transatlantic interests? These are some of the questions that must be addressed.

The early modern period was one of profound changes in Portugal that shaped the future of the Portuguese and other European societies irreversibly (Costa 2009). It is important now to identify written and iconographic sources, searching for archaeological remains, and to look into cartographic and heraldic elements related to marine mammals in the Portuguese Atlantic history. Supported on previous studies (e.g. Brito 2011; Teixeira et al. 2014), it is relevant to approach historical whaling and any episodes of whale scavenging and use, considering the importance they had in the Portuguese economy and culture over time. The environmental and ecological history of whales and whaling shall also be considered. Moreover, it is important to seriously reflect about the Portuguese contribution to expand marine commercial routes, and a new sense about the prime value of first-hand experience and direct observation as tools to understand nature. They were crucial mediators in the access to new knowledge and ways of using and representing the natural world during the early modern period (Costa 2009).

3.2 Iberian Roots of the Atlantic Shore-Based Whaling

Whaling was central to the economy and culture of the first settlers around the globe. For example, in the Arctic region, the Inuit people of Greenland did hunt cetaceans for many centuries, like the aboriginal communities living in the eastern North Pacific (Scarff 1986). Aleutian hunters paddling seaworthy kayaks did throw poisoned darts at whales and waited until they died in a matter of days. Cooperation with neighboring villages was necessary in order to find and share prey. On the European side of the Atlantic, the use of whale products also happened early. Artifacts in sperm whale ivory have been recovered at archaeological sites from the Chalcolithic period in Portugal (Schuhmacher et al. 2013) and this may relate to scavenging episodes of dead whales washed ashore. One step ahead was made by the early settlers of Norway who would drive cetaceans ashore and kill them for food and oil.

In the Middle Age, the Basques emerged as pioneers of industrial whaling when they started hunting whales in the Bay of Biscay in an organized manner around the ninth century. Their main prey was the North Atlantic Right Whale *Eubalaena gla-*

[2] For instance, Portuguese sources are never mentioned in the seminal book "Whales, Whaling and Ocean Ecosystems" edited by Estes et al. (e.g. Clapham and Link 2006; Reeves and Smith 2006).

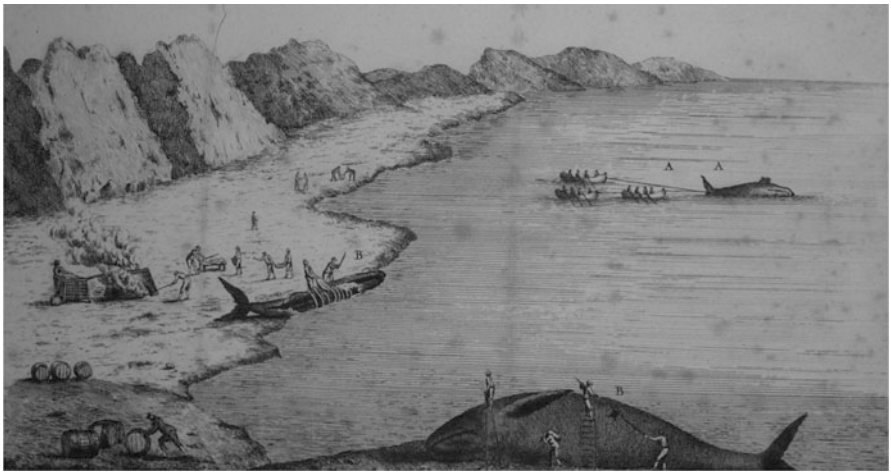

Fig. 3.1 Representation of the Basque way of capturing and cutting off the right whales ashore as it was in the Bay of Biscay since the eleventh century (Picture from Reguart (1792) *Diccionario Histórico de las Artes de la Pesca Nacional*)

cialis. They were chased at sea in small wooden boats launched from shore and rowed by villagers from nearby fishing communities. The whales harassed by the hunting party were hit with hand thrown harpoons connected to floating devices. Once the harpoons were secured, the whale had its movements restricted and diving underwater was no longer possible. The men in the boats would then close in for the kill with lances in a series of deadly blows (Fig. 3.1). The dead whale was pulled ashore and processed in situ for a rich yield of oil, meat and baleen plates (Reguart 1792; Ciriquiain 1979; Aguilar 1986; Reeves and Smith 2006). Some whale products were consumed locally while other would make valuable goods for export (Szabo 2008). Early in the twelfth century, whaling was among the most important economic activities in the Biscay area. Basque whaling expanded along the Cantabrian shore to cover most of northern Iberia (Aguilar 1986). There is also evidence of whaling activities on the western Iberian shore and in Portugal the first documented source is from the twelfth century. A royal decree ('*foral*') by King Sancho I in 1168 establishes tax values that should be paid upon trading whale products (Pereira 2006). However, it should be noted that Portuguese dates fall two centuries before the timeline for Galicia (1371) set by Aguilar (1986). This would suggest an early participation of the Portuguese in the European whaling trade (Brito 2011).

References to whaling activities on the Portuguese shore (W. Iberia) may still be found for some time in old documents but they seem to fade away at some stage in the fourteenth century (Brito and Jordão 2014). This may suggest a sharp decline in that activity on the mainland as the Portuguese were preparing their great Oceanic expansion of the fifteenth and sixteenth centuries. Trading spices and exotic products obtained in India and SE Asia was a major driving force behind this national quest.

There was little room left to other activities, besides the lucrative business of growing sugar cane in Brazil with manpower imported from African territories.

Meanwhile, the fifteenth century Basque whalers went northwards in pursuit of prey and they introduced new techniques there. Now they were able to process dead whales in the high seas by pulling the carcasses alongside the hull of seagoing whaling ships. Lumps of whale fat were put into boilers heated with furnaces lit onboard. Blubber was converted into oil and could be stored for long periods of time in wood barrels. Whaling activities reached further away from home and expanded to include hunting grounds around Ireland, the Faroe Islands and beyond. In the sixteenth century they were in Labrador and a shore station was established at Red Bay (Cumbaa 1986). They also reached Arctic waters in Spitzberg and Greenland. Basque whalers were often hired on board of Dutch and English ships. They shared their expertise and trained foreign crews, thus helping to launch the whaling industry in other countries.

The Portuguese sailed mostly the South Atlantic and Indian oceanic routes. We explore their impact at establishing and developing new whaling stations on Atlantic shores.

3.3 Early Modern Whaling in the Atlantic Islands

During the period of the Portuguese sea voyages of Atlantic exploration, fishing was an important part of daily life and the capture of marine fauna occasionally included dolphins and large whales. Over the fifteenth and sixteenth centuries, with the discovery of new shores and faraway seas, the importance of the whaling industry to the Portuguese (and other European nations) moved away from Europe to other geographic locations, such as the Atlantic islands, the West Indies, the northeastern shores of North America, and Brazil (Cazeils 2000).

The first descriptions of whales occurring in the Madeira Archipelago are included in the epic poem "Insulana" by Manoel Thomas, 1635, as these animals were animating the bays of Madeira Island but not really hunted yet (Ribeiro 1991). In 1595 it is mentioned that a large whale was in the bay of Funchal and interfered with boats coming in to trade their goods in the town. Although it did not make any victims, the local authorities instructed the boatman Simão Rodrigues to take it out of the bay, paying him for that work the amount of 4,000 reis[3] (Ribeiro 1991). In the seventeenth century using whales to make oil was not widespread and reference to these animals in Madeira is also offbeat. It seems that keeping special boats and skilled crews able to perform the arduous task of whaling was not viable then, either for native or foreign entrepreneurs alike. Settlers in Madeira, like the Portuguese Crown, were much more interested in exploiting the land and they did introduce ecologically and economically viable new agriculture products. So, whales might have been caught sparingly but not in a systematic way as it did happen latter, in the

[3] *Reis* were the sixteenth century Portuguese currency.

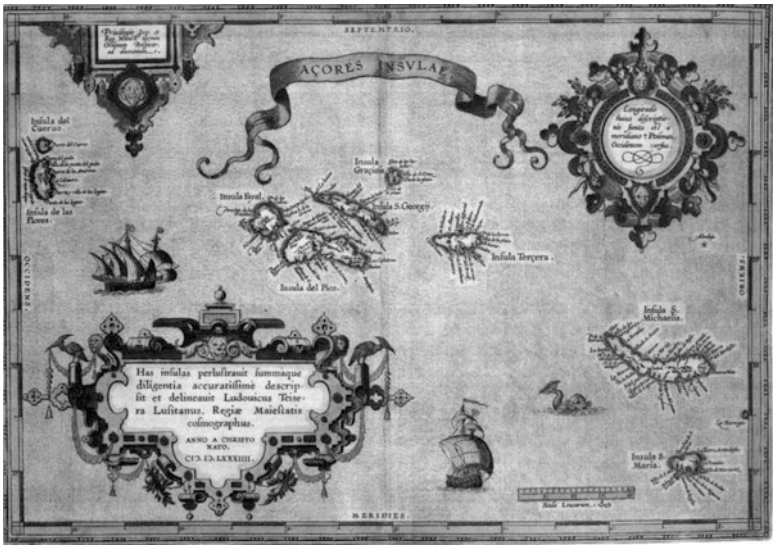

Fig. 3.2 One sixteenth century map of the Azorean Archipelago with a whale (or another large marine animal) alongside the islands and the boats, as depicted by the Portuguese Royal cosmographer Luis Teixeira (1584)

early modern period in Madeira. The accounting book of the Customs at Madeira only reports the capture of one whale in October 1682. It was bought by Diogo Peter – an English merchant – and yielded the value of 64,000 reis after the capture expenses were paid (Ribeiro 1991).

For the Azores Archipelago, it is considered that from the sixteenth century onwards the settlers were becoming experts at capturing whales, mostly because of the large number of stranded sperm whales occurring in several islands (Fig. 3.2). Some authors even state that the Azoreans took their expertise across the Atlantic into Brazilian shores (Ribeiro 1998) but there is no real evidence of a dedicated whale hunt in the Azores in early modern times. In contrast, the occurrence of large whales close to shore and stranding events are often reported (Frutuoso 2005):

> [whales] reach the coast of the island [S. Miguel] sometimes, most on the north that on the south, especially on the coast of the place of Rabo de Peixe, where they are many sea beans, [which are] said to be a nice or natural delicacy to them (…) and given that, only the oil from them is availed (…)

It is only after the seventeenth century that whaling starts to emerge as a local activity with economic relevance and it was under the influence of the American Yankee whalers (Reeves and Smith 2006) that a shore based whaling on its own right develops from the eighteenth to the twentieth century.

In the Madeira and Azores archipelagos, both settlers and the Portuguese cCrown would prefer the economic activities ashore rather than investing in the exploitation of marine resources. This added to the fact that a Royal concession was granted to whaling in Brazil in the seventeenth century and a monopoly was established there,

strongly conditioning the development of any kind of early whaling activity in those Atlantic islands.

References to the presence of whales are also found for other Atlantic islands under the Portuguese Crown administration, such as the Sao Tome and Principe archipelago located in the Gulf of Guinea (Anonymous 1989):

> Between this island [Sao Tome] and the coast of Africa we can see such a huge amount of large and small whales that is a wonderful thing to say.

Also the Cape Verde Islands are worth mentioning here. The stringent diet of the islanders was complemented with whatever available resources could be found in their harsh natural environment. Hunting and fishing would complement any derivatives of livestock farming (such as meat, cheese and milk) and all of these were valuable food items. Fishing would have been an important activity for coastal communities depending on a wide variety of seafood, and this also included the use of whales in their diet (Vieira n.d.). The gathering of ambergris, mainly in S. Nicolau, Sal and Brava, indicates the regular occurrence and the scavenging of sperm whales (Marques 1985). It is also known that before the establishment of whaling in Brazil, whale oil (probably from stranded whales) was being imported from the Cape Verde Islands to this overseas region (Pedrosa 2009).

Even if whales were captured only in small numbers and mostly for local use, in the Portuguese Atlantic Islands no clear indication of quantities or species was found. Some whale products were obtained and traded within the Portuguese Atlantic Empire in the early modern centuries, as it would also be expected to occur in associated European markets. Among the products resulting from whale exploitation that were sold to Europe, oil, meat and baleen stand out. The oil, commonly referred to as "fish oil" was the result of melting the animal fat and would be commonly used for lighting, soap production, or sealing the hull and wooden joints of seagoing vessels. The meat was to be consumed as human food, and could be eaten fresh or salted, although whale meat was often considered inferior and worse on taste than beef. In Europe, the interest in products of the whaling industry was growing slowly but steadily. Whales were then perceived as convenient living sources of fat ready for consumption, producers of oil and raw materials (baleen for instance), with a wide range of applications in European markets. Whales were thus captured all over the Portuguese Empire and they were more valued every day (Ellis 1969).

3.4 American and Brazilian Whaling: The Start of a Long-Lasting Endeavor

Whales were a valuable marine resource and an important source of income to many cultures all over the Atlantic. For instance, Native Americans of the Algonquin People living in Long Island (close to present day New York) were catching whales at sea with dugout canoes many years before the seventeenth century when European settlers stepped in (Pritchard 2007). The Long Island Right Whale fishery was then

operated for almost 300 years under control of the European settlers, until it came to an halt in 1924 (Reeves and Mitchell 1986). It is worth noting that according to Rattray (1953), it was the Long Island Indians who "introduced" white settlers to the whale fishery.

Human interaction with cetaceans was also reported in areas further south. Spanish colonists reaching Florida in the sixteenth century made fancy claims about blowhole plugs used by daring native fishermen who jumped on the back of whales surfacing for air and would try to suffocate them (Acosta 2008).

Relatively few whaling operations arising from local initiative and invention have been reported in tropical latitudes (Reeves and Smith 2006) but there are other examples in the Indo-Pacific (Indonesia, Philippines). Aboriginal whaling in these areas involved the islanders leaping from a boat onto a whale's back to secure the harpoon or to embed one large hook (Reeves and Smith 2006).

Since the discovery and colonization of Brazil in 1500, several reports and descriptions about the occurrence and stranding of whales on the shore there did reach Portugal and Europe (e.g. Cardim 1980; Gandavo 1980; Sousa 1989).

The first native people using whale products in Brazil where probably indigenous from Ceará who collected ambergris from stranded sperm whales on the beach. However, the first solid references of a directional and organized hunting for whales are from colonial Brazil in the beginning of the seventeenth century (Ellis 1969; Edmunson and Hart 2014). There was a clear need for oil in Brazil then and this could be provided by killing and processing whales (Salvador 1889):

> It was great throughout the State of Brazil the lack in grease or fish oil, either for trailer boats and ships, as to light up the mills (…) and it was a shame to suffer this lack, seeing the whales, which are the same grease, throughout this bay without no one to fish them (…) but then God, that all provides, has given the will to a certain Pedro de Orecha, Biscainho [from Biscay] so that he wished to come to this fishery (…)

In 1602, a century after the arrival of the Portuguese, and during the Iberian Union, Felipe III of Spain – Felipe II of Portugal – has conferred to the Biscayan captain Pêro de Urecha a license to hunt whales along the Brazilian coast for 10 years. The target species was the Southern Right Whale *Eubalaena australis* and during this period (from 1602 to 1612) two or three whaling vessels traveled from Biscay to the *Bahia de Todos os Santos Reconcavo* with expert crews of Basque hunters on board. This occurred coincidently to the whales breeding season (Salvador 1889; Pedrosa 2009):

> In the months from May to June, breeding season, many [whales] came to the Brazilian shores and many stranded on beaches and shallow waters dying suffocated due to their own weight compression

The crown has established that the whale oil should supply the *Reconcavo* demands and the remaining product should be sent only to Portuguese ports. The Basque techniques were performed in front of the Portuguese settlers, who learned their methods of harpooning, and how to transport, handle and process the whales.

In 1613 the first colonial "*armação*"[4] was held in Salvador (in the Island of Itaparica) by António Machado de Vasconcelos, who chose a location where whales could be hunted even inside the bay (Edmunson and Hart 2014). Thus, the whale hunting monopoly in Brazil was established in 1614 and cetaceans were considered "royal fish" and property of the Crown. For the next two centuries, with a special focus after the Restoration of the Portuguese Independence from Spain in 1640, and in order to address the colonial expenses, several concessions were granted by the colonial government to private whaling entrepreneurs in a constant feud with local inhabitants who also wanted to enjoy the economic benefits of this activity (Ellis 1969; Edmunson and Hart 2014). Also during this period, due to the whaling success in Bahia, the activity has expanded to some areas further south, first to Rio de Janeiro, then São Paulo, and later to Santa Catarina. From the seventeenth century onwards, there were successive reports about the importance and success of this enterprise (Anonymous 1657). In one whaling season of the seventeenth century an average of 46 whales were captured per year, and in the first half of the eighteenth century the captures increased to an average of 150 whales (Ellis 1969).

From Bahia to Santa Catarina, "*armações*" were usually set at the entrance of bays and straits protected from strong wave action and southern winds, which would also provide sheltered places for breeding whales. The hunt was carried out in the breeding season and the presence of calves was also an advantage to help hunting adult females.[5] Nevertheless it was a very difficult and dangerous activity still holding to traditional methods that were not very much developed over long periods of time. A rowing boat with the harpooner standing in the bow approached the whale and several strikes of harpoons and spears weakened the animal, while a second boat helped to achieve the killing and at towing the dead whale ashore (Fig. 3.3). The animal was slashed to remove the fat that would produce the oil that lightened Salvador and Rio de Janeiro. The meat, tongue and entrails were also removed but in general a lot of the animal was not used and would be discarded. By the end of the eighteenth century American whalers started to hunt whales in Brazilian waters with a modern approach (Edmunson and Hart 2014). This was a turning point in Brazilian whaling that resulted of the intense American whaling there together with the depletion of the Southern Right Whale populations. Just a few years later the first drill for oil marked the end of a whaling era in Brazil (Ellis 1969; Edmunson and Hart 2014).

[4] *Armação* (*singular*) *or Armações* (*plural*) are the Portuguese words for the designation of a permanent location equipped with all the necessary appliances for the whale hunt, dismantling and processing into oil.

[5] The first whaling target were Right Whales (adults calving in Brazilian shores from May to June) but when the population became seriously depleted, the target moved to Humpback Whales *Megaptera novaeangliae* breeding from June to September (Salvador 1889).

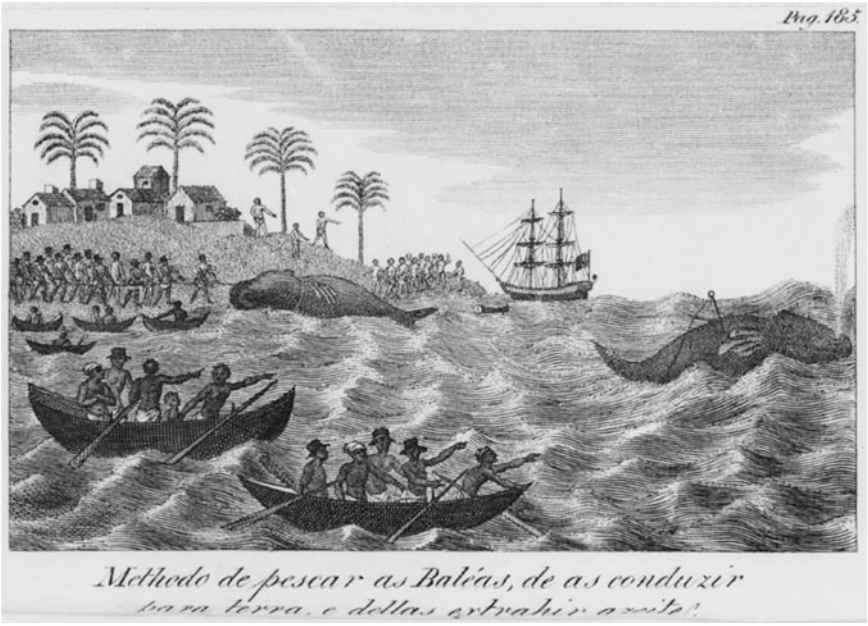

Fig. 3.3 "The way of fishing whales, of conducting them to land and from them extracting the oil". A drawing showing Brazilian shore-based whaling from Beauchamp (1767–1832) *Historia de Brazil*

3.5 Discussion

Man had been using stranded whales for quite a long time before people in the maritime communities began to think about ways of capturing them. At first this was achieved through leading whales into areas of shallow water on the coast, such as estuaries, where they would be easier to kill. Later techniques were more elaborate and included actively pursuing the whales at sea. To reach this purpose, some distinct and pretty ingenious processes were employed which have been historically described by navigators and explorers travelling in the Atlantic Ocean. Large cetaceans provide a number of resources and products, mainly oil and meat but also baleen and bones. In the early modern period these were always in demand not only in Europe but also in the new European settlements on both sides of the Atlantic.

Commercial whaling, in the sense of a continuous and directed effort pursued for profit, had its origin in the Eastern North Atlantic and was carried out initially by the Basques and the Portuguese, and subsequently by other European people. There was a well-organized whale hunt in the shores of the Iberian Peninsula beginning earlier than the eleventh century and this was taken afterwards to the New World. Even though various coastal whale hunts existed in Europe since medieval times (Clapham and Link 2006; Szabo 2008), by the sixteenth century Iberian whalers were already pursuing their quarry much further across the Atlantic and this effort

was supported upon expertise and techniques from the Basques and early Portuguese whalers. In Iberian shores, the main captured target was the Right Whale – but it is likely that any other whale species with coastal habits could also become a target in the new Atlantic regions. The colonization of the New World by Europeans (both in the northern and southern hemispheres) allowed the development of new whaling endeavors and started the exploitation of pristine whale populations (Clapham and Link 2006).

Within the context of the Portuguese Expansion in the Atlantic, the discovery of a New Natural World has brought strong stimulus to describing the novelty, exoticism, beauty and strangeness of nature but, even more important, in appreciating its value as an economic resource. The Portuguese traveling to the African and Brazilian coasts, upon arriving on those shores were dazzled by the new cultural, geographical and natural sceneries, including the occurrence and abundance of marine wildlife (Seixas 2003). They often observed whales at sea, and their abundance and proximity to the coast quickly drew attention for its possible use and economic value (already known from Iberian coasts). These sightings were usually reported (e.g. Cardim 1980) and the information about the natural richness of new land and seas quickly reached the kingdoms in Europe. In fact, there are several authors from the fifteenth to the seventeenth century who wrote about whales in the Atlantic Islands, West Africa and Brazil (e.g. Salvador 1889), describing also their occurrence and local importance. In the present work we identify and review 43 different historical sources referring to hunting, sightings and the stranding of whales in the early modern period, as witnessed in the Atlantic spaces under the influence of the Iberian kingdoms. These sources include old village charts from Portugal, chronicles of the early Atlantic voyagers, and natural history reports from the new oversea territories (Fig. 3.4 and Table 3.1). The coeval narratives allow us to understand the relevance of this activity and why they are instrumental to obtain information about the natural and economic aspects and how they were interconnected at that time.

The Basque shore-based model (Reeves and Smith 2006) was imported into several far-away trans-Atlantic regions with significant impact on Brazilian coasts. Following the same process of discovery and exploitation of natural resources, in the early seventeenth century settlers in Brazil started to explore the breeding grounds of large whales off their shores and their efforts were supported by the Crown. They opened a new activity that developed into a continuous process that persisted until the middle twentieth century. Researchers and scholars assign the Basque whaling as a decisive settling authority in a regional or national sphere of influence, both in Europe and in the context of the new overseas settlements. The Portuguese have also played an important role in the history of whaling with impact on the marine environment. Not so much because they utilized techniques pioneered by the Basques but mostly because they were the promoters of the whaling activity in vast areas and introduced it at many new Atlantic regions. In Brazil, whaling eventually reached a prominent place in the Royal finances and that turned out to be a local activity into an Atlantic monopoly, which was also an important economic resource for the financial management of the Portuguese Kingdom.

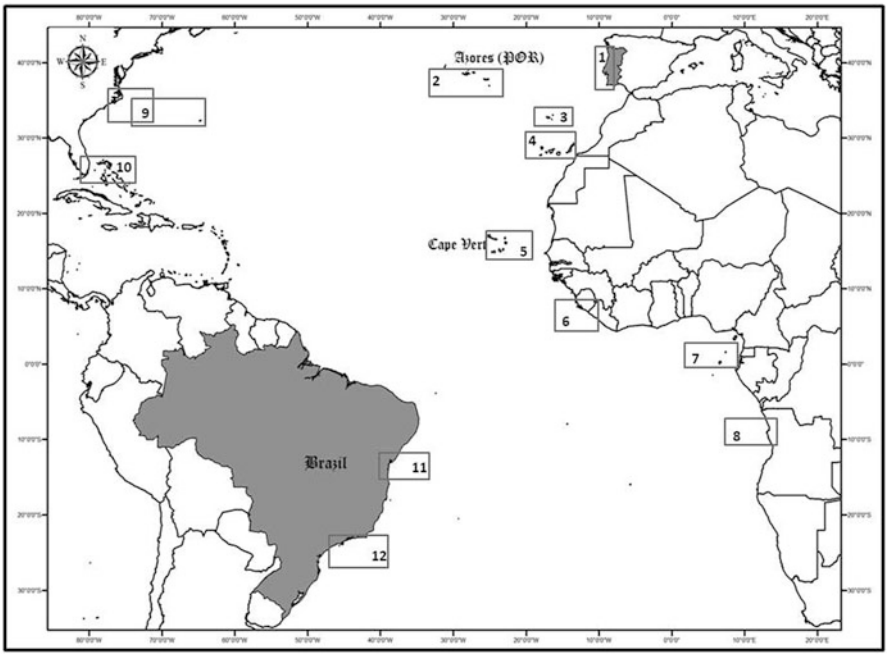

Fig. 3.4 Map of the Atlantic Ocean as we know it today, showing some regions where whaling, whale sightings and whale strandings were documented in the fifteenth to seventeenth centuries. The Atlantic regions highlighted are: *1* Portugal mainland, *2* the Azores archipelago, *3* Madeira archipelago, 4 Canary Islands, *5* Cape Verde Islands, *6* Guinea, *7* São Tome and Principe, *8* Luanda (Angola), *9* Virgin Islands (USA) and Bermudas, *10* Florida (USA), *11* Salvador and Bahia (Brazil), *12* Santos (Brazil)

Table 3.1 Atlantic regions are documented in the text and the number of historical sources about whale hunting, sightings and strandings for each of them in the fifteenth and seventeenth centuries

N°	Region	Hunting	Sightings	Strandings
1	Portugal mainland	16	1	4
2	Azores Archipelago (Portugal)	1	1	2
3	Madeira Archipelago (Portugal)	1	1	
4	Canary Islands (Spain)	–	1	–
5	Cape Verde Islands	–	1	–
6	Guinea	–	1	–
7	São Tome and Principe	–	1	–
8	Luanda (Angola)	–	1	–
9	Virginia (USA)/Bermudas	–	1	–
10	Florida (USA)	1	–	–
11	Salvador and Bahia (Brazil)	3	3	2
12	Santos (Brazil)	–	1	–

The total number of sources reviewed in this work is 43 and it includes, village charts, voyage chronicles, and natural history reports from the new oversea territories

At the same time, the success of the Brazilian early modern whaling together with the American, British and French whaling since the eighteenth century, had contributed to the depletion of Southern Right Whale populations, changing their natural environment until the present day. This is particularly relevant in a context of globalization of techniques and ways of handling renewable resources obtained from the sea. First, the hunt was mainly dedicated to catching the Right Whale during the calving season, but after the depletion of this species the whalers switched to hunt the Humpback Whale. This type of shore based whaling continuously occurring in several Atlantic grounds, severely depleted whale populations and changed the natural balance of ecosystems. Due to such series of global or local extinctions, whaling drastically changed the pristine condition of the marine environment over the last 500 years. And the proportions of this change are still witnessed today. The historical data currently available shows that important changes did occur on the past distribution and abundance of whale populations in the Atlantic.

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Chapter 4
Good Fisheries vs. Bad Fisheries: Ideological and Scientific Base for the Governmental Projects of Modernization of Russian System of Marine Harvesting in the Eighteenth Century

Alexei Kraikovski

Abstract In the eighteenth century, Peter the Great and his successors invested a lot of energy and funding to make Russia a European country. This process included the transformation of political, economic and cultural life – the nature use system was definitely not an exception. The paper will discuss the ideological base for the project of modernization of marine harvesting in the Russian North, which took place in the eighteenth century. This region corresponds to the White and Barents Sea basin and was the only place where Russia had direct contact to the Oceanic environment in the seventeenth century. The Russians living there known as the Pomors (the people of the Sea in Russian) created original system of marine harvesting based on the exploitation of marine and coastal ecosystems.

The Russian authorities didn't intend to intervene into the marine harvesting economy before Peter the Great. In 1697–1698 this Tsar had visited Europe including the Netherlands and Britain, two major maritime powers of the period. Being impressed with the European culture as a whole, Peter the Great tried to implement European (Dutch) experience wherever it was possible. As whaling and herring productions were among the most important and profitable branches of the Dutch economy he tried to replace traditional Russian methods of marine resource use (sealing, walrus hunting, salmon fisheries etc.) with advanced European innovations. Later these projects of improvement and Europeanization of the Russian marine harvesting were considered as significant part of the Peters political legacy and the Russian government tried to complete these plans more than once. The Pomors were ordered to build the vessels of European types instead of traditional Russian ships. The monopolistic companies created by the government got significant economic privileges in turn for the obligation to invest profits into the development of the new branches of marine economy – whaling and herring production.

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The Government provided all the possible support including direct financial subsidies and industrial espionage. The last but not least – foreign experts came from Europe to teach Russians and spent years of their life on the severe White Sea shore trying to implement advanced technologies of marine harvesting in the new environment.

My argument is that the ideological base for this project was quite an ideal image of the Russian nature as superabundant, but poorly managed. This image was of European origin and the Russian rulers adopted it together with European culture in the early eighteenth century. As this ideal image had nothing to do with the reality (far more complicated) the projects completely failed.

It turned out that the environment of the White Sea (the chemical composition of the sea water, hydrological regime, ice regime etc.) is very unfriendly for the new technologies. For instance, the nets successfully used by the Dutch fishermen to catch the North Sea herring couldn't be used with the same result in the White Sea because of the different fish (the White Sea herring is not the same as the North Sea herring) and different underwater relief. The ice regime in the strait connecting the White and the Barents Sea closed shipping there for the major part of the year and the whaling ships couldn't come on time to Spitsbergen to kill whales while poor infrastructure and harsh climate prevented the development of the whaling base directly on the Barents Sea shore.

On the other hand, both the local users and the management of the newly founded monopolistic companies were rather interested in the control over the traditional marine harvesting then in the development of the new activities. The foreign experts seem to be the only actors interested in the modernization of the Russian marine harvesting, but their expertise was useless outside from their normal environment.

4.1 Introduction

In the 1 of July 1768 (OS) the Russian Empress Catherine the Great in the major imperial summer residence of Peterhof signed the decree that permanently abolished all sorts of monopolistic rights in the northern Russian marine harvesting and opened this branch of commerce to everyone.[1] Up to that moment the rulers of Russia for more than 60 years have organized monopolistic companies that promised to develop the new branches of marine resource exploitation like whaling and to reorganize all the industry on the base of the European practices in turn for the governmental support and priveleges on the market. Those companies definitely failed to modernize the Russian marine harvesting and signing the decree the Empress stopped the project as quite unsuccessful from the governmental point of view. On the other hand, these enterprises were rather profitable for the shareholders

[1] See Russian State Archives of the Ancient Documents (hereafter RGADA), f. 397, inv. 1, file 238, p. 67.

(but neither for the state nor for the fishermen and marine mammals hunters) and therefore among the owners one can find the names of top-level persons. For instance, Alexander Menshikov (the closest confidant of Peter I) owned the company in 1703–1721,[2] Petr Shafirov (the famous diplomat and the head of the College of Commerce) in 1734–1739, baron A. K. von Schemberg (the business partner of E. I. Biron, the lover of the Empress Anna Ioannovna)[3] in 1739–1742 and count Petr Shuvalov (one of the most outstanding administrators of Russia in the reign of Elizaveta Petrovna) and his descendants in 1748–1768.[4] In 1731–1734 the monopoly belonged to the family of privileged merchants Evreinovs and in 1723–1731 and 1742–1748 in was owned by the state.[5] As a result this period is known in the history of the Russian North as "the era of monopolies" and the decree signed by the Empress in 1768 was indeed the moment of radical change of paradigm of development of the Russian system of marine resource exploitation. Several details are important (and somehow symbolic) in the document. It was signed in Peterhof, the residence symbolizing the inextricable connection between the Europanized Russia

[2] The Tsar concentrated all the fisheries in his country in the state property under the supervision of the specially organized administrative body – Ingermanland Office with the closest Tsars confidant Alexander Menshikov at the head. Also he granted to Menshikov the privilege to organize the monopolistic company with official goal to improve the marine resource use in the Russian North through the control over the blubber trade. Later the privilege has been extended to the cod fish commerce. In turn the company had to take care on the development of whaling. See for details Kraikovski A, Dadykina M (2014) "Promysel staratsya umnozhit" – deyatelnost Salnoy kompanii A. D. Menshikova i morskie promysly na Russkom Severe v 1704–1721 gg. In: Menshikovskie chteniya, vol. 5. Publishing house "XVIII century", St. Petersburg, p. 71–78.

[3] K. A. von Schemberg was famous as one of the most unscrupulous and dishonest monopolists in the eighteenth century history of Russian economy. See Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 441–445.

[4] Petr Shuvalov got monopoly as a result of covert struggle with two other pretenders and possessed the rights to his death in 1762. See RGADA, f. 11, inv. 1, file 307, p. 5 back – 9. See also Belov MI (1956) Istoriya otkrytiya i osvoeniya Severnogo Morskogo puti, vol. 1. Morskoy Transport, Moscow, p. 344–346.

[5] The history of Kola whaling company (officially existed in 1723–1731, active during 1726–1729) and of the State-owned Blubber Company (1726–1731) organized to compensate to the Treasury the losses caused by the whaling expeditions through the monopoly on the blubber market is presented in several books and papers (See for instance Chulkov M (1782) Istoricheskoe opisanie rossiyskoiy kommertsii, vol. 1, book 2. St. Petersburg, p. 366–413; Ogorodnikov S (1890) Ocherk istorii goroda Arhangelska v torgovo-promyshlennom otnoshenii. St. Petersburg, p. 184–188; Veberman E (1914) Kitoboynyi promysel v Rossii. Izvestiya Moskovskogo kommercheskogo instituta. Kommerchesko-tehnicheskoe otdelenie, vol. 19, book 2. Moscow. ; Belov MI (1956) Istoriya otkrytiya i osvoeniya Severnogo Morskogo puti, vol. 1. Morskoy Transport, Moscow, p. 346–347). The detailed history of monopolies is beyond the scope of the paper. See for more details: Kraikovski A (2010) The governmental projects of the whaling development in the 18th c. Russia. In Ringstad JE. (ed.) Whaling and History III. Hvalfangstmuseum, Sandefjord, p. 171–176; Kraikovski A (2009) The governmental projects of modernization of herring fisheries in Russia. In Makowiecki D. et al. (eds) Fishes – culture – environment trough Archaeoichtyology, Ethnography and History. The 15th meeting of ICAZ FRWG. Environment and Culture, vol. 7. Bogucki Wydawnictwo Naukowe, Poznan, p. 96–98; Kraikovski A, Lajus J (2005) The adventures of Portuguese salt in Russia from the seventeenth to the twentieth centuries. In I Seminario Internacional sobre o sal portugues. Instituto de Historia Moderna da Universidade do Porto, Porto, p. 278–285.

and the marine environment and moreover – the new position of the Russian tsar as the sovereign over the Sea as well as over the land.

Secondly, the document was a clear manifestation of the generational change in the imperial elite. The confidants of the new relatively young (39 years old) Empress that came to the throne as recently as in 1762 were definitely "new people" in comparison to the statesmen of the previous reign. In the economic sphere this meant the adherence to the principals of physiocracy (including economic liberation) instead of mercantilist idea of the ensuring the growth of governmental revenue at any cost. The decree was the end of discussion between the representatives of the two economic ideologies[6] and it demonstrated the Empress herself made her final economic choice (she signed the decree on the abolition of monopolies in Russia 6 years earlier and this monopoly was the last on in the country).

Finally, the document by no means marked the end of the governmental policy aimed to modernize and "Europeanize" the Russian marine harvesting. The main difference in comparison to the previous time, however, was the reliance on the power of free market, not on the monopolistic companies. It was claimed that everyone is invited to prepare the projects of the development of whaling in the Russian North for the consideration of the Empress. This clearly demonstrates the fact that the Government still believed that the existing marine harvesting was not good enough and required some improvement. The main aim of the paper is to explore the ideological base for this assumption that determined the governmental policy concerning the marine resource exploitation in the eighteenth century with special emphasis on the image of environment. Indeed, if we agree with Witold Kula that the "economic activity has always been a process of exchange of energy between man and nature"[7] and with Donald Worster that for the people of the eighteenth century the nature was predominantly "the Great Economist"[8] then we definitely have to discuss the role of environment in the governmental decisions concerning the reorganization of significant branch of marine economy.

To study this issue we have to look at the projects of marine harvesting improvement proposed to the Russian government in the eighteenth century by different authors. These documents (both accepted and rejected) were integral part of this story. Three things are to be discussed here before we go further. Firstly, the term "project" in this paper is used in relatively narrow sence. It means the projects of fast wade-ranging and significant improvement of (economic) life in the country proposed by the interested person (or some narrow group of interested persons) to the state administration. Daniel Defoe in 1697 ironically defined such a project as

[6] The discussion can be traced through the documents of the Commission of Commerce (for more details on this governmental body see: Molodtsova NV (1995) Komissiya o Kommertsii 1762–1796. Candidate disstertation. MGU, Moscow) prepared during the exchange of opinions about the project of state monopoly for the blubber trade in the North presented by the Governor of Archangelsk E. Golovtsyn in May 1768 (see: RGADA, f. 397, inv. 1, file 238, p. 3–63 back).

[7] Kula W (2001) The Problems and Methods of Economic History. Ashgate, p. 365.

[8] Worster D (1994) Nature's Economy: A History of Ecological Ideas. Cambridge University Press, Cambridge, UK, p. 7.

"a vast undertaking, too big to be managed, and therefore likely enough to come to nothing".[9] Maximillian Novak clarified that in the time of Defoe this undertaking predominantly was connected to the "unscrupulus schemes of getting money"[10], and Erik Ringmar directly connected the authors of such projects ("projectors") to the development of the modern European business and commerce[11], while Christine MacLeod demonstrated the opposition between the inventors and "dishonest projectors and monopolists" who were definitely important actors of British modernization – but rather as a problem and obstacle.[12] Consequently comes the second important thing to remember - writing the projects of this kind was definitely part of modern European culture (i.e. not Russian), and I can only agree to Jarmo Kotilaine who proposed to consider the foreign economic projectors coming to Russia in the seventeenth century as part of general process of infiltration of European Merchantilism into Eurasian Empire.[13] The last but not least important notice is the specific character of interrelations between the Russian society and the marine environment before the time of Peter the Great, i.e. before the time of modernization and Europeanization of Russia. The outstanding importance of the sea (and "access to the sea", whatever this term means) in the Russian modernization is undisputable but it would be definitely a fault to underestimate the experience Russians had in shipbuilding, shipping and marine harvesting by the late seventeenth century. Considering Russia as an open field for their ideas, some kind of "tabula rasa" the projectors faced in reality the long-existing tradition having behind centuries of dealing with specific environment of the Russian rivers, lakes, and seas.[14]

The major research question of the paper is: what was the "reputation" of the Russian marine environment (i.e. of the marine environment that the authorities in St. Petersburg considered as available for the Russians) in the eyes of the project authors and decision-makers? How did they see and justify the possible ways to get better economic results in the exploitation of this environment? And the last but not the least – how did they explain (if they did) the fact that the projects failed and what was the role of nature in these explanations?[15]

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[9] Defoe D (1887) An Essay upon Projects. Cassell & Company, Limited, London, Paris, New York & Melbourne. http://www.gutenberg.org/files/4087/4087-h/4087-h.htm

[10] Novak M (2008) Introduction. In: The Age of Projects. Toronto University Press, Toronto, p. 3.

[11] See: Ringmar E (2007) Why Europe Was First. Social Change and Economic Growth in Europe and East Asia, 1500–2050. Anthem Press, London, p. 114–119.

[12] MacLeod C (2007) Heroes of Invention: Technology, Liberalism and British Identity, 1750–1914. Cambridge Studies in Economic History. Cambridge University Press, New York, p. 33–40.

[13] See: Kotilaine J (2004) Mercantilism in Pre-Petrine Russia. In: Kotilaine J, Poe M (eds) Modernizing Muscovy. Reform and Social Change in Seventeenth-Century Russia. RoutledgeCurzon Studies in the History of Russia and Eastern Europe. RoutledgeCurzon, London, p 137–166.

[14] See Kraikovski A (2015) 'The Sea on One Side, Trouble on the Other': Russian Marine Resource Use before Peter the Great. Slavonic and East European Review 93 (1): 39 - 65.

[15] The history of the administrative activities the government undertook in order to implement projects to life is beyond the scope of the paper. See for more details: Kraikovski A (2010) The governmental projects of the whaling development in the 18th c. Russia. In Ringstad JE. (ed.)

4.2 Actors and Dates: The Projects Under Consideration

Chronologically the paper considered the texts prepared between 1698, when the Amsterdam dweller Benedictus Nebel presented his project to the tsar Peter the First, to 1798, when Ivan Lepehin, the prominent Russian scientist, professor of St. Petersburg Academy of Sciences, presented "The project on the convenience of Whaling in Russia".[16] In total, the research is based on the 12 documents:

- Two projects by Benedictus Nebel presented in February 1698 (1)[17] and 1729 (2).[18]
- Conditions provided by Matvei Evreinov in 1722 (3).[19]

Whaling and History III. Hvalfangstmuseum, Sandefjord, p. 171–176; Kraikovski A (2009) The governmental projects of modernization of herring fisheries in Russia. In Makowiecki D et al (eds) Fishes – culture – environment trough Archaeoichtyology, Ethnography and History. The 15th meeting of ICAZ FRWG. Environment and Culture V, vol. 7. Bogucki Wydawnictwo Naukowe, Poznan. 2009, p. 96–98; Kraikovski A Lajus J (2005) The adventures of Portuguese salt in Russia from the seventeenth to the twentieth centuries. In: I Seminario Internacional sobre o sal portugues. Instituto de Historia Moderna da Universidade do Porto, Porto, p. 278–285.

[16] Though the French projector Jean de Gron proposed the large-scale reorganization of the Russian maritime economy including implementation of the European shipbuilding and whaling as early as in the mid-seventeenth century, this project is out of the focus of this paper. See for details: Kotilaine J (2004) Mercantilism in Pre-Petrine Russia. In: Kotilaine J, Poe M (eds) Modernizing Muscovy. Reform and Social Change in Seventeenth-Century Russia. RoutledgeCurzon Studies in the History of Russia and Eastern Europe. RoutledgeCurzon, London [etc.], p 142–143.

[17] RGADA, f. 50, inv. 1, year 1698, f. 1. Benedictus Nebel asked for the monopoly in fish trade in the vicinity of Kola, on the Barents Sea. The project itself consist of two parts – the letter from Nebel to Franz Lefort (the Russian Ambassador) and memorandum with request for the monopoly for the fish trade in Kola for 15 years. This privilege has been granted but nothing is known about any commercial activities by Nebel and his company in the Russian North. However, Nebel himself later claimed that at the same time he presented also the project to the tsar (not to Lefort) proposing to establish a company for the development of new branches of marine harvesting, namely participation in the international fisheries on Doggersbank and whaling (RGADA, f. 397, inv. 1, f. 221, p. 7). The text of this project is still not found but we may suppose that Peter used this idea as the base for practical measures in the reorganization of marine harvesting.

[18] In 1729 Benedict Nebel proposed to the Emperor Peter II the new project of a company controlling enormous marine harvesting economy including Spitsbergen whaling and fisheries in the Atlantic Ocean. However, he was definitely not influential enough to get support from the state for this grandiose enterprise. See RGADA, f. 397, inv. 1, file 221, p. 1–10.

[19] In 1721 Peter the First decided that the Menshikov company turned out to be inefficient. Moreover, the Tsar claimed that the representatives of nobility are not good enough in the commerce and the monopolistic rights will be used more efficiently by merchants. Since that moment the possibilities of new company became a matter of discussion between the government and the merchants. The rich Russian businessman Matvei Evreinov proposed the conditions for the new company and even got the privilege from the Tsar, but this monopoly was abolished almost immediately (See: Ogorodnikov S (1890) Ocherk istorii goroda Arhangelska v torgovo-promyshlennom otnoshenii. St. Petersburg, p. 183–184.).

- Project by Solomon Vernizobre, 1723 (4).[20]
- Project by Petr Shafirov, 1726 (5).[21]
- Conditions by Andrei Evreinov and brothers, 1731 (6).[22]
- Conditions by Petr Shafirov, 1734 (7).[23]
- Project by Egor Golovtsyn, 1768 (8).[24]
- Projects by G. Trappe, 1768 (9) and 1769 (10).[25]
- Project by Semen Vishniakov, 1776 (11).[26]
- Project by Ivan Lepehin, 1798 (12).[27]

As one can see, we deal here actually with the sources of two kinds - projects and conditions, and the texts are far from any sameness. The projects (1, 2, 4, 8, 9, 10, 11, 12) were the texts prepared by the applicants who either wanted to get the monopolistic rights from the government or to attract the attention of the high authorities to the idea of monopolistic company. In general, the authors of these texts normally used more rhetoric instruments that allow to make some insights into the "ideology" of the projects. The conditions (3, 6, 7) were prepared by those who have got proposal from the Government to organize the monopolistic company, and therefore had the opportunity to be more concentrated on the practical plans. The project 5 is rather unique document proposed by the Government in order to attract the merchants as potential shareholders of the whaling company. Additionally, the governmental documents, legislation and the correspondence around the monopolistic companies of 1703–1762 will be used to get deeper insight of the story.

These documents were some kind of link between several groups of actors to be discussed separately. On the one hand, the texts of the projects reveal to us their

[20] The text is published in: Chulkov M (1782) Istoricheskoe opisanie rossiyskoiy kommertsii, vol. 1, book 2. St. Petersburg, p.. 362–365. Solomon Vernizobre was the French merchant. His project was rejected and in November 1723 the tsar ordered to organize the state-owned company for whaling (See: Polnoe Sobranie Zakonov Rossiyskoy Imperii (hereafter PSZ) (1830), vol. VII. St. Petersburg, p. 152–153).

[21] The Project on the development of whaling proposed in 1726 by baron Petr Shafirov. At that moment he was the president of the College of Commerce, the administrative body that controlled, among other things, all the commercial shipping in the country including marine harvesting. This is the only example of a project proposed by the state to the merchants and not vice versa with the aim to involve the private business into the state organized industry. The text is published in: Chulkov M (1782) Istoricheskoe opisanie rossiyskoiy kommertsii, vol. 1, book 2. St. Petersburg, p. 378–385.

[22] The sons of Matvei Evreinov have got monopoly from the Empress Anna Ioannovna. See the text of their conditions: RGADA, f. 397, inv. 1, file 221, p. 15–17.

[23] In February 1734 Petr Shafirov petitioned to the Empress Anna Ioannovna and managed to get monopolistsic rights from Evreinovs: RGADA, f. 11, inv. 1, file 307, p. 4–4 back.

[24] RGADA, f. 397, inv. 1, file 238, p. 3–63 back.

[25] Trappe according to the official reports was the French merchant, the texts see in: RGADA, f. 397, inv. 1, file 238, p. 85–90, 94 back – 97.

[26] St. Petersburg merchant. The text is in: RGADA, f. 397, inv. 1, file 238, p. 106–112 back.

[27] Russian State Historical Archives (hereafter RGIA), f. 1285, inv. 1, file 79, p. 2–24. This project was discussed by several governmental bodies and apparently indirectly influenced the White Sea company created in 1803, which started the new century for the marine harvesting of the Russian North.

authors perspective. It is worth noting that this group of actors is nothing like homogeneous. It includes foreign entrepreneurs (Nebel, Vernizobre, Trappe), Russian merchants (Matvei Evreinov, Semen Vishniakov), the representatives of high-level buraucracy (Shafirov and Golovtsyn), and academic professor (Lepehin).[28] On the other hand, the authors "constructed" the texts for particular readers and those readers can undoubtedly be considered as influential actors quite important for the proper understanding of the texts of the projects – both their ideas and rhetoric. This group of actors consisted of decision-makers, and first of all – of the ruling persons. The projects were addressed to almost all the Russian sovereigns of the eighteenth century, namely to Peter I (1, 3, 4), Catherine I (5), Peter II (2), Anna Ioannovna (6, 7), Catherine II (8, 9, 10, 11), and Paul I (12). Additionally the group includes the representatives of high-level nobility and bureaucracy who were involved in the discussion as a representatives of the state administration.

Both authors and decision-makers based their activities on some preliminary considerations and their vision of the Russian marine environment was the most important element of their picture of the world for the proper understanding of the projects and decisions. Therefore, the projects reflect the changing image of nature from the late seventeenth to the late eighteenth century.

4.3 The Poor Land of Abundance: Russian Environment Seen Through the Projects

To get the correct understanding of the image of Russian marine environment constructed in the project we have first of all to look at the general development of the environmental ideas in Russia in the period under study. The eighteenth century was a very special time in the history of natural science. The picture of the world that existed in Europe (and was adopted by the Europianized and educated part of the Russian society) changed radically between 1698 and 1798.[29]

As it was mentioned above, the story under study started during the Grand Embassy – large-scale foreign policy project the Tsar Peter the First organized in 1697–1698. The project included diplomatic mission to Europe in order to get support in the war against the Ottoman Empire, which definitely failed, and enormous (and very successful) transfer of European knowledge and technologies to Russia. Irina and Dmitrii Gouzevich in their comprehensive research on the Grand Embassy

[28] The top-level persons like Alexander Menshikov and Petr Shuvalov for sure had no need to prepare projects of any kind. They have got monopolistic rights directly from the sovereigns using their high official position.

[29] The problem of interconnections between the Russian marine harvesting and the development of European environmental science is quite poorly studied. R. Jones with his research on the history of Russian activities in the North Pacific is clearly an exception, see Jones R (2014) Empire of Extinction. Russians and the North Pacific's Strange Beasts of the Sea, 1741–1867. Oxford University Press, New York.

called it "information and technical power breakthrough exercised through diplomatic channels under the personal supervision of the Tsar".[30] During this trip looking for the secret of European prosperity and advancement the young 25 years old Peter paid special attention to the maritime component of European culture and economy. In September 1697 he visited the Dutch whaling ships that returned from Spitsbergen with unprecedentally rich haul and was strongly impressed with this experience.[31] Wasn't this trip also decisive for the formation of the image of the marine environment (and environment in general) for the Russian elite and first of all for the Tsar Peter? It goes without saying that when he came to Europe he, as well as his confidants, was rather experienced sailor[32] but what did he know about the sea as natural object? For sure he was able to control the vessel on the surface of the water and consequently he was familiar to the waves, currents and winds, but what about the marine life?

The information on the education of the Tsar is rather scarce and there are no mentions of any lessons in Natural studies. The only data on direct contact between Peter and the marine environment is the episode that took place on September 17 1693 during the first visit to Archangelsk. According to one of the descriptions of this trip, while travelling on the Dvina river accompanied by the Archbishop of Archangelsk and Holmogory, the young monarch noticed beluga whale. He immediately started to pursue the animal in the small boat in order to catch it.[33] In this story he appears rather as a reckless hunter than as an inquisitive naturalist. The sea for him looked like a hunting ground, not like a research site.

Thus, the Grand Embassy in the life of Peter the First and his companions was the time when they discovered not only Europe, but to some extent all the world, at least the environmental side of it. Since the very start of the trip they observed all sorts of natural collections and curiosities (anatomic and zoological collections of Frederik Ruysch, botanical gardens, private collections etc.).[34] So, we may assume that these impressions were the base of their general understanding of environment, including the Russian one. In other words, the tsar and the Russian elite involved into the process of modernization and Europeanization had quite specific perspective of the Russian nature – they have seen it "through the window" of the European

[30] Gouzevich D, Gouzevich I (2008) Velikoe posolstvo. Rubezh epoh ili nachalo puti. Dmitriy Bulanin, St. Petersburg, p. 395.

[31] See: Kraikovski A (2014) "Kak spushchennyi korabl'" – plany perenosa niderlandskih tehnologiy morskogo promysla i idei evropeizatsii Rossii pri Petre I. In: Rossiya – Niderlandy. Dialog kultur v evropeiskom prostranstve. Materialy V Mezhdunarodnogo petrovskogo kongressa. Evropeiskiy Dom, St. Petersburg, p. 265–268. See also: Gouzevich D, Gouzevich I (2008) Velikoe posolstvo. Rubezh epoh ili nachalo puti. Dmitriy Bulanin, St. Petersburg, p. 201.

[32] The problem of interrelations between Peter the First and the Sea got some attention from the scholars. The most detailed analysis see in: Bespyatyh YuN (2010) Archangelsk nakanune i v gody Severnoy voyny 1700–1721. Blits, St. Petersburg, p. 50–101.

[33] Bespyatyh YuN (2010) Archangelsk nakanune i v gody Severnoi voiny 1700–1721. Blits, St. Petersburg, p. 131.

[34] See for details Gouzevich D, Gouzevich I (2008) Velikoe posolstvo. Rubezh epoh ili nachalo puti. Dmitriiy Bulanin, St. Petersburg, p. 203–210.

(and predominantly Dutch) late seventeenth century "Kunstcammer", the complex museum that aimed to present all the Universe in miniature.[35] So, what image of the marine environment the visitors could get from these museums and how could it be connected to the image of the Russian environment developed by Europeans and imported back to Russia in the heads of the Europeanized elite?

Firstly, this was the period when the Classical natural history developed trying to understand the Gods creation that "proved to be much larger and more complex than what Europeans originally thought".[36] So, God was rather important part of the world as it was imagined by the Europeans.[37] The same is true for the Russians who considered the landscape, visible environment as a link between the human and God who created this world and prepared it to be used by man.[38]

Secondly, the Russian Sea was imagined as superabundant and exotic, full of marine creatures of all sorts including very strange ones.[39]

Thirdly, the Ocean in this imaginary world was relatively homogeneous, without any insuperable natural borders. The idea of strict geographic localization of species was the thing of the future and there was no real understanding of crucial differences between the waters of different Seas as habitats. That is what Ryan Jones considered as the lack of understanding of biogeography and ecosystems, the problem that eventually led in the eighteenth century to the extinction of species in the North Pacific. [40]

To what extent this vision of environment was reflected in the texts of the projects?

First of all, the projects definitely demonstrate that the idea of God as the supreme power existed and was to some extent connected to the understanding of the place Russia occupied among the European maritime nations. Benedictus Nebel in 1698 (project 1) supposed that in the land of Lapps (Kola peninsula) he was going to deal with, "one can see nothing but great blessing from God".[41] God could help in business providing successful hunting, as it was stated in the contract between the

[35] Later the tsar reproduced these impressions in St. Petersburg. See for details: Moiseeva TM (2000) Petrovskaya Kunstkamera v kontekste zapadnoevropeiskih muzeev XVI – XVIII vv. In:Taksami ChM (ed) 285 let Peterburgskoy Kunstkamere: Materialy itogovoy nauchnoy konferencii MAE RAN, posvyashchennoy 285-letiyu Kunstkamery. Nauka. S.-Peterb. izd. firma RAN, Saint-Petersburg, p. 24–33.

[36] Reumer J, Post K (2010) Classical Natural History: the importance of volunteers in collection management and research. Quaderni del Museo di Storia Naturale di Livorno 23: 29.

[37] See for details: Worster D (1998) Natures Economy. A history of ecological ideas. Cambridge University Press, Cambridge, p. 2–25.

[38] See: Kivelson V (2012) Kartografii tsarstva. Zemlya i ee znacheniya v Rossii XVII veka. NLO, Moscow, p. 140.

[39] See: Herrmann B, Karlsons G, Steinsiek P, Kraikovski A, Lajus J, Holm P, Hoffmann RC (2005) Abundance of Species in Historic Times. In: Angoletti M et al (eds) History and Sustainability. 3nd International Conference of the European Society for Environmental History. Proceedings. University of Florence, Florence, p. 147–149.

[40] Jones R (2011) "A 'Havock Made among Them': Animals, Empire, and Extinction in the Russian North Pacific, 1741–1810. Environmental History 16: 585–609.

[41] RGADA, f. 50, inv. 1, year 1698, file 1, p. 5.

shareholders of Menshikov company.[42] However, the main blessing from Him was the fact that Russia is situated closer to the major whaling grounds in comparison to the other European countries and consequently has important advantages (project 8).[43] The Russian Emperor (or Empress) in this picture of the World definitely had some special relations to God. Therefore three whales stranded in 1726 in Motovskaia bay situated some 60 km from Kola on the Barents Sea shore were for the director of the Kola whaling company Yakov Neklyudov a clear demonstration of some special "luck of Her Imperial Magesty".[44]

In general the Ocean was described as the core environment of modernity and "Europeanness". The intention to become the modern European country in the texts of the projects was inextricably linked to the command over the marine environment. For instance, Benedictus Nebel (perhaps the most eloquent projector under study) provided in 1729 (project 2) the impressive perspective of the interconnection between the development of Spitsbergen whaling "as it is normal in Holland, England, France, Denmark, Sweden and other places",[45] increase of commerce with Spain, Portugal and France and, as a final goal, getting "likewise the other maritime countries" access to the American silver going annually to Cadiz, i.e. to the globally important Atlantic economy.[46] Additionally the whaling (as well as other European methods of marine harvesting) is described as sort of European secret, some kind of special expertise. For instance, Solomon Vernisobre stressed that his plans of whaling and cod salting required the opportunity to import experts from France and was ready to select only 12 people from the locals to teach them on the fishing grounds provided that "they have to stay on the grounds permanently without any absence" (obviously to keep the secret).[47] Benedictus Nebel from his side definitely preferred the Dutch expertise[48] and the same is true for the directors of the Kola whaling company.[49]

At the same time, all the authors of the projects described the Russian sea in the time of the project proposal as quite unproperly managed and used part of the abundant Ocean. Nebel even stated (project 1) that the blessed land of Lapps "feels great damage" from the locals who do not use it properly.[50] Vernizobre (project 4) stressed

[42] See RGADA, f. 198, inv. 1, file 3, p. 1 back.

[43] See RGADA, f. 1261, inv. 6, file 67, p. 65.

[44] See RGADA, f. 198, inv. 1, file 218, p. 8–8 back. It is worth noting that this Bay is famous in the Russian North as the place where to the streams normally bring dead whales, so, these three whales were nothing like exception but on the contrary – very ordinary phenomenon.

[45] RGADA, f. 397, inv. 1, file 221, p. 5.

[46] RGADA, f. 397, inv. 1, file 221, p. 1 back.

[47] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 363–364.

[48] RGADA, f. 397, inv. 1, file 221, p. 9.

[49] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 366.

[50] RGADA, f. 50, inv. 1, year 1698, file 1, p. 5.

that the situation in the Russian marine harvesting is so bad that there is no hope to improve it quickly and it will be a long and hard way.[51]

To sum up – Russia (and the Russian Emperor) is blessed by God, its environment is abundant and the marine environment is not an exception. On the other hand, the Russian system of management is very poor and the Russians to some extent reject the God's blessing. The only solution is to take expertise from Europe as the Europeans are familiar with the Sea, and the Ocean by itself is an element of European culture and identity. Consequently, this technological transfer will be both profitable and "natural", it will follow the Gods' will and improve the tragic position of unproperly managed abundant environment. The Government obviously totally agreed to this vision of the situation and wanted to change it. But what did it mean in practice? And what was the expected result of those practical measures for the marine environment?

4.4 Dreams of Success: Practical Measures in the Projects

As it was mentioned above, significant part of texts under study were conditions proposed by the actors who have got an offer from the authorities to organize the monopolistic companies. The authors of those documents mainly concentrated attention on the practical things – what they were going to get from the Government and what could be the results of their efforts. In general, these proposals were more or less the same in the projects proposed by different actors. However, some analysis is possible in order to see through the proposed practical measures the basic ideology of projects. What kind of new imaginary reality the projectors created and what imaginary environment was the base for it?

Several practical measures were common for all the documents and the centralization was the most important one. The Russian system of marine harvesting that existed before the eighteenth century was based on the activities of a number of independent actors who were not united and controlled by one agency. As a result it looked quite chaotic (though provided significant flexibility and adaptability) and in the eyes of the regular eighteenth century State was thing of the past. Egor Golovtsyn in his project (8) directly stated that "monopolies are sometimes useful… and the marine harvesting had always been in good condition when concentrated in one hands".[52] Solomon Vernisobre stressed (project 4) that this concentration was necessary because of big investments (he called it "great expenses").[53]

Secondly, all the projectors paid some attention to the delivery of necessary commodities and materials. Every project included some specific combination of these

[51] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 364.

[52] See RGADA, f. 397, inv. 1, file 238, p. 11–12.

[53] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 364.

necessities. For instance, Solomon Vernizobre supposed that the Russian North needed French salt and high-quality ropes[54] and Benedictus Nebel in 1698 promised to deliver to Kola "some houses (in Russian the translator used the word *domy*. Apparently it is to be understood here as "families", not as "buildings" – A. K.) able to grow vegetables" and to solve the problem of provision, quite important for this Northern town where the climate is too harsh for growing cereals.[55]

Thirdly, special attention was paid to the problem of ships and shipbuilding. Benedictus Nebel in 1698 stressed that the absence of good ships was the main cause for all the other problems.[56] The companies considered the ships as important part of their capital and investments. For instance, in 1708 Menshikov company invested into the shipbuilding 1533 rub., or about 8 % of all the capital the company possessed.[57] Matvei Evreinov in 1721 (document 3) made a commitment to build ships to transport commodities abroad[58] and Solomon Vernisobre (4) promised the same in 1723.[59]

The special importance of the ships in the eyes of the state authorities was demonstrated when the governmentally owned Kola Whaling company started its activities in 1723 with the order signed by Peter the Great to build three ships in Archangelsk[60], and later the government in the unique project written in 1726 (project 5) used these three ships as the strongest argument for the eventual participants of the whaling company. Noticeably, it didn't work and the merchants were not attracted.[61] The same problem was central for Benedictus Nebel in 1729 (project 2) who promised to build the fleet of 25 big ships for whaling, 30 average ships of fisheries in the opened sea and 50 small ships for coastal fisheries.[62]

The situation didn't change significantly in the second half of the century. G. Trappe in 1768 (project 9) highlighted the fact that he has big experience in building the ships for whaling. He obviously considering this as his major advantage.[63] Semen Vishniakov in 1776 (project 11) started his project with the requirement to provide the place for shipyard and permission to cut the trees for ships and

[54] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 362–363.

[55] RGADA, f. 50, inv. 1, year 1698, file 1, p. 9.

[56] RGADA, f. 50, inv. 1, year 1698, file 1, p. 5 back – 6.

[57] Archives of St. Petersburg Institute of History, Russian Academy of Sciences (hereafter SPb II RAN), f. 83, inv. 1, file 1418, p. 1–2.

[58] RGADA, f. 397, inv. 1, file 221, p. 18.

[59] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 363.

[60] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 366.

[61] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 379.

[62] RGADA, f. 397, inv. 1, file 221, p. 8.

[63] RGADA, f. 397, inv. 1, file 238, p. 85–85 back.

build vessels wherever the company will find it convenient.[64] In general, the problem of ships seems to be among the major concerns the projectors had and it deserves special discussion. In this paper there is no space for detailed story of implementation of the European types vessels in the Russian commercial shipping including marine harvesting. However, it is important to note that some link can be drawn from these repeating points of the projects and impressive (though unsuccessful) governmental efforts to make the people of the Russian North to use the Dutch vessels like hoekers, fleuts and yachts instead of their traditional vessels like *koch*, *lodia* or *soima*.[65]

Finally, the authors of projects and conditions concentrated special attention on the problem of taxes and governmental control. The eighteenth century was the time when the Russian taxation system was changed radically and quite often – taxes appeared and disappeared, the population tried to find the way to avoid payments, the government created systems of control.[66] So it is quite understandable that both projectors and the authorities considered this problem as crucially important. It is worth noting that the projectors were faced with some kind of challenge trying to discuss this issue in their texts. They had to find balance of interests between the State and the future monopolistic company (i.e. the projectors themselves). The problem is not that simple and it is to be considered in the context of economic ideology of the time. On the one hand, mercantilist theory required the increase of the governmental revenue and that was the main thing the projector had to promise. Eventually he had to demonstrate that "the profit of Imperial Majesty" is his main concern, the most important reason for his activities. This was important part of rhetoric from the very beginning. For instance, Benedictus Nebel in 1698 promised to provide "profit to His Majesty and also increase of taxes"[67] and in 1729 claimed that his project demonstrates "high interest of Her Majesty".[68] On the other hand, the companies were commercial enterprizes and their real goal was to get commercial privileges. Normally the projectors tried to get exemption from certain taxes in turn for the promise to increase the flow of money from customs duties. For instance, Solomon Vernisobre asked for duty-free importation of salt and other goods from France.[69] The Government for its part also used to promise some taxation privileges. For instance in the project of 1726 the Empress Catherine the First promised exemption from some taxes for the shareholders of the eventual company who would

[64] RGADA, f. 397, inv. 1, file 238, p. 109.

[65] For more details see for instance: Bryzgalov VV (2003) The building of Western European Ships in Pomorye (the first half of the eighteenth century). In: The Netherlands and Northern Russia. Blits, St. Petersburg, p. 396–397.

[66] See for details: Kozlov SA, Dmitrieva ZV (1999) Nalogi v Rossii do XIX v. Istoricheskaya illustratsiya, St. Petersburg.

[67] RGADA, f. 50, inv. 1, year 1698, file 1, p. 6 back.

[68] RGADA, f. 397, inv. 1, file 221, p. 85 back – 6.

[69] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 362–363.

invest at least 4,000 rub.[70] In general, the government considered manipulations with the taxes as important instrument of control.

At the same time the projectors "constructed" in their texts a variety of rather different economic models for their future companies. In general, the basic idea was to get control over the existing marine harvesting to be more precise the projectors wanted to get the monopoly for the purchase from the fishermen and hunters and resell to the foreign merchants the products of traditional marine harvesting industry (cod, blubber etc.) that were in demand on the international market. The profits theoretically were to be reinvested into the modernization of fisheries and marine mammals hunting. However, a big difference at this point exists between the projects by different authors.

What about the environment, however? The nature apparently had quite modest place in the practical plans of the monopolistic companies with the clear exception of the Arctic archipelago of Spitsbergen. This region was the major ground for the European whalers in the seventeenth century, and as it was mentioned above, Peter the First and his companions paid visit to the Spitsbergen whaling ships in 1697 during the Grand Embassy. Apparently since that moment the Russian authorities have got special interest in the development of the Russian activities on Spitsbergen considering this as part of Europeanization.

If we look on the image of Spitsbergen in the texts under study, we can see that the authors of the projects who tried to apply for the governmental support, like Benedictus Nebel, Solomon Vernizobre, and others were quite enthusiastic describing the resources of Spitsbergen. The authors of "conditions" (i.e. the people of practice), however, demonstrated very weak interest towards this archipelago. For instance, merchants of Evreinov family in 1731 (document 6) directly refused to engage in whaling and asked for special taxation privileges.[71] The government finally required from them to send at least one ship to Spitsbergen annually though no information is available if the company did it. Moreover, the monopolistic control over the existing marine harvesting was considered as a compensation for the material losses caused by Spitsbergen whaling.[72] In other words, the importance and abundance of Spitsbergen was very doubtful for the practicians, while the authors of the theoretical projects used to present almost ideal image of this part of Arctic as important source of income. Noticeably, the governmental decision makers were mainly on the "theoretical" side, paying special attention to the development of the Russian activities on Spitsbergen.

The Serene Prince Alexander Menshikov, the closest confidant of Peter the First who accompanied the tsar during the Grand Embassy and organized the first monopolistic company for marine harvesting in 1703, was to be the most convinced proponent of the Spitsbergen whaling. The whaling ship sent by his company to

[70] Chulkov M (1782) Istoricheskoe opisanie rossiyskoy kommertsii, vol. 1, book 2. St. Petersburg, p. 378–379

[71] See RGADA, f. 397, inv. 1, file 221, p. 16–19.

[72] See RGADA, f. 397, inv. 1, file 221, p. 12–12 back.

Spitsbergen in 1709 was the first documented Russian vessel that visited this archipelago.[73] After 1721 when Peter the First dismissed him from this commission and founded the state-owned Kola whaling company, the Prince didn't leave this venture. After Peters death in 1725 Menshikov immediately used strong connection to the new Empress Catherine the First (she was the lover of Menshikov before the Tsar met her) and got total control over the Kola company. He invested 5,000 rub.[74] and the directors of the company as well as the president of College of Commerce Petr Shafirov used to send him detailed reports especially highlighting the information on the trips to Spitsbergen. For instance, on August 6, 1726 Iakov Nekludov, the director of the Kola company, reported from Kola to the Prince that he expects the ships to be back from Grunland (Spitsbergen – A. K.) in August.[75] On June 22, 1727 Petr Shafirov informed Menshikov that he has got report from Solomon Vernisobre, the second director of the Kola company, that the ships left the harbor of Kola and departed to Spitsbergen.[76]

To sum up – the projects considered the environment as rather an object of human efforts but not as an actor of the story. Moreover, the nature was conceptualized to be very friendly to the modernization projects as no natural obstacles or threats were mentioned in the texts. The proposed and taken practical measures included economic and administrative decisions but not environmental management. Indeed, the existing marine harvesting was described as inefficient and even abusive for the blessed and abundant nature created by God for the prosperity of the Emperor. The key to the success, according to the texts under study, was the strict control from the company, support from the state, invitation of European experts, delivery of some necessary goods and instruments, and construction of proper vessels, i.e. – transfer of knowledge (very practical knowledge, nothing scientific).

Spitsbergen was the only environmental object discussed in connection to the practices of the monopolistic companies, and this discussion seems to be a bit strange. The projectors and the authorities considered Spitsbergen as rich and abundant without any arguments. According to them, the whaling on Spitsbergen, whish was previously foolishly neglected, was to become the core of this reorganization (one could ask – is Spitsbergen more blessed by God than the White Sea or the Murman Coast then? Or perhaps the Russians will bring Gods blessing with them?). At the same time the owners of the monopolistic rights tried to avoid Spitsbergen activities without any explanations. This strange discussion around the environment and resources of Spitsbergen continued until the late eighteenth century, and to get insight of the situation we have to study in details the history of the last project of whaling development proposed in 1798 by Ivan Lepehin.

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[73] See Kraikovski A, Dadykina M (2014) Promysel staratsya umnozhit': deyatelnost Salnoy kompanii A. D. Menshikova i morskie promysly na Russkom Severe: 1704–1721. In: Menshikovskie chteniya, vol. 5. Publishing House "XVIII century", St. Petersburg, p. 74–75.

[74] RGADA, f. 198, inv. 1, file 218, p. 1.

[75] RGADA, f. 198, inv. 1, file 218, p. 9.

[76] RGADA, f. 198, inv. 1, file 1035, p. 75 back.

4.5 The Project by Ivan Lepehin and the Merchants of Archangelsk

Ivan Lepehin sent his project to the government when Russia was very different from the late seventeenth century Muscovy. For the proper understanding of the text some details are needed both on the author and on the situation in the country.

Ivan Lepehin belonged to the generation of the Russian naturalists which appeared on the scene in the second half of the eighteenth century. He was educated in St. Petersburg Academy and his advisor Stepan Krasheninnikov was one of the first Russian scientists. He was famous for research expedition to Kamchatka described in the book that became classic of this kind of literature in Russian language.[77] In 1762–1767 Lepehin studied medicine in the Universities of Strasbourg and Leiden. When returned to St. Petersburg, he worked in St. Petersburg Academy of sciences in the field of the Natural science. By 1798 he was an experienced researcher having behind 6 years of scientific expeditions across the European part of the Russian Empire (1768–1773). We should remember, that 2 years (1771 and 1772) this expedition spent in the Russian North. Lepehin studied all the coasts and the islands of the White Sea. He visited Kola peninsula and sent a special research group with young Nikolay Ozeretskovskiy (the future famous scientist) to study the Barents Sea shore, the town of Kola and the area of Mezen. Thereby the expedition studied all the major zones of marine harvesting in the Russian North, be it salmon fisheries in the rivers, cod and halibut fisheries in the Barents Sea or marine mammals hunting, which was special expertise of Mezen dwellers. The expedition was mainly interested in the Natural science and the participants collected a plenty of data on the local biota including the marine one, paying special attention to the species used by the local population. For instance, Nikolay Ozeretskovskiy published special volumes dedicated to the eiderdown (which was important target for the Russian Arctic hunting expeditions) and to walrus hunting.[78] Thus, Ivan Lepehin in 1798 was definitely an expert (and possibly the best expert in Russia) in the environment of the Russian North and his knowledge was based on the advanced scientific methods. This was crucial difference between the professor of the St. Petersburg Academy and the authors of other projects, be they merchants or officials.

The administrative system of Russia also was quite different in comparison to the first half of the eighteenth century. The Empire by this time had very complicated and branched administrative apparatus and the Emperor himself was not anymore involved into the discussion of whaling projects. Apparently this was connected to several circumstances. Firstly, all the enterprizes in this sphere that took place during the eighteenth century turned out to be unsuccessful and the supreme power obviously lost interest. Additionally, the special administrative body (Department in

[77] See: Krasheninnikov S (1994) Opisanie zemli Kamchatki. St. Petersburg, 1755, vol. 1–2. Nauka, St. Petersburg.

[78] See for details: Aleksandrovskaya OA et al. (2011) M. V. Lomonosov i akademicheskie ekseditsii XVIII veka. RTSoft, Moscow, p. 90–129.

the structure of the Ruling Senate, one of the top-level governmental agencies of the Empire) was organized for the analysis of the new inventions and projects and all the documents of that kind were sent there, not to the Tsar. Finally, the issue itself dropped out of the spotlight of the government. During the eighteenth century the problem of marine harvesting modernization was considered as important part of political legacy of Peter the Great, but by the end of the century this inertia was lost. Paul the First who came to the throne in 1796 was very far from modernization and Europeanization ideas of his great-grandfather as well as from his passion for the sea. This was the background for the project Ivan Lepehin prepared, and this background to a great extent determined the result of the Lepehins efforts.

The project by Ivan Lepehin is by far the most extensive of all the studied texts, it includes 39 pages.[79] The text starts with the introduction describing the "legendary prehistory" of whaling starting from the Creation. More or less this can be labeled as "Theologic" part of the text. This description reveals rather specific picture of environment, significantly different from that of the earlier projects. For Ivan Lepehin God distributed resources around the world more or less evenly. The natural resources of the Northern Ocean are considered as compensation for the dwellers of the North for the scarcity of terrestrial resources. The Northern people from their part are adapted to eating the meat of marine animals and in general to use the resources of the Ocean instead of the products of agriculture.[80] Thus, the picture of environment Lepehin draws is fare more "balanced" without any mentions of superabundance or any kind of special Gods blessing for Russia.

The next section of the project can be labeled as "Ethnographic". It contains description of whaling practices used by indigenous people in remote regions of the world.[81] This part of the project is to be considered in the perspective of Empire and colonialism. The representatives of indigenous people are contrasted to the "educated European nations" though Lepehin recognizes that they have "human mind" which "overcomes the nature".[82] The ethnographic descriptions in the text can be connected to the results of the eighteenth century Academic research expeditions – apparently the most impressive imperial project in the history of the Russian science. For instance, the description of whaling methods used by the kamchadaly and olutory (the tribes on Kamchatka) Lepehin obviously took from the "Description of Kamchatka" written by his tutor Stepan Krasheninnikov.[83] The section is concluded with the comparison between the people of the North who kill whales by necessity because of the severe environment and natural preference, and the educated Europeans who overcome hardships in their pursuit of whales driven by market and industrial needs.[84]

[79] See: RGIA, f. 1285, inv. 2, file 79, p. 2–22.

[80] RGIA, f. 1285, inv. 2, file 79, p. 2–2 back.

[81] RGIA, f. 1285, inv. 2, file 79, p. 2 back – 4 back.

[82] RGIA, f. 1285, inv. 2, file 79, p. 3.

[83] See: Krasheninnikov S (1994) Opisanie zemli Kamchatki. St. Petersburg, 1755, vol. 1. Nauka, St. Petersburg, p. 299–301.

[84] RGIA, f. 1285, inv. 2, file 79, p. 5.

"Historic" section of the text introduces the reader into the history of European whaling – from Bascques to the Dutch whalers described as the best experts in the world.[85] In this section Lepehin tried to draw the link between the political conflicts in Europe and the natural resources of the North. To strengthen the argument he provided the economic data on the delivery of blubber from Spitsbergen and the revenue the Dutch whalers used to get from the market. It is worth noting here, that Lepehin apparently knew nothing about the crisis of the Dutch whaling. Meanwhile, during the eighteenth century "the size of the catches varied from year to a year, but it also fell to a distinctly lower long-run level between 1680s and 1720s. Until the 1680s whalers could count on catches between 200 and 300 vats of blubber per ship and after a sharp decline in 1690s, catches of 200 or more vats per ship continued to be achieved into the 1710s. Thereafter, the average catch plunged: in 1720s and 1730s, and again after 1755 the whaling vessels were lucky to sail home with 100 vats of blubber".[86] In general this part of the text is written to demonstrate to the reader the possible economic profit and to highlight the fact that this branch of maritime economy is "tested" by civilized and educated nations for a long time – and therefore it can't be unprofitable.

The next section can be labeled as "zoological". It includes the detailed description of the whales anatomy and physiology.[87] It is worth noting that no previous project included the information of such a kind. Zoological data was needed for Kunstcammer, but not for the state offices. In general the actors of the story studied above showed no interest in the whale biology as it had no connection to the financial revenue and the only biological problem important for them was the method of killing whale – which was the sphere of invited whalers' expertise. This part of the text includes references to the authors personal research experience as well as to the scientific literature and in general looks quite fundamental and demonstrates the high level of scientific expertise.

The next section contains the data on the organization of the whaling expeditions in Europe and may be conditionally marked as "technological and economical". The description of the hunting process, from the very beginning to the operations on the blubber market and the distribution of the revenue, is rather detailed and provides some comparative perspective. The author obviously kept an eye on the latest technological improvements and this section is necessary to demonstrate to the reader the innovative character of the proposed new branch of economy.[88]

Finally, the author have turned to the main issue, namely to the opportunities for whaling in Russia. Several points are important in the further text. Firstly, Lepehin noted that the ice regime of the White Sea prevents shipping in Spring and attracted the attention of the reader to the town of Kola situated on the Barents Sea having

[85] RGIA, f. 1285, inv. 2, file 79, p. 5–7 back.

[86] de Vries J, van der Woude A (1997) The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500–1815. Cambridge University Press, Cambridge, p. 263.

[87] RGIA, f. 1285, inv. 2, file 79, p. 7 back. – 11.

[88] RGIA, f. 1285, inv. 2, file 79, p. 11–16.

opened access to the Ocean almost all year round.[89] Then the author developed this idea further and described Ekaterininskaya harbour to the north from Kola as the most appropriate place for the whaling base and also for the navy.[90] And finally he described the abundance of all sorts of marine life in the Northern Sea that could provide additional profit to the whalers, special expertise of the Pomors in the Arctic navigation, and referred to the experience of Shuvalov monopolistic company as an example for the future governmental activities.[91]

To sum up, the projects looks very "scientific". Ivan Lepehin used all his academic skills, in the project the reader can see him as naturalist, ethnographer, historian, economist and technological expert (not an engineer). The picture of the world created in the text on the first glance looks quite solid. The author described the environment that was not legendary superabundant but provided opportunities for the fishermen and marine mammals hunters – and the Russians who were definitely able to use these opportunities for the common benefits. At the same time Ivan Lepehin obviously was not looking for any profit or privileges for himself and was motivated by patriotism. No mentions of any monopoly can be found in the text – it is definitely written by the man of the time of Catherine the Great. The officials of the Ruling Senate decided that this work deserved special acknowledgement from the government and decided to contact the Governor of Archangelsk in order to use the project in practice.[92]

Noteworthy that the first issue the Governor started to discuss was the problem of ships. He mentioned in the reports delivered to St. Petersburg a variety of issues like, for instance, the permissions to cut down the trees, the constructions of the vessel, the participation of the naval shipyards in the construction of the commercial ships etc.[93] So it seems evident that the local administration still had the same vision of the problem of interrelations between the Russians and the Sea that was recorded in the eighteenth century projects studied above. The ship construction and the shipbuilding technique was still considered as a key to the new system of mastering the marine environment. This perspective didn't work previously and it was very likely that the project by Lepehin would eventually lead to the creation of another failed company. However, the story made another turn.

In Archangelsk the project met unexpected (though quite predictable) opponents, namely the local merchants who were invited by the administration to discuss the text. The protocol of this discussion is the only example of "the local voice from the lower strata of society" available for the research.[94] Nobody asked the Pomors before what do they think about all these modernization and Europeanization projects – or at least no records on this issue survived. This text is very important for the understanding of the difference between the "theoretics" propagating the Spitsbergen

[89] RGIA, f. 1285, inv. 2, file 79, p. 16–16 back.
[90] RGIA, f. 1285, inv. 2, file 79, p. 17–17 back.
[91] RGIA, f. 1285, inv. 2, file 79, p. 18–22.
[92] RGIA, f. 1285, inv. 2, file 79, p. 25–25 back.
[93] RGIA, f. 1285, inv. 2, file 79, p. 38–42 back.
[94] RGIA, f. 1285, inv. 2, file 79, p. 43–46.

activities and the practicians trying to avoid it. Ivan Lepehin provided all the arguments that were possible for the projector proposing the development of whaling on Spitsbergen in order to make Russia modernized European maritime country. The answers from the merchants of Archangelsk provided the "practical" perspective from the people who were invited to invest their own money and based their answer on their own experience. This is perfect opportunity to compare their picture of the Northern environment with that of St. Petersburg professor and get the answer why the projects failed.

In their answer dated November 16 1800 (symbolically in the very end of the last year of the eighteenth century) the merchants stated that the whaling is known for 200 years and the Russians would become whalers too as soon as it will become profitable. According to the document, the main problems had nothing to do with the abundance of whales nor with the taxation system or construction of vessels. Very schematically, to the opinion of Archangelsk merchants, the Russians had no enough capital for investments, no stock exchange mechanism to create strong companies able to combine the funds from numerous small shareholders, and no insurance system able to attract money from the lower strata of society (and all that existed in Europe). This group of problems may be labeled as "institutional". Additionally the merchants demonstrated quite impressive understanding of interconnection between the environmental conditions and the commercial activities. Indeed, they argued, the Europeans due to the ice regime in the Northern Sea depart from their harbours in the early spring, spend summer hunting and deliver the product in autumn – and directly to the European market. In other words, money invested in winter will return in autumn. In Russia the ice prevents shipping until summer and the whaling expedition from Archangelsk will have to winter somewhere else to be able to reach Spitsbergen in the eary spring. Therefore, the whalers departing from Archangelsk will open the hunting season only in the next year, in other words, the capital invested in spring will return possibly next autumn – if the merchant will be lucky. And finally the merchants argued that Kola had very small population and therefore it couldn't serve as the base for whaling fleet and as a source of working hands.

So the merchants demonstrated very alternative vision of the environment and the interrelations between the Russians and the Sea. For them the marine environment was quite familiar as a source of income and they had no doubts that the Russians could be the same successful whalers as the Dutch or the Hamburgers. This was not the problem of technological secrets or constructions of ships. This had nothing to do neither with the "political will" nor with the "education and enlightment". The major problem for them was what we may call "the lack of capitalism". The local picture of the world represented environment as quite unfriendly to the commercial activities. Harsh climate slows down the capital tournover – that is the major problem for the Pomor merchants. Abundance of resources means nothing in this picture of the world, the whales are not the sign of Gods blessing but just huge animals somewhere in the Ocean beyond our reach. In other words – they are not the natural resource but rather exhibits for the Kunstcammer.

4.6 Conclusion

Summarizing the research we can draw several important trends of development of the environmental vision which served as a base for the projects of modernization and Europeanization of the Russian marine harvesting in the eighteenth century.

First of all, the Natural science made important contribution into the story. The projects of both late seventeenth and late eighteenth century were based on the certain level of environmental knowledge and the differences between the projects by Benedictus Nebel and Ivan Lepehin is to some extent the demonstration of differences between these levels in 1698 and in 1798. The role of God and Emperor decreased both "textually" (there are almost no mentions of these actors in Lepehins project) and "organizationally" (the Supreme power was not any more involved into the discussion).

The shift from the merchantilist ideas to the physiocratic theories led to the shift from the promises of rapid and easy governmental income to the impressive plans of general improvement of economic life in the region. The new branches of economy (and the natural resources behind it) were considered firstly as untouched storage of revenue for the State, but later – as important reserve of wealth for the nation as a whole.

This latter trend is connected to some kind of decentralization of knowledge. In the end of the story the Europeanized and rather scientific world picture created in St. Petersburg confronted the local understanding of nature – far less scientific and far more practical. This story can be also considered in terms of imaginary environment. The authors of the projects as well as the governmental officials had in mind some ideal situation, when Europeanized Russians will go the European Ocean (Spitsbergen) on the European ships under the supervision of European experts and managers and all this triumph of Europeanness with provide profits and wealth to everybody. The practicians (be they managers, merchants or hunters) however had quite different vision. Spitsbergen, according to their experience, was rather dangerous than profitable. What they proposed was the monopolistic exploitation of the existing system of fisheries and marine mammals hunting as the way to compensate the losses and expenses connected to the Spitsbergen projects. In terms of imaginary environment this means the exploitation of abundance that God donated to Russians directly near their houses.

The result of this confrontation seems to provide the key to unlock the history of failed struggle of the "good fisheries" vs. "bad fisheries".

Part II
Transforming In Sito – Manipulating, Changing and Evolving Landscapes, Waterscapes, Airscapes (Classical Approach of Territorial Changes, Causes, Actors and Consequences)

Chapter 5
Water Management and Dam Construction in the Italian South

Maria Gabriella Rienzo

Abstract While a large body of the literature on environmental policies has focused its attention on the impact of regulations on productivity, less attention has been given to the link between industrial policies and transformations of the landscape and of the life of local communities. In this paper I adopt the theoretical approach that has revived recognition of the active role of nature in the historical process to study how, in a remote area of the Italian South, the environment has been affected by industrial policies that totally changed it.

The research, rather than starting with the well-worn comparison between southern backwardness and northern development, analyses the history of southern agricultural economies in relation to the policies for land management and rational use of water. This reaffirms the primacy of nature, our foremost provider of renewable assets and resources, and the importance of endowment with energy resources, among the most valuable of which is water.

In Italy, in the first half of the twentieth century, the water resources had a dominant role for the life of the people and for the industrialization, representing the principal industrial source of energy, as the country was devoid of coal and fossil fuels. Its exploitation cemented a block of power between democratic politicians technocrats and reformers, that developed spatial planning projects, pretending to contribute at the development of the backward areas of the country.

The case reveals the role of water in the dualism of Italian industrialization, between the Italy of the rivers (North) and the Italy of the torrents (South) and the sharp contrast between the northern national ruling class and the southern bourgesie, aimed to preserve their power, keeping the traditional structures of the great landholding.

The work shows how the will to endow the Calabrian territory of large electrical infrastructure in the 1920s responded primarily to the needs of the northern entrepreneurial class to exploit new financial opportunities but had no propulsive effects on the regional economic life.

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The construction of dams in Calabria created a critical situation, linked not to water shortages but to its exploitation, the consequences of which led to the complete transformation of the environment, its abandon from the local communities who suffered for the loss of their land and customary resources.

5.1 Introduction

While a large body of literature on environmental policies has focused its attention on the impact of regulations on productivity, less attention has been given to the link between industrial policies and transformation of the landscape and local communities. In this paper I adopt the theoretical approach that has revived recognition of the active role of nature in the historical process to study how, in a remote area of the Italian South, the environment has been totally changed as a result of industrial policies (Georgescu-Roegen 1976; Worster 1985; White 1995; Blackbourne 2007).[1] The novelty of the case study is that rather than starting with the well-worn Italian comparison between southern backwardness and northern development, this research analyses the history of southern agricultural economies in relation to policies for land management, and to the rational use of water (Bevilacqua, Corona 2000).[2] This adds an original contribution to discussion of environmental history reaffirming the primacy of nature, our foremost provider of renewable assets and resources, and the importance of endowment with energy resources, among the most valuable of which is water.

In the forms it takes that are beyond human control, water has been represented, in the southern Italian areas, as an evil spirit and a threat to life. When harnessed and channelled it is seen instead as a purifying element, and a resource that is indispensable for life and economic development (Maneglier 1994; Sorcinelli 1998; Ball 1999;etc.).[3] 'Hydraulic society', discussed by Worster, describes a social system

[1] Georgescu-Roegen, N 1976, *Energy and economic myths*. Pergamon, New York; Worster, D 1985, *Rivers of Empire. Water*, *Aridity and the American West*. Oxford University Press, Oxford; White, R 1995, *The Organic Machine. The Remaking of the Columbia River*. Hill and Wang, New York; Blackbourn, D 2007, *The Conquest of Nature*: *Water*, *Landscape and the Making of Modern Germany*. W.W. Norton, New York and London.

[2] Bevilacqua, P and Corona, G (eds) 2000, *Ambiente e risorse nel Mezzogiorno contemporaneo*. Donzelli, Rome.

[3] See Hervé Maneglier, *Storia dell'acqua* (Milan: Sugarco, 1994), 9–12, and Paolo Sorcinelli, *Storia sociale dell'acqua* Milan: Mondadori, 1998), 8. See also Philip Ball, *H2O*: *A Biography of Water* (London: Weidenfeld and Nicolson, 1999; Jacques Bethemont, *Les grands fleuves* (Paris: Armand Colin, 1999); Istituto di ricerca sulle acque del Consiglio nazionale delle ricerche, *Un futuro per l'acqua* (Rome: CNR, 1999); Istituto Ambiente Italia (ed.), *Un futuro per l'acqua in Italia* (Rome: Legambiente, 1998); Leonard Sklar and Patrick McCully, 'Damming the River s: The World Bank's Lending for Large Dams', *Internationa Rivers Network Working Papers* 5 (1994); Patrick McCully, *Silenced Rivers*: *The Ecology and Politics of Large Dams* (London: Zed Books, 1996); John McNeill, *Something New under the Sun*: *An Environmental History of the*

based on the management and control of water resources, which completely transforms a territory's population distribution, production, and politics and White emphasize the role that the energetic function of the water systems has, affecting economic and social environments (Worster 1985; White 1995).[4] In the cases examined in this article, the progressive 'taming' of water in the sub-Apennine area of northern Puglia harnessed this resource for various forms of economic exploitation, with inevitable environmental and social consequences. Water was used as a source of mechanical energy, and for irrigation, fishing, raising livestock, and domestic supply in towns and cities.

As a preface to discussing water in Italy, it should be noted that the country's water system is characterized by a dualism: the rivers of the North contrast with the torrents of the South. This 'dual hydraulic Italy' has influenced the economic system, having significant effects on society and the environment in both the pre-industrial and industrial eras (Cafagna 1989; Isenburg 1986).[5] The water from the Alps comes from high-level snow and has its lowest runoff in the depths of winter because of the freezing temperatures, while the thaw generates its maximum flow in the hotter months. By contrast, water from the Apennines is in full flow in winter and at its lowest in summer, thus creating difficult conditions both for traditional agriculture and for the introduction of new crops requiring irrigation (Civita 1922).[6]

The distinction between 'river Italy' and 'torrent Italy' had symbolized the contrast between the nation's ruling class, the hydraulic capitalism, which promoted an ideology of increased productivity, and that of the South, which was intent on preserving the traditional pattern of landownership within large estates. From the start of the nineteenth century, and for almost all the twentieth, water was the main source of biological, mechanical, and hydroelectric energy for Italy, a country lacking coal. The use of this new energy led to the establishment of a nexus of power, linking elected politicians with forward-thinking technocrats, water bureaucrats, engineers, which created regional planning projects aimed at developing the country's more backward areas. This new hydraulic capitalism, through the manipulation of rivers and control of flows, intended to dominate nature for the freedom of man to pursue national power. Especially in the South, water was the only energy resource available for programmes of industrialization, and so the control of water

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Twentieth-Century World (London: Penguin, 2002); Riccardo Petrella, *Il Manifesto dell'acqua. Il diritto alla vita per tutti* (Turin: Abele, 2001); Jacques Sironneau, *L'eau, nouvel enjeu stratégique mondial* (Paris: Economica, 1996).

[4] Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (Oxford: Oxford University Press, 1985), 67–9; Worster (ed.), *The Ends of the Earth: Perspectives on Modern Environmental History* (Cambridge: Cambridge University Press, 1988). See also Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 1995).

[5] See Luciano Cafagna, *Dualismo e sviluppo nella storia d'Italia* (Venice: Marsilio,1989), 85; see also Teresa Isenburg, *Acque e Stato. Energia, bonifiche, irrigazione in Italia fra 1930 e 1950* (Milan: Franco Angeli, 1986).

[6] D. Civita, *Il problema idroelettrico in Italia e l'attività delle imprese elettriche* (Rome: La Poligrafica Nazionale, 1922).

resources initiated a 'season of water research and large-scale projects for water management' which subsequently merited their own chapter in Italy's environmental history (D'Souza 2006; Bevilacqua 1993).[7] The construction of dams, and the substantial auxiliary hydraulic plant, fitted within a scientific and economic model intent on making rational adjustments to the environmental equilibrium, in order either to increase agricultural irrigation and the availability of drinking water, or to initiate production of hydroelectric energy for industrial use (De Pieri 1909; Civita 1922).[8]

5.1.1 The Case and the Challenges for Development of a Backward Area

This article will give close consideration to the construction of dams; their economic, social, and environmental effects, which follow from the disruption to ecosystems and to the living conditions of the population, have until now had a considerable attention from historians (think about Erik Swyngedouw, on Spanish water-management, is the obvious starting point, being widely cited as a landmark point in the study of waterscapes, followed by Matthew Gandy, Stephane Castonguay, Maria Kaika, Harold Platt, Harriet Ritvo, Norman Smith, Owen Roberts, Binnie and others). [9] I will specifically examine the case of Puglia. Within this region, 460,000 ha of the Tavoliere area were identified for land improvement by the decree law of 28 November 1929, no. 2234, and nine river basin consortia were established by the decree of 5 December 1930, no. 5814. Starting in the 1930s, the *Consorzio per la Bonifica della Capitanata* (Consortium for Reclamation of the Capitanata) planned complex water schemes and reclamation projects through the rational use of water, which it then carried out by building dams on the main watercourses that cross the Tavoliere territory: the Fortore to the north; in the centre the Candelaro and its tributaries (the Triolo, Salsa, Celone, and Vulgano), the Cervaro, and the Carapelle; the Ofanto to the south (Afan De Rivera 1832; Rossi-Doria 1961 and 1982).[10]

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[7] D'Souza, R 2006, *Drowned and Dammed*: *colonial capitalism and flood control in Easter India*. Oxford University Press, New Delhi; Piero Bevilacqua, *Breve storia dell'Italia meridionale dall'Ottocento a oggi* (Rome: Donzelli, 1993), 90.

[8] G. De Pieri, *La Capitanata. Appunti e note statistiche illustrative* (San Severo: 1909), 22; Civita, *Il problema idroelettrico*, 12.

[9] Swyngedouw, E. *Social Power and the Urbanisation of Water*: *Flows of Power*. Oxford University Press, 2004; Gandy, M. *Concrete and Clay*: *Reworking Nature in New York City*. Mit Press, 2003; Castonguay, S. et Evenden. M. *Urban Rivers* : *Re-making Rivers*, *Cities and Space in Europe and North America*. Pittsburgh, University of Pittsburgh Press, 2012; Kaika, M. *City of Flows*: *Modernity*, *Nature*, *and the City*. London: Routledge, 2005; Platt, H.L. *Shock Cities*: *The Environmental Transformation and Reform of Manchester and Chicago*. University of Chicago Press, 2006.

[10] See Carlo Afan De Rivera, *Considerazioni sui mezzi per restituire il valore proprio ai doni che la natura ha conceduto al Regno delle Due Sicilie* (Naples: 1832); Manlio Rossi-Doria, 'Aspetti e

In Puglia the Apennine river water, with its torrential and seasonal profile, was a natural force that was hard to use and control; the alternation between periods of drought and swollen rivers had been an insurmountable obstacle to regional development. The experts aimed to retain the water in reservoirs to allow for continuous use of the river flows, and to divert it towards power stations, irrigation channels, and other civil and industrial uses. The enormous potential of intensive agricultural activity in the Tavoliere area persuaded governments, across the twentieth century, to sponsor substantial planning efforts aimed at launching a large-scale project in Puglia, in order to recover the malarial plain through hydraulic reclamation work (D'Antone 1988).[11]

During the course of the twentieth century the 'second hydraulic Italy', as the South was described at the 1914 Forestry and Irrigation Conference in Naples,[12] discovered that water could be used not just for irrigation and drinking, but also as a precious source of mechanical energy in a country lacking fossil fuels (Bardini 1998; Barca 2010).[13] It was planned to block the river courses either to produce electricity with hydraulic energy, as in Calabria, or to control the flow and create irrigation basins, as in Puglia. The production of *carbone verde* ('green power'), water energy from the woods rather than glaciers, was the starting point for any modernization project in the Italian South.

Using the case of Puglia, this article will focus on:

1. The emerging hydraulic capitalism in Italy that, underestimating the primary role of natural resources, of which water is one of the most important, planned to achieve the comprehensive control of the water system in the South of Italy to transform a backward area of the country in a modern industrial region;
2. The negative effects of the process on the physical environment, the unsustainability (thinking about the economic sustainability of Solow) of the technological techniques intended to dominate nature to reorganize the hydraulic system of southern land, which became a testing ground for new projects relating to an ambitious future of industrial development;
3. At the end of the process the problematic balance between management of the hydraulic system and preservation of water as a valued collective resource, the destabilization of established territorial arrangements, and the withdrawal of the land from its customary use by local communities (thinking about the control of resources of Dasgupta).

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problemi delle trasformazioni fondiarie nel Mezzogiorno. La bonifica nello sviluppo del Mezzogiorno', *Mondo economico*, 24 (1961); Rossi-Doria, *Scritti sul Mezzogiorno* (Turin: Einaudi, 1982).

[11] Leandra D'Antone, 'Medici, ingegneri, agronomi nella bonifica del Tavoliere', in P. Bevilacqua (ed.), *Il Tavoliere della Puglia. Bonifica e trasformazione tra XIX e XX secolo* (Rome-Bari: Laterza, 1988), pp. 83–6; D'Antone, *Scienze e governo del territorio*, *medici*, *ingegneri*, *agronomi e urbanisti nel Tavoliere di Puglia*, *1865–1965* (Milan: Franco Angeli, 1990).

[12] *Atti del III Congresso forestale italiano e del I Congresso per l'irrigazione* (*Napoli 31 maggio – 6 giugno 1914*) (Portici, 1916).

[13] See Carlo Bardini, *Senza carbone nell'età del vapore* (Milan: Franco Angeli, 1998); Stefania Barca, Enclosing water. Nature and political economy in a mediterranean valley, 1796–1916, The White Horse Press, Cambridge, 2010.

Events in Puglia are illustrated by the hydraulic improvement works in the Tavoliere area; these were first planned in the 1930s, according to the general obsession for manipulating hydraulic systems to pursue national power, in order to reclaim the malarial areas (Di Giovine 1984; Bevilacqua, Rossi-Doria 1984; Massafra 1984).[14] The reclamation and irrigation programmes gave new importance to the role of water in improving the productivity of agricultural land, and imagined the transformation of the Tavoliere into 'Italy's California'.[15] They expected to transform the region into an economically dynamic and modern productive landscape. 'It has been a struggle to tame water and make it safe, and now we see it as having the potential to trigger a new growth process and accelerate economic and social development, through irrigation'.[16]

The intention was to lay the foundations for the economic recovery of a strategic agricultural area.[17] Compared to hillier land, this plain was 'naturally more fertile, easier to improve in terms of roads, and better suited to accommodating industrial initiatives and the many modern-day human activities'.[18] Running from the Adriatic in the north to the Carapelle torrent in the south, with the Gargano promontory to the east and the Apennine foothills to the west, the vast plain of 460,000 ha was mostly used as pasture; otherwise, land was cultivated for crops, and some areas had orchards and plantations (olives, almond trees, and vines).[19] From the second half of the 1880s, the traditional extensive cereal-growing farms had more dynamic large cereal businesses alongside them; the latter, however, had to come to terms with territory which was drought-ridden in summer and malarial

[14] G. Di Giovine, 'Il Consorzio di bonifica e gli agricoltori del Tavoliere', in Consorzio per la bonifica della Capitanata, *Cinquant'anni di Bonifica del Tavoliere* (Foggia: Bastogi, 1984), pp.17–23; see also Piero Bevilacqua and Manlio Rossi-Doria, *Le bonifiche in Italia dal'700 ad oggi* (Turin: Einaudi, 1984); Angelo Massafra (ed.), *Produzione*, *mercato e classi sociali nella Capitanata moderna e contemporanea* (Foggia: Grenzi, 1984).

[15] ACS, Ministero dell'Interno, Direzione generale della sanità pubblica, 1910–1920, Dott. Cav. Messi Gustavo, *Relazione sulle opere di bonifica effettuate o in corso di esecuzione o in progetto nella provincia di Capitanata*, anno 1915, fasc. 2.183.6,b. 103; L. Rubino, 'Effetto bonifica sull'azienda coltivatrice', in Consorzio per la bonifica della Capitanata, *Cinquant'anni*, pp. 23–31; see also R. Tramonte, *Bonifica integrale in Capitanata*, *opposizione al Piano generale di bonifica del comprensorio compilato dal Consorzio generale di bonifica e trasformazione fondiaria della Capitanata* (Bari: Laterza, 1934); Tramonte, *L'irrigazione in Puglia* (Bari: Laterza, 1949).

[16] G. Rotella, *Cinquant'anni di bonifica nel Tavoliere*, in Conzorzio per la bonifica della Capitanata, *Cinquant'anni*, pp. 31–171.

[17] See D'Antone, 'Medici, ingegneri, agronomi'; D'Antone, *Scienze e governo del territorio*; G. Postiglione, 'Irrigazione e trasformazioni fondiarie', in Federazione nazionale delle irrigazioni, *II Congresso nazionale delle irrigazioni*, *Bari 14–16 aprile 1926* (1926).

[18] Bevilacqua, *Breve storia*, 92.

[19] 'Relazione per la Puglia', *Atti della Giunta per l'Inchiesta agraria e sulle condizioni della classe agricola*, vol. 12 (Rome: 1884); 'Relazione del delegato tecnico Prof. Errico Presutti', *Inchiesta parlamentare sulle condizioni dei contadini nelle province meridionali e nella Sicilia*, vol. 13, tomo 1 (Rome: 1909); 'Relazione della Sottogiunta parlamentare On. Girolamo Giusso', *Inchiesta parlamentare sulle condizioni dei contadini nelle province meridionali e nella Sicilia*, vol. 13, tomo 1 (Rome: 1911).

in winter, because of the extreme torrential nature of the rivers which flooded the land before joining the Adriatic.[20]

Trends in crop cultivation had developed in much the same way across the four areas that made up the Tavoliere plain. In the northern area, where large cereal businesses predominated, the autumn cultivation of beet, and subsequently sunflowers and tomatoes, was only introduced with the land reform of the 1950s. In the central area smallholdings with vineyards and olive groves were the main feature between Torremaggiore and San Severo, whereas the area between San Severo and Foggia, which had a particularly erratic water supply, was characterized by medium- and large-size farms chiefly growing cereals.[21] During the 1950s this latter area also saw vineyards and olive groves springing up alongside cereal cultivation, and the introduction of beet crops. The part of the plain lying south of Foggia was until the 1950s used only for wheat, but subsequently the abundant supply of water from artesian wells, the presence of resourceful entrepreneurs, and the suitable size of farms all favoured the development of intensive systems, mainly based on grapes for eating, olives, and vegetables (artichokes, cabbages, turnips, fennel, celery, and lettuces); wheat, however, still accounted for 61 % of the land.[22] Fruit farming (peaches and almonds) also spread within this area. Irrigation, before the new works were carried out, was based on using the water tables below ground.[23]

At the northern edge of the plain lay the marshland of the Lesina and Varano lagoons, and to the east the coastal region overlooking the Gulf of Manfredonia, also marshy, thanks to the Versentino, Salso, and Salpi lakes.[24] The plain was crossed by numerous streams and rivers: in the north the Fortore, which rose in the Benevento area and joined the Adriatic above the Lesina lake; in the centre the Candelaro, separating the Gargano promontory from the Tavoliere and gathering the waters of its many tributaries which rose below the Apennines (Radicosa, Triolo, Salsa, Celone, Vulgano); still in the centre, the Cervaro and Carapelle, which ran almost parallel to each other from the Irpinia area; and in the south the 163 km of

[20] G. Scelsi, *Statistica generale della provincia di Capitanata* (Milan: 1867); G. Tropeano, 'La storia clinica della Capitanata', *Giornale della malaria*, 1 (1907), p. 47; Tropeano, *La malaria nel Mezzogiorno* (Naples: 1908). See also: Bevilacqua, *Il Tavoliere della Puglia*; Saverio Russo, *Paesaggio agrario e assetti colturali in Puglia tra Otto e Novecento* (Bari: Edipuglia, 2001); P. Di Cicco, *Le vie della transumanza* (Foggia: Bastogi, 1984).

[21] A. Lo Re, *Capitanata triste* (Cerignola: 1899); Lo Re, *Quindici anni di esperienze dedicate ai granicultori del Tavoliere* (Piacenza: 1909); Consorzio per la bonifica della Capitanata, 'Comprensorio irriguo del Fortore: progetto della rete irrigua', in *Cinquant'anni di bonifica del Tavoliere*, pp. 179–201.

[22] Consorzio generale di bonifica e trasformazione fondiaria della Capitanata, *Attività dei Consorzi di bonifica del Tavoliere per il biennio 1945–1947* (Foggia: 1947); Consorzio per la bonifica della Capitanata, 'Comprensorio irriguo del Fortore'.

[23] ACS-1 (see Archival sources below): Relazione sulle opere di bonifica effettuate o in corso di esecuzione o in progetto nella provincial di Capitanata (1915). See also F. Giordano, *Bonifiche in Capitanata* (Naples: 1879); R. Tramonte, *Bonifica integrale in Capitanata*, *opposizione al Piano generale di bonifica del comprensorio compilato dal Consorzio generale di bonifica e trasformazione fondiaria della Capitanata* (Bari: Laterza, 1934).

[24] ASF-1: Relazione al Prefetto di Foggia del Consiglio sanitario provinciale (1874).

the Ofanto, separating the Tavoliere from both the Basilicata region and the province of Bari.[25]

From spring to autumn the area was uninhabitable due to malaria: in the early decades of the twentieth century this still resulted in around 15,000 deaths and at least 36,000 cases of illness each year.[26] Agriculture was practised by cereal cultivation, with a 3-year rotation (wheat to wheat to oats) and some areas given over to beans and other legumes, alternating with pasture for migrant livestock.[27] The work was focussed in the season of the grain harvest, which drew in some 60,000 *braccianti* (casual farm workers) from both local and neighbouring areas, and in the subsequent sowing season: this kept the population's residence in the unhealthy plain to a minimum. Agricultural work was seen as an activity to be carried out for a certain number of hours per day and days per year, with the farm workers not living in the country but in urban centres. Not surprisingly, both the farms and settlements which were created by the land reform of the 1950s were immediately abandoned.[28] At that time, as in the rest of southern Italy, there was no economic activity other than agriculture, and so the demand for work and earnings continued to weigh disproportionately heavily on this sector.[29]

The year 1925 saw the start of much research and experimentation, undertaken both by technical staff from the consortia and Puglia's water supply agency[30] and by staff from the other main agricultural and economic bodies: Giuseppe Di Lonardo and Giuseppe Colacicco, engineers from the water agency's Irrigation Department; Enrico Pantanelli, head of the Agricultural Office in Bari; Emanuele De Cillis, a dry farming theorist from the Agricultural College in Portici; and Gaetano Postiglione, an early advocate of Fascism in the region, who was chairman of Puglia's water agency from 1923 to 1932.[31] These experts argued for land development, aimed

[25] ACS-1: Relazione sulle opere di bonifica. See also G. Colacicco, *Le acque artesiane del Tavoliere* (Foggia: Bastogi, 1933); Colacicco, *Cenni sullo stato attuale delle sistemazioni idrauliche sulle esondazioni e sulle rotte dei principali torrenti del Tavoliere* (Foggia: Bastogi, 1952).

[26] Bevilacqua, *Breve storia*, 95. See also P. Corti, 'Malaria e società contadina nel Mezzogiorno', in *Storia d'Italia*, *Annali*, vol. 7 (Turin: Einaudi, 1984), 635–678; Ministero dell'Interno, Direzione generale della sanità, *La malaria in Italia e i risultati della lotta anitmalarica* (Rome: 1924); Ministero dei lavori pubblici, Reparto idrografico di Bari, *Piano regolatore delle utilizzazioni idriche della Puglia e della Basilicata dal Fortore al Basento* (Rome: 1930).

[27] G. Rotella, *Bonifica e crescita del Tavoliere* (Foggia: Bastogi, 1985), 15.

[28] Consorzio per la bonifica della Capitanata, 'Comprensorio irriguo del Fortore', 196.

[29] Bevilacqua, *Breve storia*, 93. See also Paolo Malanima, *L'economia italiana. Dalla crescita medievale alla crescita contemporanea* (Bologna: Il Mulino, 2002); Malanima, *Uomini*, *risorse*, *tecniche nell'economia europea dal X al XIX secolo* (Milan: Mondadori, 2003).

[30] Ente autonomo Acquedotto Pugliese, *L'alimentazione idrica e il risanamento igienico nella regione pugliese* (Bari: 1934); Ente per lo sviluppo dell'irrigazione e della trasformazione fondiaria della Puglia e della Lucania, *Ordinamento e attività dell'Ente* (Bari: 1950); Ente per lo sviluppo, *Attività svolta dall'Ente dal 1949 al 1955* (Bari: 1956); Luigi Masella, *Acquedotto pugliese. Intervento pubblico e modernizzazione nel Mezzogiorno* (Milan: Franco Angeli, 1995); Michele Viterbo, *La Puglia e il suo acquedotto* (Bari: Laterza, 1955).

[31] G. Di Lonardo, *Le acque sotterranee in Italia*, *Regione pugliese* (Rome: La Poligrafica Nazionale, 1935); Colacicco, *Le acque artesiane*; Colacicco, *Cenni sullo stato attuale*; E. Pantanelli, *Studio di*

particularly at curbing agricultural unemployment, based on four types of farming business: large cereal and pasturage farms, medium-sized units practising dry farming, medium-sized farms with partial irrigation, and small farms practising intensive arboriculture, with or without irrigation.[32] At the beginning of the 1930s, increased agricultural unemployment brought landowners' and experts' proposals together within the idea that plans for reclamation and agricultural development should be particularly aimed at the social control of casual farm labour, by establishing the peasantry's presence in the countryside throughout the year.[33]

The *Consorzio generale per la Bonifica e la trasformazione fondiaria della Capitanata* (General consortium for land reclamation and development in the Capitanata area) was established in 1933. This had the challenging task, across a vast area, of initiating schemes aimed at the best use of agricultural land and at safeguarding the human settlements, which were threatened both by periodic flooding from the rivers and by the scourge of malaria.[34] In compliance with the law of 13 February 1933, the Consorzio put forward a series of three reclamation plans. In 1934, engineer Roberto Curato's plan stuck closely to the economic and environmental dynamics of the Tavoliere plain; it proposed the division of landed property, and the scientific rationalization of dry cereal farming.[35]

In 1938, the plan by Aurelio Carrante, Puglia's inspector of agriculture, and Giuseppe Medici and Luigi Perdisa, lecturers in agricultural economics at the universities of Turin and Bologna respectively, particularly addressed the creation of an infrastructure – roads and centres with services, for the steady transfer of people into the country – rather than the transformation of the agricultural system.[36] This plan owed the removal of the Consorzio from local control to the replacement in 1935 of Arrigo Serpieri as Undersecretary for Agriculture, by Gabriele Canelli of Foggia.

In 1946, the plan by Mazzocchi Alemanni, an agricultural economist, argued that land division should be accompanied by reductions in pasturage, in favour of a cereal-cultivation and livestock-rearing system based on dry fodder and arbori-

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massima per la trasformazione agraria de comprensorio (Rome: 1932); Pantanelli, *Trasformazione agraria delle valli Cervaro e Candelaro* (Rome: 1932); E. De Cillis, *La concezione integrale della fertilità nella tecnica agrari. Il raduno dei tecnici agricoli del Mezzogiorno e delle isole* (Portici 1931); E. De Cillis, *Dopo nove anni di sperimentazione cerealicola in clima caldo-arido* (*Cerignola*) (Portici: 1932); E. De Cillis, A. De Dominicis, G. Tommasi, and G. Colacicco, *Piano di massima di bonifica e trasformazione fondiaria del Tavoliere centrale* (Foggia: Bastogi, 1932); G. Postiglione, 'Irrigazione e trasformazioni fondiarie', in Federazione nazionale delle irrigazioni, *II Congresso nazionale delle irrigazioni*, *Bari 14–16 aprile 1926* (1926).

[32] D'Antone, 'Medici, ingegneri, agronomi'; Ministero dei lavori pubblici, *Piano regolatore*.

[33] Pantanelli, *Trasformazione agraria delle valli Cervaro e Candelaro*, Roma, 1932.

[34] *Ibidem*.

[35] R. Curato, *Piano generale per la bonifica del comprensorio* (Rome: La Poligrafica Nazionale, 1933); Bevilacqua, *Il Tavoliere*, 22.

[36] A. Carrante, G. Medici, and L. Perdisa, *Direttive per la trasformazione* (Rome: La Poligrafica Nazionale, 1939).

culture, making use of subterranean water.[37] This foresaw 'creation of a patchwork of farms, linked by a comprehensive road network and peppered with villages and new rural centres with housing and services'.[38] It took its inspiration from the agronomic models of the sharecropping area and the Po valley, which seemed suitable for the climate and soil conditions of the Capitanata area.[39] Mazzocchi Alemanni had been director of the Italian Colonial Institute in 1920, general inspector of the *Opera nazionale combattenti* (the organization that supported ex-soldiers) from 1933 to 1939, and head of the body for settling the Sicilian *latifundia* from 1939 to 1944. Adopting anew the Serpieri-style approach of the Curato plan, his intention was to give a fresh impetus to full-blown reclamation and land development; his plan went against the extensive cereal cultivation practised by the large estates, which was seen as responsible for agriculture's backwardness and the destitution of the underemployed workforce. He wanted systems based on rotation in which cereals would be replace by dry fodder crops, with a commitment to settling more people on the land. The construction of five rural villages was planned, with service buildings (church, school, clinic, shops, and council office) as well as accommodation for farming families. These were to be grouped together in various blocks, but the limited finance available was inadequate for the complexity of the work envisaged.[40]

This latter plan was still limited by an outdated ruralist model for land development. As Manlio Rossi-Doria had reported in a thorough assessment of the Tavoliere countryside, this and the scarcity of water had prevented a structural transformation of the territory which would have enabled the peasant population to break free and orient agricultural production towards the market.[41] In the 10 years between 1933 and 1943 the Consorzio was nevertheless responsible for some impressive results: it constructed 436 km of reclamation roads, 135 km of river channelling, 50 km of embankment, 59 electricity bridges, 344 km of drainage gullies, and 3 drainage plants, as well as reclaiming lakes and building electricity supply lines and rural waterworks.[42] In 1947, after the war, once the bombing damage to the works had been made good, work on land reclamation and development started again. However, the mass of unemployed agricultural workers was swollen by the return of peasants from the front; they demanded land and the break-up of the great estates, fuelling

[37] N. Mazzocchi Alemanni, *Direttive di massima del piano di trasformazione fondiaria del Tavoliere* (Rome: 1946).

[38] Pantanelli, *Trasformazione agraria*, xix.

[39] Rotella, *Bonifica e crescita*, 60. See also V. Peglion, *Pastorizia, cerealicoltura e trasformazioni fondiarie nella Capitanata* (Foggia: 1926)

[40] Mazzocchi Alemanni, *Direttive*; Rotella, *Bonifica e crescita*, 109.

[41] Rossi-Doria, *Scritti sul Mezzogiorno*, 79. See also V. Fiore and A. Vitulli (eds), *La Puglia di Manlio Rossi-Doria* (Foggia: Daunia, 1995).

[42] Mazzocchi Alemanni, *Direttive*, 93.

social conflict.[43] The problem of demographic pressure due to unemployed and underemployed agricultural labour was renewed, 'with increased seriousness and urgent need for resolution'.[44]

Decisive change came in 1948 when the Tavoliere was included in the districts that were allocated Marshall Plan funding, with a 5-year work plan at a total cost of 50 billion lire, and commitments were required for the reclamation of an area of 50,000 ha.[45] The arrival of the law on Land Reform, in October 1950, gave rise to property redistribution which was directly determined and overseen by the public authority; this had 'an important social role and a limited economic effect',[46] inasmuch as it reduced the role of the old agrarian class but did not trigger any structural change in southern agriculture.[47] On 7 February 1951 an office of the Land Reform programme was established to identify the land to be expropriated. Through the *Cassa per il Mezzogiorno*, the body responsible for funding development in the Italian South, the State then gave the reclamation consortia funding for a substantial plan of public water, road, and civil works (control of river flow, upstream and downstream, creation of rural waterworks and electricity supply lines for agriculture) and agricultural development, in order to permanently remove the main obstacle to the practice of agriculture: lack of water.[48] The financial resources triggered a new phase of research and technical analysis aimed at encouraging, across southern Italy, the use of water for industry as well as for agriculture. The impressive work programme, which spawned the Occhito, Osento, and Capacciotti dam projects among others, was intended to be a considered response to the territory's development needs. Water was to be used as a productive resource, held back in large reservoirs in the winter and then carefully released during the dry seasons.[49]

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[43] Bevilacqua, *Breve storia*, 97–8; Piero Bevilacqua, *Tra natura e storia. Ambiente*, *economie*, *risorse in Italia* (Rome: Donzelli, 1996).

[44] Rotella, *Bonifica e crescita*, 108. See also Giuseppe Barone, *Mezzogiorno e modernizzazione* (Turin: Einaudi, 1986).

[45] Mazzocchi Alemanni, *Direttive*, 39.

[46] Bevilacqua, *Breve storia*, 100–2.

[47] Bevilacqua, *Il Tavoliere di Puglia*; Piero Bevilacqua, 'Le rivoluzioni dell'acqua', in Bevilacqua (ed.), *Storia dell'agricoltura italiana in età contemporanea*, 3 vols (Venice: Marsilio, 1989–1991), 1, 255–318; Piero Bevilacqua, *Terre del grano*, *terre degli alberi*: *l'ambiente nella storia del Mezzogiorno* (Rionero in Vulture: Calice, 1992).

[48] Rotella, *Bonifica e crescita*, 115–9. See also S. La Sorsa, *Aspetti demografici*, *economici sociali e approvvigionamento idrico della Puglia* (Bari: 1952); Colacicco, *Cenni sullo stato attuale*; A. Checco, 'La vicenda economica del Tavoliere dalla legge di affrancamento del 1865 alla I guerra mondiale', in Bevilacqua, *Il Tavoliere della Puglia* (1988).

[49] Consorzio generale di bonifica e trasformazione fondiaria della Capitanata, *Attività dei Consorzi di bonifica del Tavoliere per il biennio 1945–1947* (Foggia: 1947); Ente per lo sviluppo

5.1.2 The Project

The water plans envisaged the creation of reservoirs, at the foot of the mountains, to moderate the floods, regularize river flow, and improve the land so that it could be reallocated to agriculture. The system would be self-regulating: late winter and early spring, times of heavy rainfall, would be when water built up in a reservoir, and then from April onwards the machinery would release more water as the irrigation phase started. The reservoirs would be complemented by a distribution network providing water for irrigation, human consumption, and industry. Thus the winter river water would collect in the large reservoirs, to be used for agriculture in the dry periods of summer and autumn, and for drinking and industry all year round. The aim was in particular to transform waterlogged areas into agricultural land and launch schemes to draw off water for irrigation within the immense Tavoliere plain.[50] The projects envisaged, and described briefly below, were as follows: Ionico-Sinni, Basento-Bradano, Ofanto, Fortore, and Carapelle-Cervaro (still not undertaken).[51]

The Ionico-Sinni project involved land in Puglia, Basilicata, and Calabria (and, within these regions, in the provinces of Potenza, Matera, Taranto, Brindisi, Lecce, and Cosenza) and related to two reservoirs: Monte Cotugno, on the Sinni river, and Pertusillo, on the Agri, with capacities of 430 million and 145 million cubic metres respectively. This project was to provide the Puglia water authority with a substantial amount of water for drinking and domestic use by the populations of Puglia and Basilicata, and would otherwise supply water for irrigation and industry. Territories to benefit from irrigation from this scheme were the Metaponto plain, eastern Puglia, and northern Calabria.

The Basento-Bradano project involved land in Puglia and Basilicata (in the provinces of Taranto and Matera) and concerned the Ponte Fontanelle dam on the Camastra torrent (a tributary of the Basento), the Trivigno weir on the Basento, and the Acerenza and Genzano reservoirs on the Basento and Bradano rivers. This was to provide around 175 million cubic metres of water for drinking and domestic use, irrigation, and industry.

The Ofanto project involved land in Campania, Basilicata, and Puglia. The main place for water collection was the dam at Conza della Campania, with a planned

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dell'irrigazione e della trasformazione fondiaria della Puglia e della Lucania, *Ordinamento e attività dell'Ente* (Bari: 1950), and *Attività svolta dall'Ente dal 1949 al 1955* (Bari: 1956).

[50] ACS-2: Ministero Agricoltura e Foreste, Direzione generale bonifiche, 'Progetto esecutivo della distribuzione irrigua delle acque dell'Ofanto e affluenti nel comprensorio consorziale in sinistra dell'Ofanto', 30 May 1956.

[51] S. Ciccone, 'Il governo dell'acqua in Capitanata: le fasi dello sviluppo', in M.G. Rienzo (ed.), *Foggia sostenibile. Istituzioni intermedie e sviluppo locale in Capitanata* (Rome: Donzelli, 2004). See also V. Marzi, 'Comprensorio irriguo in sinistra Ofanto', in Consorzio per la bonifica della Capitanata, *Cinquant'anni di Bonifica del Tavoliere* (Foggia: Bastogi, 1984), pp. 201–33; F. Mercurio, 1990, *La frontiera del Tavoliere. Agricoltura, bonifiche e società nel processo di modernizzazione del Mezzogiorno tra'800 e'900* (Foggia: Grenzi, 1990).

capacity of 54 million cubic metres. There were other collection points planned along the river and its tributaries (the Saetta, Osento, Rendina, Marana Capacciotti, and Locone dams, and the S. Venere weir). In total, about 310 million cubic metres of water was to be collected, destined for the usual three sectors: civil, irrigation, and industrial.

The Fortore project involved land in the Puglia and Molise regions, and distribution was to come from the Occhito reservoir on the Fortore river, and the Celone reservoir on the torrent of the same name. After construction of the Occhito and Capacciotti dams, the Consorzio planned a number of aqueducts to serve every part of the district where human settlement might be anticipated. In view of the increasing requirements for drinking water in irrigated territory undergoing agro-industrial expansion, the following were envisaged: the Piano dei Limiti dam, with a capacity of 48 million cubic metres; a dam on the Carapelle, to provide water half for drinking and half for the irrigation of 18,000 hectares; the Triolo, Salsa, and Vulgano dams, which along with the Celone dam were to supplement the Fortore river flow, while the others would serve to create new irrigated areas in the highest part of the province of Foggia.[52]

5.2 Impact on the Physical Environment

To give an idea both of the scale of the works and of the profound changes they brought about in the ecosystem, we will briefly consider the Fortore project and the construction of the Occhito dam. This straddles the Molise-Puglia border and is one of the largest earth dams in Europe: its reservoir has a total capacity of 333 million cubic metres, 250 million of which are for irrigation, and it particularly affects the local districts of Carlantino and Celenza Valfortore.[53] It has recently been in the public eye, with experts assessing its socio-economic and environmental damage in view of concerns about the construction of a second dam, downstream from Occhito, at Piano dei Limiti; this would be in the territories of Colletorto, in Molise, and Casalnuovo Monterotaro, in Puglia, taking 200 and 300 ha from them respectively, and we will return to this later.[54]

There are 16 local districts with territory bordering the Occhito reservoir: 5 in Puglia, 10 in Molise, and 1 in Campania, with their centres between 1.5 and 10 km

[52] ACS-2.

[53] ACS-3: Ministero Agricoltura e Foreste, Direzione generale bonifiche, 'Progetto esecutivo per la costruzione della diga sul Fortore in località Occhito'. Report presented 6 August 1956.

[54] 'Diga di Occhito. Studio sui danni provocati', 5 March 2007; Salvatore Ciocca, 'Nuova diga Piano dei Limiti-Diga di Occhito: è tutto a posto?', 2 November 2007 <http://www.altromolise.it/notizia.php?argomento=e-mail&articolo=27903> [accessed 27 April 2012]; 'Allagamenti diga Occhito', 26 April 2009 <http://www.primonumero.it/attualita/news/topnews.php?id=1240680107> [accessed 27 April 2012]; Vincenzo Rizzi, 'Diga di Piano dei Limiti: non si farà più, meglio così …', 16 February 2011 <http://www.sipontoblog.it/2011/02/diga-di-piano-dei-limiti-non-si-fara.html> [accessed 27 April 2012].

from the water: in the province of Foggia, Carlantino (1.5 km east), Casalnuovo Monterotaro (10 km northeast), Celenza Valfortore (2 km east), San Marco la Catola (5 km east), and Volturara (9 km southeast); in Molise and Campania, Bonefro (9 km north), Castelvetere in Valfortore (9 km south), Colletorto (4 km north), Gambatesa (2 km south), Macchia Valfortore (2 km west), Pietracatella (5 km west), Riccia (7 km southwest), San Giuliano di Puglia (6.5 km north), Sant'Elia (5 km west), Santa Croce di Magliano (9 km north), and Tufara (4 km south).[55]

If we return to the Piano dei Limiti dam, the Fortore water project saw its construction as an important development opportunity for the inland areas of the two regions involved, as a bringer of well-being and work, and as the salvation of sugar beet cultivation, and hence of the sugar plant at Termoli. However, the local councils of Carlantino and Celenza Valfortore now opposed this new development, having already experienced the problems created by the Occhito dam. The Casalnuovo Monterotaro council, directly affected by the new dam, and four environmental organizations (Italia Nostra, Legambiente, the Italian League for Bird Protection LIPU, World Wildlife Fund) described it as pointless and harmful, emphasizing the upheaval it would bring, the dangers related to the area's unstable seismic and geological situation, the loss to agriculture of more fertile land, and the heightening of climatic change already occurring due to the Occhito reservoir.[56]

The Fortore area extended over 329,663 ha, including the entire San Severo district and parts of sixteen other local districts. The river's flow was by nature extremely torrent-like, with 'the potential to change, in a matter of hours, from a trickle to a flood, because of the steepness of the slopes along the basin's great stretches of mountain'.[57] To create the Occhito dam, complex works of diversion, modification, embankment, and containment of the river and its tributaries also had to be undertaken, as well as defences for the riversides and sections downstream from the dam against the potential release of heavy outflow. To protect the Occhito lake, hydraulic work was undertaken in the Salice valley and its tributaries and in the Santa Lucia valley, both in the Carlantino district, in the 'Vallone del Ladro' outside S. Elia a Pianisi, and in the 'Vallone delle Ripe' outside Celenza Valfortore, to add to forestry work and reforestation to defend this same reservoir.[58]

This dam, to the northwest of the province of Foggia where the Fortore river acts as the boundary between Puglia and both Campania and Molise, had been planned in the early decades of the twentieth century by the Royal Commission for irrigation, led by Foggia's parliamentary deputy Girolamo Giusso,[59] to collect 410 million cubic metres of water in an enormous artificial reservoir on the Fortore, at Occhito. The first project for the diversion and distribution network goes back to 1956; this envisaged the irrigation of about 70,000 ha of countryside from May to

[55] Consorzio per la bonifica della Capitanata, 'Comprensorio irriguo del Fortore', 181.

[56] Ciocca, 'Nuova diga'.

[57] Rotella, *Bonifica e crescita*, 30.

[58] Rotella, *Bonifica e crescita*, 72.

[59] Girolamo Giusso, 'Relazione della Sottogiunta parlamentare', in *Inchiesta parlamentare sulle condizioni dei contadini nelle province meridionali e nella Sicilia*, vol. 13, part 1 (Rome, 1911).

November in the central part of the Tavoliere, north and south of San Severo, using small channels.[60] A second plan was drawn up in 1959 and anticipated using piped water, under pressure, to irrigate about 124,000 ha. This was approved by the *Consiglio superiore dell'Agricoltura* (Higher Agriculture Council) in 1961.[61] The dam was built by the *Consorzio per la Bonifica della Capitanata* at the end of the 1950s, and was expected to improve the lot of around 30,000 agricultural workers, who had been forced into seasonal migration because the farms they worked were too small and could not, under dry farming, guarantee an acceptable income.

The Consorzio dispossessed 1,437 landowners of 180,560 ha; 130,348 were in Puglia, and of these 57,357 were in the province of Foggia alone. The local district of Carlantino suffered the most: 1,000 of its 1,500 ha of farmland, previously vineyards, olive groves and orchards, were taken. Opposition by peasants and landowners, who reinforced their fencing with stakes and barbed wire, came to nothing. A road linking Carlantino to Occhito was built between 1958 and 1959, and work on the dam took place between 1959 and 1963.[62] The work started with the construction of a tunnel, 15.94 km long and able to take 30 m^3 per second, to divert water to a distribution reservoir with a capacity of 30,000 cubic metres at Finocchito. This was the main junction from which water could flow to the north or south of the Tavoliere and into Puglia's water system. The Puglia water authority built a large plant at Finocchito which was to render water from the Occhito reservoir drinkable, before letting it flow into the supply pipes for much of the province of Foggia. The Consorzio was to take what was left of the water, channelling it into an irrigation network. The dam itself, built at a place called Casone, has a width of 500 m and is 60 m high, 67 m thick at its base, and 11 m at its crest. Its total capacity is 333 million cubic metres and its usable capacity 250 million, reserve capacity for floods 43 million, and residual capacity 40 million. The artificial lake created by the dam is 13 km long and has an average width of 1 km, while its surface area is 14 km^2 at maximum, and its perimeter 142 km.[63] The dam started to operate in 1966.

The environmental consequences of the Occhito dam have included: changes in timing of the river Fortore's floods and flow, and deterioration of its river basin; the raising and lowering of underground water-bearing strata with the start of land slippage and subsidence in nearby towns and villages; and increased hydrogeological instability, already a problem for the sub-Apennine area of northern Puglia, due to the enormous quantity of cement needed to build the dam. According to numerous press reports the dam was built in an area at risk of earthquakes, and after its construction there were seismic events across most of the territory, and especially in the Carlantino district.[64] In 2007 Carlantino's mayor, Vito Guerrera, apparently claimed that land movement in the village had been happening for years, and in 1984 had caused an entire area, Toppo, 'to slide towards the artificial lake': 15 houses, its little

[60] ACS-2.

[61] Consorzio per la bonifica della Capitanata, 'Comprensorio irriguo del Fortore', 181.

[62] Rotella, *Bonifica e crescita*, 145.

[63] ACS-3.

[64] 'Diga di Occhito. Studio sui danni provocati'; Ciocca, 'Nuova diga'.

square, and trees were swept away. It seems that a 3-km stretch was moving slowly towards the reservoir.[65] Moreover, according to studies carried out by the Occhito rain measurement station built by the Consorzio, the dam's construction seems to have been followed by local climate change: from 'continental' dry conditions to high humidity and frequent mist, because of the marked difference in temperature between the air and the reservoir water. This change, it seems, has given conditions related to the damp climate, such as osteoporosis and rheumatoid arthritis, to the local population.[66] Recently, there has been an alert regarding the red algae found, which can damage the health of people using the reservoir water for drinking.[67]

5.3 Impact on Local Populations

The main consequences for local populations of creating water schemes, and of the construction of the Occhito dam in this case, can be summarised as a complete disruption of the traditional structures of southern Italian agrarian society. The equilibrium of the system of the great agricultural estates, the 'latifondi', was fundamentally threatened by the expropriation of land, the loss of fertile terrain from local agriculture which was already precarious, and the enforced departure of the communities of shepherd-peasants from the valley-bottom villages, now under water, with neither advance information on the projects, nor compensation, nor adequate opportunities to relocate. To have some idea of the resultant environmental devastation, one might consider that the catchment basin for the Occhito reservoir had a surface area of 1,012 km^2.[68] This part of the population, already at the edge of the province, underwent a further marginalization from the rest of the territory. People lost the economic and cultural traditions of their places of origin, the ecosystem they understood, and direct access to resources they had used for generations. The short-term impact of the project's first phase was relatively beneficial. At Carlantino, for example, during the years of the dam's construction, new housing to modern specifications was built along new roads, while many of the old houses were rebuilt, often with extra floors and modern services. Pipes were laid for the provision of drinking water, and a sewage system built so that toilets could be installed. The road system also benefited from the dam construction, in that many roads were rebuilt and new ones were established.[69] For a number of years, more than a hundred local workers, as well as similar numbers from other regions, had regular work on the dam's building sites; they moved with their families to Carlantino or neighbouring villages. The flow of money gave rise to widespread benefits and improved standards of living,

[65] Ciocca, 'Nuova diga'.

[66] 'Diga di Occhito. Studio sui danni provocati'.

[67] 'Alga rossa nella diga di Occhito', 9 March 2009 <http://www.lagazzettadelmolise.it/2009/03/09/alga-rossa-nella-diga-di-occhito-wwf-e-consumatori-riaprono-il-caso/> [accessed 6 May 2012].

[68] Rizzi, 'Diga di Piano dei Limiti'.

[69] 'Diga di Occhito. Studio sui danni provocati'; Ciocca, 'Nuova diga'.

which translated into a rise in the population. This can be seen in the censuses, which demonstrate a demographic high point in 1961, followed by an unstoppable decline in subsequent years.

By contrast, the longer-term effects were depopulation and emigration from both the inland and mountain areas.[70] In the areas of plain, which theoretically should have benefited the most from the dams, the land reclamation and expansion of irrigation had positive effects which included the profound structural transformation of the territory within a short span of time. They allowed for the end of the cereal-growing and pasturage regime, reductions in dry farming, livestock, and forestry work. Cultivation of durum wheat for pasta production was boosted, and horticulture and fruit farming got underway. However, the agricultural workforce was substantially reduced by the concentration of production in the areas reached by irrigation, and by the modernization of agriculture through mechanization and the introduction of chemical fertilizers: between 1951 and 1971 the countryside emptied.[71] Moreover, the exodus was encouraged in the 1960s by the lure of work in the industries of northern Italy; this led to the final abandonment of the land in Puglia by the active workforce, which left both the interior mountain areas and the farms and farmhouses in the plains, while the elderly, women, and children returned to their places of origin, leaving entire villages with amenities, schools, clinics, and social centres empty. There was not sufficient time for the progress brought on by irrigation to keep the peasants from emigration. The long-term economic cost of the dam works was thus the impoverishment of local districts through their agriculture's loss of fertile land. In addition, frequent flooding related to surges in the Fortore river, because of unregulated releases from the Occhito dam walls, have repeatedly caused harvest losses and extensive damage to farms and livestock breeding downstream from the reservoir.[72]

5.4 Concluding Remarks

This case study demonstrates how dam construction in Puglia, as happened similarly in Calabria, created a critical situation related not to the scarcity of water, but rather to its use: the consequences of this for the transformation of the land, and its structural organization, impacted on the life of local communities, modifying settlement patterns and affecting the balance in the management of agriculture and traditional resources.

[70] Istat, Popolazione residente dei Comuni (2001). Population figures for Carlantino, 1951–2001, are as follows:

1951	1961	1971	1981	1991	2001
1,980	2,094	1,789	1,539	1,449	1,294

[71] Bevilacqua, *Breve storia*, 107–9.

[72] 'Diga di Occhito. Studio sui danni provocati'.

In relation to the first issue, the relationship between man and nature and particularly between man and water, which emerged from the plans of those working on development of the Italian South, we have seen how policies for land management through the rational use of water only partially achieved their intended goals, and failed in the primary aim of fostering development locally. The hydraulic capitalism, using the new scientific and technical knowledge developed between the late nineteenth and early twentieth centuries, and the subsequent innovations regarding the usage of water as a resource, developed the conviction that the material and moral evolution of southern Italy could only be brought about by substantial reclamation programmes and hydroelectric installations. The wish to endow the territory with a substantial infrastructure was in fact a response, above all, to the needs of the nation's new entrepreneurial and financial classes; these were intent on using technical, financial and institutional opportunities in order to resolve the problems of backwardness of the Italian South, which prevented the economic life of this region from moving forward. Great forces were brought into play in the development schemes which offered the tools to overcome the nature and resistance of the physical environment, in order to manage water and harness its new energy, and great hopes were placed in the future economic outcomes of these transformations. However, the policy for land management took little account of the differences within each area, nor of the economic, environmental, cultural, and social particularities of local populations.

Problems from construction of the dams added to problems already brought about by the agrarian reform process. This had created farms that were too small, forcing land recipients to increase the crops under cultivation, which fetched too low a price on the market and were hard to grow within dry farming, while waiting for irrigation schemes. Moreover, the idea of moving peasants to rural townships met with their stiff resistance: they were profoundly reluctant to leave their home villages. The cemetery in the town of Mezzanone provides an excellent illustration: at least until the 1980s it was never used, as those living on the farms preferred to be buried in their districts of origin.[73] Not even the financial results of Puglia's water plants met expectations. Although some important projects were completed, the irregularity of river flows continued to mean irregular inflow to the reservoirs, resulting in flood surges and consequent overflow and flooding of the surrounding land in periods of heavy rainfall. In the dry seasons, given the substantial amounts of water drawn off by Puglia's water authority for domestic use, little was left for irrigation and industrial use: this limited the introduction of crops needing irrigation to agricultural production in the Tavoliere area, which was constrained by the limited amount of water allocated per hectare. In addition, various bodies (the authority for irrigation, reclamation consortia, and others) undertook the management of water collection without there being comprehensive forward planning regarding

[73] Rotella, *Bonifica e crescita*, 147.

usable water, much less its distribution among different users. The limited amount of water available meant that satisfactory planning for agricultural irrigation could not be carried out; it also obstructed development of any local processing industry for agricultural production, so much so that 'sugar beet went off towards Molise, tomatoes to the Sarno-Nocera area, and other crops were taken away by big industrial concerns in central and northern Italy'.[74]

As regards the second issue, the effects of restructuring the hydraulic system on the physical environment, the general consequences of building large dams are well known: changes in ecosystems because of the disruption of natural environmental equilibria; climatic change (swings in temperature and precipitation, and increased humidity near the reservoirs); changes in plant and animal species in altered habitats (extinction of some species, particularly fish which cannot get upriver due to the dams); interruption of migration routes; salinization and risk of pollution of reservoir water (due to the concentration of chemical fertilizers and other harmful substances carried by water); coastal recession because of reduced river debris, which accumulates in the artificial basins and never reaches the river mouth; and seismic activity.[75] In the case examined, the construction of the installations and other works had a profound impact on the geomorphological structure of this southern territory, and gave rise to some of the phenomena listed above, albeit on a small scale. Heavy human usage of the environment and its energy assets caused change, destabilizing ancient configurations, altering ecosystems, and replacing the natural hydrogeological order with artificial hydrological systems. According to Vandana Shiva, 'water development projects can themselves disrupt the hydrological cycle and destroy water resources in basins'.[76] Significantly, the Italian Ministry for Infrastructure recently (February 2011) decided to remove the Piano dei Limiti dam from the list of major works in the national Irrigation Plan, although in the post-war period it had been seen as strategically important for the area's wellbeing.

We come now to the third issue, the fragile balance between management of the hydraulic system and safeguarding the collective asset of land and water. When water assumed the role of a vital development resource, the major economic and political interests connected to its exploitation, especially those of large national capital, were quick to sideline any attention to protecting the wellbeing of local communities. Once work was completed, no ecological balance was achieved

[74] Ciccone, 'Il governo dell'acqua', 58.

[75] S. Neri Serneri and S. Adorno (eds), *Industria*, *ambiente e territorio. Per una storia ambientale delle aree industriali in Italia* (Bologna: Il Mulino, 2009); S. Neri Serneri, *Incorporare la natura. Storie ambientali del Novecento* (Rome: Carocci, 2005).

[76] Vandana Shiva, *Water Wars*: *Privatisation*, *Pollution and Profit* (London: Pluto Press, 2002), 63. See also World Health Organization Regional Office for Europe, *Environment and Health*: *The European Charter and Commentary* (Copenhagen: WHO, 1989); Clive Ponting, *A Green History of the World* (Harmondsworth: Penguin, 1992).

between the populations and the territory, and resistance to development was offered both by the communities of shepherd-peasants, who demanded their rights to usage and collective management of water resources, and by landowners, who had expropriation forced upon them. In the short term there was a positive impact, related to construction of the installations, when the population was forced to switch from traditional to new occupations; in the long term, the effects were negative, as once the work was complete both old and new work opportunities permanently disappeared, forcing communities to abandon these places and creating depopulation. The alteration of ecosystems destroyed the logic of the established coexistence of man and environment, born of adaptations by productive forces to local conditions over centuries. The legal nature of places and resources changed, from goods for common use to private goods; consequently, in some cases, communities were deprived of their collective right to use natural resources.[77] The works generally changed the external nature of places alongside the very nature of people and their relationship systems. Residents of the affected communities were subjected to the effects of the demand for modernity, but benefited from its advantages either in limited fashion or not at all.

As happened in Calabria, Puglia's water projects represented an attempt by national organized capitalism to restructure southern *latifondismo*, the system of large agricultural estates, not so much through reform of the landownership regime, nor by using tax allowances and easing trading restrictions, but rather by substantial developments in the infrastructure for managing water. From the current technical perspective as well, dam construction is nowadays a controversial technology in both developed and developing countries: its destructive ecological impact, especially in the case of large dams, and its negative social consequences have been highlighted by a substantial body of international public opinion (D'Souza 2006; Blackbourne 2007; Mitchell 2002; Flyvbjerg 2003; Josephson 2002). In recent years the pursuit of supply-side hydrology has been considered on its environmental negative side effects and the planners are leaning towards more sustainable and less destructive options, particularly interesting for their reliability and competitiveness, which can guarantee the same services. The economic, social, technological and environmental stories relating to dam construction have been complex, especially in the first half of the twentieth century, when political and ideological reasons led to progress in some national and international areas being identified with the ability to control nature and water resources, symbolically confirmed by the construction of reservoirs. Ecologists demonstrated that fluvial regimes are complex geomorphologic, chemical and biological processes in motion (D'Souza 2006, 64) and their manipulation can affect badly either the environment and the local communities, loosing precious agricultural land.

This case study, moreover, aims to contribute to the scholarly debates on the history of water drainage and irrigations schemes, sheding light upon a piece of European environmental history little known to the larger public, but that can be easily be compared to similar case studies drawn from the environmental history

[77] G. Corona, 'Diritto e natura: la fine di un millennio', *Meridiana*, 28 (1997), 127–61.

literature on dam-building and water management in Europe and the wider world (India, Africa, the Middle East and other cases within Europe) (Swyngedouw 2004; Gandy 2003; Castonguay 2012; Kaika 2005; Platt 2006 and others). It invites us to reflect more deeply on the idea of unsustainability of economic development, in whose name the role of nature in the historical process has been suppressed, without bearing in mind the natural balance between man and territory. We might conclude, with Vandana Shiva, that 'when the technology euphoria of dam building arrived [in Puglia, in our case], so did the ecological disruption and social conflict associated with it'.[78]

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ACS = Archivio Centrale dello Stato (Central State Archives), Rome; ASF = Archivio di Stato di Foggia (State Archives in Foggia)

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ACS-3: Ministero Agricoltura e Foreste, Direzione generale bonifiche, Progetto esecutivo per la costruzione della diga sul Fortore in località Occhito. Report submitted 6 August 1956.

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[78] Swyngedouw, E. *Social Power and the Urbanisation of Water*: *Flows of Power***.** Oxford University Press, 2004; Gandy, M. *Concrete and Clay*: *Reworking Nature in New York City*. Mit Press, 2003; Castonguay, S. et Evenden. M. *Urban Rivers* : *Re-making Rivers*, *Cities and Space in Europe and North America*. Pittsburgh, University of Pittsburgh Press, 2012; Kaika, M. *City of Flows*: *Modernity*, *Nature*, *and the City*. London: Routledge, 2005; Platt, H.L. *Shock Cities*: *The Environmental Transformation and Reform of Manchester and Chicago*. University of Chicago Press, 2006; Shiva, W. *Water Wars*: *Privatization*, *Pollution*, *and Profit*, London: Pluto Press, 2002, p. 61.

Chapter 6
From the City to the *Dacha*: Socio-cultural Factors Behind the Creation of St. Petersburg's *Dacha* Belt (Russia, Nineteenth/ Early Twentieth Century)

Olga Malinova-Tziafeta

Abstract This article explores how and why the St. Petersburg city limits did not witness the same suburbanization that was typical of other European cities. Instead, a thick belt of single-family summer residences, or *dachas*, appeared: city-dwellers abandoned the city in the summer months, only to return to their apartments in the autumn.

The Russian dacha of this time was conceptually linked directly to the idea of *urban agriculture* though, naturally, not in the form we have become used to in today's world. In this case, the issue of the day was neither an economic crisis, nor a food deficit. Rather, this was a particular approach to solving the numerous problems of urbanization, by forming a special, "intermediate" type of agricultural area, which was so closely interconnected with the *urbis*, that it almost became a part of the city.

In this "leisure zone" around the city, the usual agricultural activities of peasants were replaced by rudimentary service industries: peasants started offering the services and products in demand amongst the *dachniki* visiting their second homes. This was a sort of "no man's land"—neither truly representative of the city or the country.

Ecological history here is closely connected with the new social history. The *dacha* belt was partly developed by the middle class (numerous social groups, that were balanced in the center of a social ladder between the highest aristocracy and regular workers), and partly by enterprising inhabitants of the country, who worked to develop trade with the *dachniki* in their own locality.

Dachas had become a sort of Russian panacea—the preferred solution for a multitude of urban problems and the best solution to public needs. In public discussions of the problems the city of St. Petersburg faced, the dacha inevitably appears as a

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refuge from the aggressive urban environment and destructive cultural elements. The construction of collector sewage disposal and prevention of infectious diseases, accelerating lifestyles and stress, the spread of railway networks, class differences and the fight for consumer rights—all of these topics had an influence, one way or another, on the development of the dacha belt. The middle class of St. Petersburg believed that the best thing you could do to strengthen your health, nerves and social standing was to set off from the city for the summer retreat. Yet, there were other ways of solving the city's problems…

This article explores how and why the city limits of St. Petersburg, capital of Russia, did not witness the same suburbanization that was typical of other European cities. Instead, a thick belt of single-family summer residences, or *dachas*, appeared: city-dwellers abandoned the city in the summer months, only to return to their apartments in the autumn.

The 1870s and 1880s was a time in which the *dacha* space around St. Petersburg saw rapid expansion. New settlements arose around railway stations, although the railway lines had already been laid for a decade (1850–1860s). What inspired this change in *dacha* geography? Why did it become the cultural norm to live in two homes—one in summer, and another in winter? After all, the arrangement offers no economic advantage or practical convenience. In fact, for many city-dwellers of modest means the summer decampment meant transferring all their furniture, cutlery and crockery to the country, then back again. An answer can be found in the heated public debates of these same two decades—in themselves a new phenomenon for Russia. The state, and society at large, were going through the Great Reforms, and previously rigid censorship had been made marginally more lenient. The press won the right to discuss the city's problems, but still had to avoid political issues. Doctors, hygiene specialists and psychiatrists seized this opportunity to popularize the latest scientific breakthroughs. With time, however, the problems of the city were to become deeply politicized.

The chosen topic is not without significance in a modern interpretation of *human ecology*. Ecological history here is closely connected with the new social history. On the one hand, ecological history is interwoven with a traditional set of problems for ecological history, cleansing the urban environment, as well as the inherent challenge of constructing above- and below-ground infrastructure. Meanwhile the Russian dacha of this time was conceptually linked directly to the idea of urban agriculture. On the other hand, the development of these processes would not have been possible without active participation by the urban citizenry themselves, a group that for the first time in Russia's history proved able to declare its needs, making broad use of the public space. The concept of *dacha*s had by this time been discussed in cultural circles, and this attention focussed primarily on cultural and social practices closely linked to *dacha* use (Lovell 2003; Traven 2005; Bashmakoff and Ristolainen 2009; Caldwell 2011). I demonstrate that *dacha*s were intrinsically connected to the town, as well as city culture and city problems. Therefore, my work considers not only the *dacha*, but focus rather on *dachniki*—the city dwellers who

used *dachas*, and the level of their engagement to solve city problems and develop the dacha belt. This dacha folk can nominally be thought of as a middle class. D*achniki* represented numerous social groups that were balanced in the centre of a social ladder between the highest aristocracy and regular workers.

It is well known that Russia's middle-class ultimately failed to protect its political interests, and consequently suffered greatly during the October Revolution of 1917 (Owen 1981; Ruckman 1984; Clowes and Kassow 1991; Balzar 1995; West 1998). Some researchers suppose that Russia has never produced a full-fledged middle class (Rieber 1982; Bailes 1995, 40–41). However, the use of the term is still justified, to demarcate social structures rapidly changing under the influence of reforms and the rapid development of capitalist relations. Many landowners from noble families became impoverished, while the merchants accumulated fortunes through trade. Technical progress for the first time offered new privileges to relatively poor city-dwellers in Europe and in Russia: fashionable clothes, novel domestic appliances, new entertainments and art forms, and education (see Williams 1982, 4). Mass culture became sufficiently universal to start uniting isolated social groups (McReynolds 2003). The social boundaries formed by immense estates contradicted the new social order, and were quickly broken down. A society built around estates became one governed by classes. The 'middle class', an initially vague term, in this case referred to an unstable social structure, and above all shared experience and values that were, to a certain degree, common to disparate social groups in England, France, Germany and the USA (Stearns 1979; Blumin 1989; Gay 1984, 3-69), but also Russia (McReynolds 2003). In St. Petersburg, these groups had a variety of social identities, but shared a common need to resolve the problems of the city, and city life. The highest aristocracy were far less disturbed by such problems. They had sufficient funds to ensure a high level of comfort year-round. Workers did not have the opportunity to visit dachas, possessed no means of influencing the authorities, and were often illiterate.

The article describes the unbreakable connection between sorting and attempting to solve ecological problems and, on the other hand, socio-cultural and political processes unfolding in the Russian capital.

6.1 Issues in the Urbanisation of St. Petersburg and the Middle Class

Prior to the Russian revolution, the *dacha* appears in literature and art as an idyllic world of recreation and pleasant leisure, of creative inspiration in nature. Summer idleness made it easy to find new acquaintances out of curiosity, for pleasure or other advantages, simultaneously reinforcing one's social and financial status, etc. Yet the fashion for renting dachas was also driven by more mundane aspects of life in the summer months. The most serious problems to have made dachas a vital necessity were urban pollution, epidemics of infectious diseases, and general anxiety in the city about nervous and psychic disorders. For a long time these topics

were considered inappropriate for discussion in the press, and thus did not cross over into the field of socially significant issues requiring state or municipal intervention. In the 1860s, during a period of reform, the problems of urbanisation and *public health* became, for the first time, subjects of general discussion. Reforms strengthened the rule of law in Russia, powerfully boosting the significance of public opinion. The state began funding the development of hygiene as a science: hygiene faculties and laboratories appeared in Russian universities in the 1860s, and were headed by Professors F.F. Erisman and A.P. Dobroslavin, students of the famous German professor Max von Pettenckofer (Voronikhin 1891, 9; Shirokova 1998, 58–60, 71). Doctors began actively popularising new medical knowledge. Even famed academics complemented their scientific works with articles for popular periodicals, and gave free public lectures (Dobroslavin 1875). Censorship ceased to hold back criticism of sanitary regimes in the capital, which invaded the pages of medical literature and periodicals, as well as popular books and pamphlets, as well as the gutter press.

The authorities and the general public were in agreement that these problems required the most decisive measures, overhauling both city life and the city itself. The newly-created body of city self-government, the *Gorodskaia Duma*, engaged actively in this process, alongside various public groups. Alongside the doctors, engineers and journalists, regular newspaper readers also assumed an active position, making this a truly broad, grass-roots movement. These groups were driven by personal and professional interests that were often very different. Nevertheless, the authorities and the public were forced to find ways to work together. The successes and drawbacks in this process determined the face of St. Petersburg as it solved its "big-city crisis". Compared to other major European cities the Northern Capital, unfortunately, was poorly developed in terms of infrastructure (Bater 1976, 268–269) and hygiene issues.

The problems of urbanisation in the nineteenth century were typical for major European and American industrial centres. These included overpopulation and pollution of cities, with a risk of epidemics. In the second half of the nineteenth century, European medicine had linked pollution of the human living space (soil, water and air) by discharges of organic waste with the development of dangerous diseases (smallpox, tuberculosis, cholera, scarlet fever, etc.). Louis Pasteur proved that it was not smells that were dangerous, as was previously thought, but microbes—pathogenic organisms invisible to the human eye. While microbiology remained a theoretical field of medical knowledge, the practitioners of the field—hygienists—went into battle. Both branches of the new science found the elimination of dirt—the nutritious environment of microbes—to be an effective way to fight epidemics (Erisman 1893, 190). That generated the need to construct sewage collection systems, the infrastructure megaprojects of the nineteenth century (Wohl 1983; Woods and Woodward 1984; Bynum and Porter 1991; Hardy 1993; Evans 1996). Nervous disorders were also common; these were associated with the development of capitalist relations, instability and accelerating lifestyles (Oppenheim 2001; Radkau 1998; Killen 2006).

In Europe, the situation in cities could be improved by the construction of sewage systems, as well as by suburbanization. Railways linked the city centre with numerous single-storey settlements, where middle-class families could live in detached houses with their own gardens (Warner 1978; Jackson 1985; Sommer 1997; Freeman 1999). In St. Petersburg both sewage systems and suburbanisation were highly desired projects. They were studied and discussed frequently, but nevertheless this never translated into actual development.

6.1.1 The Suburbanization Project and Clashes of Interests Around Urban Improvement in St. Petersburg

The natural suburbanization of St. Petersburg was hindered by the insufficient development of public transport (the absence of a broad network of tramways, or regular, frequent and cheap railway links between the centre and suburbs). This prevented St. Petersburg from becoming an industrial-type city, with a division between poor and elite districts, the so-called "horizontal division". St. Petersburg developed instead as a pre-industrial town might, where the division between more, and less, prestigious locations took place in each building (so-called "vertical division") (Bater 1976, 402–403). Splendid apartments for the rich, with six or more rooms, were to be found on the second floor or *bel etage*, while in the basement and attic the poor were cramped as many as ten people to a room. Of course, the richer residents ascended to their homes via marble staircases with carpet and doorman, while their poorer neighbours used a narrow, rear staircase (Yukhniova 2008, 112–113, 254). However, both groups would inevitably meet on the street. In the second half of the nineteenth century, the population became ever more concentrated in a small, urban area (mainly due to an influx of former peasants and commoners), which consequently boosted the concentration of organic waste, as the lack of housing became ever more severe.

Doctors and pundits claimed that cholera, typhoid, scarlet fever, etc. epidemics were a threat to every city resident, without exception (V.F. 1874, 30–31). However, closer study shows that the problem mainly affected the poorer members of the middle class and workers, while the aristocracy and rich building owners were less concerned. For example, the vested economic interests of building owners were one of the major factors behind the impasse over decentralization. Suburbanization projects were not supported by the city authorities, or by the Transport Ministry. James Bater indicated that this would have deprived apartment owners in the central part of the city of their monopoly, and of significant incomes from housing rental (Bater 1976, 277, 282–308). Significantly, this group (0.5 % of the total population of St. Petersburg) (Yukhniova 2008, 122) determined the policies of both agencies.

Meanwhile, a relatively poor and undiscriminating public, readers of the gutter-press newspaper '*Peterburgskii listok*', in an attempt to improve their lot in at least one area, created a real "sanitary movement" in the 1870s. In St. Petersburg of the

1860s and 1870s, doctors' calls to keep towns and settlements clean to protect oneself and one's loved ones, and reduce the general mortality rate, could be heard everywhere. '*Peterburgskii listok*' contributed to this activity by reporting individual cases of unsanitary conditions, such as a cesspit that had not been cleaned out on time, or a building owner's refusal to conduct needed repairs in residential premises. The titles of such reports speak for themselves, "Headbreaking in the Tsamutali building" (a lady and her son, when crossing an unlit yard one evening, fell into a freshly-dug pit) (Golovolomnia… 1872), "The indecent landlord and his house" (the roof in a house leaks due to the failure to remove winter snow, making the apartments humid, while the landlord is rude to his tenants, unabashedly using vulgar street language) (1872). Russian law offered only very weak governance of rental relationships, or consumer rights in general. Building owners had free reign to evict tenants, to increase rental rates, and so forth (Yukhniova 2008, 120, 122–123, 133–139). Tenants did not have the right to demand that landlords respected their rights, as there were no relevant laws, or courts that could hear cases regarding the dangers of premises for tenants' health. Sanitary rules existed, but pertained rather to the field of maintaining public order on the streets, and it was the remit of the police to enforce them. Compliance with the law within buildings was not in any way the duty of the landlord to his tenants, even under rental contracts. Meanwhile, landlords came to unofficial agreements with the police, and sanitary control was often no more than a sham (Erisman 1893, 27). Nevertheless, the topic was of concern to society, and poorer tenants started to use the newspapers to protect their interests.

These measures could not resolve sanitary problems in general, although they did prove useful, for example in fighting the cholera epidemic of 1871. The judicial authorities, *Gorodskaia Duma* and the police took a very serious attitude to the newspaper initiative. A conference of justice commissioners ruled that cases of disruption of public order (in this case, public sanitary order) were to be immediately accepted for review. In March of 1871 alone, when a cholera epidemic broke out in the city, more than 60 landlords were found liable on accusations of neglectful maintenance of their buildings. The issue was usually that of cleaning waste and cess pits, with the contents of the latter sometimes being illegally poured into rivers and canals—the source of drinking and washing water for local residents. Court hearings were open, and the *Peterburgskii listok* proudly printed the names of perpetrators, with the fines levied (mainly 5 to 15 roubles, with rare mentions of 50 roubles) (Po obvineniiu…1871). Unfortunately, cess pits continued to be connected to rain runoff channels that fed into small rivers, and the authorities and police were forced to turn a blind eye (Domontovich 1874, 111, 143). However, at least some form of justice had been found for landowners. The fines were not as feared as the bad publicity—city residents were intimidated by gossip, especially newspaper reports. As the sociologist R.E. Park noted, public opinion and simple rumours remained an important source of social control in the city for much of the first half of the twentieth century (Park 1955, 93).

Expert assessments and complaints in the newspapers turned the topic of pollution in the urban space from a problem of urban management to one of social

significance—the stuff of protests. Residents stood up to arbitrary rule by landlords, and demanded that contractual obligations were observed. Moreover, they founded their complaints not on the letter of the law, but the demands of day-to-day life, the latest medical knowledge. Middle-class petersburgers were ready to defend their right to healthy living conditions and respect, while the *Peterburgskii listok* called for the public to spare no effort (Rezul'taty…1871).

Conversely, newspapers aiming at high-society readers (*Journal de St. Petersbourg* and *Novoe vremia*), declined to even discuss measures to clean up the city. Cholera was only mentioned in the dry summaries of the Sanitary Commission (the number of infected, died and cured) and obituaries. Publications printed calls to improve public transport. This would allow poorer families to settle in more convenient housing far from the centre, which would positively impact *public health*. Opinions were stated about other expensive megaprojects, installing electrical street lights and improving the water network. However, there was no decisive opposition to the general policies of the city authorities, no crusade against cholera and overcrowding (Bater 1985, 364–366).

The problems of the city were identified and categorized, and increasingly worried the public, although those forces that had the greatest vested interest in the implementation of urban improvement projects were experts, or from the lowest layers of the middle class. Neither the former nor the latter could directly influence the city authorities, or the policy for decision-making. For more than four decades decisive actions were expected from the city authorities, i.e. from the highest levels of the middle classes, who were more-or-less indifferent to these problems. The design of a sewer system was most widely discussed the press.

6.1.2 The Difficulties of Selecting a Sewage System Design

As the highest social strata had little practical interest, and the civil spirit was weak among municipal authorities, these stakeholders had no positive contribution to make, to solve the complex problem of building a sewage system, as researchers have frequently pointed out (Bater 1976, 187, 367). The institutions of the then-embryonic civil society, such as the elected body of city self-government, found themselves between a rock and a hard place: on one side there was the indifference of the city authorities and, on the other, an endless list of city problems requiring expensive solutions (Brower, 138–139). My study demonstrates that the active role of the public, also striving to influence the solution to the problem, was also highly ambiguous.

It was in 1864 that the *Gorodskaia Duma* announced a competition for engineering solutions to the sewage problem, although just discussing the results took another 40 years. The construction of the sewage system was hindered by several factors simultaneously. First, the state refused to participate in funding and organizing the project. Second, trade and industrial companies did not possess sufficient funds to do so (Bater 1976, 360–365). The bill was to be covered in full by the

Gorodskaia Duma, a house of self-government, yet the city's budget was modest, especially considering the multitude of different tasks involved (Sukhorukova 2005, 66–80). Second, the responsibility for selecting a design was delegated to a special committee attached to the *Gorodskaia Duma* with elected members. Only building owners could be elected to the committee, and these were usually not engineering experts (Trudy… , 6–19). However, the committee was charged with reviewing the designs of Russian and foreign engineers, allocating funds for expensive field tests, while the members had to be personally present during such works and scrupulously verify all the design calculations. At this time sewage systems, were a new and poorly-developed field, requiring a high level of specialist knowledge not just on the part of the engineers, but also any supervisory agency (Velikhov 1909, 1066).

A fair number of doctors and engineers could accelerate the selection of a design of quality. However, they had no means of applying pressure on either the central or local authorities. Prior to the 1905 revolution, Russia was run as an autocracy, with no parliament. The only way to exert pressure on the committee was via public opinion, by the use of the press. Experts gradually inserted into the public consciousness the idea that a sewage system was the only way to save the city, and that priority had to be given to a quality, rather than economy. The best, if not the ideal, system had to be chosen, so that the city's fecal matter would under no circumstances stand stagnant in or beside residential buildings, and would not pollute the city's rivers (Erisman 1893, 36–51). The Russian populace readily supported this idea.

The crux of the problem was that both sides—both the committee and independent experts—had overestimated the abilities of science, and were unprepared to accept inevitable risks. By the 1870s, sewage systems had been built in London, Paris, and many other European cities. Practical experience showed that such systems were far from a panacea. Moreover, such systems created a number of additional hygiene problems for these cities, as well as the surrounding areas.

In the first half of the 1870s, the committee was prepared to construct a system based on the design of the engineer A.F. Burov (an adaptation of Ch.T. Liernur's system, which had been tried and tested in Amsterdam and Leiden). The design was approved by the *Russian Technical Society*, although the leading hygiene experts (G. Arkhangel'skij, A. Borodin, A. Dobroslavin, F. Erisman, Yu. Giubner, I. Skvortsov) were unanimously against the design. They could not accept that hazardous waste would not immediately vanish, without trace, from people's homes, but would first accumulate in immobile trunks, to be eventually pumped out using a vacuum mechanism. These vacuum systems were prone to malfunction, and protracted repairs could create health hazards for entire residential buildings (Arkhangel'skij et al. 1875, 341–343). After lengthy debates in the press and the committee, Burov's proposal was eventually declined. The battle against Burov's design became a symbol of the independent role of the press and direct public participation in city life, both of which were fundamentally new for Russia. Rejection of the design prompted noisy celebration by the *Peterburgskii listok*, a gutter-press publication with a relatively poor readership (Zarubin 1875).

Naturally, the hygienists could not have imagined that by their deliberations, they would be denying the city the right to any sewage system whatever. Rather, they were loudly arguing for the flush sewage system of W. Lindley. This was similar to our modern systems, water pressure drives waste matter through underground pipes, to be ejected at a safe distance from the city. The hygienists left the engineers and the committee to analyze the design in greater detail.

However, it was now the committee's turn to reject the project, citing obvious side-effects. It was clear that the processing of excrement was extremely expensive and therefore an unsaleable idea, while the best cleansing mechanisms remained primitive. In practice, this meant that wherever the waste was discharged, the surrounding river or land would be transformed into a colossal cess pit. All life in the vicinity would become impossible—this could be seen in the example of London, Paris and, later, Warsaw (Trudy, 33–34). It would be too complicated to remove city waste to surrounding fields, given that St. Petersburg is a large city located inside a river delta, with the city center in the lower part of the delta basin, while the level of ground rises towards the edges of the city. For sewage waste not to form blockages in collector pipes, sewage lines would have to be laid on an incline: close to ground level at the city center, and lower towards the suburbs. Calculations showed that the output point of evacuation pipes would have to be at least 10 m below the surface, making construction work more complex, and ever more expensive (Trudy… 16).

There was another danger associated with running an evacuation line towards the shallow waters of the Gulf of Finland: the southern shore is home to the imperial residences of Petergof, Strelna and Oranienbaum. The weak currents at the shoreline meant that periodic stagnation was more than likely. If the city's waste was removed to the southern shore, the subsequent rehabilitation of the area would be more expensive than the cost of any sewage system. Moreover, the city was a frequent victim of flooding. Strong winds often whipped sea water into the city's rivers. If such floods were to spread not just destruction and water damage across the capital, but also the city's fecal waste… Such a construction plan was a guaranteed humanitarian disaster (Zarubin 1886, 38; Fainberg 1909, 746). With time, the approach of the city authorities became one of paralyzing perfectionism: with a firm belief in the rapid development of science and technology, they patiently waited for the ideal project to come along, meanwhile rejecting every realistic solution (Domontovich 1874, 242–253). If a project had been chosen, and the only remaining hurdle to construction would be the financial issue, then the city authorities would have had cause to put pressure on the state. But after the rejection of Burov's design, all work on the project slipped into an era of stagnation.

It was the Northern climate, with its severe frosts, that allowed the city authorities to take their time, assessing the risks and finding grounds for doubt. During the cold season decomposition would slow down, and the smells became less noticeable (Bater 1976, 185). Meanwhile during the summer—the season with the most lethal epidemics—the aristocrats and 'middle class' retreated to their summer houses outside the city. Major European cities were not blessed with any such 'breathing time'. There, sewage systems had to be built at any cost, and regardless of the possible side-effects. Moreover, the city administrations of European towns experienced

massive pressure, compared to that in Russia. In St. Petersburg, political forces had not yet formed, that could work to conduct political reforms and use the epidemic to bring public opinion round, as was happening in Germany. The problem of the Hamburg sewer system, for example, was discussed in that country in the Reichstag, on the initiative of the leftwing faction, linked to the Union of Landowners (*Grundeigentümerverein*) and the Social-Democratic Party. Discussions of city problems never ceased in Hamburg itself, too (Evans 1996, 636, 706–707). In Russia, unions and parties were both banned, and there was no parliament at all. The sufferings of the lower classes, who were the main victims of epidemics, certainly inspired sympathy (Domontovich 1874, 242–253), but apparently did not influence the *Gorodskaia Duma*, partly because the poor could not vote in Duma elections. Meanwhile the class of building owners possessed the finances to sidestep the summer stench, and lived in clean, ordered and expensive city districts, in spacious apartments located at respectable distances from waste and cess pits.

Thus, the active engagement of experts and a broad circle of readers to make the urban environment more healthy was made possible by a certain degree of patronage by the authorities. Hygiene developed as a science. Newspapers were allowed to criticize the disorder in the city, without fear of repressive censorship, in the form of temporary or permanent shut-downs, a common practice for halting undesirable discussions. Public hygiene was becoming an important topic for the city's residents and authorities, a herald of reform.

In the 1870s public organizations (city self-government and active public groups, such as doctors, engineers and journalists) were unable to coordinate their efforts to choose an adequate means of cleaning up the city and ensuring that the project was implemented. These efforts were closely interlinked. The city authorities could not insist on their prerogatives without listening to the press which, in turn, was much more sympathetic towards the views of public figures than the words of the city fathers.

However, the interests of social groups (landlords on one hand and experts, mostly not property owners, on the other) starkly contradicted each other. A negative role was also played by the inflated expectations of the capabilities of new technologies, and the fact that the expert community had no official representative within the agencies of power, including local self-government.

As early as the mid-1880s, the level of activity of society in the fight to clean up the city had noticeably fallen. The popular hygiene periodical *Zdorov'e* ceased circulation (1883), and mentions of sanitary affairs and sewers grew rare in newspapers. This was partly because readers had grown sick of scandalous revelations of sanitary violations, while the authorities had no intention of rejecting the idea of a sewer system, so there were essentially no grounds for active protests. Part of the reason was the political reaction, that occurred after the assassination of Alexander II, the reformer, in 1881, when the country ceased to purse reforms. Public discussions became undesirable, especially those denouncing the authorities. The topic of *public health*, whilst not completely banned, was put on a back burner. In the press, it was replaced by material on personal hygiene (for example, on washing carpets and remedies for bad breath) (Zdorov'e), as well as the prevention of nervous and

psychological disorders. The era of psychoanalysis had not yet begun, but developing capitalistic relations in reformed society brought a wave of new anxieties and internal conflicts, due to unfamiliar mental loads, competition, ambition and new opportunities to enhance one's social status, etc. It was considered that psychological health for fatigued white-collar workers (and then for people driven to their wits' end by idleness) was a matter of observing hygiene rules. A life force was to be derived from constructive physical labour in nature (for example, cultivating flowers), physical movement and physically active games in fresh air (see for example Kraft-Ebing 1885, 83–84). Thus, the natural shelter from the polluted city air and aggressive urban culture was the tried-and-tested suburban dacha. The pre-revolutionary middle class ended up mimicking an aristocratic tradition: in the winter season they lived in the city, and between May and October they left the city in favour of *dacha*s.

6.2 Development of the Dacha Space and the Middle Class

The efforts of the middle class did, however, meet with tangible success in one area—the development of a new dacha space. This was to become a sort of half-way zone, neither city nor country, a distant Arcadia, as far as possible from the imperfections of the city. Advances in medicine had greatly enriched concepts of quality rest, and summer life was to compensate for all of the inconveniences of the winter. Here, people would breathe fresh air, enjoy the quiet (without even a hint of the city's overcrowding), play lawn sports, and consume fresh produce and water, ideally whilst still taking advantage of city amenities.

In the 1870s many of the areas previously used as dacha zones, at a distance of 20 km from the city limits, became unsuitable for the dacha lifestyle. Here, on the city's periphery, river water brought concentrated city waste, or carts and barges would bring an endless flow of city 'gold'—the contents of waste pits, as fertilizer for peasants. The press wrote of this, as did dacha guidebooks on occasion (Simanskii 1881). Factories and other plants popped up here and there, surrounded by worker settlements. The culture and way of life of workers and the middle classes were so different that their mutual rejection was inevitable. Dacha dwellers complained that parks were neglected, or filled with vulgar entertainments such as bawdy folk singing (Prazdnoshataiushchiisia 1880). The coarse morals of the worker class, of public swearing, fights and hooliganism against "well-dressed gentlefolk" intimidated would-be dacha residents far more than the idea of unsanitary conditions (Iz dachnykh mest 1876). The exodus of dacha residents from these places was like an involuntary evacuation from an unhealthy, alien environment.

The middle class had the railway at their disposal, that cut right through the Petersburg Guberniya in the 1860s–1870s, but it took more than iron rails to create new dacha districts. The *dacha* belt was partly developed by the middle class themselves, and partly by enterprising inhabitants of the country (as nobles as peasants), who worked to develop trade with the *dachniki* in their own locality. Both groups

negotiated with the Transport Ministry to open new *dacha* stations. The ministry itself did not have an interest in doing so, as this slowed the movement of trains. Entrepreneurs were prepared to build whole dacha settlements for rent, while cooperatives of peasants agreed to build railway platforms and meet all the costs of their upkeep,[1] but this was not always enough (Listok 1876).

The *dacha* belt became a sort of satellite of the city, which was filled only during the summer. *Dacha* owners found different ways to ensure that *dacha* districts were improved and developed. Here, kiosks peddled produce or minor repairs, and theatre troupes would tour; in short, the infrastructure of the city was recreated in miniature. If the capital's regular outskirts could hardly boast shops selling fashion goods, and villages survived with farming and traditional crafts, the most impressive dacha districts were transformed into a simulacrum of the city. For example, *Starosiverskaia*, apart from boasting a line of regular shops and repair workshops "lived to see the opening of the Chinese shop Tsin'-Lun' and, of course, has its own theatre[…]. What more can one ask of a… village?" (Simanskii 1892, 91). To attract dacha passengers to unpopular dacha stations (for example, Oranienbaum), the railway administration decided to open a concert station, to invite theatrical groups and musicians (Iz dachnykh mest 1880). Middle-class travellers attempted to adjust the public transport timetable themselves, via the newspapers. This is how they would arrange with the railway management to offer an additional dacha train, at a later time, for example (Vnimaniiu… 1874).

While they turned into a mirror-image of the city, dacha spaces still retained their country identity, as they became a zone for *urban agriculture*, though, naturally, not in the form we have become used to in today's world. In this case, the issue of the day was neither an economic crisis, nor a food deficit. Rather, this was a particular approach to solving the numerous problems of urbanization, by forming a special, "intermediate" type of agricultural area, which was so closely interconnected with the urbis, that it almost became a part of the city. The peasant economy re-oriented itself to the subsistence economy to service the dachniki. Peasants let their *izba*s for the summer to incoming city residents, and grew whatever could be sold to the summer visitors: berries, potatoes, green produce, etc. The absence of a sewage system in the city gave them a helping hand. So-called sanitation carts sold their cargo just outside the city and peasants used this as fertilizer. The greater the distance from the city, the more modest were harvests (Meien 1912, 29). In addition, many farmers kept milk cows. *Dacha* industries were so profitable that even peasants would purchase staple products, such as bread, from kiosks. Kitchen gardens replaced field farming, and farmers had long stopped growing cereals. Beyond the *dacha* districts, however, everything remained unchanged: peasants continued to live off the land (Statisticheskii sbornik 1896, 196–197). The *dachniki* themselves chose to grow flowers at their rented *dacha*s, a practice that appeared to peasants to be an exotic upper-class caprice (L-ov. Malaia Izhora 1869). On the one hand, city residents did everything they could for beauty, and on the other, cultivating flowers was considered

[1] Rossiiskii gosudarstvennyi istoricheskii arkhiv (RGIA), f. 262, Op. 1, p. 2, d. 4477 (1879–80); d. 552 (1872).

to be a powerful medicine against another "city disease" – neurasthenia. In the nineteenth century, this term covered a whole range of different nervous disorders, that must have then appeared obscure and unknowable.

Personal comfort at the dacha, that Arcadia for city-dwellers, was an important ingredient of mental and emotional health, yet dacha residents had to fight for the basics themselves. Even railway travel was a trial; according to social norms of the time, which remained valid in the last quarter of the nineteenth century, people were hailed and spoken to according to their social position, which was ascertained by such visual factors as behaviour and clothing (Lotman 1997, 492; Schenk 2010, 232). Poorer, modestly-dressed passengers in third class seats were given rough treatment by the railway staff. Their complaints about sanitary violations (messy carriages, stuffy air, stench, etc.) were ignored, and they could be verbally insulted, or short-changed, with impunity (Fon-Nos 1881, 303–304). It was a challenge to resolve conflicts immediately, as railway staff were a part of a corporation, and their leadership would most likely defend them (Pravilova 2000, 62). Minor misdemeanours by staff were not referred to the courts, as the rights of railway passengers were not laid out in law. Passengers depended on instructions from a conductor or stationmaster, who would refer, in turn, to railway regulations (Pravila dvizheniia… 1889, 116), many of which were unknown to the general public (Ded Pafnutij 1874). Nevertheless, passengers fought back against arbitrary authority, writing to newspapers with complaints. As in the fight against dishonest landlords, the railway complaints reflected the call of the times: to respect contractual obligations, i.e. to ensure that not only passengers, but also railway employees diligently fulfilled all their obligations. A full-fledged information war broke out on the pages of newspapers, between the administrations of railways and passengers frequenting dacha routes. As a result, the most presentable centres on the Tsarskoselskaya railway lost their popularity, while the remote corners of the northern Vyborg direction were, conversely, settled by regular summer visitors (Simanskii 1892, VI). The dacha residents themselves gradually turned into citizens, as they worked to bring reason and order to their environment, insisting that their rights were respected.

Dachas offered city-dwellers numerous opportunities that would be inaccessible in town. As the supply of dacha-zone homes to let in summer greatly exceeded demand, there was a broad choice of location and house types. Dacha owners and entrepreneurs competed with each other in terms of infrastructure, amenities and entertainments on offer. The middle class found a version of heaven at the dacha, limited only by the financial resources of each individual family. Yet, unfortunately, the *dacha* was ultimately not the ideal solution to the problems of urbanization. Rather, the middle classes used it as a way to escape problems, abandoning poorer residents to their lot.

6.3 The Politicization of the Urban Improvement Issues

Meanwhile, St. Petersburg's urbanization problems needed solutions. The mortality rate in the Russian capital greatly exceeded that of all other European capitals (Frenkel' 1909, 1054). In urban areas scarlet fever, typhoid, cholera and other dangerous gastro-intestinal infections (labelled "local cholera" or "cholera of the poor", perhaps in ignorance of the different forms of the disease) would flare up and kill in large numbers, before quietening down into simmering epidemic hotspots that would never quite vanish (German 1871, 88–89). The highly infectious *cholera asiatica* would occasionally appear within the city, claiming lives across the social spectrum, reaching high into the upper aristocracy. The City Duma, meanwhile, still dithered over the choice of sewer system.

To worsen the deadlock, some engineers and doctors even attempted to convince the public that a sewage system would not bring any benefit to the city, and that it would be sufficient to more rigidly monitor cleanliness and order in the old 'village' waste removal system, whilst paying more attention to supplementary hygiene measures (Domontovich 1874, 118, 334–335; Fedorov 1900, 3–24). However, the *Russian Technical Society* called this "scientific heresy" (Fedorov 1900, 3–4). The hygienists ensured that, in the public consciousness, the idea of a sewage system was firmly linked to the ideas of progress and the common good. Society at large did not allow itself to be convinced otherwise, even when the obvious shortcomings of European sewage systems became common knowledge. Delays to construction exacerbated class tensions and deepened the public's mistrust of both the city and state authorities.

The problem was resolved only after the revolution of 1905, when Russia obtained a multi-party parliament. The government of Pyotr Stolypin found itself in disagreement with the opposition, which demanded that more functions and financial capabilities be transferred to the *Gorodskaia Duma*. The Constitutional Democrats Party, being the most active in this question, demanded an overhaul of the 1892 law that established the *Gorodskaia Duma*. The sewage system was pounced upon as a blatant example of society suffering at the hands of imperfect laws and poor management. Highly critical articles appeared in the press. Stolypin, who strove to centralize authority and undermine revolutionary thinking, defeated the opposition by turning their own arguments against them: in response to the catastrophic cholera epidemic of 1908, he produced a law stipulating the mandatory construction of a sewage and water supply system in St. Petersburg. According to this 1909 bill, responsibility for the project was withdrawn from the *Gorodskaia Duma*, casting shame over that body, with the official declaration that the Duma was neither willing nor capable of finishing the job. In a speech to parliament, Stolypin said that he was ashamed of his motherland and that he felt the pain of the thousands of impoverished Russians who died due to the inaction of their country (Stolypin 1991, 317, 322–323). Parliamentary deputies spoke in favour of protecting the principle of self-government by the Duma and the division of powers, forming a historically rare point of agreement between right-wing and left-wing politicians (Velikhov

1911, 55–56), yet the bill still became law. Unfortunately, no sewage system was to be built this time, either. Construction work began in 1912, but was restricted only to a small part of the city (Goloday Island). With the death of Stolypin (1911) and the outbreak of the First World War (1914) the attention of state bureaucrats switched to other needs, and construction never gained pace.

The problem of sewage in St. Petersburg/Petrograd/Leningrad, as well as the housing issue, were now targeted in the *Bolsheviks*' political manifesto. The Marxists decided that it was only after a revolution that a cardinal solution could be found, and the reality of life in St. Petersburg only served to support this opinion. They believed that a revolution was necessary, if only to conduct such massive public-interest projects (Harris 2013, 42–71). The state had to possess sufficient power and resources to organize and finance such efforts, regardless of the interests and intentions of the richer city residents. In pre-revolutionary St. Petersburg, the sewer project could not be selected and made reality, as doctors and engineers were dependent on the incompetent and inert city authorities. Attempting to resolve sanitation, healthcare, housing and other city problems for the entire population, experts in various fields initiated and then developed a state system of experts in the USSR. Eventually, this system had a clear structure: a number of state expert institutes with various specialty areas was subordinate to, and in direct contact with, state ministries, and some also had close contacts with various supervisory agencies (such as GosStroj USSR). It was in this way that the profession of engineer ceased to mimic that of architects responsible for aristocrats' palaces, when professionals were forced to accept the amateurish demands of their clients, or patiently explain how they were counterproductive to the whole project. Large-scale works to construct sewage networks began after the Russian revolution 1917. It was only in the 1930s, after the revolution and the subsequent civil war, that the system could be completed, by which time it almost had to be rebuilt from scratch.

6.4 Conclusion

In 1870–1914, the borders of the dacha space underwent major changes. This process was affected by factors that had roots in the problems of urbanization, i.e. they were far removed from the pleasures of dacha life. Dachas had become a sort of Russian panacea—the preferred solution for a multitude of urban problems and the best solution to public needs. In public discussions of the problems the city of St. Petersburg faced, the dacha inevitably appears as a refuge from the aggressive urban environment and destructive cultural elements. This expansion took place thanks to middle-class city and suburban residents. The development of new territories, suitable for high-quality summer leisure, became a temporary solution to the problems of urban improvement in the Russian capital, and an alternative to suburbanization.

Large-scale urban improvement projects could not be executed, because different middle-class groups were unable to unite and handle social problems together.

Later, these unresolved problems became a major factor in politics, when the interests of the middle classes no longer played a central role.

In the 1860s and 1870s questions of the pollution/cleaning of the city were actively explored in the press, and became a part of quasi-political campaigns by the middle class against the policies of the city authorities, railway administration, etc. These demands were rooted in consumers' awareness of their rights and their striving to defend them, while legislation in this area of individuals' rights had yet to be developed. A society shaped by estates had started to become a society of classes, and the middle class protested against attempts by various agencies and service providers to impose their authority, instead calling for contractual rights and duties to be clearly established and observed.

In the 1880s, as this reaction played out and reforms ground to a standstill, discussions of the city's problems seemed to fall silent. However the public, convinced of the need for decisive measures, had been given every reason to critically express its dissatisfaction with the authorities. Stolypin's attempt to build a sewer system, resolving a crisis by supressing public initiatives, provoked widespread public fury, without leading to a fundamental solution to the problem. As a result, St. Petersburg's sanitation problems strengthened the reasoning of the Marxists, who claimed that a solution could only be possible after a revolutionary transformation of the social order.

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Zdorov'e: Zhurnal dlia vsekh N1/1901

Chapter 7
A Double Landscape Shaped by a Century of Logging Industry and Resort Development on Prahova Valley and the Surrounding Mountains

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Abstract The present paper investigates spatial connections between mountaineering, nature protection and logging industry in the Southern Carpathians. It inquires factors determining landscape changes, thus considering the role of mountaineering and tourism associations in supporting the establishment of protected areas.

It was starting with the 1880s that a permanent resort was created on the mountain's outskirts while still extracting large volumes of timber from its valleys. At the beginning there was some consensus between these social and economic dimensions, until the interest in tourism development increased. This was driven by two factors: the railway construction in 1879 between Romania and Transylvania, while the second factor was the social value assigned by the presence of the Romanian royal family and its investments in a mountain residence. It drawn politicians, intellectuals, scientists and tourism boosters to this emerging resort and some of them were passionate about mountain expeditions.

The research started with supposedly simple questions: where was the mountaineering activity set and why there? What was the influence of clear-cut forest exploitation and landscape degradation on mountaineers' trail preferences? To answer these questions we assessed the perception of mountaineers who had written and published their walking and climbing experiences.

One example is the writings of Romanian geographer and biologist Mihai Haret who, with great interest in nature preservation, was also a prominent member of the French Alpine Club and the Romanian Geography Society. The use of these writings was useful in terms of providing details regarding the cognitive representations of the mountain landscape before Second World War.

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The shortcoming of this approach is that written spaces don't present definite limits, making it difficult to locate places where specific environmental responses occur and are recorded. Moreover, the time interval between crossing a particular space and writing about it induces several other cognitive distortions which alter the process of mapping these perceptions.

Our results include mapping the spatial pattern of mountaineering trails which were structured towards specific places and attractions until 1948 when mountaineering associations were closed due to political changes and the interference of communist ideology while tourism activity came under state control.

We also produced a cognitive map of mountaineers' perceptions based on their written responses to environment, which were structured according to topophilia, topophobia and topo-indifference. As observed, the topophilia responses concentrate in areas unimpaired by logging activities. These superpose with protected areas which were actually established later in 1943 under the direct influence of mountaineer's interventions within the National Commission for Nature Monuments. Therefore mountaineers have changed, through their own experiences, the economic role of the forest and placed more emphasis on its scenic beauty and aesthetic value which were promoted through writings and photos that were often portraying a picturesque mountain forest landscape. On the other hand, the topophobia and topo-indifference responses are congruent to clear-cut forest exploitations and degraded landscapes.

The present paper investigates spatial connections between mountaineering, nature protection and logging industry in the Romanian Carpathians. It inquires factors that determined landscape change, thus considering the role of mountaineering and associative organisations in changing the mountain's image. This fact mobilised political and public support in establishing protected areas in Romania. The research started with supposedly simple questions worth asking: where was the mountaineering activity set and why there? What is the link between place-specific emotions and environmental actions in the case of mountaineers? To answer these questions satisfactorily we assessed the perception of mountaineers who had written and published their climbing experiences. One example is the writings of statesmen and scientist Mihai Haret who advocated nature preservation in Romania and organised the mountaineering activity in this part of the Carpathians. The use of these writings was useful in terms of providing details regarding the cognitive representations of the mountain landscape before World War II.

7.1 Introduction: Mountaineering Narratives of Sense of Place in Literary Space

Historical landscape change in the Romanian Carpathians from the perspective of bonding with nature is still an understudied subject. This inquiry contributes to conceptualizations of 'human response to environment', considering that the

environment is a source of pleasure, an 'object of profound attachment and love' (Tuan 1990:xii). Emotions are often highly important during people's involvement in environmental activities, being described as 'biological, cognitive and behavioural' subjective responses to important life events which manifest themselves as feelings of contentment and discontentment (Parrot 2004:6). A strong feeling towards nature and its diversity is closely linked to the idea of sense of place which implies an empathetic identification with the environment and a desire to protect it (Reed and Rothenberg 1993:155). Place-specific emotional responses are strong motivations for environmental actions in a particular type of landscape (Vining 1992) which can't be achieved without an emotional bond with nature given that 'we will not fight to save what we do not love' (Gould 1991:14). Moreover, Sharpe (2005:9) notes that 'emotions accompany us on our journey through experience, acting as expressions of and lenses through which we understand what we encounter.' In a clear reference to mountain experiences, the British mountaineer George Mallory implies that emotions 'are not incidental in mountaineering, but a vital and inseparable part of it' (Readman 2014).

We considered that an exploration of mountaineering literature can become instrumental in tracing the narratives of place-specific emotions which could have triggered landscape changes. Storytelling, as well as literary and scientific description help define a place's character and shape the experiences it offers (Pagh 1999; Tuan 1991; Lando 1996). In literature, sense of place was inherited from the romanticism's attachment to place which transformed inhospitable nature into appealing landscapes. The 'Romantic Movement' was influenced and anticipated by Rousseau's appreciation of 'Nature' and his emphasis on emotion (LaFreniere 1990). The stories surrounding first ascents gave mountains a human interest they might otherwise lack, thus they defined these places in the public imaginaries (Conway 1904:264; Schut 2013). Mountaineers created affective attachments to written spaces and built emotional bonds to mobilize public participation. In a more contemporary context, Brown and Pickerill (2009) explore the role of emotion in activism, arguing that place is frequently used to produce sustainable emotions for social action. As pointed by Lutwack (1984), literature always reflects place-specific attitudes that come from personal experiences and social context. Authors of travel logs and stories choose to describe certain places 'as some paths become preferable, some places desirable, others avoidable, a kind of mental mapping occurred' in their texts (Tuan 1990:28; Lévy 1989). These reflect the author's experience, the knowledge of mountains and familiar routes (Brossard and Wieber 2008:44), thus the sense of place which is dependent on the depth of experience with settings and social relationships with settings (Relph 1976).

To investigate the emotional geography of how mountaineers interacted with specific places, we emphasized the elements of cognitive mapping contained in literary texts, considering this to be a process where individuals 'collect, organize, store, recall and manipulate information about a special environment' which reflect the world as some person believes it to be (Downs and Stea 1977:6). The mental images of the mountain provide insights into the spatial behaviour of people (Kearney and Kaplan 1997) and attachment to particular places, thus enhancing the understanding of links between landscape perception and environmental actions. An important

approach of mapping literary space is based on linguistic characteristics. For example, Piatti et al. (2009) have developed a grid to locate place specific features throughout hundreds of novels from the eighteenth century Europe. The literary space includes settings, zones where actions take place, routes along which characters move, being divided between 'gravity centres' and 'unwritten regions'. Moretti (1999:13) pointed out that maps must represent places and relationships 'in the hope that the visual construct will be more than the sum of its parts: that it will show a shape, a pattern that may add something to the information that went into making them'. Carey (2007) gives an example of endangered nature narrative analysis, based on popular science writing, popular books and newspapers, at its centre being questions of power in defining and creating specific protection laws and policies.

Yet, a shortcoming of this approach is that writing is composed of two acts, one of exploration and the other of presentation, thus the time interval between them induces cognitive distortions (Turchi 2004:30). An additional criticism on the use of literary texts in historical mental mapping is that written spaces don't present definite limits (Piatti et al. 2009), making it difficult to locate places where specific environmental responses occur and are recorded. In addition, some visits and ascents are still waiting for detailed historical studies, considering that some might have not been intended for public awareness. Tuan (1991:687–688) notes that 'an explorer might have named features and envisaged routes and prospects without telling anyone or putting anything down on paper.' To complete the matter, it should be added that sources are scattered in different archives, due to the complicated history of the Carpathian region before the twentieth century.

7.2 Dimensions of a Double Landscape: Logging and Tourism on Prahova Valley

The study area is located in the Romanian Carpathians, particularly focusing on Bucegi and Baiului mountains which stretch along Prahova Valley. The national mountaineering movement started here, despite that the highest peak called 'Omu' barely exceeds 2,500 m. The valley's remoteness progressively diminished starting with 1695 when Sinaia monastery was built and it opened the site for permanent settlers, while its political role attracted the interest of statesmen (Popp 1930). In this sense, as in other mountains monasteries were the only permanent shelters, monks being versatile explorers of places (Puşcariu 1946:14; Rădulescu 1946:147). In fact, Archimandrite Nifon founded one of the first alpine societies in Romania in 1893, '*Societatea Carpatină Sinaia*', and wrote several guidebooks. Consequently, the first colonisation factor was the railway constructed in 1879 between Romania and Transylvania. It 'attracted urban and industrial growth on an unprecedented scale' (Turnock 2001:142) in the mountain area of Prahova Valley, especially wood processing by Schiel timber company around Buşteni (Turnock 1988). Schiel Paper Factory was founded in 1882 and progressively obtained concessions to work on the entire valley. Initially the exploitation increased close to villages, but by the beginning of

twentieth century Schiel started clearing woodlands deep inside Bucegi massif, further away from the resorts. Timber extraction was favoured by the construction of 23 km narrow gauge railways and 13.5 km cableway transport (Bellu 2007:151). Until 1932, forest exploitation expended on 11,650 ha in Bucegi and Baiului mountains, out of which 6,150 ha represented clear felling (Fabrica de Hârtie Buşteni 1933).

The second colonisation factor was the social value assigned by the patronage of the royal family at Sinaia and its investments in a mountain residence (Pătru-Stupariu et al. 2011). It's worth mentioning the royal family's support (Puşcariu 1946:14) in propagandizing mountaineering and especially Queen Elisabeth for whom 'Nature' became inspirational in her writing original and vibrant fictions using place personifications (Zimmermann 2011). She changed Nature's image through her own example of mountain exploration. After her first climb in 1871 (Regele Carol I 1993), this activity drew the interest of politicians, scholars and tourism boosters. Changes in attitude are also associated with the 'benign and well suited' nature of mountains for the needs of those in poor health (Tuan 2003:74). As follows, the valley developed around a 'castle-museum', completed by a chain of small villages that prospered in an obvious manner, by stretching its habitats at altitudes that are rarely encountered in the Carpathians (Vâlsan 1924). The rail system also became a precondition for accelerating passenger journeys to the mountain resorts while 'the scenic charms of Bucegi became accessible to the Bucharest people and the royal family, with its place in the new town of Sinaia' (Turnock 2001:145). Still, as in similar cases, the growth in outdoor movement isn't associated to a 'public refusal of the industrial spirit' (Kupper 2014). Mountaineers often used the loggers' cabins to explore the routes, given that associations couldn't provide enough accommodation until the beginning of twentieth century (Urechia 1926). It should be mentioned that the initial consensus between nature exploration and timer extraction is also argued by the social affiliation of timber company owners as Schiel and E. Costinescu to the outdoor movement on Prahova Valley (S.T.R. 1904:100; T.C.R. 1926:30).

7.3 Mountaineering in Bucegi and Baiului Mountains: Creating Sense of Place

The 'revolution in taste' (Powell 1978:99) ran in step with mountaineering, finally residing in mountains becoming 'the quintessential Romantic icon: sublime, isolated, wild, a symbol for all seasons of emotions' (Flanagan 1996:11). The interpretation and use of mountains changed for the Romanian society during the second half of the nineteenth century when it started to organise societies for mountain exploration. Even from the beginning, these societies organized collective trips and started building or improving refuges and paths in order to make climbing experiences possible. It is important to note that there were delays in infiltrating these ideas across the Carpathians, considering the political fragmentation of the territory. The frontier between Romania (the *Regat*) and Transylvania crossed Bucegi Mountains until 1918, but the associative life of mountaineers wasn't separated by this line. Moreover, it produced a particular integrating space where members of

alpine and tourist clubs were granted free passage by the Ministry of Finance (S.T.R. 1904:4). There is also a continuity of marked routes on both sides of the frontier, as in the case of Vosges Mountains (Fuchs and Stumpp 2013:3).

The associations from the Transylvanian side of the mountains were more developed and connected to the European mountaineering practices. It's the case of the Transylvanian Carpathian Association ('*Siebenbürgischer Karpatenverein*' SKV) that was founded in 1880 after the German and Austrian Alpine Association (Deutscher und Österreichischer Alpenverein – DuÖAV) model. It had its own periodical publication, *Jahrbuch*, which contained trail descriptions and research articles that were intended to create collective awareness and involvement (Wedekind 2005).

This example was shortly followed by mountaineers from Romania who had close relationships with SKV. A concise historical review of mountaineering in Bucegi and Baiului mountains couldn't overlook the activity of statesmen, scientist and mountaineer Mihai Haret. At the middle of the nineteenth century he started a real outdoor movement south of the border together with writer Fany Seculici (also known as Bucura Dumbravă) by setting in 1921 an association with poetical name, the Wayfarer's Inn ('*Hanul Drumeţilor*'). Its members didn't limit to conquering the Carpathian peaks, they also climbed higher peaks in Europe. Fany Seculici is the first Romanian woman to climb Mont Blanc in 1923 (Baticu and Ţiţeica 1984:149; Marinescu 2012).

Haret transformed the Wayfarer's Inn into a national tourist club in April 1926, expanding the former association's activities to the entire Romanian Carpathians, at the advice of F. Regaud, president of the French Alpine Club, and F. Dumensil, general secretary of the French Touring Club (Baticu and Ţiţeica 1984:159; Haret 1930:154). The aims of the Romanian Touring-Club Society (T.C.R.) were energetically realized from the beginning, especially the creation of foot-paths and way marking following the Swiss Alpine Club and DuÖAV models (Haret 1926) which became compulsory for all tourism associations active in the Carpathians during the inter-war period (Puşcariu 1946). Another aim was to build mountain shelters, in the attempt to make mountaineers feel comfortable and secure in these places (Bucura Dumbravă 1924).

Therefore, the spatial pattern of mountaineering activity in Bucegi and Baiului mountains is structured in relation to specific attractions and to the progressive appropriation of the mountain which is composed of knowledge of the places and secure shelters (Fig. 7.1). At the beginning of the twentieth century, while most peaks had been climbed by the classic routes, we observe an increased spatial density of routes reaching Omu peak. This situation is explained by changes in mountaineering which included new climbing practices. Thus, it wasn't only the summit drawing attention, but also the first ascent of more difficult routes (Nettlefold and Stratford 1999).

Based on the statute of associative organizations, we observed that members were carefully selected at first through recommendations. However, Haret used his leadership position within T.C.R. to emphasize the value of popular involvement in mountaineering and nature protection, being concerned with the weakness of this new movement (Haret 1924:301). He used T.C.R.'s annual journal '*Anuarul Bucegilor*' (1926–1928) to increase propaganda among young urban scholars: 'Go

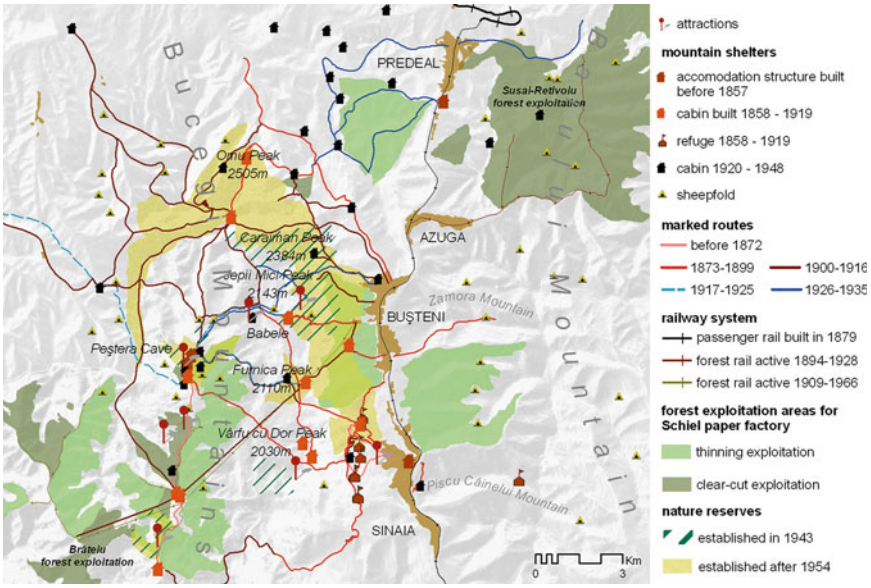

Fig. 7.1 Spatial pattern of mountaineering activity in relation to routes, shelters and forest exploitation areas before World War II

into the mountains! Go during vacations, winter holydays, no matter the sacrifice, against any difficulty. Explore the mountain, acknowledge it and bond to it. Love him! Adore him! Respect him! The one who beholds the mountain is also reaching an endless stream of beauty, grandeur, health, of powerful and exciting emotions. The dangers we weather in mountains are shaping our character, they teach us solidarity, strengthen our will and make us selfless' (Haret 1924:4–5). This mobilization would come with the price of an old dilemma: how to promote mountains and still preserve place character? Since unsurprisingly, the mountain area of Prahova Valley became a popular target for excursions in the twentieth century, more and more 'pseudo-tourists' and 'pseudo-mountaineers' walked the routes (T.C.R. 1926:79). Many believed that returning home with a bouquet of edelweiss hanging from the backpack was a proof of moral courage and bravery (Braham 2004). This encouraged sheepherders to sell these flowers to opportunistic tourists. But even members in associations were seen wearing them as a sign of affiliation (Muston 1927:83).

More mountaineers wanted to discover new places while others continued to climb the already known routes. The diversity of preferences reflects in the affiliation to different types of alpine and tourist clubs. By the break of World War II, the number of tourism associations in Romania reached 35 (with 16,523 members), while 43 % focused on mountain activities (O.N.T. 1939:33). In order to provide safety and comfort in remote places, these associations have built 94 shelters, out of which 27.6 % were located in the massifs surrounding Prahova Valley (O.N.T. 1947:6–7). After World War II, the political changes in Romania adversely affected the normal development of mountaineering. In 1948 the alpine and tourist clubs

were dissolved and replaced by a popular tourism association with a clear interference of communist ideology (Defta 1993:273).

7.4 Mapping Sense of Place Based on Responses to Environment

White (1985:307) thought that nature is more a human invention than a physical setting for living beings. In consequence, the historian's difficult task of recreating a cultural world which reflects the concerns of those who lived within it might 'find the beginnings of such an approach in Yi-Fu Tuan's *Topophilia* which uses what might be called environmental ethnographies and where action within the environment is stressed as much as abstract thought about it'. Moreover, even if topophilia sentiments of the past are 'irretrievably lost' we can still acknowledge them through 'literature and through the art of words' (Tuan 1990:121). Schenk (2013:1) argues that 'mental mapping' or 'environmental images' based on literary texts has a heuristic potential for historical research of 'qualitative characteristics'. Meanings and values attached to specific places described by mountaineers can be expressed by cognitive maps (Bjornson 1981).

Experiences with and in nature are felt very different, yet all mountaineers who wrote about their climbs (Table 7.1) seem to 'resonate with a meaning' which is subsumed to uncertainty and the impetuousness of adventure (Heitschmidt 2014; Kianicka et al. 2006; Stedman 2003).

The intensity of emotions varies according to the author's subjectivity and own biography of experiences (Morgan et al. 2005), yet they all have a clear environ-

Table 7.1 Mountaineering narratives at the turn of the twentieth century in Romania

Mountaineer	Social properties	Reference to published mountain experience	Literary type
Nifon (1855–1909)	Archimandrite at Sinaia Monastery	Preumblărie la Sinaia (published in 1885)	Guidebook
Nicolae Garoflid (1845–1900)	Doctor, member of Romanian Royal Geography Society	Guide de Sinaia et Câmpina (1885)	Guidebook
Maude Rea Parkinson 1860–1938	Foreign language teacher in Bucharest	Twenty years in Romania (1921)	Travel log
Nestor Urechia (1866–1931)	Engineer and novelist	Dans les Carpates roumaines (Les Bucegi) (1906)	Novel
	Director in the Ministry of Public Work (1917–1920)	Robinsonii Bucegilor, întâmplările a trei cercetaşi (1916)	Novel
		Vraja Bucegilor (1926)	Travel log
Mihai Haret (1884–1940)	Geographer, naturalist, president of Romanian Touring-Club	În munţii Sinaiei, Rucărului şi Branului (1910)	Guidebook
	Member of Commission for Natural Monuments		

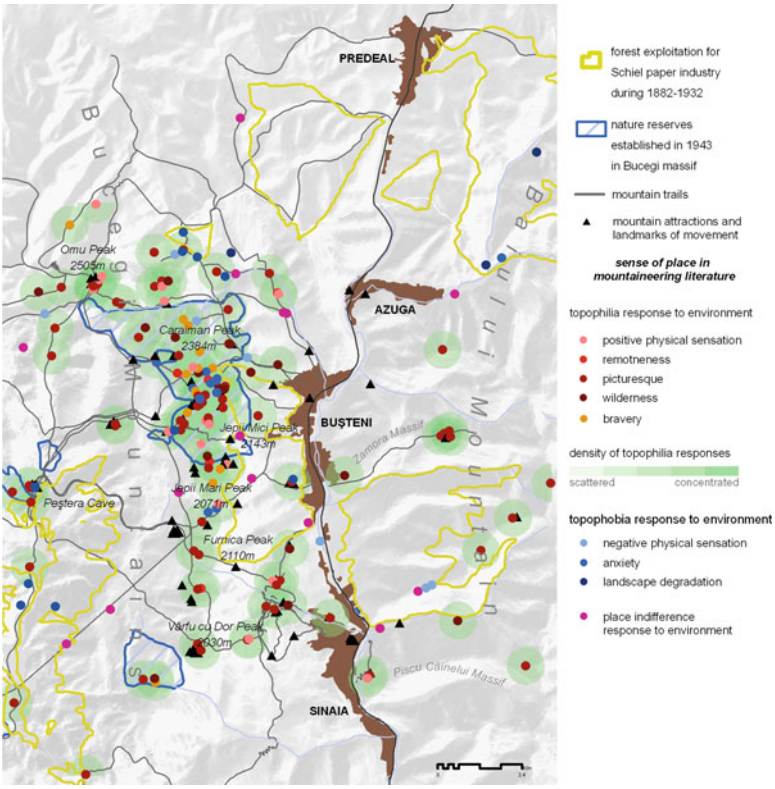

Fig. 7.2 Sense of place mapped in mountaineering literature based on responses to environment

mental source (Cater 2006). We used three types of mountaineering texts: novels, travel logs and guidebooks to identify responses to environment (Fig. 7.2). Travel logs and guidebooks are generally abundant in information about routes and place descriptions which leave 'deep impressions in the reader's mind' (Taylor 2006:191). In contrast, novels lead the reader on a journey, where he is compelled to see what and how the author wants him to see (Gould and White 1974:82). Emotional connections to mountains were structured according to topophilia, topophobia and place indifference responses to environment which come from the relation between body and mind (Deleuze and Parnet 1987:147).

Topophilia is formed of constituent parts like positive responses to environment, wilderness, remoteness, picturesque places and bravery. We used *wilderness* with the sense of a subjective 'state of mind' which doesn't correspond to an actual condition, being the result of social appropriation (Nash 1982 apud Kupper 2014:3; Oelschlaeger 1991; Tuan 1990:112). Since ideas about wilderness circulating in the European society were grounded in the same traditions of the Romanticism (Schama 1995) it's not surprisingly that places in Bucegi are described as 'romantic wilderness' (Garoflid 1885). *Remoteness*, as a similar state of mind, is related to the spirit of the time which brought forth mountaineering and need to escape crowded urban places. It evokes pure interest of the urban middle class in mountain and solitude (Lunn 1912).

Picturesque represents an aesthetic category expressing romanticism: 'this meadow offers the most beautiful and romantic view' (Nifon 1885:19). In mountaineering narrative, perfect experiences are those which achieve picturesque sensibility (Brown 2007:13). Some narratives use the word 'panorama' (Haret 1910) to describe the visual conquest of a summit or viewpoint. *Bravery* is associated with the 'conquering rhetoric' of mountaineering narratives, in which remote and dangerous places are 'defeated' (Moraldo 2013). Characters don't 'stand back from fighting the mountain which surrenders' and they feel 'stronger than the most virtuous emperor when crossing a narrow bench in Bucegi' (Urechia 1926:40).

Topophobia or the fear of places (Tuan 1979) can be divided in negative responses to environment, anxiety and landscape degradation. *Anxiety* manifests when some places are experienced as threatening. In this case the author's discourse is saturated with linguistic constructions like: 'her legs began to tremble from fear' or 'we felt the earth crumbling under our feet' (Parkinson 1921). The disdain towards the *degradation* or *decay of landscape elements* is expressed by authors who look at rotting tree trunks left behind by timber companies, sick trees and mouldering leaves. The rhetoric includes expressions like 'terrifying spectacle' when watching traces left behind by the cableway exploitation and the 'dreadful sight' (Urechia 1906) of the burned forest on Blana massif, or 'devastated site' of the timber deposit from Zănoaga Mare gorges.

Place indifference is associated with anonymous and monotonous settings as Bucegi mountain tableland which has little importance in mountaineers' writings. Lewicka (2011) attributes place indifference to the sentiment of 'placelessness' (Hammon 1992; Relph 1976) and an unnecessary creation of emotional bonds with places. In opposition to places which create either positive of negative bonds, time and distances in these experiential places are compressed while the mountaineer mentally projects the image of a certain point of interest.

As observed, the topophilia responses concentrate in areas unimpaired by logging activities. These superpose with protected areas which were actually established later in 1943 under the direct influence of mountaineer's interventions within the Commission for Natural Monuments. On the contrary, topophobia and some place indifference responses are largely congruent with clear-cut forest exploitations and degraded landscapes.

We exemplify the method through the novels of Nestor Urechia which are inspired by real places in Bucegi and Baiului mountains (Fig. 7.3). Urechia is representative for members of the Wayfarer's Inn who wrote fiction about mountain experiences. This category of mountaineers has a deeper capacity to express emotions regarding certain places reflecting responses to environment. Urechia's place-saturate realistic fiction emphasises that the bond with nature is rooted in friendship which is set between mountaineers and nature. A similar approach is found at the Norwegian philosopher-mountaineers, especially Faarlund's concept of 'loving nature' through his own understanding of '*friluftsliv*' as a 'metaphor of friendship' (Reed and Rothenberg 1993:156; Crowley 2013:46).

Urechia's story is filled with place descriptions and focuses on climbing experiences of three 'boy scouts' (Urechia 1923). Attention is drawn to their name: the '*Robinsons*' of Bucegi Mountains. In fact, Defoe's book was translated and adapted

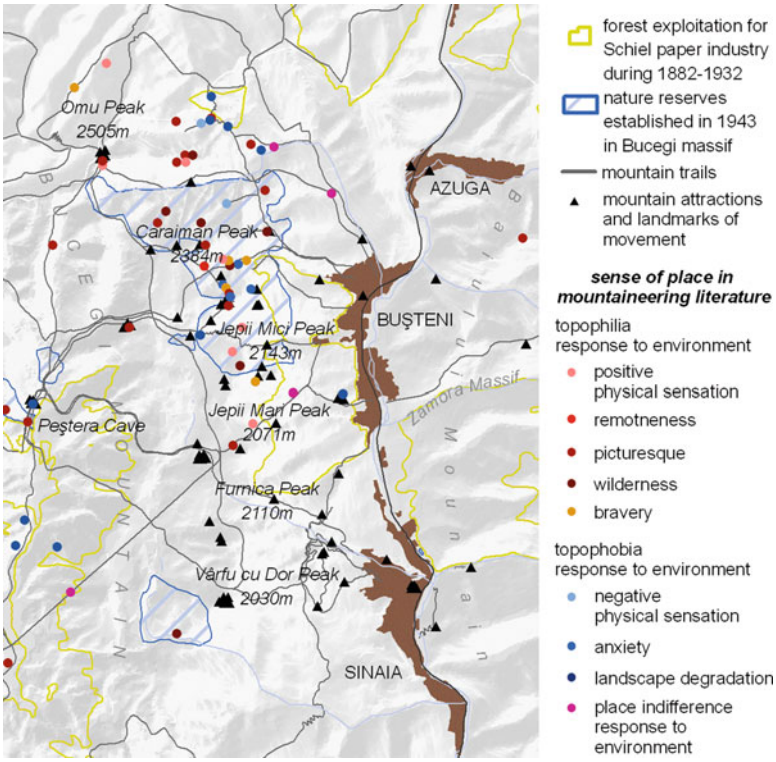

Fig. 7.3 Emotional responses to environment in Nestor Urechia novels

starting with 1835 by Romanian authors who have introduced the literary genre of adventure book in the national culture (Dimitriu 2006:76). Urechia especially stresses the heroic actions during dangerous explorations of trails and hidden caves. Shelter arrangements are also featured prominently in the text. Thus, the author, a mountaineer himself, draws a parallel to the 'survival narrative' of Crusoe who finally becomes 'completely naturalized to the place' he had struggled with (Lutwack 1984:33), a process that Urechia expressly followed in his adventure novel where nature becomes habitable, seaming a home like place. Tuan (2003) suggests that as people become naturalized to spaces, the sense of security and familiarity increases, and these spaces become 'their places'.

7.5 From Mountaineers to Preservationists

Against this background of bonding with places, we concluded on the extent to which the growing appreciation of nature led to its protection, considering that both mountaineers and preservationists found their driver in the Romantics' sensibility to beauty of nature (Readman 2014). The social elite and urban middle class have changed perception of mountains and later came to support the conservation

movement (Kupper 2014:25). Still, we acknowledge that nature's 'glorification and emphasis on the importance of non-material values' did not produce any direct conservation measures (Ditt and Rafferty 1996) until the beginning of the twentieth century when political and social preconditions emerged for nature conservation initiatives.

After World War I, interest in nature protection increased along with the outdoor movement on Prahova Valley. With resorts developing in this area, the 'civilisation' reconsidered the impact of deforestation on landscape aesthetics (Antonescu-Remuş 1887:98). Social elites became concerned with the identity of places visited and argued for fir tree plantations on deforested areas (Mack 1906; Antonescu 1926; Pătru Stupariu et al. 2013). Eventhough all tourist associations manifested an interest in protecting nature, the environmental actions had different purposes according to perceptions of what had to be protected. First, it was the game that became endangered so tourist associations prioritised nature protection in 1893, understood as rare animals like the red deer, the wood grouse and the brown trout (Societatea Carpatină Sinaia 1893). It's worth mentioning that the first real action to protect nature on Prahova Valley started with 1883 when the forest on the royal domain became subject to strict conservation for aesthetical purposes (Mack 1906:16). Also, other associations thought of the impact that grazing had on the mountain flora, as the Romanian Tourist Society that lobbied in 1912 for relocating grazing areas from the estates surrounding Sinaia and Buşteni, especially the royal domain, in confidence that 'other large landowners will follow the example' (Borza 1924).

Still, it was not until 1921 that a tourist association emerged with the purpose to create national parks (Mohan and Ardelean 2006; Löve and Löve 1966). Haret (1921) argued that it was the war and the damage it had brought to the mountain forest (Antonescu 1926:258) that determined a group from the middle class' elite to associate in organising nature protection in Romania. First was the Wayfarer's Inn, associated with the figure of geographer Mihai Haret, and then followed the 'Mountain Brotherhood' Association which was created by Antarctic explorer and bio-speleologist Emil Racoviţă. As founder of the Romanian Naturalists Society, Racoviţă was recognised as the driving force in establishing the Romanian national park and reserves system (Borza 1933). The two figures have joined actions in nature protection and legal recognition of national parks (Haret 1921) by merging their associations in a single entity, the Romanian Touring Club which has propagandized intensely between 1922 and 1928 and gathered the support of other statesmen, scientists and artists. One of them was botanist Alexandru Borza who joined Racoviţă's Mountain Brotherhood Association after climbing the Alps in 1907. He promoted the idea of creating a national park in Romania based on the American model which 'supported both preservation and tourist use' (Kupper 2009:60). The idea emerged especially after attending the fourth International Botanical Congress organised by Cornell University in August 1926 on which occasion he travelled widely to Yellowstone and Rocky Mountain National Parks (Borda 1985:75–78). At the first Congress of Romanian Naturalists in 1928, Borza supported Racoviţă in unifying scientific and political perspectives on designing national parks (Borza 1933:8). Racoviţă succeeded in passing the first law for the protection of natural

monuments in 1930. The protection system considered both scientific and aesthetic values of reserves, as well as land ownership, land use conflicts caused by economic interests including logging, grazing and tourism pressure. For its implementation, it was established the Commission for Natural Monuments that was attached to the Ministry of Agriculture and Landed Estates. It should be pointed out that its members (e.g. A.P. Bâznoşanu, E. Racoviţă, M. Haret, V. Puşcariu, G. Vâlsan, M. Drăcea, etc.) were also part of the scientific and administrative committees of T.C.R. and SKV tourist societies.

Haret was deeply influenced by his friendship with Racoviţă and his perspective on national parks. Thus, Haret achieved the largest initiative for nature protection through the Wayfarer's Inn which managed to start the effective creation of the first Romanian national park in Bucegi mountains, in Cocora century-old forest that covered 8 ha (Seghedin 2012). Being politically minded, Haret made use of the intention of King Carol II to transform the entire northern side of Bucegi into a national park. Finally, after several years of documenting the scientific and aesthetic resources, Haret argued that the creation of several reserves is more suitable with the economic development of Prahova Valley instead of an integral protection of the massif (Comisia Monumentelor Naturii 1938), suppressing his own desire to establish a national park in Bucegi. Therefore Prahova Valley lost the fight in creating the first national park in favour of Retezat Mountains. Still, six nature reserves were established here in 1943 after Haret's death (Comisia Monumentelor Naturii 1943). They widely covered those areas which had been described as wild and picturesque by mountaineers at the turn of the twentieth century.

Therefore the behavioural revolution brought by mountaineering in Romania placed more emphasis on the scenic beauty and aesthetic value of nature before World War II. As argued, past emotional bonds with places and observations of the forest destruction have motivated preservation action. The fact that these mountaineers changed the view on nature gives food for thought, considering that they mobilized the national environment conservation movement.

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Chapter 8
A Long Term Perspective of Landscape Evolution in a Coastal Interface: Case Studies from the Portuguese West Coast, Near the Aveiro Lagoon

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Abstract Based on data from different disciplines, such as Archaeology, Palaeobotany and History, the key moments of landscape evolution in the coastal stretch surrounding the Aveiro Lagoon are identified and interpreted in a broad diachronic perspective. In the southern part of the region, just north of the Lower Mondego River Valley, we find a broad flattened area, where the predominant sandy soils overlap deposits from ancient Pleistocene beaches. The wide and complex chronology of these deposits and the characteristics of its components suggest that during their development, environmental constraints, such as climate and vegetation, imposed severe limitations on human settling, as testified by the absence of archaeological remains in the lower

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deposits, extending westwards, which survey was facilitated by various sand quarries. This evidence contrasts with the presence of Acheulean assemblages in Mealhada, nearby the Cértima valley, in deposits which some authors considered to be equivalent to some of the Pleistocene beaches indicated.

Later on, in the end of the Pleistocene, the extensive dune formations that cover the previous Pleistocene deposits was associated with a severe episode of aridity that affected the entire region. Represented by a covers and extremely aeolised, this formation was currently named Areias da Gândara. Recent studies allow more precise chronology and also reinforce their similarity to the Landes formations, in France.

Lack of data from the Pleistocene-Holocene transition does not allow us to characterize the coastal landscape in this phase. Still, it is clear that in the Mid-Holocene extensive pine and oak forests were found in the region. As in other western Iberian coastal areas, during the Bronze, human activities led to a significant decrease in forest areas, marking a new phase of landscape evolution. These seem to be connected with changes in human societies, agriculture and settlement. This trend became clearer in later periods, following major changes in the strategies of occupation and exploitation of the territory. It is clear, from this stage, the expansion of heathland presumably as a result of the increase in animal husbandry.

These were already predominant in Roman times.

Agricultural and grazing signs continue to be important drivers of change throughout Medieval and Modern times. These and the climate changes related to the Little Ice Age led to a progressive destruction of vegetation cover and subsequent sand accumulation. This scenario which affected several areas of the Portuguese coast has been intensively studied further north in the Aveiro Lagoon.

That is exactly what was happening across the Gelfa, the medieval name assigned to the sandy spit developed from the South of Espinho that closed the large bay formerly localized in the area of the current Aveiro lagoon. Until the nineteenth century no permanent human occupation was found in the sandy cordon, probably due to lack of suitable agricultural fields and the risk of piracy. Such areas were only used for pasture as well as a starting base for sea fishing with the art of xávega, further developed by the implementation of the canning industry (eighteenth century). This scenario only changed with the forest stands for dune fixation initiated during the twentieth century.

Whether climatically induced or anthropogenic, changes in vegetation are an important variable for the understanding of the trends in human settlement in the region in a long-term perspective.

However, it is necessary to increase our knowledge of the diachronic, regarding such multiplicity of factors. Only then will we be able to fully understand the characteristics and the intensity of such changes.

8.1 Introduction

This paper is the result of convergent reflections on different moments of human occupation in an area of the Portuguese coastline, marked by a complex and dynamic geomorphology, in order to analyse human-environment interactions according to a long-term perspective.

The study area, the coast between the Mondego and Vouga rivers, has been studied through different scopes. In this area, important studies in the fields of Geomorphology (Dinis 2004; Gomes 2008), Palaeopalynology (Danielsen 2008, 2009; Danielsen et al. 2012), Archaeology (Vilaça and Cunha-Ribeiro 2008) and History (Bastos 2006) were carried out. On account of these studies it became clear that this region suffered major changes which limited human actions but did not prevent the establishment of populations in areas formerly occupied by the sea. In recent times, human actions became the major driver of landscape change in the region.

An interdisciplinary approach to the *longue durée* allows for a better perception of the way human communities interacted in such a harsh environment, how they were constrained by it and which adaptive behaviours they developed. Here we present a review focusing mainly on the evolution of the human occupation of this territory, for which we selected the most informative data for each specific historical period, whether from geomorphological studies, palynological data or written documentation. A particular emphasis will be given to the trends in vegetation cover, for they are informative of the broad environmental changes and how these have limited or are the result of human intervention.

Unfortunately, information regarding the human presence and landscape evolution is not homogeneous throughout the study area and the time periods in focus. Still, despite this discontinuity in the palaeoecological and archaeological records, it is possible to understand the main trends of human occupation of the territory since the Pleistocene. To do so, this work will focus on specific time-periods and specific locations within the study area where the available data is particularly valuable.

The chronological and geographical segmentation resulting from the available data and its intrinsic variability highlights continuities without denying, however, the existence of the concomitants chronological disparities. But above all it stresses the importance of observing these phenomena in a long-term perspective and understanding them as a single reality – humans living in their environmental context – and not as isolated areas of knowledge.

8.2 The Study Area

The study area corresponds to the northern part of the Western Meso-Cenozoic sedimentary basin – the Lusitanian Basin – that stands north of the Mondego Valley, in the central zone of the western coast of the Iberian Peninsula.

The southern area is separated from the Mondego Valley by Serra da Boa Viagem and the Jurassic plateau that expands between Cantanhede and Ança. The northern area extends to Silvade, south of Espinho, from where a barrier between the inner coastal lagoon of Aveiro and the Atlantic Ocean developed in historical times.

This is an area of low terrains, contrasting with the Iberian Massif reliefs on the eastern edge, where the watershed of Lower Vouga is now slotting. Its relief is marked mainly by different platforms and small hills crossed by gentle embedded valleys, with a large dune field along the shore line.

From a geomorphological point of view, this is a coastal platform covered by marine and continental sediments of Plio-Quaternary age (Fig. 8.1), whose

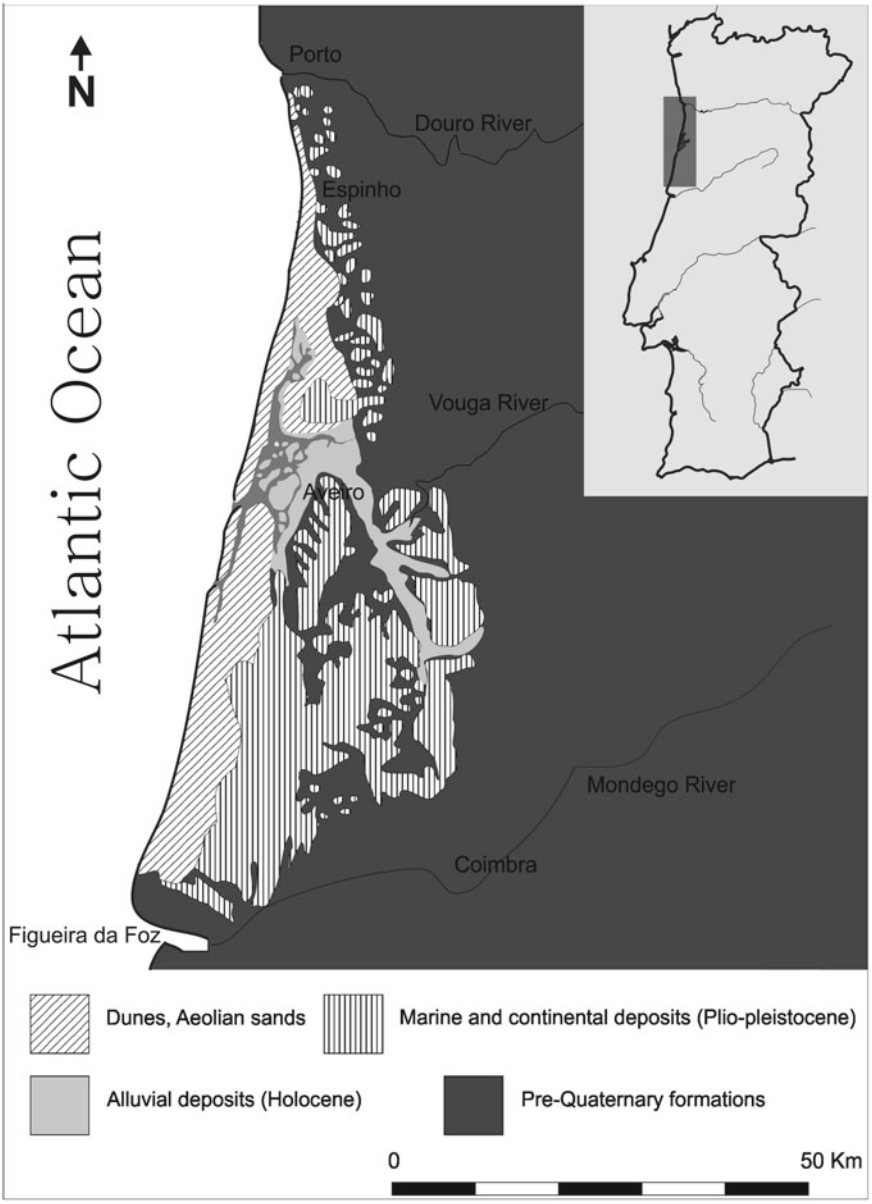

Fig. 8.1 Extract of the geological map of the quaternary of Portugal (Serviços Geológicos de Portugal 1969, modified)

deposition witnesses the wide change of the shoreline in this area of the coast, caused by the variation in sea level and tectonics (Dinis 2004; Gomes 2008).

On a regional level, geologists identified three main morphostructural units (Dinis 2004). To east, the Cértima River, flowing from south to north, following the

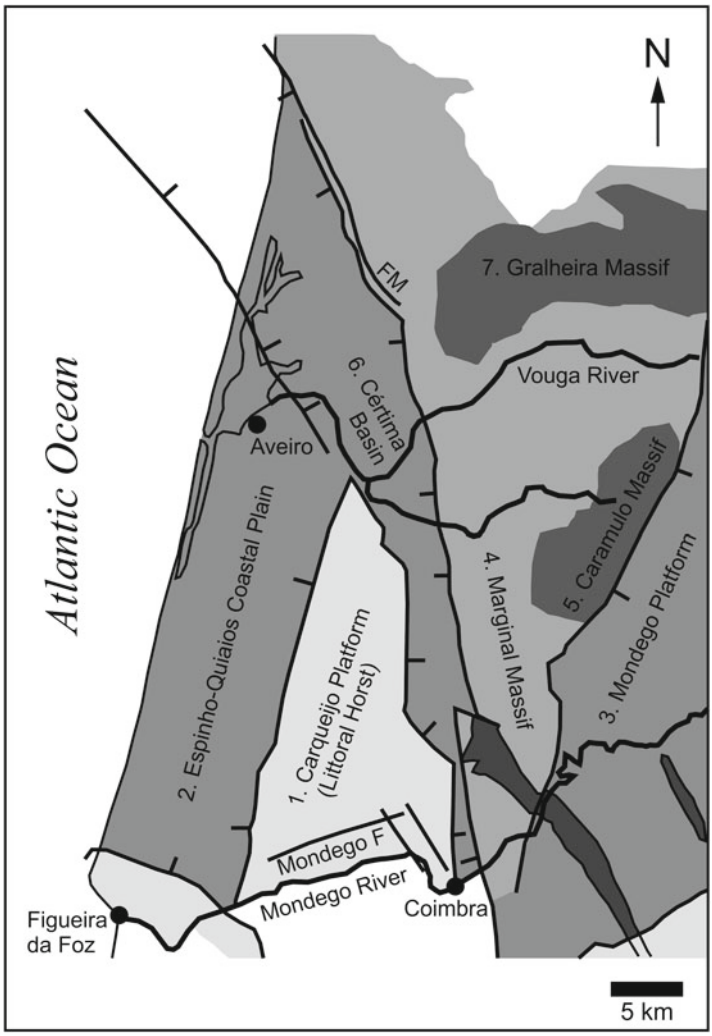

Fig. 8.2 Main morphostructural units of the region: *1* Carqueijo platform (Litoral Horst), *2* Espinho-Quiaios Coastal Plain, *3* Mondego platform, *4* Marginal Massif, *5* Caramulo Massif, *6* Cértima Basin, *7* Gralheira Massif (Dinis 2004, 2006, simplified)

graben that borders the Hesperic Massif. Then, after guiding the drainage of the final section of the Águeda River and the Vouga River, the Cértima depression merges with the local barrier of the lagoon (Fig. 8.2).

In the southern half of the study area, west of the Cértima depression, a second morphostructural unit develops, extending north to near to Aveiro. It is an uplifted platform, which preserves the original Plio-Calabrian surface. This littoral horst, circumscribed by several structural accidents, presents a Plio-Pleistocene sedimentation with significant variations of facies among most of the inner areas and those near the coast. In some sites of the platform there are still remains of coversands that

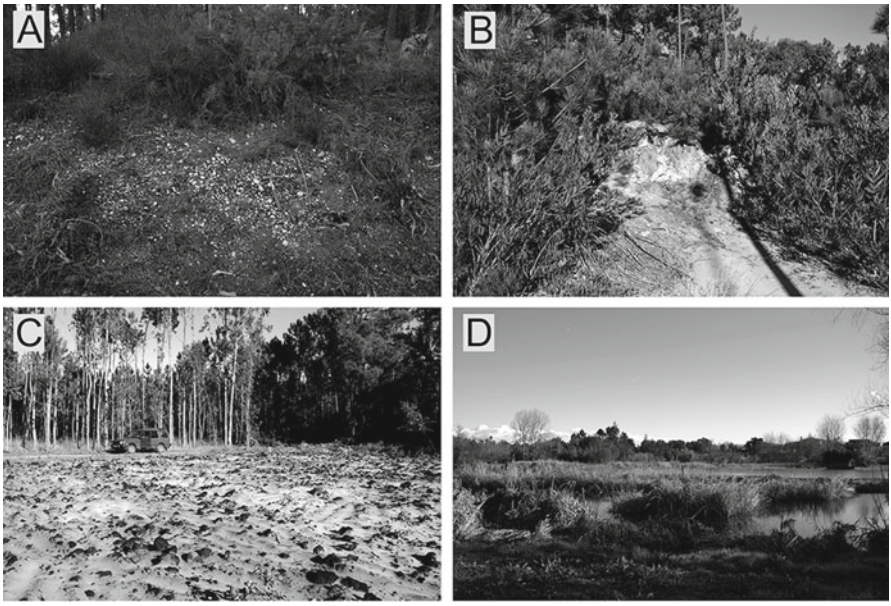

Fig. 8.3 (**a**) Marine deposit; (**b**, **c**) Aeolian formation. *Darker clods* in photo *C* are remains of a podzolic soil developed in the Aeolian formation. (**d**) One of the several lagoons of the region (Hortas lagoon, Febres, Cantanhede)

expand more significantly to the west (Fig. 8.3b), as is the case of "Areias da Gândara" (Gândara Sands formation) (Carvalho 1954; Dinis 2004).

The last and the most western morphostructural unit follows the coast line between Espinho and Quiaios, with sediments of Quaternary age and the prevalence of aeolian formations. In the southern part of the study area it is possible to recognize an evolution of these sand deposits from east to west, admitting even a fini-Pleistocene chronology for older deposits represented there. The wide dune field that follows the coastline incorporates, further north, the fragile barrier that separates the lagoon from the Atlantic and sets the current geography of the region, both with a noticeably historical chronology.

The drainage of the entire area is part of the Low Vouga Valley, whose recent history is also marked by sedimentation phenomena and variation of the coastline that developed around the formation and transformation of the Aveiro lagoon, with natural impact on vegetation and landscape.

8.3 Pleistocene Times

As described above, large patches of sedimentary deposits of Plio-Plistocene age form several platforms between the depression occupied by the Cértima River on the east edge of the study area and the string of dunes that follow the shoreline to the west. Spreading from east to west, and although not always recognizable topographically, these deposits allow a recognition of distinct depositional cycles,

sometimes even polycyclic, as a result of the evolution of the coastline throughout the Quaternary, due to eustatism and tectonics (Dinis 2004).

Some authors in the 1950s reported the presence of lithic assemblages which were connected with the Acheulean on the surface of the highest deposits. However, the study of these collections was never accomplished. Surveys in the lower deposits, extended westward (Fig. 8.3a), occasionally facilitated by several sand pits, revealed, on the other hand, an almost total absence of lithic remains (Cunha-Ribeiro 1984). This fact seemed to be somewhat unexpected, seeing as Acheulean assemblages were known in the inner Cértima Valley, in Mealhada (Cunha-Ribeiro 1996–1997), in deposits that are considered to be correlative of the marine formations identified further west (Soares et al. 1997).

The diversity of facies within the deposits witnesses the succession of transgressive events due to the development of coastal and fluvial sediments, with a drift from continental facies in the east to a more expressive marine sedimentation in the west (Dinis 2004). Sometimes, there is aeolian material in deposits of marine origin (Cunha-Ribeiro 1984), beside areas with cover sand assignable to the "Areias da Gândara" formation (Dinis 2004). This suggests the existence of a flat littoral with broad areas subject to continuous tidal action, where the lack of vegetation could be responsible for aridity, thus influencing important episodes of deflation.

These observations are consistent with data from deep-sea cores extracted on the Portuguese coast (Sánchez-Goñi et al. 2000; Roucoux et al. 2001), although it is not possible to correlate them chronologically with the various cycles of sedimentation identified in the study area. In any case, they outline a general increase of steppe vegetation during the coldest climatic phases, which would naturally be well marked in flat coast areas.

This interpretive model cannot disregard the recent identification of Middle Palaeolithic sites in coastal contexts further south, as is the case of the archaeological remains from Praia do Pedrogão, about 60 km south. However, these remains relate to a continental sedimentary cycle, connected with a regressive episode (Aubry et al. 2005).

Further south, in the site of Mira-Nascente, the presence of Middle Palaeolithic assemblages is apparently associated with a wave-cut platform uplift, etched in the Jurassic outcrop that arises in current coastal cliffs, locally associated with the edge of an active diapiric structure (Haws et al. 2010). Although this human occupation is in association with a tidal flat, its topographical position suggests that it is a refuge area where the Middle Palaeolithic humans would surely have taken advantage of the locally available resources, allowing us to witness the exploitation of an ecosystem where human presence had not been previously identified.

Another archaeological site related to the Middle Palaeolithic was also identified near Foz do Arelho, in the context of "The Landscapes and Seascapes of Portuguese Estremadura Project" (Haws et al. 2010). This new site is located at the base of a small valley carved in a high coastal cliff, subsequently filled with Pleistocene sediments, occupying a well-protected position. It is, however, an occupation which may be dated from MIS 5e, suggesting that it may be related to the Last Interglacial. Furthermore, the previous archaeological site, Mira-Nascente, would date from MIS 3 (Haws et al. 2010) (according to its researchers), that is to say, before the Last Glacial Maximum (LGM), as may also be the case of the archaeological site of Praia do Pedrogão, for which there is no absolute dating.

In the Latest Pleistocene, the extensive coverage of previous Plio-Pleistocene formations is associated with a severe episode of aridity that affects much of the coastal platform in the study area. Represented by an important cover sand, whose structure is at present-day only partially preserved, it is associated with the "Areias da Gândara" formation, which depicts, with the adjacent dune field and the several lagoons of the region, a typical flat coast landscape (Fig. 8.3d), much the same as the area studied (Carvalho 1950, 1954; Dinis 2004).

The correlation between "Areias da Gândara" and the Landes region, in the Southwest of France, with its wide coversand, was suggested at the end of the nineteenth century by Paul Choffat (Choffat 1889). Halfway through the twentieth century, this issue was retrieved by Soares de Carvalho, and was supported by sedimentary analysis of sands and comparison between the podzolic soils identified in both regions (Fig. 8.3c) (Carvalho 1954, 1964). But unlike the sands of the Landes, the origin of "Areias da Gândara" was not related to a cold periglaciar climate and its age was posterior to the last Pleistocene formations covering the region.

Recent studies suggest a more precise age for this coversand (André et al. 2009) and also allow an association with the Landes region (Bertran et al. 2009). Some authors also sustain the presence of these deposits in other areas of the Portuguese coastline, where the earliest phase of their formation is associated with the LGM, thus coinciding with the earliest phase of development of the Landes coversand (André et al. 2009). A second episode of aeolisation would date from the beginning of the Holocene, with the last phase occurring between the Middle Ages and present day.

However, it is now possible to connect the "Areias da Gândara" and other Portuguese coversand with those from the Landes region, as well as from other areas of Europe (Fig. 8.4). These formations record repeated episodes of intense aridity and deflation, thus the impact on the decrease of vegetation in regions with a flat coast seems obvious.

The existence of traces of human presence in regions adjacent to the area where the "Areias da Gândara" formation developed are recognized today (Almeida et al. 2002; Angelucci 2002; Vilaça and Cunha-Ribeiro 2008; Cunha Ribeiro 1995–1996). Therefore, it is urgent to establish the chronological correlation between these different realities. In doing so, it will be possible to clarify if the area affected by drought did indeed correspond, or not, to a real human desert, as well as evaluate the time scale of this phenomenon of eventual desertification.

Lastly, could these phases of dryness have occurred with the same impact in previous moments of the Pleistocene?

8.4 Holocene and Roman Times

Unfortunately, there is a complete absence of data for the period between the Pleistocene and the Middle Holocene. As a result, it is not possible to describe the dynamics that led to the scenario suggested by palynological data for late prehistoric times, particularly from the third or second millennia BC onwards.

Such palynological data has been obtained by Randi Danielsen and other researchers (Danielsen 2008, 2009; Danielsen et al. 2012) in the Quiaios-Mira lakes and near-

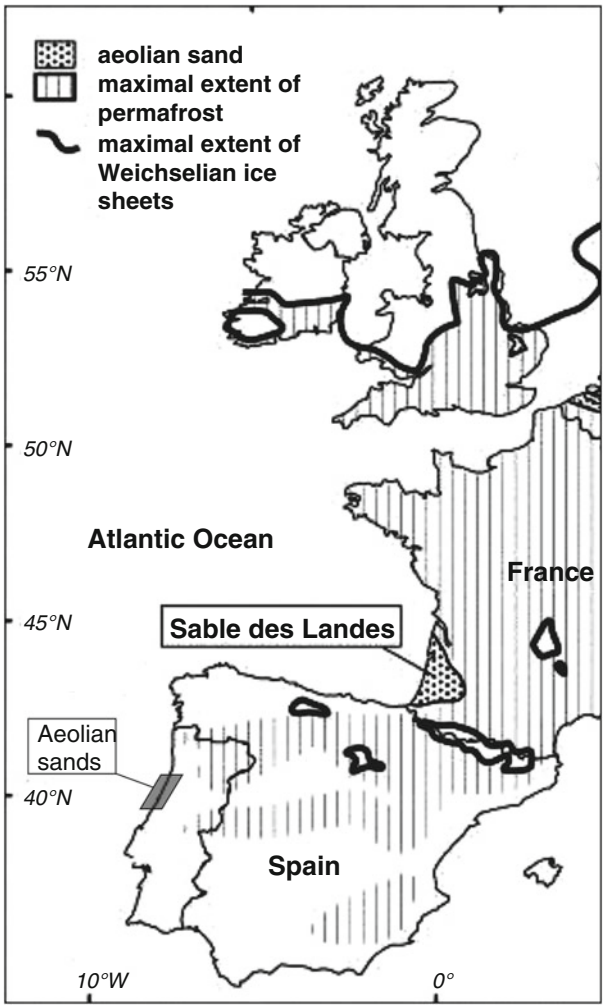

Fig. 8.4 Sables des Landes (France) and the aeolian formations of the studied area (Bertran et al. 2009, modified)

by contexts. Furthermore, palynological and wooden remains were recovered in boreholes in the sand dunes of the same region (Danielsen 2009; Danielsen et al. 2012).

Wooden remains with no taxonomic identification were recovered in a layer at a depth of 9.5 m (Borehole F16) and dated to 5590 ± 45 BP (4503–4344 cal BC 2σ), i.e. the Neolithic. In another borehole (F19), at a depth of 14.5 m, *Fraxinus* wood was found and dated to 4375 ± 40 BP (3261–2902 cal BC 2σ) (Danielsen 2009; Danielsen et al. 2012), i.e. the transition from the Neolithic to the Chalcolithic.

Such isolated botanical records are difficult to interpret but, together with palynological data covering subsequent periods, they have been used as evidence to back the existence of a forest in the region until at least 4000 BP (Danielsen 2009;

Danielsen et al. 2012). Such forest area must have been constituted by *Pinus* and *Quercus*, probably with *Fraxinus* in freshwater areas and *Alnus* in coastal marshes.

Since palynological data from around 1600 BP do not document any clear signs of forests, suggesting a landscape where heathland prevailed, somewhere after 4000 BP and before 1600 BP the area surely suffered major changes (Danielsen 2008, 2009; Danielsen et al. 2012). Within this period, noticeable social, economic and technological changes occurred, as it refers to the Chalcolithic, Bronze and Iron Age and the Roman Period.

These data are only partially tallied by the pollen diagram obtained in the near-by Lagoa do Saloio, located south of our study area, in Nazaré. It testifies an increasing heathland and *Pinus* area and a decrease in *Quercus* in the ninth to seventh centuries cal BC, followed by a phase of forest recovery in which *Pinus* percentage reaches its maximum, after which there is a strong decrease in arboreal pollen since the Roman Period (Gomes 2011).

Such great deforestation has been attributed to human pressure and climate change (Danielsen 2009; Danielsen et al. 2012). We must emphasize the role of human pressure in this trend. Taking into account the data from other areas of western Iberia, such as the southwest Portuguese coast (Mateus 1992; Queiroz 1999), the southern coast of Portugal (Fletcher et al. 2007), inland contexts such as Serra da Estrela (Knaap and Leeuwen 1997) and northwest Spain (Ramil Rego et al. 1998; Muñoz Sobrino et al. 1997, 2005; Mighall et al. 2006; López Merino et al. 2010, 2012), it is clear that the role of human action in landscape changes increased as agricultural activities – including crop and animal husbandry – developed. The Bronze Age, mostly since 2000–1500 cal BC, appears to have been an important shifting moment with increasing deforestation.

In fact, although possibly inflated by some climatic worsening (Martinez-Cortizas et al. 2009; López Merino et al. 2010), changes in landscape composition seem to be mostly anthropogenic and correlated to changes in human societies, agriculture and settlement. Such deforestation trend continued throughout the Iron Age and increased during the Roman period with the onset of new social, economic and territorial models.

Archaeological evidence in the region testifies a great human presence in the periods considered. Figure 8.5 illustrates the evidences of human settling in the region during Bronze Age, Iron Age and the Roman Period. Data was obtained through the Endovelico database (http://arqueologia.igespar.pt/) from the Direção-Geral do Património Cultural, and although possibly biased by the geography of archaeological interventions, it clearly shows a profuse and diversified human occupation of the territory surrounding the coastal dunes. During Roman times, *villae*, farms and other rural settlements attest to changes in human territorial strategies pointing to more productive agrarian systems which surely had severe effects on the landscape.

As a result, landscapes at the end of the Roman period and beginning of the Middle Ages were dominated by heathland with several *Ericaceae* and *Cistaceae* (Danielsen 2008, 2009; Danielsen et al. 2012). The percentage of arboreal pollen in the palynological sequences is very low at this stage and the pollen of *Triticum* and *Plantago lanceolata* points out the existence of cultivated areas and pasturelands. At the same time, wetland plants are conspicuous, which fits well with data from other palynologi-

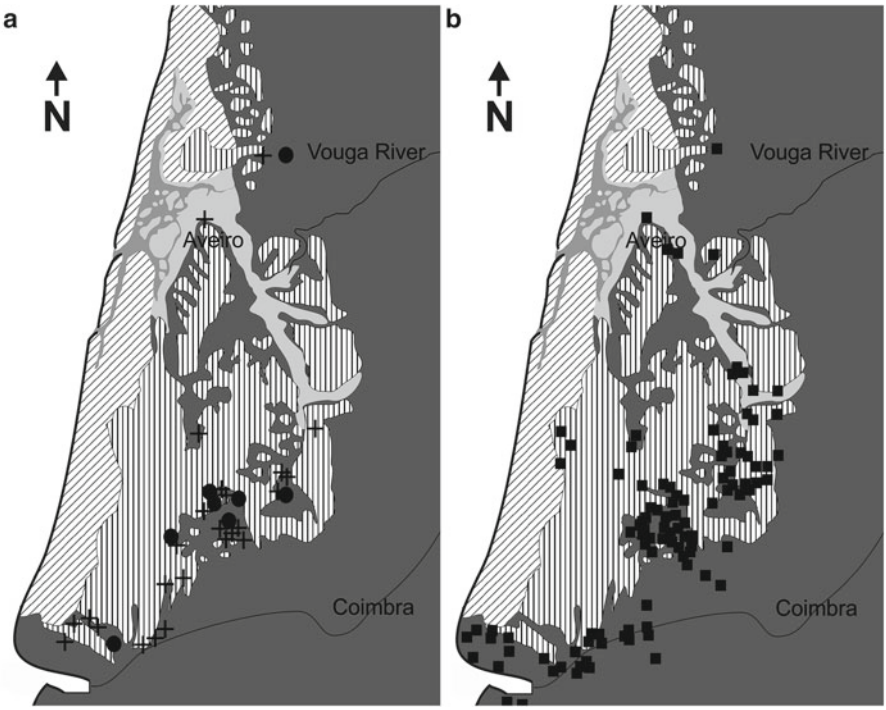

Fig. 8.5 Location of archaeological Bronze Age (*Circles*), Iron Age (*Crosses*) and Roman (*Squares*) sites in the area between the lower courses of the rivers Mondego and Vouga

cal studies done in the western Iberian coast, south and north of our study area, which suggest this is a phase of increasing humidity. Still, at this point the lakes record the beginning of sediment accumulation (Danielsen 2008, 2009; Danielsen et al. 2012).

8.5 Medieval Times

As a matter of fact, during the transition from the first to the second millennium, the lagoon area corresponded to a large bay where the Vouga River used to flow. The progression of a slight sandy spit, rooted at the south of Espinho, had confined this large bay and subsequently formed the lagoon, whose total configuration will only be established in the nineteenth century. The existence of a long-shore drift normally occurring from north to south, which involved great amounts of sand, made it possible. As a result, in medieval times, the coastal layout of the region presented a different configuration when compared with present day (Souto 1923; Martins 1947; Bastos 2006). The sand supply results from natural causes such as climatic variations, tectonic events, and the average level oscillations of the sea. Nevertheless, anthropic actions that occurred in Entre-Douro-e-Minho region also increased the deposits of considerable debris amounts on the continental shelf. The high concentration of population and subsequent exploitation of the environment, especially by

means of land clearing for agricultural usage, amplified the deposit of those debris in fluvial channels and therefore in the sea. By the year of 1064, the Christian Conquest of Coimbra allowed the pacification of the Vouga region and subsequent delimitation of new Portuguese boundaries. Such circumstances granted the possibility of excess population settling, until then concentrated in the Entre-Douro-e-Minho region (Bastos and Dias 2012).

Historical data confirms the development of the sandy spit that confined the Aveiro lagoon system. In the tenth century, the presence of a harbour and salt fields near Ovar sustained the assumption that a maritime bar existed in the area. These infra-structures were only possible due to the existence of a sandy spit, which provided the contact of sea waters in the region, as well as a peaceful environment where powerful sea waves arrived with their energy already dissipated (Oliveira 1967; Bastos 2006). In the eleventh century the sandy spit was still at the northern end of Ovar. Documents reveal that the localities of Cabanões and Vilar were geographically situated near the sea. During the twelfth and thirteenth centuries, the sandy cordon had already reached the area of Torreira (Fig. 8.6). Coeval documents report the beginning of isles formation in the bay, and intense salt exploitation between Ovar and the Vagos. This demonstrates that the sandy spit was already situated further south, in front of Vagos, providing the indispensable protection needed for salt production, safeguarding the salt fields from the direct impact of the ocean and its powerful waves. Between the fourteenth and fifteenth centuries, the conjuncture observed in Portugal (and Europe), which included periods of wars, plagues and starvation, discouraged anthropic activities. As we mentioned, these human activities were an important contribution to the deposit of fluvial sediments then carried by the sea. The result was a slow progression of the sandy spit, reaching, in those times, the area of São Jacinto. In subsequent centuries the progression continued and in the eighteenth century the sandy spit was already near Mira (Bastos 2006).

The conditions imposed by these coastal modifications influenced the meagreness of the vegetation. The soil of the Aveiro lagoon hinterland was mainly made up of sand, which posed a problem for the establishment of farmed fields. Pasturage was the only culture capable of adapting to these sandy soils. For these reasons, the region was mainly constituted of woodland, hunting fields and livestock (Silva 1991). Across the Gelfa, the medieval name assigned to the sandy spit, the presence of cattle can be documented since at least the year 1283. However, the values were lower when compared with salt fields, revealing a low patrimonial value of the territory (Oliveira 1967; Lamy 2001; Bastos and Dias 2012). The increase of maritime fishing in Aveiro region, which occurred specially from the late thirteenth century to the fifteenth century (Pereira and Bastos 2014), resulted in the increase and exploitation of the sandy spit as a starting base for sea fishing with the use of the art of *xávega*. Although the first document that securely stated the establishment of fisheries in the Gelfa (medieval name for this sandy spit) is dated from 1501 (Bastos and Dias 2012), this kind of fishing had been applied in the *Aveiro* region since at least the year 1405 (Marques 1988; Madahil 1959; Martins et al. 1792). As a result, we conclude that the absence of information about livestock after 1355 is a consequence of the implementation of fisheries in a larger scale. As a matter of fact, despite the documental lack of information, we believe that cattle (especially bulls and cows)

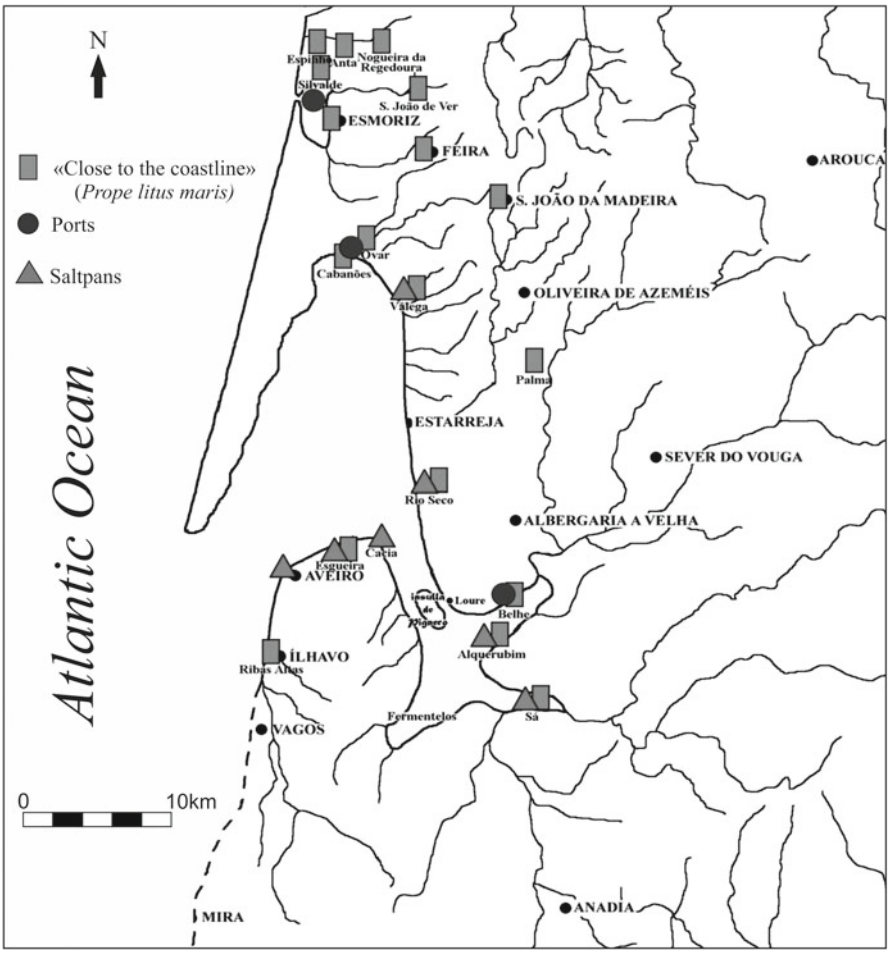

Fig. 8.6 Approach to the coastline of Aveiro's Laggon in The Middle Ages

could be started to be used as fishing labour, helping to pull the trawls of *xávega* to the beach. And how precious was that cattle! To hunt or frighten wolves that attacked in coastal zones was an ancient necessity. Therefore the fisherman's that were in the king's service participated in it and frequently asked to be excused of that job (Neves 1980; Dias 2006). And this necessity was observed further on, for example, in *Sintra*, in the year of 1462 (Chancelaria de D. Manuel I, liv. 29, fl. 50 v). Indeed, in 1549, this type of hunting was even imposed by law between Easter and end of June, precisely after the sardine spawning (Amorim 1998), and from our point of view, when the cattle was used in fisheries. The *Gelfa* should' n be an exception of this hunting practice. Mostly because we know the sandy spit named *Gelfa* was mostly used for feed cattle and also passing zone for fishing either in the ocean or in the lagoon.

Until the eighteenth century there was an objective enlargement of the forest (mainly pine trees), to aid dune fixation and impede the wind from transporting sand

inland, so as to protect surrounding agricultural fields and consequently their productivity. These pine forests were destroyed between the years of 1884 and 1906, resulting in the need to reforest the region between 1920 and 1938 (Lamy 2001).

Despite these activities, until the nineteenth century, the human occupation on the sandy spit was seasonal and restricted to sheltered coastal areas (Freitas 2010). Only with the progress of fishing, by the implementation of the canning industry, did those areas became desired by the municipalities near *Ovar* (Laranjeira 1984; Lamy 2001).

8.6 Conclusions

With regards to the study area and the time lapse, it is possible to outline the evolution of vegetation, and observe that, on one hand, this evolution conditioned human settlement and on the other, said evolution was also impacted by human activities. The overview on the subject that we have tried to trace allows us to highlighting the importance of a *longue durée* reading for the perception of this phenomenon. In addition, this allows the recognition of affinities that the different areas of knowledge involved have for the construction of History, one that is not only focused on humans, but also on their circumstances.

Hopefully, future research will be carried out, in order to better respond to the many questions that the current lack of data leaves unanswered, taking advantage of the resources that this multidisciplinary approach requires.

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Part III
Transfering (Migrations) – Resources Exploitation and Trade; Local to Global (Native Sources, New Case Studies Tans-continental Approaches!)

Chapter 9
Nonhuman Primate Trade in the Age of Discoveries: European Importation and Its Consequences

C. Veracini

Abstract The history of interactions between humans and non-human primates is simultaneously complex and fascinating. Since ancient times, human beings have interacted with non-human primates, sometimes shaping the latter populations' abundance and geographical distribution. In the Age of Discovery (fifteenth and sixteenth centuries) Europeans came in contact with sub-Saharan African and New World primates for the first time and began the first large-scale trade of these primates. They were introduced to Europe in great number being a significant part of the revenue from the trade in natural products with Africa and the Americas. The current work presents the results of a review of literary and iconographic sources of this period which contain data on African and New World primates. These sources suggest that primates were a constant presence and very sought after animals in all the phases of European expansion. They represented an authentic status symbol for nobles and wealthy citizens who used them to underscored their influence, prestige and social position. This work will also include some considerations on the consequence of this trade on primate populations.

9.1 Introduction: Human and Non-human Primate Interactions in the Western World

The interactions between humans and non-human primates (referred to as "primates" from here onwards) date back to ancient times. Its study is a complex area of research that includes many different disciplines such as history, the history of natural science, primatology, anthropology, archeozoology, ecology and ethnoprimatology. According to recent studies in ethnoprimatology, primate populations have been influenced by or been forced to respond to human activities in their recent or evolutionary histories (Fuentes 2006). Geographical distribution, abundance and

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interspecies interactions of primate populations are in many cases the result of human pressure and action (Masseti 2010). Moreover, there is an emerging consensus that the interface between human and non-human primates needs to be more documented both in the present and in the past (Fuentes 2007). This is also demonstrated by the recent interest of Early Modern historiography in studies on animals and their meaning in human culture (e.g. Fudge 2002; Cuneo 2014)

Since ancient times, primates have always been assigned a distinct place in the human imagination because of their similarities with human beings (Corbey and Theunissen 1995; Groves 2008). They have often played a role in the central debates concerning human nature and human origins, acting as a vehicle of moral and cultural criticism, and being sometimes persecuted or adored according to different cultures' interpretations (Janson 1952; Corbey and Theunissen 1995; Corbey 2005). In the Western world, primates have been invested with various meanings, both positive and negative, but have always occupied a significant place in the culture. African Primates such as the Barbary macaque (*Macaca sylvanus* Linnaeus, 1758), baboons (*Papio* spp. Erxleben, 1777), and grivet or tantalus monkeys (*Chlorocebus* spp. Gray, 1870), were well known in the Greek and Roman worlds (Groves 2008; Masseti and Bruner 2009). Monkeys as well as other exotic animals were often housed in private *menageries* or used as pets by wealthy citizens (Toynbee 1973). These animals have been described, often using mixtures of reality and mythology, by ancient natural philosophers and historians (among them Agatharchides, Herodotus, Aristotle, Galen, Strabo, and Pliny the Elder) (McDermott 1938; Groves 2008). Primates, as other animals with commercial value, were imported mostly from the North of Africa and Eastern sub-Saharan Africa where traders followed ancient Egyptian trade routes. During the Medieval period, monkeys were among the favoured pet species in Europe, together with small dogs, cats, birds, squirrels, ferrets and rabbits (Walker – Meikle 2012). The practice of keeping monkeys in captivity mainly as pets at that time, is well known. Monkeys were expensive high-status pets and were the favourite also among high prelates that liked to keep them at home (Walker – Meikle 2012). The most popular types of monkeys were tailed monkeys of the Genus *Chlorocebus* spp. (George and Yapp 1991), but the Barbary macaque and baboons could also be found among pets. These African primates were widely available in Western Europe from the twelfth century onwards, as demonstrated by their popularity in European iconography (Janson 1952) or by their remains (see Platt 1973 *apud* Walker – Meikle 2012).

After the passing over of the Cape of Bojador in 1434 by the Portuguese explorer Gil Eanes (Albuquerque 1985), new Atlantic routes were discovered. The exploration of sub-Saharan Africa, India and later the Americas, opened Europe to the influx of a massive quantity of new goods (Godinho 1965). Along these trade routes travelled many kinds of goods, natural materials and animals that were treated as any other item or object of value. The exploration of the new worlds offered to European courts a unique opportunity to obtain exotic animals and the trade of animals and their derivatives thereby increased (Toynbee 1973). Collecting exotic

animals of various kinds and keeping them in *menageries* was considered a real status symbol during the Renaissance (Gschwend 2009). *Menageries* acted as an outdoor extension of *Kunstkammers,* actual "cabinets of living curiosities", that aimed to assemble all kinds of luxury goods and exotic objects (e.g. nacre shells, tortoise shells, objects made of ivory, bezoars, stuffed animals and so on, see Pieper 1998). Among the living animals imported mainly from Africa and the Neotropics, primates seem to have been continuously traded and were very sought-after animals in all phases of the European expansion (Asúa and French 2005; Veracini 2011a). The colourful sub-Saharan African monkeys and the smart and small Neotropical ones were new to European nobles and quickly became appreciated as pets. As highlighted by recent works, primate trade in this period was not an occasional phenomenon but part of a routine trade of animals, where primates were particularly valuable and profitable goods (Teixeira and Papavero 2010; Veracini 2011a).

9.2 Aims and Methodology of the Present Study

This research aims to investigate the importation and presence of primates from Africa and the Americas in Renaissance Europe in the Early Modern period and to understand if this phenomenon could have had an early impact on the populations of primates, especially on those which have a very reduced range and are threatened with extinction. These kinds of historical studies have demonstrated to be very useful in previous work in order to gain an understanding of the original distribution of many animal species and to provide useful information concerning their conservation management (e.g. see Williams and Steadman 2001). In the current work, in order to assemble a complete picture of this complex phenomenon, data has been gathered that contains reports of trade and the presence of these primates in Renaissance European courts and noble residences from different sources, specifically: (a) Literary sources (chronicles, diplomatic letters, travel and commercial reports, ships' logs, etc.) from Portugal, Spain, Italy, France, Germany, Brazil and England from the second half of the fifteenth century until the end of the sixteenth century; when possible, the manuscripts' original language has been used; (b) Iconographic sources that show primate depictions (paintings, frescos, drawings, woodcuts etc.) where the symbolic meaning and the context of the images have also been considered; (c) Zoo-archaeological data; and, (d) Scientific and philosophical treatises of the sixteenth century. The taxon identification and description of primates reported in these documents have been analysed following morphological keys for taxonomic rank according to zoological descriptions available in scientific literature. As a general reference, primate taxonomy follows Mittermeier et al. (2013).

9.3 The Trade of Primates in the Fifteenth and Sixteenth Centuries and Their Presence in Europe

9.3.1 Portuguese Monkey Trade and Its Atlantic-European Connections

During the fifteenth and sixteenth centuries, the presence of African and New World primates has been confirmed in most of the continental European countries including in the most important European courts. Portuguese navigators and explorers were the first to enter into contact with and import sub-Saharan African primates. Portuguese travel chronicles of this period testify that the trade of monkeys was already common from the first decades after the Portuguese discovery of Western Africa. There were specific places where primates could be purchased from local people. The Gambia River was a favourite place for monkey supplies, here monkeys were frequently a gift offered to Europeans by local rulers (Monod et al. 1951). Primates were shipped to Lisbon from the territories of Senegal, Guinea Bissau, Gambia, Sierra Leone, the Ivory Coast, and later also from Central Africa, following the path of explorations and contact with local people. With the discovery of the Americas, many species of Neotropical primates also began to be imported especially from the Atlantic coast of Brazil and the Caribbean coast of Colombia and Central America (Teixeira and Papavero 2010; Veracini 2011a; Masseti and Veracini 2014). Following commercial monopolies and the Atlantic trade routes, goods and animals from the New World were mainly shipped to Lisbon and Seville. In Lisbon, a fruitful trade and exchange of animals was established that from this port reached every part of Europe. Moreover, Portuguese sailors used to bring home smaller animals (monkeys and parrots) as pets, or to be sold for additional income (Johnson 1995). For instance, the Italian explorers of Western Africa Alvise Cadamosto returned to Lisbon in 1456 with 155 parrots which were each sold for a *ducato* (Ramusio 1550). The ships that arrived from India often made stopovers in Brazil before returning to Europe. For this reason many of the animals were referred to generically as being "Indian", making no distinction between their varying places of origin. Lucas Rem (Agent of the German Welser family in Lisbon) wrote in 1508 about "strange parrots and monkeys with long and hairy tails" that he had bought in Lisbon (see Gschwend 2009). Lisbon is remembered, as described by Diego Velho da Chancellaria in 1519, as a place where "monsters, talking birds, diamonds and china" had become quite common (Bedini 1997). After 1500, no other contemporary European place could compete with Lisbon and its court for the presence of strange, marvellous and exotic animals that became part and parcel of everyday life in Portugal (Pérez de Tudela and Gschwend 2007).

At the beginning of the sixteenth century the Fugger family, a prominent group of German bankers, understanding the importance of exotic animals, had begun a large trade of animals moving from Lisbon first to Augsburg and then later to Antwerp, the most important trade centre of Northern Europe at that time (Gorgas 1997). The monkey trade of the Fugger family expanded to such an extent that the

factor of the Fuggers in Antwerp complained about the large amount of work involved with caring for primates in their facilities (Gorgas 1997). If the transportation of large animals could be very complicated, that of small monkeys and parrots was simpler, and thus more easily managed by those who did not have facilities for housing animals. When the artist Albrecht Dürer visited Flanders in 1521, he purchased some exotic animals and objects for his personal *Wunderkammer.* He also bought a *meerkätzlein,* (a "cat of the sea", monkey with a tail), as he described in his diary (Lugli 2005): "I bought a little monkey for 4 gulden, and gave 14 stivers for five fish". This little monkey was probably a marmoset. Marmosets (probably of the species *Callithrix jacchus* Linnaeus, 1758) (Fig. 9.1) seems to have reached Germany alive already by 1513 as documented by the same Dürer. In two "Folios" of The *Book of Hours of Maximilian I* (Veracini and Masseti 2010; Teixiera and Papavero 2010), and in the *Triumphal arch of the Emperor Maximilian I* (Groves 2008), we find marmosets portrayed. The artist purchased and sent back to Nuremberg many artworks, various animal horns, a piece of coral, some large fish fins and a wooden weapon he described as from the "Indies". In his diary he also wrote about a little green bird (probably a parrot) given to him by Rodrigo, the Portuguese agent in Antwerp. He reported having seen many exotic animals at the residence of the Margaret of Flanders, Duchess of Savoy (1480–1530), daughter of the Emperor Maximilian I, observing that, "she kept a collection of monkeys and parrots" (Eisler 1991). Margaret of Flanders is well known for her love for exotic animals, as demonstrated by her portrait with a probably Diana monkey (*Cercopithecus diana* Linnaeus, 1758) (Fig. 9.2), a guenon endemic to Western Africa. Dürer also drew the animals of the *menageries* of the Emperor Charles V (1500–1558) in Brussels, and expressed his lively impression after observing the strength and beauty of a male hamadryas baboon housed there (Fig. 9.3). Apparently, the common marmoset of Brazil (*C. jacchus*) could be easily purchased in Antwerp during the sixteenth century, as we know from the book *Thierbuch* (*Book of Animals*) (Fig. 9.4) written by the Swiss naturalist Conrad Gesner (1551):

> *Sagoin: Ein ardt der Meerkatzen* (A kind of sea cat)
> These animals are imported from Brazil and they can be found in Antwerp; they are not big monkeys, they are very lovely and quick; they are completely covered by a beautiful soft fur; they eat dry grapes and white bread quickly, and they can be bought for 50 crowns.

The common marmoset is a small, beautiful monkey native to the Northeastern coast of Brazil (in the states of Piauí, Paraiba, Ceará, Rio Grande do Norte, Pernambuco, Alagoas and Bahia), which was one of the first regions explored by the Portuguese after the official discovery of Brazil by Alvares Cabral in 1500. This species, together with others native to the same region (e.g. capuchin monkeys of the genus *Sapajus* Kerr, 1792), was one of the first to reach Europe alive, as we know from the iconographic record. The common marmoset is a frugivorous and insectivorous primate which makes it more adaptable to different habitats and diets than other taxa of the same family. This might be the main reason for the ability it demonstrated to survive the months of navigation necessary for its trade and for its great popularity in Europe. In fact, some chronicles report the difficulties of

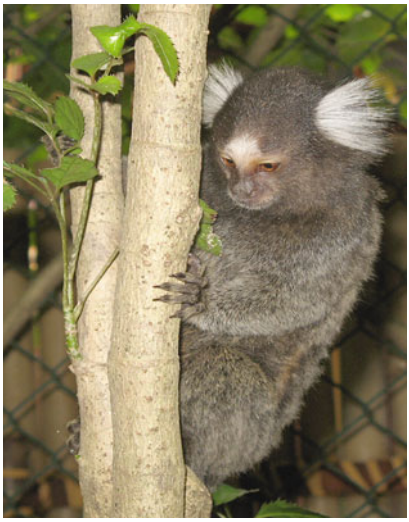

Fig. 9.1 The common marmoset (*Callithrix jacchus*) endemic of the Northeast of Brazil was one of the first primates brought to Europe after the discovery of America (Photo: Cecilia Veracini)

crossing the ocean experienced by these small monkeys, as explained by the Portuguese chronicler Pero de Magalhães Gândavo in his *História da Província de Santa Cruz*, published in 1576:

> There are also two little ones (i.e. small monkeys) on the coast, slightly larger than weasels; they are called *Sagois* and there is a blond and a brown one. […] and they are so dainty and delicate, that when they are taken from their country and shipped to this kingdom (i.e. Portugal) and arrive to the colder air, almost all die at sea, and only few manage to survive, to our great wonder (Gândavo 1965).

Konrad Gesner also reported the arrival of a drill, *Mandrillus leucocephalus* (F. Cuvier, 1807) native to the Guinea Gulf in Augsburg (Fig. 9.5). In the *Tierbuch* he wrote that this beast "caused a great sensation when it arrived in Augsburg"; the drill was inserted into a chapter of the book dedicated to wolves:

> *Von dem Wolff* (On the wolf)
> This beast is found in Índia, it climbs on the trees and picks fruit; respects elephants, but chases other animals; it has always two children, male and female.

Several other species of monkeys were exported to Northern Europe during the Renaissance by the Portuguese. The Flemish artist Joachim Beucklaer in 1566 made one of the most beautiful portrayals of two African guenons: *Cercopithecus petaurista* (Schreber 1774) and *C. diana* or *Cercopithecus roloway* Schreber 1774 (Fig. 9.6). Apparently, they were sold at the Antwerp market in the second half of the sixteenth century (Veracini 2011a). From 1479, the Portuguese had a fortress in Ghana, a settlement called *Mina,* which was Portugal's West African headquarters for trade and the exploitation of African wealth (Ballong-Wen-Mewuda 1993). In 1637, it was conquered and came under Dutch control. Many monkeys such as those portrayed by Joachim Beucklaer could have come from this place, as demonstrated by some data gathered on Catherine of Austria (the youngest sister of the

Fig. 9.2 Margaret of Flanders, daughter of the Emperor Maximilian I, portrayed with a Diana monkeys (*Cercopithecus diana*), (Anonymous first half of the sixteenth century)

Habsburg emperor, Charles V and spouse of the King of Portugal, John III). In the second half of the sixteenth century, she assumed a leading role in the procurement of exotic and rare animals for herself and her extended Habsburg family in Spain, Central Europe and the Netherlands (Pérez de Tudela and Gschwend 2007). She

Fig. 9.3 Sketch of the *menagerie* of the Emperor Charles V (1500–1558) in Brussels, with an adult male of hamadryas baboon (*Papio hamadryas*) by Albrecht Dürer, 1521

invested a great deal in the acquisition of curious and extraordinary species, helped by her global network of acquaintances and connections. In April 1557, Simão Rodrigues, the factor of São Jorge da Mina in Ghana (*Mina*), sent her a cage with parakeets and two civet cats (Pérez de Tudela and Gschwend 2007). Another official, Afonso Gonçalves Botafogo, sent another paraqueet, six civet cats, two monkeys (*bugios* in old Portuguese language) and one parrot, and in a second shipment, Botafogo gave the queen two bearded monkeys (possibly two specimens of the species *C. roloway*) known for having a large beard and for being endemic to Ghana.

Capuchin monkeys from Brazil were other very popular pets in the sixteenth century. They had already reached Germany by 1508 as documented by some engravings of the great German painter and printmaker Hans Burgkmair (1473–

Von dem Wolff.

Diese art der Wölffen ist keinem der alten Scribenten bekant gewesen. Zu zeiten in dem Teutschen Meer an dem Britanischen gestad gesehen worden: mit seiner gestalt dem Irdischē Wolff sehr ähnlich/mit einem grossen kopff/ seine augen mit vil langen haaren vmbsetzt mit nasen vnd zänen wie ein Hund/ mit starckem bart bey dem maul. Sein haut von aufgerechten haaren rauch/ gantz voller schwartzer flecken. Sein schwantz lang lecht/ dick von fleisch vnnd haar/ mit anderer gestalt dem Wolff gleich.

Von ardt deß Thiers.

Der ardt sol es sein/ daß es zum theil deß Wassers gelebe/ zum theil der erden/ es ersettiget sich der merer theil mit fischen. Als er heimsch gemacht: sol er zimlich lang gelebt haben.

Volgen hie Conterfacturen Etlicher Thieren/ so in diesem Büch an jhr recht ort nit kommen/ sampt anderen so verbessert worden sind.

Von einem frömbden Affen geschlecht.

Galiopithecus. Sagoin. Ein ardt der Meerkatzen.

Von jhrer gestalt vnd wo sie zu finden.

Frömbde Thier werden auß Frömbden/ Weiten landen gebracht/ ist menigklich wol bekant/ also sind diese thier kurtzlich auß den Newen land Bresilia gebracht worden/ gen Antorff/ ist ein sehr groß thier/ gantz lieblich/ geschwind/ doch forchtsam/ mit gantz lindem beltz bekleidet. Sie fressen fasten speiß/ weinbeeren/ weißbrot vnd dergleichen. Ein solches ist vmb fünffzig kronen verkaufft worden.

Diese

Fig. 9.4 Representation and description of a marmoset sold in Antwerp (*Tierbuch*, Konrad Gesner 1551)

1531). In 1508, Burgkmair published 6 engravings illustrating the journey of the merchant Tyrolean Balthasar Springer in the East Indies (Leitch 2009). In two of these woodcuts, Burgkmair inserted a capuchin monkey (Fig. 9.7). The monkey depicted resembles a golden-bellied capuchin monkey, *Sapajus xanthosternos* (Wied-Neuwied 1826), a rare primate native to the Bahia State of Brazil (see Veracini 2011b). Later on Burgkmair included two other monkeys (a capuchin and a Barbary macaque) in his famous work *The Triumphal Carriage of Maximilian I* (Veracini and Masseti 2010; Veracini 2011a). Capuchin monkeys are also present in


Von dem Wolff.

Von seiner gestalt / vnd wo disz Thier zu finden.

DJeses Thier ist mit grossem wunder gen Augspurg gebracht vnd gezeigt worden deß 1551. jahrs. Wart gefunden in den grossen einödinen deß Jndianischen lands/gar selten. An seinen füssen hat es finger als der mensch/vnd so man jm deütet so keert er den arß dar.

Von art vnnd natur deß thiers.

APffel/Bieren/vnnd allerley andere frücht isset diß thier/auch brot: trinckt insonderheit gern wein. So es hungerig ist so ersteigt es die böum/schüt die frücht herab. So es eine Helffanten vnder dem baum ersicht/so laßt es in beleibe/alle andere Thier mag es nit geduldẽ/sonder treibt sie von dañen. Jst von natur freudig/vorauß gegen den Weiberen/gegen welchen es sein freudigkeit viel erzeigt.

Das weiblein deß geschlechts gebiert alle zeit zwey zu mal ein par/nemlich ein männlein vnd weiblein. Jst das recht/war eigentlich thier der alten Hiæna genannt.

Von dem Vielfraß.

Gulo apud recentiores, Lupis aut Hiænis cognatus, vt videtur.

Ein Vielfraß.

Von seiner gestalt vnnd wo sie zu finden.

Solche

Fig. 9.5 Representation and description of a drill, *Mandrillus leucocephalus* endemic to the Guinea Gulf, arriving in Augsburg (*Tierbuch*, Konrad Gesner 1551)

many other German artworks of the sixteenth century. Cranach the Elder (1472–1553) decorated some *folios* of the *Book of Hours of Maximilian I* with a family of capuchin monkeys. Even after the reign of Maximilian I, capuchins seem to be quite common in Northern Europe, as evidenced in the artworks of painters such as Jan Gossaert (1478–1532), who portrayed a blond capuchin monkey (*Sapajus flavius* Schreber 1774), and Pieter Coecke van Aelst the Elder (1502–1550) and Nicolaes de Bruyn (1571–1656). In most of these artworks, morphological rendering of capuchins is accurate, indicating that the painters presumably painted from live

Fig. 9.6 *Cercopithecus petaurista* and *Cercopithecus diana* vel *roloway* portrayed by Joachim Beucklaer (1566) in the painting *Seller of animals in Antwerp*. Museum of Capodimonte, Naples

specimens. Moreover, a skull of a capuchin monkey was found in an archaeological excavation of the sixteenth century in Holland (Masseti personal communication). The trade of these monkeys is also commented on by many of the American travellers of Brazil such as Hans Staden (Staden 1970), André Thevet (Thevet 1982), Jean de Léry (1578), Fernão Cardim (1997), Gabriel Soares de Souza (Soares de Souza 1851) and others.

9.3.2 The French "Affair"

The number of animals and other natural products (e.g. dyewood, cotton, cocoa beans, copper, cochineals, etc.) brought to Europe from Brazil grew exponentially throughout the sixteenth century, as recounted in the rare ship logs that still exist. In 1511, the Portuguese ship *Bretoa* "brought back five thousand red trees, twenty two parakeets, sixteen callitrichids (small monkeys), fifteen parrots and three monkeys" (Anonymous 1881). All of these animals were valued at 24,220 *reis* (Portuguese currency), of which a quarter was paid to the King. The monthly salary of a caravel captain in the sixteenth century corresponded to 2000 *reis*, while a cabin boy received 933 and half *reis* (Teixiera and Papavero 2010). Thus, the sale of these animals represented an important increase in navigators' incomes. Considering this latter aspect no wonder if other European countries wanted to participate in this

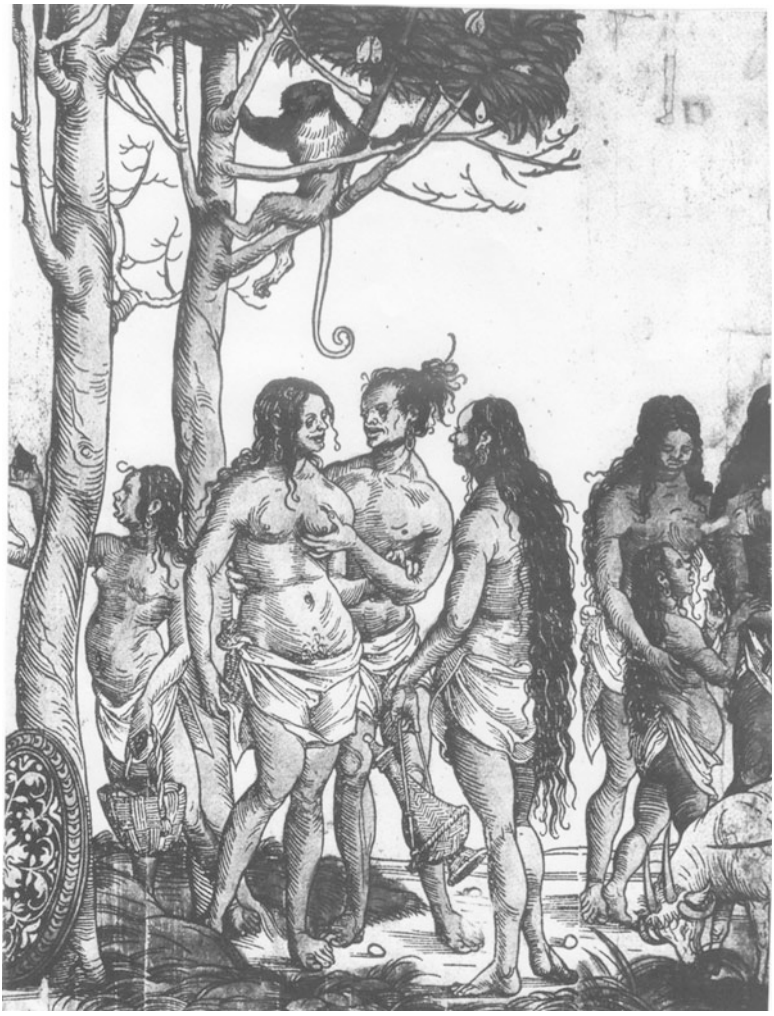

Fig. 9.7 Portrayal of a capuchin monkey (*Sapajus* cfr. xanthosternos) from Brazil in *Natives with flock of animals* (Hans Burgkmair, 1508). One of the first representations of a New World monkey

commercial activity. The December of 1530 the French ship *La Pélerine,* owned by Orbessan Bertrand, Baron of Saint-Blancard and commander of the French in the Mediterranean, left Marseille in the direction of Pernambuco. After having destroyed the Portuguese settlement of the Rio Igaraçu at Pernambuco (where there was one of the first permanent settlements built by the Portuguese in 1516, see Johnson 1995), came back in March of 1531. In September of 1531, the Portuguese captured this ship in Malaga where it held 300 tons of wood; 1.8 tons of cotton, seeds and various oils, 3000 furs of felids and other animals, 600 parrots and 300 monkeys

Fig. 9.8 Francis I, King of France, is remembered as a sovereign who showed a particular passion for animals. Here he is portrayed with an African grivet or vervet monkey (*Chlorocebus* spp.) at an apparently official meeting (Anonymous, first half of the sixteenth century)

(Dean 1997). Teixeira and Papavero (2010) reported on the value of the *Pelerine*'s animals: 3000 skins, 9000 ducats; 600 parrots, 3600 ducats; 300 monkeys, 1800 ducats (i.e. approximately 1000 Euros per specimen). The case of the *La Pélerine* was not isolated, because since 1503 when the maritime connection between France and Brazil was discovered, it had been used by the wealthy French traders' armed ships, commanded by Portuguese (called traitors because they had revealed the routes for arriving in Brazil), to go to the West Indies. Normandy became a key gateway for goods and animals from the Americas (Bueno 1988). The King of France, Francis I of Valois (1494–1547) (Fig. 9.8), came to the throne in 1515 and did not comply with the Treaty of Tordesillas, which divided the world between Spain and Portugal, and consequently broke all the peace treaties. This fact transformed a number of captains into greedy pirates, who were employed in his service to import large quantities of Brazilian dye-wood, useful in the textile production of Dieppe and Rouen (Johnson Tomlinson 1970). In this context the traffic carried on

by Jean Ango, a merchant and banker, and future Viscount of Dieppe (Guérin 1900), should be mentioned. He had more than 50 ships that sailed in many of the known seas. Through the trade he carried on between 1525 and 1530, he earned large sums of money with which he built a large residence in Dieppe made from *jacaranda* (a Brazilian precious hardwood) and red tree. It is said that his house was always full of indigenous people and animals arriving from Brazil which roamed and mingled freely in the courtyard of the house. What was a probably a common presence of monkeys in Dieppe is depicted in a frieze on wood, the "*Frise des Sauvages*", housed in the Saint-Jaques church in Dieppe, and also described in many historical documents. As reported by Anthiaume in 1916 (Anthiaume 1916 *apud* Teixeira and Papavero 2014), "travel to Brazil multiplied from 1516 to 1550. The Norman sailors were in continuous contact with the native Brazilian people, who provided them with dye-woods, spices, cotton, parrots and monkeys." Interestingly, the common marmoset (called *sagoin* in the Tupi-Guaranì native language) enjoyed such popularity in Normandy that it became a character in a popular *querelle* called the "*Valet de Marot contre Sagon*" of Bonaventure des Périers (Des Périers, 1537 *apud* Teixiera and Papavero 2014; see also Léry 1578). In 1555 in Rio de Janeiro the "*France Antartique*" was founded at the request of the French King Henry II. The French Calvinist missionary Jean de Léry (1534–1611), in his narrative *Journey to the land of Brazil* published for the first time in 1578 (Léry 1578), reveals the natives' hunting habits and how animals were considered to be the same as any other good for exchange with the Europeans, making some of these new species very common in the Old World:

> There is also in this land of Brazil a great number of small black monkeys that natives call *cay* (capuchin monkey); because many of them are already found in Europe, it seems pointless to describe them. […] Indians, after having domesticated them at home, exchange them with foreigners who travel there looking for any goods.

9.3.3 The Italian Rulers

Italian rulers had a strong tradition of keeping exotic animals for their imaging (e.g. see Mosco 1985; Lazzaro 1995). The elaborate network of ambassadors and agents that the most important Italian princes sent to the main centres of Atlantic trade (Lisbon, Seville, Antwerp), besides reporting on the evolution of discoveries and Atlantic businesses, supplied their lords with exotic wonders. Animals were often used as gifts especially for weddings, the occasion of accession to the throne, and for the reception of ambassadors or in international diplomacy such as embassies (Ringmar 2006; Belozerskaya 2006). One such embassy, sent to Pope Leo X by the Portuguese king Manuel I in 1514, is a very famous example (Bedini 1997). Besides the well-known Indian elephant called Hanno, other American and African animals

were sent to the Pope. These beasts enriched the *menagerie* of Pope Leo X who, like his late father Lorenzo de Medici, was in the habit of collecting rare and exotic animals which originated from all corners of the world. In 1519, the Renaissance artist Andrea del Sarto made a fresco, ordered by the Pope Leo X, in a Medici residence in Florence where the first representation of the rare blond capuchin monkey, *S. flavius,* endemic to North-eastern Brazil, (see Fig. 9.9) appeared. As noted by Masseti and Veracini (2010) it was probably an animal of the Pope's *menagerie.* Primates were very sought-after animals by Italian rulers in this period as demonstrated by the many other iconographic sources found in the country. Among a few other examples is the first scientific representation of the Golden-bellied capuchin monkey (*S. xanthosternos*) which was painted between 1507 to 1510 by Gerolamo Genga in a noble residence of the Sienese ruler Pandolfo Petrucci (Veracini 2011a), a common marmoset portrayed with the Cardinal Ciocchi dal Monte in Rome by Sebastiano del Piombo in 1516 (Garas 1994–1995), and another marmoset portrayed with Margaret of Austria, daughter of the Emperor Carlo V (1538–1540). Other primate representations can be found in the Medici residences in Florence (see Masseti 1991, 2008). The Medici family had a long tradition of using and possessing exotic animals (Lloyd 1971; Belozerskaya 2006). In 1537, when the family regained power after a period of struggle and exile, Cosimo de Medici, Duke of Florence, employed important artists to create works whose allegorical meaning commemorated the greatness of Lorenzo, whose image was revisited in a classical manner and depicting exotic animals he had received as gifts which had characterised his reign (Lazzari 1995) (e.g. see Vasari, *Tributo a Lorenzo de Medici,* 1556). A noble Florentine, M. Olivieri, on the 12th of October 1547 sent two baboons to the Duchess "Eleonora of Toledo", wife of Cosimo de Medici, as a sign of loyalty (Veracini 2011a). He provided instructions regarding their care and feeding, observing that:

> when given almonds or walnuts in their shells, by using a small rock the baboons will crack them gently open, much as a person would.

In 1580, various exotic animals could be seen in Florence, as Montaigne notes during his trip to Italy in 1580–1581. Duke Francis I, Cosimo de Medici's successor, was equally interested in the products from the newly discovered lands. He received and requested many varieties of plants and animals which were added to enrich his *studiolo* (a sort of cabinet of curiosities) in Palazzo Vecchio in Florence. Monkeys could arrive in Florence from Spain at the Medicean port of Livorno, as reported in the Universal Correspondence of the Grand Dukes of Tuscany (ASF, Mdp 538a., 14767. 1568). Francis I was a friend and admirer of the naturalist Ulisse Aldrovandi, whose work (Aldrovandi 1637) and watercolours (Aldrovandi, *Tavole*) are very rich sources of depictions of primates from Africa and the New World (Capanna and Gippoliti 2007; Veracini 2012).

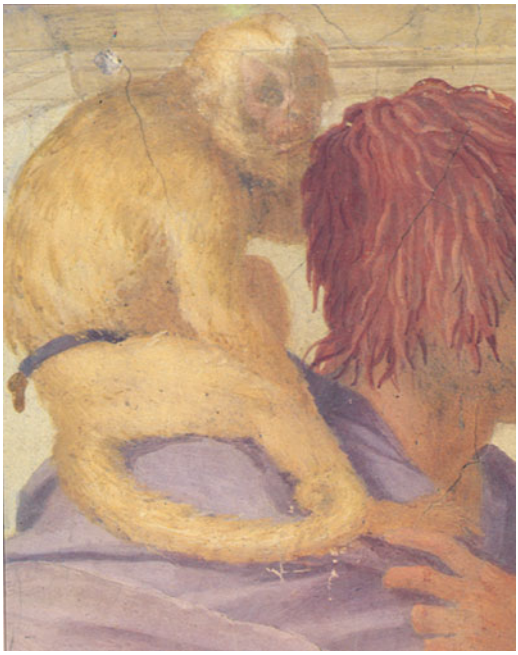

Fig. 9.9 The blond capuchin monkey (*Sapajus flavius*) portrayed by Andrea del Sarto in 1519 in the *Villa de Medici* of Poggio a Caiano (*apud* Masseti and Veracini 2010)

9.3.4 The Spanish Interest in Monkeys and the Presence of Monkeys in England

There still isn't quantitative data available about the importation of monkeys from the Spanish colonies in South and Central America, but evidence of a significant shipping of monkeys to Spain is found in the work of Gonzalo Fernández de Oviedo (Fernández de Oviedo y Valdez 1852), a historian and scholar, and the official Chronicler of the West Indies under Charles V. In his work "*Historia General y Natural de las Indias*", he says:

> In many parts of the mainland there are wild monkeys of so many kinds and differences which cannot be described in just a few words if one had to explain its different forms and its countless playful pranks. […] And because every day they are brought to Spain I will not say much things about them.

Other Spanish language authors, such as Tomáz Lópes Medel, comment the trade of primates from South America. Medel travelled to Guatemala as an official observer for the crown in 1549 and went to various locations in Central and South America. He referred in his writings to the various species of monkeys present there, and indicated the trade of these to Seville, whose survival was facilitated, in his opinion, by the warm climate of the southern regions of Spain.

During the second half of the sixteenth century, the Spanish royal family and its extended Augsburg family in Vienna benefited enormously from family ties with

Portugal to acquire domesticated and exotic animals. Exotic animals were continually requested by and invoiced to Vienna or Prague, sometimes with the help of the imperial ambassador in Spain, Hans Khevenhüller (Pérez de Tudela and Gschwend 2007). An anonymous letter written in Milan in 1578 talks about Don Remiro Nuñez de Guzmán, a Spanish nobleman on his way to meet the Emperor Rudolf II, who was to bring pets as a gift from Philip II:

> […] In this place there is me, Don Remiro Nuñez de Guzman, brought by the Catholic King (Philip II) to the Majestic (Emperor Rudolf II of Austria), who has to leave today for bringing a gift of 22 young very beautiful horses, a mule, a lion, a leopard, seven monkeys, and six greyhounds […]. (ASF, MdP 3254 f. 427, 1578.).

The children of Philip II lived in the Alcázar palace in Madrid surrounded by exotic animals such as parrots and monkeys. Thrushes, starlings, finches and exotic birds were not only housed in palace aviaries, but also traveled in cages between residences, as did tame squirrels, monkeys and parrots (Pérez de Tudela and Gschwend 2007). His daughter, The Infanta Isabella Clara Eugenia, was portrayed in her youth with a marmoset in 1571 by the painter Alonso Sanchez Coelho (see Urbani 2007), and later (ca. 1585) with a golden lion tamarin (*Leontopithecus rosalia* Linnaeus, 1766), endemic to the state of Rio de Janeiro in Brazil, and a cotton-top tamarin from Colombia (*Saguinus oedipus* Linnaeus, 1758) (Fig. 9.10). At a later date also the queen of Spain, Margaret (1584–1611), was portrayed by Bartolomé González y Serrano, (ca. 1600) with another golden lion tamarin (see Veracini 2011a).

Although less frequently than in Germany and southern Europe, monkeys were found also in Renaissance England. The presence of monkeys is testified to by some paintings of the Tudor family such as the *Portrait of a Boy with a marmoset* by Hans Holbein (Groves 2008) and the portrait of Catherine of Aragon, the first wife of Henry VIII, by Lucas Hombolte (or Horenbout or Hornebolte) dating to around 1536 (Urbani 2007). In this portrait, the queen is shown holding a capuchin monkey, tentatively identified by Masseti and Veracini (2010) as a young white-fronted capuchin (*Cebus cesarae* Hershkovitz, 1949). In addition, in 1562, Alessandro Magno, an Italian merchant's son, wrote his account of a popular entertainment event that reflects a certain level of popularity of monkeys in England. In the Bear Garden in London he saw a show where a horse was taken into the ring with a monkey in the saddle. The horse was then attacked by dogs:

> It is wonderful to see the horse galloping along, kicking up the ground and champing at the but, with the monkey holding very tightly to the saddle, and crying out frequently when he is bitten by the dogs.

This type of entertainment was also commented on by writers of the period, or as in the case of St. Pavles-Church in 1621, criticised when reporting the use of baboons and "apes" (Barbary macaques) for these kinds of activities (Fudge 2002).

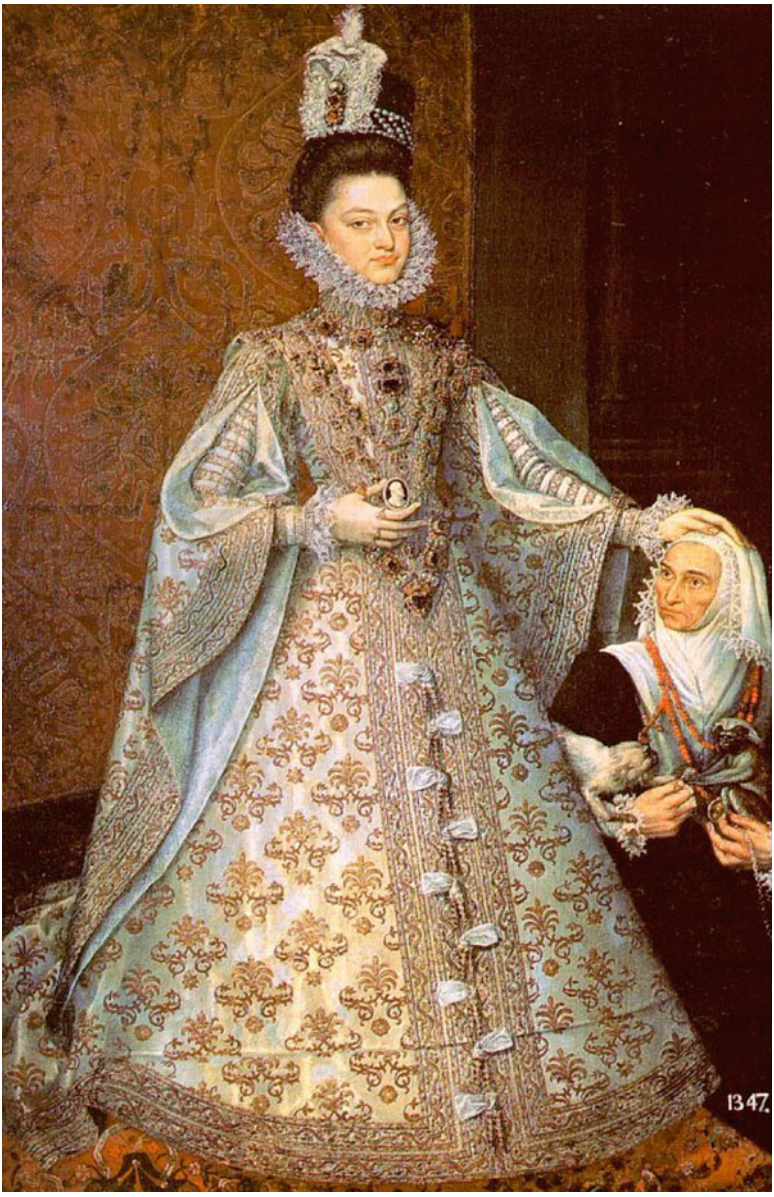

Fig. 9.10 The Infanta Clara Eugenia with Ana Magdalena Ruiz with a golden lion tamarin (*Leontopithecus rosalia*) from Brazil and a cotton top tamarin (*Saguinus oedipus*) from Colombia (Sánchez Coello, ca.1585). Museo del Prado, Madrid

9.4 Consequences of Primate Trade: Inference and Hypotheses

By comparatively analysing the iconographic and literary sources where traded primates in the fifteenth and sixteenth centuries are present, the following species can be found: (a) *taxa* from Africa: *M. sylvanus, Chlorocebus sabeus* (Linnaeus, 1766), *Chlorocebus aethiops* (Linnaeus, 1758), *C. diana*, *C. roloway*, *C. petaurista*, *Cercocebus torquatus* (Kerr, 1792), *Papio hamadryas* (Linnaeus, 1758), *Papio anubis* Lesson, 1827, *M. leucocephalus* and probably *Cercocebus atys* (Audebert, 1797) and *Papio papio* Desmarest, 1820; (b) *taxa* from the Neotropics: *C. jacchus*, *Callithrix geoffroyi* E. Géoffroy, 1812, *Callithrix*. spp., *L. rosalia*, *S. oedipus*, *S. flavius*, *S. xanthosternos*, *Sapajus nigritus* (Goldfuss, 1809), *Cebus capuchinus* (Linneo, 1758), *Saimiri sciureus* (Linnaeus, 1758), probably *C. cesarae, Cebus olivaceus* Schomburgk, 1848 and also likely specimens of the Family Atelidae. Regarding African primates, quantitative data about the consequences of its trade have not yet been established because the investigation is still ongoing. Nevertheless, historical sources which have been examined so far reported a vigorous level of business activity by the Portuguese and other European nations in Western and Equatorial Africa during the time period under consideration. From the second half of the fifteenth century until 1586, the Portuguese were assiduous at fairs and markets which were held in Gambia and Guinea, "where there were sold all the things that were being produced in those lands and those in the surrounding" (D'Almada 1594). Not only did the Portuguese do a lot of business in Gambia, but so did the English, Flemish, French and Spanish, as told by the Portuguese writer D'Almada (1594), where animals (such as civet cats, parrots, monkeys) and animal derivates (ivory, skins, etc.) were the main exported products. For instance, from 1517 until 1561, 112 ships departed from the Portuguese settlement of *Mina* in Ghana (Godinho 1965) and one can only imagine the quantity of animals shipped to Lisbon together with gold and other goods. The trade of primates seems to have not led to rapid local extinction (as did happen with other mammals such as elephants, hippos and monk seals in Western Africa), nevertheless, their populations are likely very reduced today in comparison with the abundance described in the pre-colonial period by almost all of the travellers of the era (e.g. Monod et al. 1951). Today, most Western African primate species are endangered with extinction (Mittermeier et al. 2013).

Regarding Neotropical primates, some additional inferences about the impact of the their trade are possible, as it can be established from documents that one ship could transport up to 300 monkeys (e.g. the ship *La Pelérine*). Considering the high frequency of commercial voyages and the quite limited geographical range of some of these species, it is possibly that this trade could have locally damaged some primate populations (e.g. the Brazilian species of *S. flavius, S. xanthosternos* and *L. rosalia*). It is obviously impossible to quantify the exact number of monkeys traded in the sixteenth. However, it is possible to estimate the impact of this trade by cross-referencing contemporary biological and ecological knowledge with historical data. Teixeira and Papavero (2010) estimate that 188–226 monkeys were shipped each

year from Brazil by the Portuguese, and that figure can be correct or even underestimated considering the 300 monkeys recorded to be brought back to Europe by *La Pelerine.* Taking as an example the blond capuchin monkey (*S. flavius*), endemic to the coastal area of Northeastern Brazil (in the states of Rio Grande do Norte, Paraíba, Pernambuco and Alagoas), which had an originally small geographical distribution (Mittermeier et al. 2013), such a trade could have had a notable impact on this species. The state of Pernambuco, encompassing the *S. flavius*'s geographical range, was one of the three main centres for supplying dye-wood. The first European settlement in Brazilian territory was a *feitoria* (fort), built in 1516 by Cristovão Jacques, *fidalgo* of King Manuel I, at the entrance to the bay of Itamaracá Island, closed to Recife, today capital of the state of Pernambuco (Albuquerque 1993). As noted, the French and Portuguese competed in this region with each other to monopolise access to natural products in the first decades of the sixteenth century. It is estimated that during the sixteenth century, something approaching 8000 tons of dye-wood from Brazil a year were imported to Portugal and France (Dean 1997). Later on, this area became one of the most important places for sugar cane production (Oliveira, de 1990). As already noted, voyages of the time were dependent on winds and seasons, so ships returning from India might easily reach the coast of Brazil brought by the winds, and thence to Europe. The Portuguese crown did its utmost to systematically integrate the Brazilian coast within the Atlantic trade routes, and many vessels coming from India stopped there. As noted by Pieper (Pieper 2008): "The import of South American hides was only profitable because they were shipped to Europe as ballast on the return voyages of highly valued goods like spices, precious metal or silk textiles which constituted the larger part of goods brought to Europe that paid for the transportation cost of hides and timber." From 1497 to 1612, 806 vessels left Portugal in the direction of India (Falcão 1859) and to this figure we have to include an undetermined number of French and Portuguese ships which went to Brazil directly from Europe. Hypothesising that just one third of the ships from India might have stopped in Brazil and each of them return with a mean of 100 monkeys (a purposefully underestimated projection, just one third of the number of monkeys carried by *La Pelerine*), it can be estimated that ca. 26,866 animals were taken from the wild (above all in the main centres for supplying dye-wood) over the course of about one century. Fialho and Gonçalves (2008) suggest a population density of two social groups with a mean of seven individuals each per square kilometre for *S. flavius,* thus in order to fill ship with a cargo of 100 or more individuals, a vast area would have to have been exploited. Considering the destruction of the costal Atlantic forests for sugar cane plantations and dye-wood harvest, it is possible to estimate a drastic population decline in the Pernambuco State of this species already by the end of the sixteenth century. The systematic trade of capuchin monkeys (and other species from the Atlantic coast of Brazil) continued to occur throughout the seventeenth century, and even in the following centuries, as revealed by many iconographic and literary sources. These are probably the reasons why the

blond capuchin monkey disappeared for two centuries, the last report having been by the German naturalist Johann Schreber in 1774 (Schreber 1774). In fact, the blond capuchin has only been recently rediscovered and confirmed as an extant species by De Oliveira and Langguth in 2006. Some years later, Masseti and Veracini (2010) found the first scientific representation of this species in 1519 in a fresco in Italy proving the early trade of this species. Nowadays, *S. flavius* is classified as Critically Endangered on *The IUCN Red List* (2016) and is one of the five primate species targeted by the Brazilian government among its conservation priorities in Northeastern Brazil, with a total population of only 1000–2000 (Mittermeier et al. 2013). This case study shows how historical issues, coupled with contemporary issues in Brazil (such as forest destruction and illegal pet trade), could have dramatically damaged the populations of this and other primates in Brazil (Veracini and Bezerra 2013). The story of the blond capuchin monkey provides us with a picture of the size of traffic in biodiversity in the Age of Discovery, and gives us an idea of the profound impact that anthropic actions have had in moulding and shaping primate populations.

9.5 Concluding Remarks

(a) The trade of monkeys from Africa and South and Central America in the fifteenth and sixteenth centuries was not an occasional phenomenon but part of a routine trade of animals where primates were a particularly valuable and profitable goods.
(b) Primates were very appreciated high status pets and played an interesting role in European cultural and artistic circuits. Early Modern European literary and iconographic sources suggest the existence of an international network of primate trade involving the main strategic locations of the overseas trade.
(c) More than 20 *taxa* of monkeys were imported in this period to Europe.
(d) In some regions of Brazil early primate exploitation can have drastically contributed to the reduction of some primate populations.

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Chapter 10
African Crops in the Environmental History of New World Plantation Societies

Judith A. Carney and Richard N. Rosomoff

Abstract The literature on the Columbian Exchange emphasizes the New World and Asian crops that transformed the food systems of Africa but ignores the role of African introductions in the environmental history of tropical America. This paper addresses the research lacunae by identifying the neglected African components of the Columbian Exchange. Next, it situates African crop transfers historically, drawing attention to the transatlantic slave trade and their importance as provisions on slave ships. This consideration leads to a research emphasis on subsistence, namely the foodstaples that underpinned the transatlantic commerce in human beings and plantation commodity production. The paper illustrates the agency of enslaved Africans in instigating the cultivation of Old World tropical staples. It is hypothesized that from seeds and rootstock occasionally remaining from slave-ship voyages, enslaved Africans accessed familiar dietary staples. They established them in the yards around their humble dwellings and in plantation provision grounds, where European naturalists and slaveholders reported first encountering the novel plants.

As inadvertent introductions, African food crops depended upon slave ships for their circulation and African slaves for pioneering them as subsistence staples on slave food plots. The paper's emphasis on subsistence and the tropical crops that diffused from Africa to plantation societies underscores the role of enslaved Africans in shaping the foodways and environmental history of tropical America.

10.1 Introduction

For much of the twentieth century, Brazil's leading rice-producing state was Maranhão, where the crop was predominantly grown by mixed-race smallholders. There, *quilombo* descendants of runaway slaves tell a legend of rice beginnings in

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their communities. In the time of the transatlantic slave trade, a slave ship arrives to disembark its cargo of captive Africans. One enslaved woman, seeing she is about to be taken off the ship, steals some unhusked rice grains from the ship's larder and hides them in her hair. The risk of discovery is enormous, but she knows something important that makes the danger worthwhile: that unmilled grains are also seeds, and from the seeds rice can be grown, a gift that will forever feed her runaway descendants. The *quilombolos* owe their lives and their livelihoods to this daring act of foresight and vision.

This story—as well as the many versions that are told by different maroon peoples across much of northeastern South America—perfectly allegorizes an astonishing chapter in the environmental history of the Americas. The oral histories told here stand in stark contrast to the conventional slaveholder account of rice beginnings in the New World. These maroon narratives assert that Africans, through the conveyance of a slave vessel, introduced a familiar and esteemed dietary staple. And they did this under the gaze of their unsuspecting captors.

The maroon legends, understood as allegory, articulate an alternative paradigm of New World plant dispersal but one that our historical archives largely fail to corroborate. Nevertheless, the stories give voice to an unwritten history of the arrival of African crops in the Americas.

A major challenge of environmental history is the limitations of colonial and national archives for revealing the contributions of peoples whose marginal social position render them largely invisible in written documentation. The forced migration of some 12.5 million Africans to the Americas between the sixteenth and nineteenth centuries serves as a preeminent example. The written record on slave contributions is sparse, and the silence is adduced as evidence that slaves' influence on New World environmental history was confined to rote performance of masters' directives. An institution that lasted some 350 years leaves a persistent legacy that fails to consider slave agency in shaping environments. Yet, until the first decade of the nineteenth century, Africans and their descendants in the Americas outnumbered European immigrants. Enslaved Africans were stolen from societies whose farming and herding practices were adapted to the tropics. After the Middle Passage they were settled in tropical and sub-tropical environments not much different from those they left. History emphasizes the labor they performed and the commodities they produced for export. However, slaves also produced the food they ate and the subsistence staples upon which their survival depended. It is through the food systems they created that the African contributions to New World environmental history emerge.

The epistemic limitations of slavery's archival record can be confronted through an interdisciplinary approach involving multiple research methodologies. Where written documentation is lacking, evidence from food plant dispersals, historical linguistics, oral histories, archaeology, and the visual record clarify what was once obscure. These combined approaches bring new attention to the role of African food crops in the transatlantic slave trade, and the sites where they were established in tropical America.

This chapter is divided into five sections. The first section discusses the significance of Columbian Exchange scholarship for linking plant introductions and human agency to landscape change. This is followed by a list of the food plants that colonial era commentators claimed came from Africa. The discussion next shifts to the importance of African dietary staples as slave ship provisions and the significance of slave agency in establishing them in plantation food plots. The plantation locales where these crops were grown illustrate the role of slaves in transforming environments for subsistence cultivation. Finally, we look for evidence of slave agency in the African vernacular names for the plants that entered colonial languages. Having no word in their own languages for these tropical staples, slaveholders borrowed the African names by which they were known to their slaves.

10.2 The Columbian Exchange: Migrants and Environmental Transformations

Alfred W. Crosby's *The Columbian Exchange* (1972) brought scholarly attention to the intercontinental exchange of crops, animals, and microbes that occurred in the period of European maritime expansion, from the sixteenth to the nineteenth centuries. Columbian Exchange species wrought pronounced environmental transformations around the globe, as new foods were adopted and others became commodities in new lands. Colonial archives substantiate the significance of these biotic transfers but place the diffusion narrative in the words, experiences, and perceptions of the Europeans who participated in shaping the early modern world. The "New World" was forged by the subjugation of Amerindian peoples and the appropriation of their lands; it was also indelibly shaped by the forced migration of enslaved Africans to colonial plantations and mines. As the substantial body of Columbian Exchange scholarship makes clear, European hegemony was built not only on firearms and military dominance but also on the plants, livestock, and pathogens European ships and commercial interests transplanted to new lands. These accounts ignore African domesticated species, the narrative focusing instead on the Amerindian and Asian crops Europeans introduced to other lands. To the extent Africa plays a part in the Columbian Exchange, it is as a passive recipient. Scholarship emphasizes, for example, the revolutionary role of Amerindian crops such as peanuts and maize on African food systems (Crosby 1972).

In his second book, Crosby drew attention to the contributions of migrants to the environmental histories of selected regions around the globe. *Ecological Imperialism* (1986) discusses how emigrants to New Zealand, Australia, and South Africa carried their Old World crops and animals to the new lands they settled. With these familiar temperate-zone species, migrants deliberately transformed distant and exotic outposts into landscapes resembling the ones they had left behind. In this way, ordinary people—not merely agents of empire and plutocrat planters—actively remade environments into approximations of their birth countries, transforming

them into *Neo-Europes*. This innovative research perspective has illuminated the ways that migrants—the subaltern, nameless throngs of settlers—shaped the environmental histories of new lands (Crosby 1986).

The massive influx of African migrants to the Americas unfolds without similar application, in part because the historical association of Africans with slavery in archival sources renders them as passive actors, incapable of independent action or self-conscious agency. However, two central insights of Columbian Exchange scholarship offer a way forward: the emphasis on food plants for illuminating subaltern history and the ways migrants shaped environmental history with familiar plant and animal species. This chapter looks at crop transfers that were *out* of Africa and at migrants who were enslaved. The African components of the Columbian Exchange were quite unlike any other for they unfolded in the context of the transatlantic slave trade and the involuntary exile of Africans to the Americas.

10.3 Euro-American Commentaries and Slave Agency

The history of the early plantation period in the Americas contains the assertions of a number of Europeans who credit slaves with the introduction of specific foods, all previously grown in Africa. There are at least two dozen Old World tropical plants that naturalists and visitors to plantation societies claimed slaves introduced. These include: yams, sorghum, millet, sesame, black-eyed and pigeon peas, the kola nut, oil palm, and okra (Grimé 1979; Carney and Rosomoff 2009).

If we take at their word commentaries by seventeenth- and eighteenth-century historical personages such as Hans Sloane (the founder of the British Museum), Willem Piso and Georg Marcgraf (members of the Dutch scientific expedition to Brazil in the 1630s), Thomas Jefferson, and others who made these claims, we might ask how it was possible that slaves introduced crops to the Americas. After all, Africans were landed in plantation societies as chattel, without personal belongings. Crediting enslaved Africans with plant introductions attributes to them an agency that is entirely at odds with the longstanding view that slaves contributed little but muscle to the agricultural history of the Americas. The question is why such prominent historical witnesses would claim otherwise.

Commentaries on the early period of Atlantic slavery were written by Europe's educated classes: slave ship captains, plantation owners, naturalists, merchants, administrators, military officers, and religious missionaries. Their words, and the texts they wrote, offer perspectives that rarely enfranchised the voices of Amerindians or enslaved Africans. The experiences of those whose worlds were upended by European conquest are seldom voiced in written accounts of the period. Nonetheless, it is possible to seek out these lost histories through other means. Giving voice to the apparent silence of African slaves in New World environmental history leads to considering other forms of evidence that are more emblematic of the Africanist scholarship tradition. This includes non-archival constructions of knowledge about people who did not—or could not—leave written records and whose actions were

Table 10.1 Old world tropical food crops present in plantation societies

Cereals	
Sorghum	*Sorghum bicolor*
Rice	*Oryza* spp.
Millet	*Pennisetum glaucum*
Tubers	
Yams	*Dioscorea cayenensis*
	D. rotundata
Plantain/banana	*Musa* spp.
Taro/eddo	*Colocasia esculenta*
Legumes	
Black-eyed pea/cowpea calavance	*Vigna unguiculata*
Pigeon/angola/congo pea/guandul	*Cajanus cajan*
Bambara groundnut/*Voandzeia*	*Vigna subterranea*
Lablab/hyacinth/bonavist bean	*Lablab purpureus*
Beverages	
Roselle/bissap	*Hibiscus sabdariffa*
Kola nut	*Cola* spp.
Oil plants and fruits	
Sesame/benne	*Sesamum radiatum*
Castor bean	*Ricinus communis*
Oil palm	*Elaeis guineensis*
Watermelon	*Citrullus lanatus*
Muskmelon	*Cucumis melo*
Ackee	*Blighia sapida*
Melegueta pepper	*Aframomum melegueta*
Vegetables and spices	
Okra	*Hibiscus esculentus*
Egyptian spinach/jute mallow	*Corchorus olitorius*
Guinea pepper	*Xylopia aethiopica*
Guinea squash	*Solanum aethiopicum*

recorded by outsiders. A historical geographical perspective that addresses the complex interplay of culture, knowledge systems, and environments in periods of sweeping historical upheavals provides a uniquely informative kind of "text."

Many of the plants European observers attributed to slave introduction are, in fact, of African origin. Nearly two dozen African foodstaples arrived in the New World tropics between the sixteenth and eighteenth centuries. They are mentioned in plantation records and in historical accounts from the period (Table 10.1). Most were domesticated in Africa. Other Old World staples, such as the banana, plantain, and taro, originated in Asia and reached tropical Africa millennia before the Columbian Exchange. They arrived through overland and maritime trade networks in prehistory, when Africans adopted them into existing agricultural systems.

Africans participated fully in the process of plant and animal domestication that occurred in different parts of the world beginning some 10,000 years ago. African

contributions to global food supplies include nine cereals, half a dozen root crops, five oil-producing plants, several forage crops and as many vegetables, three fruit and nut crops, coffee, and the bottleneck gourd. Most of the African domesticates are tropical species and not widely known to Western consumers. These contributions to world food supplies are often overlooked because many of the continent's staples are incorrectly considered to be of Asian origin. Africa harbors varieties of sesame (*benne*), eggplant, and pigeon pea and, significantly, an indigenous species of rice, *Oryza glaberrima* (Carney and Rosomoff 2009). Consideration of Africa's agricultural history belies the common perception of a land that is perpetually hungry,

10.4 African Food Crops in the Atlantic Slave Trade

The business of slavery vitally depended on food grown in Africa to provision the captives destined for shipment to the Americas. Despite the removal of able-bodied youth from the population at large, Africa routinely produced surplus food during the Atlantic slave trade. We know this from slave-ship manifests as well as the logs and drawings of ship captains. While slave ships carried some food stores from Europe, captains relied in no small part on African victuals to provision their human cargoes across the Middle Passage. Slavers acquired food for the transatlantic crossing from African merchant middlemen, supplies stocked by European forts along the Guinea Coast, and in local markets. The food slavers purchased in Guinea's ports included the Amerindian introductions—maize, peanuts, and the sweet potato emphasized by Columbian Exchange literature—but also indigenous African staples, such as millet, sorghum, rice, yams (*Dioscorea cayenensis*, *D. rotundata*), black-eyed peas, and the small-grained native African cereal, *fonio* (*Digitaria exilis*). Captains of slave ships often showed a distinct preference for traditional African dietary staples because they commonly believed that mortality rates across the Middle Passage diminished when captives were given food to which they were accustomed (Carney and Rosomoff 2009).

The Asian root crops and tubers, which Africans had adopted millennia before the arrival of Europeans, additionally figured among slaver food purchases, notably the Asian yam, taro, and plantains. African medicinal plants were also frequent passengers on slave ships. The kola nut was prized for its ability to improve the taste of stored drinking water. Slave-ship captains borrowed the African practice: by placing kola nuts in shipboard water casks, stagnant water could be refreshed and made palatable again during the long transatlantic voyage (Hair et al. 1992).

No African crop attracted European attention as much as rice. In Guinea, Captain Samuel Gamble described a tidal rice farming system that furnished the food for his transatlantic slave voyage of 1793–1994 (Fig. 10.1) (Mouser 2002). By the time of his account, rice had become well established in the Americas as a commercial crop, transforming landscapes and economies of colonial Carolina, Brazil, and Suriname. Plantations dedicated to rice earned fortunes for generations of planters

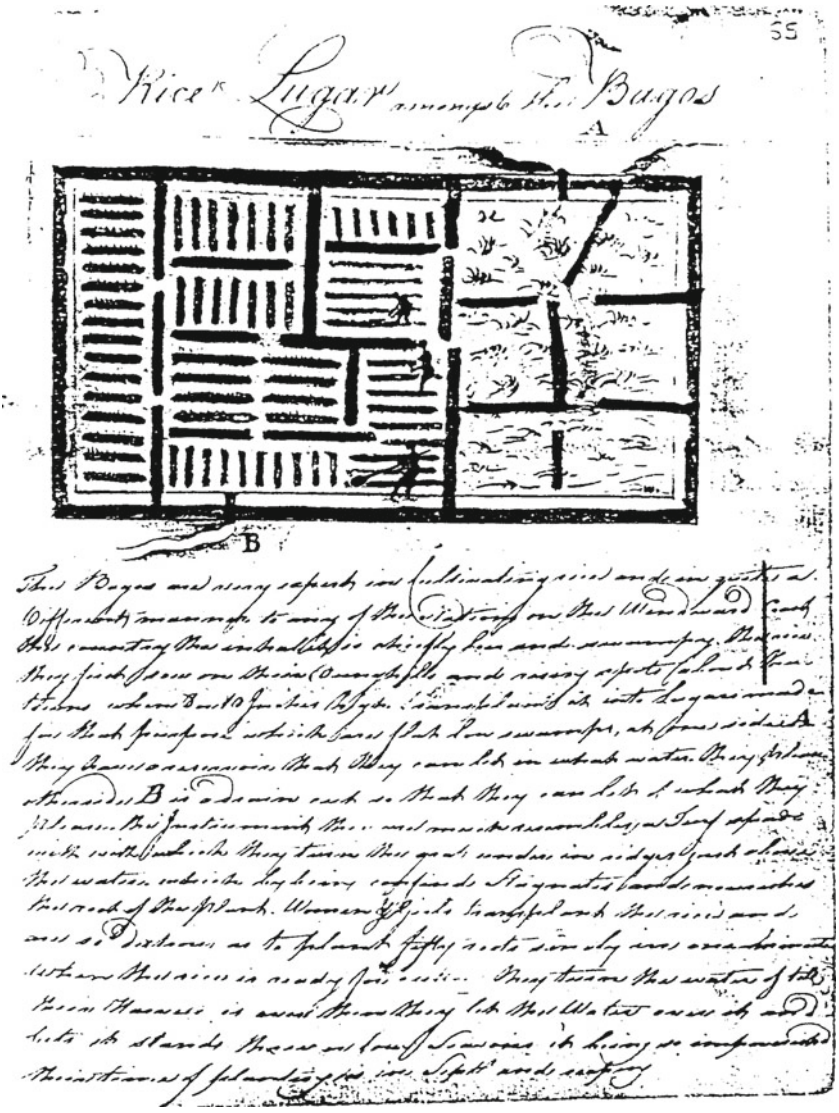

Fig. 10.1 The slave captain Samuel Gamble's description of Baga rice cultivation, c. 1793 (Source: courtesy National Maritime Museum, London)

and slaveholders. Yet rice was a crop introduced to the Americas; it was not cultivated in the New World until the arrival of Europeans and enslaved Africans. *Glaberrima* rice had been domesticated in West Africa 3000 years before Portuguese mariners first encountered it in the middle of the fifteenth century. The Portuguese would not come into contact with Asian rice societies (growing the Asian *Oryza sativa* species) until Vasco da Gama's epochal 1497 voyage to India (Carney 2001).

How did European interest in rice translate into the vast and highly profitable plantation system that first emerged in the Carolina colony? The commonly accepted answer is given by Carolinian planters and their descendants, who credit their own ingenuity with discovering a crop so eminently suited to cultivation in the coastal wetlands (Doar 1970 [1936]). Such claims must be assessed against the founding planters' utter lack of experience with this tropical crop and its sophisticated water-management regimes. Moreover, other comments from the historical record call into question the prevailing narrative. In 1648, decades prior to Carolina's founding, a letter from the initial period of Virginia's settlement reports: "The governor *Sir William* [Berkeley], caused half a bushel of Rice…to be sowen, and it prospered gallantly…for we perceive the ground and Climate is very proper for it…as our *Negroes* affirme, which in their Country is most of their food." (Littlefield 1981, p. 100). The comment reveals the presence of slaves from the West African rice-growing region. It acknowledges their agricultural expertise and presents them more as collaborators than unskilled laborers. A countervailing narrative begins to emerge: perhaps slaves contributed more to the agricultural history of the New World than has been credited.

While rice did not become a prominent plantation crop in Virginia, it did find footing in the Carolina colony within a decade of its founding in 1670. The introduction of rice to Carolina is not well documented. However, one archival reference from the 1690s finds rice the unexpected dividend of a slave ship arriving from West Africa: "a Portuguese *vessel* arrived with slaves from the east, with a considerable quantity of rice, being the ship's provision: this rice *Carolinians* gladly took in exchange for a supply of their own produce…but was not sufficient to supply the demand of all those that would have procured it to plant" (Collinson 1766). The comment exemplifies the role of rice in provisioning a slave ship. It is likely that among the captives were some who knew how to plant and process the grain. Significantly, the quote also indicates that the rice was unmilled, which allowed it to serve as seed for planting. In this documented instance, the historical record converges with the maroon oral history that opened this chapter: both emphasize the primacy of a slave ship and leftover grains for rice introduction.

From its beginnings, Carolina rice culture bore unmistakable resemblance to African tidal, inland swamp, and rainfed rice systems. Beyond similarities of topography and microenvironment, it also relied upon African methods of sowing, growing, harvesting, milling, winnowing, and cooking the grain (Carney 2001). Rice cultivation symbolized not only the transfer of African seed to the colony, but the simultaneous migration of a highly sophisticated African agricultural and processing technology. From humble beginnings the Carolina rice economy was built upon what enslaved rice growers knew—that from field to kitchen, rice was African.

The onset of Carolina rice culture is perhaps best understood by recognizing that slaves were anything but passive participants. Evidence of their agency can be found in the plots and physical spaces where the enslaved cultivated their own food. Slaves grew food not only for those who held them in bondage, but also, out of necessity, for themselves. When sugar failed as an export commodity in the early Carolina colony, planters looked to exploit other crops in their midst. Two African

foodstaples—rice and black-eyed peas—were already being grown in slave food plots. These crops, along with salted beef, were introduced to the British West Indies and quickly became profitable exports. After first establishing itself as a larder to the English Caribbean, the Carolina colony came into its own by the mid-eighteenth century as the Atlantic world's chief supplier of rice (McWilliams 2005).

Social memories of African agency in Carolina rice culture survive among descendants of enslaved rice growers. The Gullah population of coastal South Carolina memorializes the contributions of their African forebears by calling rice not by its English name, but by its African Mande-language family name, *malo*—a word that persisted well into the twentieth century (Turner 2002, 128).

10.5 Subsistence and Slave Food Fields

The presence of rice and other African foodstaples in slave food fields holds the key for understanding the process by which slaves instigated cultivation of these crops. The cereal grains and root crops occasionally remaining aboard slave voyages provided enslaved Africans opportunities to access familiar dietary staples and to quietly cultivate them in their dooryard gardens and subsistence plots. The plants that grew there attracted the attention of planters and naturalists, to whom some were new and novel species. A few plants were adapted to export markets and became commodities; others found their way onto planters' tables, significantly amending white tastes and white cuisines.

In the initial period of plantation building white colonizers of tropical America knew little about growing food in the tropics. The principal food that concerned them was sugar, a manifestly profitable commodity that required apprenticeship for growers eager to learn its proper cultivation and processing methods (Christopher Columbus had apprenticed in sugarcane cultivation and trade on Madeira fourteen years prior to his first transatlantic voyage 1492). With their attention and energies focused on commodity production, European planters in the New World tropics for the most part left the crucial matter of producing food to their slaves. There was reason for this. The peoples that the colonizers subjugated—initially Amerindian, then African—were for the most part already expert tropical farmers. Tropical agriculture relies on an entirely different array of crops and cultivation methods than those used in temperate climates. It requires expertise in adapting agricultural practices and cultivars to high temperature and precipitation regimes, soils of often limited fertility, and the year-round menace of insect pests. For the uninitiated, the production of food in the tropics presented considerable challenges met only by inculcation of radically new practices and paradigms.

The food fields allotted slaves for subsistence were known variously as provision grounds, yam grounds, or slave gardens (Fig. 10.2). They included the small yards surrounding dwellings that slaves intensively cultivated (Fig. 10.3) (Parry 1955). Slaves also grew crops in plantation areas where sugarcane had exhausted the soil, transforming marginal land into food forests. Old World tropical tubers, such as

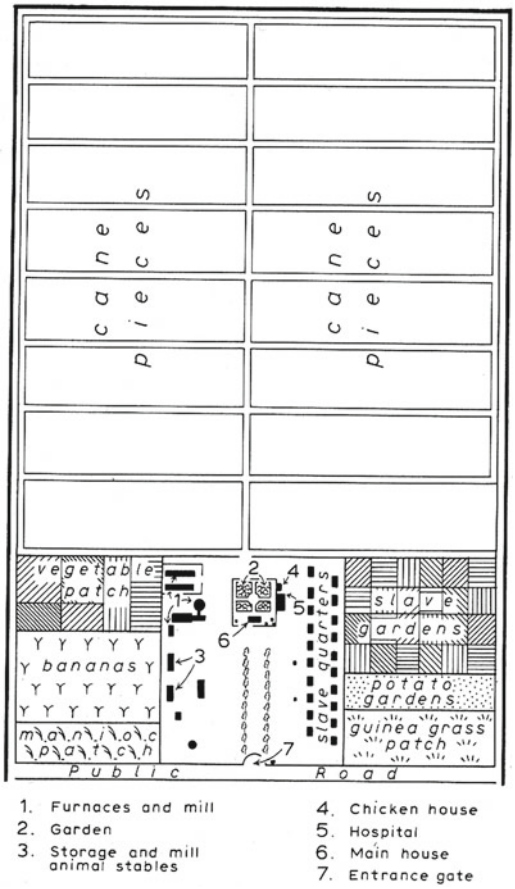

Fig. 10.2 Sugarcane plantation sketch. *Avalle's Idealized Sugar Plantation*, Saint Domingue, 1796 (Source: David Watts, The West Indies: Patterns of Development, Culture, and Environmental Change since 1492 (Cambridge: Cambridge University Press, 1987), 390.

yams, plantain-banana, and taro produced prolifically in poor soils. They had the advantage of growing with fewer labor inputs and could be continuously harvested as needed. The extraordinary range of crops slaves planted from the Old and New World tropics made their food fields, in the words of one eighteenth-century observer of Saint Domingue, "*une petite Guinée*" (Tomich 1993).

The food fields of runaway slaves also demonstrated a preference for African dietary staples. Several drawings from military campaigns in Dutch Guiana show maroon fields that had been carved from the rainforest and planted to rice, yams, and plantains (Fig. 10.4). Other eighteenth-century reports from the colony indicate the Saramaka Maroons grew millet, the *Voandzeia* groundnut, okra, pigeon pea, watermelon, and sesame (Price 1991; Price and Price 1992). Drawings from Minas Gerais, Brazil, where militias destroyed many fugitive communities, illustrate landscape transformations to accommodate food fields and defensive palisades of an African provenance (Fig. 10.5) (Duvall 2009).

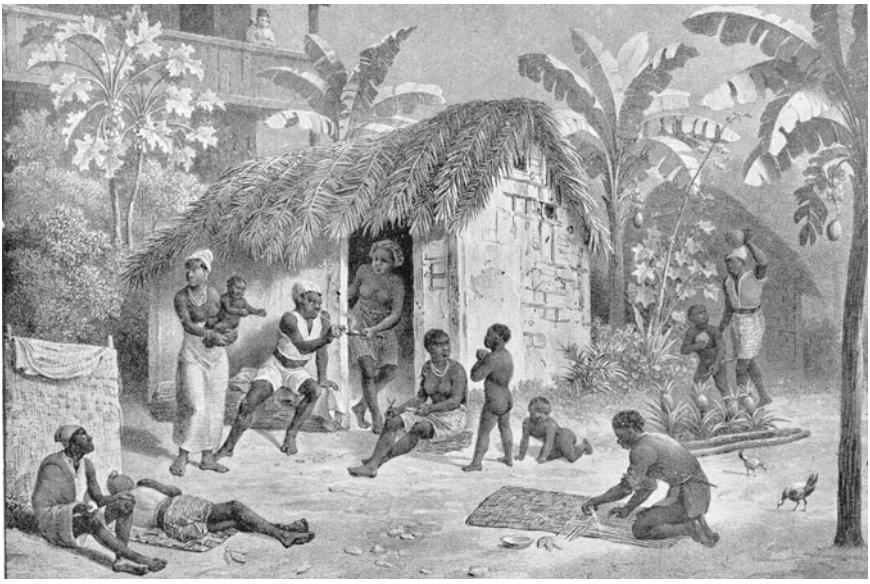

Fig. 10.3 "Dwelling of the Blacks" or slave quarters in Brazil (Source: Johann Moritz Rugendas, *Viagem Pitoresca através do Brasil* (São Paulo: Livraria Martins Editôra, 1954 [1821-1825]), plate 4/5, following p. 205)

10.6 African Plants and the Transatlantic Commodity Chain

At least 35,000 slave voyages carried the 11 million Africans documented to have disembarked in the Americas (Eltis and Richardson 2010). The lengthy sea voyage across the Atlantic was but one leg of a many segmented journey. Indeed, the business of slavery operated across vast geographical space as a kind of transnational commodity chain. Each segment—the capture of Africans, their imprisonment in African ports of embarkation, forced deportation aboard slave ships, and sale at the auction blocks of the Americas—represented a series of spatially distinct transactions that were realized by a shifting set of owner-beneficiaries.

Profits within each segment of the commodity chain depended on the efficient transfer of Africans to the next set of owner-beneficiaries. This included the transmission of useful information to facilitate the movement of human "commodities" to the next segment. Food, and the locations where it could be purchased, was an indispensable part of the process. Captains of slavers arriving along the African coast learned where African food surpluses were sold and which subsistence staples were available. But how Africans grew these crops was of little importance on a transatlantic voyage. By the time the captives reached the auction blocks of the New World, the only persons in the commodity chain experienced in cultivating the foodstaples that accompanied them into bondage were the enslaved Africans themselves.

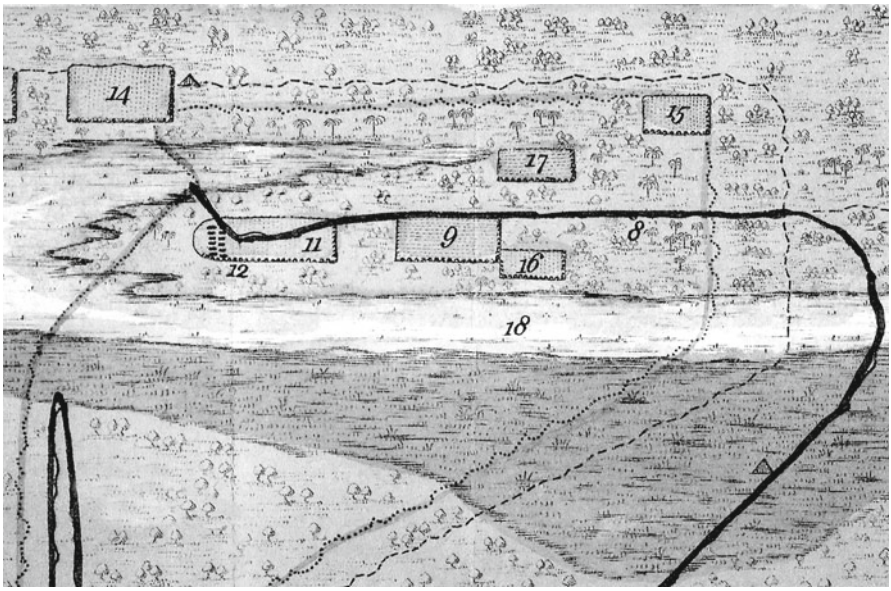

Fig. 10.4 Maroon settlement, located in northeast Suriname between the Cottica and Marowijne Rivers, destroyed by the militia of Captain John Stedman in November 1776
Legend (in modified form):
8 fallow field
9 rice and maize field
11, *16* rice fields
12 maroon hamlet
14 former settlement
15, *17* agricultural fields (manioc, yams, plantains)
18 protective swamp
Source: John Gabriel Stedman, Narrative, of a five years' expedition, against the revolted Negroes of Surinam, in Guiana, 2 vols. (London: J. Johnson, 1813), II: 128–129

But for slave-ship captains, the utility of African crops ended when their victims were disembarked and sold. For the landed African captives, that utility was never lost; it was recast and transformed in the plantation and mining societies of the New World. The familiar foods and medicines that accompanied them across the Middle Passage could now forestall hunger and treat ailments. Here a new narrative emerges, one that engages the role of enslaved Africans in instigating the cultivation of familiar plants in new lands.

In the early colonial period, plantation owners encountered many new plants growing in the food plots of their slaves. Europeans referred to some species by geographical descriptors that indicated their African provenance. Many of these dietary staples are still known in the Portuguese, Spanish, French, and English languages by the place name "guinea", the name slave traders generically applied to the African continent. In English we have guinea corn (sorghum), guinea sorrel (*Hibiscus sabdariffa*)—the plant that is the basis of the popular Mexican beverage,

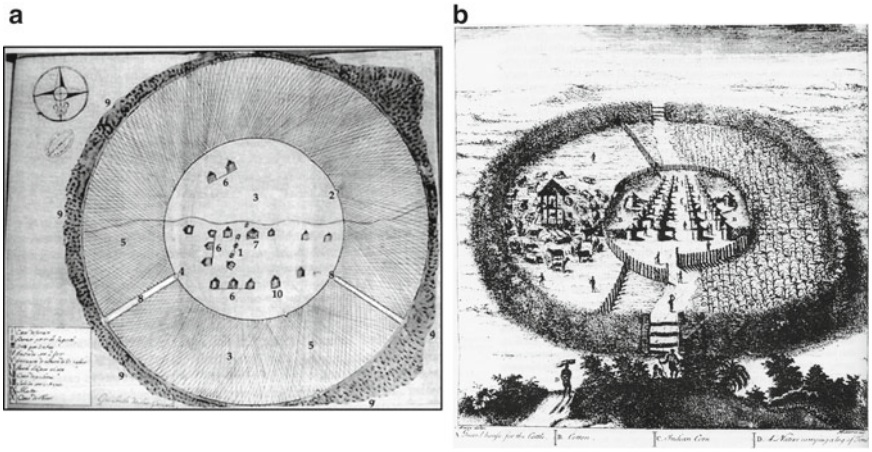

Fig. 10.5 African landscape transformations in eighteenth-century Brazil and Senegambia
(**a**) Quilombo de São Gonçalo, Minas Gerais, Brazil c. 1769
Drawn by a member of the Inácio Correia Pamplona paramilitary expedition 10 years after São Gonçalo's initial destruction
Legend
1 Blacksmith structures
2 Holes for escape
3 Garden area
4 Entry with two booby-traps
5 Trenches
6 Walls connecting houses
7 Milling structure with mortar and pestles for pounding grain
8 Exit with stake traps
9 Primary forest
10 Structure with weaving looms
Source: *Anais da Biblioteca Nacional*, volume 108, 1988 (Rio de Janeiro: FundaçãoBiblioteca Nacional, 1992), p. 107
(**b**) *Fula Village and Plantation*
Legend
A Guard house for the cattle
B Cotton field
C Indian corn (maize)
D "Native" carrying firewood
Source: Francis Moore, Travels into the Inland Parts of Africa (London: Edward Cave, 1738), facing p. 35

jamaica, and referred to as the tropical cranberry drink—guinea squash (*Solanum aethiopicum*), guinea melon (*Cucumis melo*), guinea pepper (*Xylopia aethiopica*), guinea grass (*Panicum maximum*), and the guinea fowl (*Numida meleagris*).

Other Old World tropical introductions were named after specific African regions or slave ports, where surplus food was usually available and easily purchased for the Atlantic crossing. For example, the African pigeon pea was called Congo or Angola pea in English, *pois d'angole* in French, *loango pesi* in Dutch. One type of cooking banana or plantain is still known in Brazil as *banana de São Tomé*. In the former

plantation areas of eastern Cuba, along Colombia's Caribbean coast, and in El Salvador, bananas are called *guineos*, underscoring their arrival from the African continent, where Europeans first encountered this Old World tropical species (Carney and Rosomoff 2009; van Andel et al. 2014).

Such toponyms draw attention to the importance of Africa as the source of food species critical to provisioning slave ships bound for the Americas. In this respect, slave vessels served as an inadvertent conduit for the introduction of African food-staples to the Western Hemisphere. Even though not every slave ship stocked adequate food supplies, and most victuals were consumed en route, leftover provisions in the form of seeds and rootstock were not an infrequent consequence of Atlantic crossings.

Many of the plant introductions to tropical America are known in colonial languages by their African vernacular names. This draws attention to enslaved Africans who instigated their cultivation and to the sites in plantation societies where they established them. Plantation owners and European naturalists in the Americas encountered many novel plants in slave dooryard gardens and food plots. For the crops that had no existing words in European languages, they borrowed the names by which they were known to the slaves who grew and prepared them. Slave agency is suggested by the African loan words that were adopted by the colonial languages of former plantation societies. "Banana," for example, is a word of unknown African origin. Yams and okra are plant names borrowed from African languages as are many others grown in tropical America, such as *guandu*, *guandul*, *wando* (Portuguese, Spanish, and Dutch for the pigeon pea); *quiabo*, *quingombó*, *oko* (Portuguese and Spanish for okra); *bissy* and *eddo* (for kola nut and taro in the English Caribbean, respectively); *pindal* and *goober* (in South Carolina and the English Caribbean for the peanut), and *benne* (for sesame); *abbay* and *dendê* (the Jamaican English and Brazilian Portuguese words for the African oil palm) (Schneider 1991; Cassidy and Le Page 2002).

The African oil palm (*Elaeis guineensis*) forms an important cultural landscape of Brazil. Groves of *dendê* extend across a 30-km portion of the Atlantic coastal lowlands of Bahia. This plant, so significant to west-central African foodways, was brought to Bahia during the early colonial period, when the region became the center of Brazil's sugar industry and a major destination for the slave trade. *Dendê* defines Afro-Brazilian cuisine but also testifies to a New World landscape shaped by Africans and maintained by their descendants. The region is generally known as *Costa do Dendê* or the Oil Palm Coast. The use of an African vernacular word for the oil palm and as geographical descriptor for a cultural landscape transformed by enslaved Africans provides a rare acknowledgement of their agency in New World environmental history (Watkins 2015).

African names are also given to many dish preparations of tropical America. The one-pot stews known in the Caribbean as *callalou* and in Louisiana as *gumbo* are perhaps the best known. In Bahian cuisine, *acarajé* is a popular fritter made with black-eyed peas. A regional specialty of Maranhão, Brazil, is *arroz de cuxá*, rice with sorrel. The loan word *cuxá* comes from the West African Mande language

word *kucha*. Rice-growing Mande speakers still cultivate and make several food preparations with sorrel, *Hibiscus sabdariffa*, another West African domesticate. During the eighteenth century, Maranhão's rice plantation economy was largely supported by slaves drawn from Mande-speaking regions in Senegambia and Guinea-Bissau (Carreira 1983). The social memory of Maranhão's African rice growers is vested in this humble dish and in the oral history passed down through the generations: that an African woman left a slave ship in a new land with grains of rice in her hair.

The social and racial prejudice that divided slaveholders from those they enslaved failed to keep separate the foods they ate. In the tropics, presumed walls of culinary segregation disintegrated over time as signature ingredients of the African diaspora stealthily made their way into white kitchens and dining rooms (Wilson 1964). Today we recognize the infiltration of these African staples in the distinctive regional foodways of former plantation societies that extend from South Carolina and Louisiana through the Caribbean to Mexico's Gulf Coast and Bahia, Brazil.

10.7 Conclusion

The African crops carried to tropical and subtropical America during the slave trade owe their establishment to the first generations of Africans enslaved on New World plantations. Slaves grew these to ward off hunger, diversify their diet, reinstate customary food preferences, and to treat illness. The migrations of African plants in the period of plantation slavery are thus ineluctably tied to the institution and processes of the transatlantic trade in human beings. Slave ships carried Africa's botanical heritage, which gave uprooted Africans opportunities to establish them anew in the spaces allowed them for food cultivation in plantation societies. In their dooryard gardens and food fields slaveholders discovered many of these crops and often exploited their commercial potential.

Driven by the basic human need for food, slaves transformed Neotropical environments into sites of food production. From such modest foundations, maroons sourced the African staples that facilitated their survival in fugitive communities. Drawings and occasional commentaries from the eighteenth century validate this geographical flow of African food crops across the Middle Passage of slavery to New World slave societies and beyond to the remote regions where fugitive slaves sought and occasionally found freedom. African crops remain prominent to this day in the fields planted by the Maroon peoples of Suriname (van Andel 2010).

Through the cultivation of food, Africans and their descendants in the Americas shaped New World environmental history. They left their ineffaceable mark in the rice fields wrested from Carolina marshlands, the yam, rice, and plantain food plots carved from Suriname's rain-forested interior, and the oil palm landscape heritage of Bahia, Brazil. And they did so under circumstances faced by no other immigrant group to the Americas.

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Chapter 11
Sugar Cane and the Environment under Dutch Rule in Seventeenth Century Taiwan

Hua-pi Tseng

Abstract In the sixteenth century sugar conquered the world and substituted honey became diet favorite and important in the world trade. In the seventeenth century, Taiwan started producing sugar under the Dutch rule. Sugar led Taiwan into the world trade and earned profit for the Dutch Eastern Indian Company. During the Dutch's rule, sugar cane also was one of the most representative tropic crops in Taiwan.

Sugar production always changes ecological system tremendously, because it would involve the exploitation of land, forests, and animals. In the sugar trade, empire powers exploited the lands they colonized to plant sugar cane. Kenneth Pomeranz & Steve Tipok had argued in their book, *The World that Trade Created*, Taiwan could be saved from sugar shock because of Zheng Chenggong who ruled Taiwan after the Dutch. It meant Zheng was key figure to preserve natural environment by not executing monoculture of sugar cane plantation policy in the land.

My paper will majorly tackle the sugar policies under the Dutch rule. It will analyze why the sugar cane plantation could be successful in Taiwan, whether sugar monoculture would sustain without Zheng's conquer, and what impacts on the environment through the plantation of sugar cane occurred in the land.

My current study shows that due to the contribution of Chinese labor and their plantation skill, and the nature of the species, sugar cane was successfully cultivated in Taiwan by the Dutch authority. The sugar industry in Taiwan was run under the model of "Chinese species, Chinese plantation skill, Chinese labor". Sugar cane changed the ecology and the demography of the land, when Chinese migrated to Taiwan regularly. **We may found that sugar influences Taiwan both naturally and culturally**. And it was not Zeng who saved Taiwan from sugar shock, because sugar shock won't have any chance occurred in Taiwan.

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In the sixteenth century, Sugar conquered the world. It replaced honey and became a dietary favorite. It also became important in the world trade. In the seventeenth century, Taiwan started producing sugar under the Dutch rule. Sugar gained profit for the Dutch East India Company and introduced Taiwan to the world trade. During the Dutch colonial period, sugar cane became one of the most representative crops grown in Taiwan. Research showed that the production of sugar led to change in land use, which affected the ecological system and environment.[1] This article analyzes the sugar policies of the Dutch in Taiwan, to examine how sugar cane was successfully cultivated, as well as the environmental consequences of its cultivation in Taiwan.

Four volumes of *De Dagregisters van het Kasteel Zeelandia* and three volumes of *The Diaries of Batavia* were used as the primary material for this research. Two volumes of *The Collections of the Dutch Governors' Letters*, both translated into Chinese and published in Taiwan,[2] were also reviewed. Academic publications, such as Tonio Andrade's *How Taiwan Became Chinese: Dutch, Spanish and Han Colonization in the Seventieth Century*, and Pol Heyns' *Economy, Land Rights and Taxation in Dutch Formosa*, as well as publications of some Taiwanese scholars, were valuable references for this research. Among works of Taiwanese scholars, Tsao Yung-ho's *Studies on the History of Early Taiwan*, Part I and II, were also important resources for this research. Tsao pioneered the research of Dutch in Taiwan since the 1950s and many have followed his footsteps.[3]

11.1 Sugar Cane in Taiwan Before Dutch Colonization

When was sugar cane first cultivated in Taiwan? Did Taiwan have its own indigenous species of sugar cane? In 1349, before the Dutch colonized Taiwan, Wang Ta-yuan mentioned sugar cane in *Brief Account of the Island (Dao Yu Zhi Lue)*《島嶼志略》. He wrote about that indigenous people in Taiwan producing salt by boiling sea water and making wine with sugar cane juice. In 1603, Chen Di, a Confucius scholar of the Ming Dynasty, depicted his encounters in Taiwan in *Record of Eastern Indigenous People (Dong Fan Ji)*《東番記》. He documented vegetables grown in the land, such as scallion, ginger, potato, and taro. He also

[1] David Watts' study on Barvades showed that the sugar cane plantation and the relationship with the exploitations of the environment. Cited from Joachim Radkau, *Nature and Power: A Global History of the Environment* (Cambridge: Cambridge University Press, 2008), pp. 152–153.

[2] This paper also reviews the following books: J.H. Galloway, *The Sugar Cane Industry: The Historical Geography from its Origins to 1914*. Cambridge: Cambridge University Press, 1989; and Kenneth Pomeranz and Steven Topik, *The World that Trade Created*. N.Y. & London: ME. Sharpe, 2006, 2nd edition.

[3] Yung-ho Tsao, *Studies on the History of Early Taiwan I&II*. Taipei: Linking Publishing, 1979, 2010. Tsao's researches enlightened many younger generations to devote to the study of early Taiwan history after the 17th century. Tsao died in 2014 (1920–2014).

listed a number of fruits, such as Coconut Palm, Taiwan Persimmon (velvet apple), Buddha's Hand Citron, and sugar cane.[4]

By 1624, the Dutch had established their ruling system in Taiwan. We found two records mentioning sugar cane in *The Diary of Batavia*, a Dutch document, in which they described animals, plants, vegetables and fruits present on the island. Many fruits were listed, including Siri, Pinang (areca catechu), banana, orange, watermelon, bottle gourd, sugar cane and others, but not coconut trees. It stated that there were plenty of such fruit plants around Da Yuan (大員) and Hsiuh Long (蕭壠), along Taiwan's southwestern plain.[5] However, it seemed as though the indigenous people did not harvest fruit from those plants.

At that time, there was a large number of deer in the land. The indigenous people used to hunt deer and turn their skin and dried meat to merchandise sold to the Chinese at a low price, or exchanged for other goods.[6] In the late 1620s, Sun-yi Peng 彭孫貽 (1615–1673) began writing *The Document of Conquering the Ocean* 《靖海志》, in which he documented the geography and landscape of Taiwan for almost five decades. He pointed out that many indigenous tribes lived under the mountains where there was fertile soil and exchanged goods with each other. Peng's book highlighted: "many poor immigrants came from Mainland China and lived along the coast. They grew sugar cane and produced sugar for a living." He estimated that there were thousands of Chinese families involved in the business of producing sugar.[7]

Through such documents, we learned that sugar cane already existed in Taiwan before the Dutch, and the indigenous people consumed sugar but not sugar cane. J. E. Heeres stated that there were some indigenous species of sugar cane in Taiwan before the Dutch arrived, because the environmental condition was very suitable for growing the plant,[8] but no record of cultivation could be found. One possible reason for the lack of documentation is that the Chinese brought sugar cane to Taiwan before the Dutch, but it wasn't grown for business purposes. During the Sung Dynasty, sugar cane plantations were common in the south of the Yangzi River in China. Since Chinese people had been travelling between Taiwan and the mainland regularly, we can assume that the "indigenous species" of Taiwan—species that came before the Dutch—originally came from China.

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[4] Di Chen, *Record of Eastern Indigenous People* (Taipei: Economic Research Center of Taiwan Bank, 1959), pp. 26–27.

[5] *The Diary of Batavia* (I) (Nan-tou: Taiwan Historica, 1970), p. 33.

[6] See the record of Feb. 1624, in *The Diary of Batavia* (I), p. 33.

[7] Peng Sun-yi, *The Document of Conquering the Ocean* (Taipei: Taiwan Bank, 1959), p. 56.

[8] J.E. Heeres, *Dagh-register fehouden int Casteel Batavis vant passerende daer ter plaetse als over geheel Nederlandts-India, Anno 1624–1629* ('s-Gravernhage: Martinus Nijhoff, 1896), p. 24; Cited from Pol Heyns, *Economy, Land Rights and Taxation in Dutch Formosa* (Taiwan, Translated by Zhen Wei-chung, Taipei: Zhong-zi Publishing, 2002), p. 57.

11.2 Sugar Cane Policies Under Dutch Rule (1624–1662)

After the Dutch colonized Taiwan, they established plantations to be cared for specifically by Chinese farmers.[9] With the help of these farmers, the Dutch were able to launch their sugar business in Taiwan.[10] There were 13 governors over the period of the Dutch colonization. Four of which—Hans Putmans, the 5th Governor (1629–1636), Johan van der Burch, the 6th Governor (1636–1640), Pieter Anthoniszoon Overtwater, the 10th Governor (1646–1649), and Nicolaes Verburch, the 11th Governor (1649–1653)—are representatives of the Dutch administration of sugar policies in Taiwan.

In 1632, Governor Putmans encouraged the Chinese farmers, providing financial aid and cattle, to grow sugar cane in Chi Kan (赤崁)—the first Chinese agricultural colony. The next year, a new species called "Bamboo Sugar Cane" was imported to Da Yuan. The harvest in 1634 was successful.[11] Then in 1635, the Dutch East India Company recruited two Chinese businessmen (also called landlords), Lin Hen-wan (林亨萬) and Su Ming-gang (蘇鳴崗) to Taiwan. Lin and Su led a total of 300 Chinese farmers to attend to the sugar cane fields assigned by the Dutch. Each of them had approximately 20 ha. It was estimated that 200–300 picul of black sugar were produced that year.[12]

At a meeting in 1635, Putmans decided to continue providing money and cattle to the Chinese farmers.[13] In 1636, the Dutch Congress in Taiwan decided to waive taxes for 5–6 years, and guaranteed the purchasing price of sugar. They also built hospitals for the Chinese farmers.[14] The Dutch found that indigenous people often harassed the farmers. Therefore, in 1635, to improve farming conditions, Putmans requested Batavia to send troops to attack Taiwanese indigenous people. Batavia sent 475 soldiers to Taiwan under the commend, and conquered Ma Dou She (麻豆社), which was the largest tribe in that area. The Dutch also signed peace treaties with other tribes nearby in 1636. In all, Putmans' policies were aimed to facilitate sugar production in Taiwan.[15]

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[9] Tonio Andrade, *How Taiwan Became Chinese: Dutch, Spanish, and Han Colonization in the 17th Century* (Taipei: Yuan-Liu, 2008; Taiwan translation edition), p. 228.

[10] VOC 1116, folio 319, Cited from Pol Heyns, *Economy, Land Rights and Taxation in Dutch Formosa* (Taiwan), p. 57.

[11] Tonio Andrade, *How Taiwan Became Chinese: Dutch, Spanish, and Han Colonization in the 17th Century*, p. 230; and footnote 28 on p. 245.

[12] Shu-sheng Chiang translated, *De dagregisters van het Kasteel Zeelandia, Taiwan 1629–1662 DEEL II*: 1629–1648 (Tainan: Tainan City Government, 2002), p. 622.

[13] Shu-sheng Chiang translated, *De dagregisters van het Kasteel Zeelandia, Taiwan 1629–1662 DEEL I: 1629–1641* (Tainan: Tainan City Government, 2000), p. 197.

[14] Shu-sheng Chiang translated, *De dagregisters van het Kasteel Zeelandia, Taiwan 1629–1662 DEEL I:* 1629–1641, p. 197; also in Pol Heyns, *Economy, Land Rights and Taxation in Dutch Formosa* (Taiwan), p. 57–58.

[15] Shu-sheng Chiang translated, *De dagregisters van het Kasteel Zeelandia, Taiwan 1629–1662 DEEL I:* 1629–1641, p. 262 & p. 232.

In order to reach the annual goal of sugar production, Governor Burch banned the eating of sugar cane grown in Chi Kan on August 13, 1639. The ban also declared that the Chinese farmers are not allowed to sell sugar to anyone besides the Dutch.[16]

The agricultural policies by the 7th governor Paulus Traudenius (1640–1643), the 8th governor Maximiliaen le Maire (1643–1644), and the 9th governor Francois Caron (1644–46), showed that the Dutch maintained a sugar industry throughout that time. By 1641, Taiwan had increased its sugar production and cultivated more land for that purpose. Around the same time, seeds of indigo plants were distributed to farmers, as the colonial government was also seeking other profitable agricultural investments.[17] In 1645, the Dutch learned that the fertile soil in Taiwan was suitable for growing crops, especially sugar cane, which could produce an abundant amount of sugar for trade. According to the records, in 1645, Chi Kan area alone could produce 1,000,000 kg of white sugar, and up to 1,500,000 kg of sugar a year.[18] Although the Dutch decided to import and grow several kinds of vegetables, such as ginns (Wolfiporia extensa) and ginger in addition to sugar cane, their focus was on sugar.

Governor Overtwater's policy on sugar was to cooperate with Chinese landlords to develop local sugar businesses and international trade. In 1639, he drafted seven landlords—Jacoma, Simtocq, Sanloe, Cambingh, Lampack, Boijcko, and Peco—to grow 262,000 sugar cane plants. Like Putmans, Overtwater protected Chinese farmers from the harassment of indigenous people and guaranteed the purchase price of sugar. Chinese farmers also grew other crops, including rice, tobacco, indigo, ginger, and ginns, for various demands.

The following table shows the numbers of sugar cane plants cultivated by the Chinese farmers led by the seven Chinese landlords:[19]

Landlord	Jacoma	Simtocq	Sanloe	Cambingh	Lampack	Boijcko	Peco
Number of sugar cane plants	50,000	30,000	40,000	12,000	30,000	70,000	30,000
Other crops	Rice, tobacco, indigo, ginger, ginns (Wolfiporia extensa), etc						

In the late 1640s, China was in short of food supply. Food shortages affected the production of sugar in Taiwan. Chinese famers were more inclined to grow rice instead of sugar cane, because rice could be sold at a better price. In 1649, Governor Verburch raised the price of sugar in response to this situation. It was proven to be

[16] Shu-sheng Chiang translated, *De dagregisters van het Kasteel Zeelandia, Taiwan 1629–1662 DEEL I:* 1629–1641, p. 447.

[17] See the records of February 1641, in *The Diary of Batavia* (II) (Taiwan), p. 311.

[18] See the records of March 1645, in *The Diary of Batavia* (II) (Taiwan), p. 456; December 1645, in *The Diary of Batavia* (II), p. 472.

[19] The reference of the table is drawn by the author, which can be seen in Pol Heyns, *Economy, Land Rights and Taxation in Dutch Formosa* (Taiwan), p. 60.

an effective strategy. He also took this opportunity to export Taiwanese sugar to Japan.[20]

In the 1650s, the sugar business in Da Yuan had been revived. In 1651, the amount of sugar being produced had reached 120,000 kg per year. After 1652, the amount of sugar exported continued to increase due to the expansion of sugar cane fields from Da Yuan to other regions in central Taiwan. As a result, Taiwanese sugar changed its name from "Da Yuan Sugar" to "Formosa Sugar".[21] In December 1658, there was an abundant harvest of rice and sugar, and "Formosa Sugar" was traded to Japan, Iran, and China.[22]

11.3 Sugar Cane Success in Taiwan

When the Dutch began their agricultural projects in Taiwan, they grew a variety of crops, for example, indigo, mulberry trees, cotton, and Cantonese ginger. Most of the crops had failed, but the cultivation of sugar cane was successful. There are a few explanations.

First of all, the growing condition in Taiwan and the nature of sugar cane plants were crucial to the success. In general, sugar cane grows well between the latitudes of 36° north and 30° south, and Taiwan is located precisely within that range. The Dutch imported "Bamboo Sugar Cane" from the southeastern part of China to Taiwan. The trunk of such variety is small but strong enough to bear wind. Therefore, it was easy to grow in Taiwan and had better chance to survive without well-established irrigation systems, which was lacking.[23] Notably, the natural environment was more suitable for the cultivation of sugar cane than for rice in seventeenth century Taiwan.

The contribution of Chinese labor was also crucial. It was an effective strategy of the Dutch to rely on Chinese farmers. The Dutch preferred Chinese workers to slaves from other continents, because they were skillful and more affordable. They were also more capable when working without instructions and supervision. As a result, the Dutch East India Company owned 60 slaves, but employed 3000 Chinese workers during that period.[24] The Dutch governors in colonial Taiwan had encouraged the cultivation of various crops since 1636, a policy that called for many

[20] Letter written by P.A. Overtwater to C. van der Lijn and Batavia Congress on Feb. 1, 1649. See *De dagregisters van het kasteel Zeelandia, Taiwan 1629–1662, DEEL III: 1648–1655*, (Tainan: Tainan City Government, 2003) p. 101.

[21] Yoko Nagatsumi, 'To Learn seventeenth century Taiwan Trade through Dutch Archives,' translated by Shiuh-feng Liu (Taiwan), in *Proceedings of the Development of Chinese Ocean History*, No. 7, ed. by Shi-Yeoung Tan (Taipei: Academia Sinica, 1999), p. 49.

[22] The record was written on December 14, 1658. See Chen, Shao-kang trans., *Dutch in Formosa* (Taiwan, Taipei: Linking Publishing, 2000), p. 507.

[23] Kouji Nakamura, 'Introduction on Industry,' in *Researches in the Taiwan History under the Dutch Rule*, Vol. I. (Taipei: Dawshiang Publisher, 1997), p. 69.

[24] Pol Heyns, *Economy, Land Rights and Taxation in Dutch Formosa* (Taiwan), p. 58.

Chinese farmers to relocate to and settle in Taiwan.[25] Besides sugar, Chinese landlords were eager to grow rice, so they also recruited Chinese farmers to cultivate their land for rice,[26] and that attracted more people to immigrate.

In December 1645, the Dutch government in Taiwan learned that China was undergoing civil war, so they decided to waive the taxes of Chinese farmers in Taiwan to encourage agricultural production.[27] In 1649, during the civil war period between late Ming and early Qing dynasties, approximately 14,000 people fled to Taiwan from China. The population of Taiwan continued to increase since.

Acknowledging the Chinese immigrants' contribution to the colonial government, the first Dutch governor in Batavia, Jan Pieterson Coen, once stated: "No one could compete with the Chinese who have served us best." In 1649, Batavia Governor Cornelis van der Lijn wrote in a letter to Governor Pieter Overtwater expressing that the Chinese were the only "honey bees" who produced honey. He believed that without the Chinese, the Dutch East India Company would not have been able to maintain their authority in Taiwan.[28]

11.4 Changes in Economy, Demographics and the Environment

The Dutch East India Company considered sugar a valuable product in the world trade. Under Dutch rule, sugar and other products from Taiwan were integrated into the Dutch's worldwide supply network. From there on, Taiwan was officially participating in the world trade, as J. H. Galloway mentioned:

> Sugar cane was a crop of long-standing domestic importance throughout Southeast Asia before the first European merchants appeared in the region, and a few places, such as southwestern Taiwan, produced a surplus for export. During the years of colonial administration, the production of sugar in Java, Taiwan, the Philippines and Malaya was transformed, commercialized, and the four countries became significant exporters.[29]

Taiwan had been isolated for thousands of years. In the seventeenth century, the Dutch not only laid a foundation for the sugar industry in Taiwan, they also brought Taiwan to the world.[30]

The large number of Chinese immigrants changed the demographics of Taiwan. There was an estimated 100,000 Chinese who immigrated to the island during the four decades of Dutch colonization. Ever since the Dutch began recruiting farmers

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[25] *The Diary of Batavia* (I) (Taiwan), pp. 179–180.

[26] *The Diary of Batavia* (I) (Taiwan), p. 193.

[27] *The Diary of Batavia* (II) (Taiwan), p. 469.

[28] *De dagregisters van het kasteel Zeelandia, Taiwan 1629–1662, DEEL III: 1648–1655*, pp. 96–97.

[29] J. H. Galloway, *The Sugar Cane Industry: A Historical Geography from its Origins to 1914* (Cambridge: Cambridge University Press, 1989), p. 208.

[30] Kenneth Pomeranz & Steve Topik, *The World that Trade Created* (N.Y. & London: ME. Sharpe, 2006; 2nd edition), pp. 126–128.

from mainland China to assist with agricultural activities in Taiwan, the nature of Chinese people's visits changed. In the past, fishermen from China's Fujian Province would come to Taiwan at certain times of the year to fish and conduct trade with the indigenous people and then return to the mainland. Under Dutch rule, more Chinese started to settle in Taiwan. Fishing activities increased as well.[31] With the assistance of Cabessas—Chinese landlords—Chinese farmers became useful labor to the Dutch. [32]Severe living conditions due to food shortage in southeastern China in the beginning of the seventeenth century, also propelled the Chinese to leave for Taiwan.

Chinese settlers were also allowed to enter the Formosa Congress Meetings as representatives. The close relationship between the Dutch and the Chinese settlers formed a "co-colonization" in Dutch colonial Taiwan.[33] This new political and demographic construct reflected the diaspora of trade and labor in East Asia,[34] which was a result of the world trade.

After the Dutch, when Zheng Chenggong was governing Taiwan (1662–1683), the Chinese immigrant population increased from 150,000 approximately to 200,000. The number reached 250,000 at the end of the seventeenth century.[35] Zheng, as a child of Ming Dynasty, intended to develop Taiwan as an anti-Qing Dynasty base.

Dutch agricultural policies in Taiwan changed the use of land and landscape. With permission from the Dutch colonial government, Chinese farmers started cultivating land beyond existing fields.[36] On Feb. 25, 1643, despite there being sufficient supply, the indigenous people in Da Yuan were demanded to grow more rice to increase the tax income for the Dutch East India Company. Chinese farmers had cultivated 3737 morgen of rice by 1654.[37] The Dutch also ordered them to cut down forests to create new farmland—a policy that led to rapid deforestation.[38] The process of creating new farmland also spoiled the habitat of deer in Taiwan, causing its population to decrease.

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[31] According to Yung-ho Tsao's study, there were about 100 boats sailing to Taiwan in 1631, and in 1637, 300–400 boats with 6,000–10,000 fishermen estimated. See Tsao, 'The Spread of Chinese People and the Exploitative Development in Taiwan,' in Tsao, *Historical Studies in Early Taiwan* (I), p. 10.

[32] "Cabessa", just like "Capitao" in Portuguese, was Chinese leader or landlord and chosen by the Dutch authority, and led Chinese farmers to do agricultural cultivation, and dealt with trade activities as well. The chosen Cabessa, as ruling class, could participate the Congress committee.

[33] Both Pol Heyns and Tonio Andrade mentioned this concept and phenomenon.

[34] Robin Cohen, *Global Diasporas: An Introduction* (Seattle: University of Washington Press, 1997), pp. 85–89.

[35] Yung-ho Tsao, 'Taiwan Reclamation during Zeng Ruling Era,' in Tsao, *Historical Studies in Early Taiwan* (I) (Taipei: Linking Publishing, 1979, 2006), p. 277.

[36] *The Diary of Batavia* (II) (Taiwan), p. 456.

[37] *De dagregisters van het kasteel Zeelandia, Taiwan 1629–1662, DEEL III: 1648*–1655, p. 289.

[38] Leonard Blusse & Natalie Everts eds. (translated by Peter Kang), *The Formosan Encounter: Notes on Formosa's Aboriginal Society: A Selection of Documents from Dutch Archival Sources*, Vol.2 (1636–1645) (Taipei: Shung Ye Museum of Formosan Aborigines, 2010), pp. 204–205.

The change in land use also affected the livelihood of the indigenous people, which had traditionally depended on fishing and hunting. The 1655 locust plague led to poor harvest of rice that year. The people pled for the right to hunt, but was denied by the authority.[39] It showed that the Dutch were strongly committed to policies favoring agriculture.

As a result of Dutch agricultural policies, cows in Taiwan became domesticated. The number of cows had increased rapidly since the 1630s. There were roughly 20 cows in the 1620s, and 360 by 1635.[40] Records show that more cows had been imported to Taiwan since.[41] Contrary to the decline of the deer population, the number of cows grew with the development of agriculture.

11.5 Balance of Sugar and Rice

In *The World that Trade Created*, Kenneth Pomeranz and Steve Topik argued that, Taiwan had the highest chance of monoculture during the 1600s under Dutch rule. Sugar cane monoculture would have been caused by the demand for sugar production and the need for trade—an incident they called the "sugar shock".[42] They agreed that Taiwan avoided the sugar shock because sea merchant Zheng Cheng-gong's invasion of Taiwan, which overthrew the Dutch, had brought attention to the importance of other crops, particularly rice.

However, before Zheng, the Dutch had experimented with the cultivation of several kinds of crops. They were seeking crops that could be grown successfully in Taiwan, especially the kinds that were valuable in trade. As promising as sugar seemed at that time, it wasn't as profitable as the Dutch had expected. Also, local dietary needs demanded additional crops. The fact is, there was little chance that the Dutch policies on sugar cane could have resulted in monoculture. There had always been a variety of crops grown simultaneously in Taiwan.

While Pomeranz and Topik's concern of the sugar shock was from an ecological standpoint, Zheng's concern was political. As a child of the Ming Dynasty, Zheng took Taiwan as an anti-Qing base. Both Zheng and the Qing government realized that internal stability was key to keeping Taiwan under control, and having a steady supply of rice was important. Producing large amounts of sugar for foreign trade, on the other hand, was not.[43]

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[39] *De dagregisters van het kasteel Zeelandia, Taiwan 1629–1662, DEEL III: 1648*–1655, pp.417–418.

[40] Tonio Andrade, *How Taiwan Became Chinese: Dutch, Spanish, and Han Colonization in the 17th Century*, (footnote 33), p. 246.

[41] For instance, there is a record about cows being imported to Taiwan in December 1640. See *The Diary of Batavia* (II) (Taiwan), pp. 246–47.

[42] Kenneth Pomeranz and Steven Topik, *The World that Trade Created*, pp. 126–128.

[43] Kenneth Pomeranz and Steven Topik, *The World that Trade Created*, pp. 127.

While in Taiwan, Zheng administered the "wasteland reclamation program"—a system often applied by previous Chinese Empires to cultivate fields for rice production.[44] The British East India Company records revealed that, in 1683, the amount of sugar produced in Taiwan was one third of the average annual amount during the Dutch period.[45] Even though Zheng made food crops the priority, he didn't give up on sugar production. Sugar was still beneficial in generating extra income for his regime in Taiwan.

The enormous profit gained by exporting sugar to Japan and the Philippines was one reason that prompted the Qing Empire to include Taiwan in its political territory.[46] Sugar production was continued after Qing defeated Zheng's grandson and took over the island in 1683. But when more and more farmers started growing sugar cane instead of rice, the Qing government intervened. In the late 1670s, Kao Kong-chien (高拱乾), Administrator of Taiwan and Hsiamen, began to worry that sugar would take over rice, so he issued a ban on the cultivation of sugar cane, declaring the need for people to grow rice to prevent Taiwan from food shortages.[47] Besides, Taiwan had to supply food to Fujian, Canton, and Zhejiang provinces as well.[48]

From the Dutch colonial period to Zheng's regime, and later the Qing Dynasty, sugar and rice had always coexisted and become correlated agriculturally and economically. The balance between sugar cane and food crops demanded authorities to deliberate their policies on land use.

11.6 Conclusion

In the 1600s, imperial powers in the world trade, such as the British, Spanish, Portuguese, and the Dutch, established sugar industries in many colonies. Sugar was one of the most profitable colonial products at that time. When the Dutch colonized Taiwan from 1624 to 1662, they transformed sugar cane from its original state as a wild plant into a cash crop.

The cultivation of sugar cane plants and the production of sugar, systemized by the Dutch, impacted Taiwan in a few ways: First of all, Taiwan entered the world trade through producing sugar for the Dutch East India Company. The Dutch

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[44] Yung-ho Tsao, 'Taiwan Reclamation during Zeng's Ruling Era,' in Tsao, *Studies on the History of Early Taiwan (1)*, pp. 287–288.

[45] Kouji Nakamura, *Study of Taiwan History under Dutch Rule, Vol 1: Introduction & Industry* (Taipei: Daw Shiang Publishing Co., 1997, p. 78.

[46] Yong-he Yu, *Travel Accounts of Bi Hai* (Nan-tou: Taiwan Historica, 1996), p. 31.

[47] Kong-chien Kao, *The Accounts of Taiwan Region, vol. 10*, (Taipei: Taiwan Bank, 1958), pp. 250–251.

[48] The Compilation Committee of Taiwan Historical Sources ed., *The Archival Collections of Emperor's Edicts on Taiwan Relation in Qing Dynasty, vol.1*, (Taipei:Council for Cultural Affairs, Executive Yuan, 2004), p. 115, 164, 327, 418.

established a foundation of sugar industry in Taiwan, which continued after they left. Secondly, the large number of Chinese who immigrated to Taiwan and settled as farmers and workers changed the demographics of the island. They contributed their labor and farming skills to the cultivation of crops at first, and later became an important political asset for regimes that entered Taiwan after the Dutch. If "Asian species, American land, European skill, and African labor" was the trans-continental model of sugar production,[49] "Chinese species, Chinese farming skill, Chinese labor" was the Taiwanese format.

More importantly, the cultivation of sugar cane influenced policies of land use in Taiwan. Forests were cut down to create farmland. This resulted in deforestation of the southwestern Taiwan and changed the habitat of animals, which led to the decline of some species. On the other hand, the number of cows increased as they were employed for farming. Changes in land use also altered the lifestyle of the indigenous people whose livelihood depended heavily on hunting.

Sugar cane became an important part of Taiwan's diverse agriculture. Even though sugar cane plantations was a major crop at that time, the Dutch colonial government, as well as local farmers, had always grown a variety of crops for different needs. The profit of sugar trade had tempted many to give up growing food crops. The danger of food shortage alerted authorities to not over-emphasize the production of sugar and overlook food crops, especially rice. Throughout the Dutch colonial period, Zheng Chenggong's regime, and the Qing Dynasty, policies were enforced in Taiwan to maintain a balance between rice and sugar productions. Therefore, we can argue that the sugar trade in Taiwan under Dutch rule initiated a long-lasting debate in Taiwan regarding the politics of land use and food supply. Between the seventeenth century and the Japanese colonial period, the contradictory relation of rice and sugar in Taiwan was common. It can be concluded that sugar influenced Taiwan ecologically and culturally.

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[49] Toby Musgrave, *An Empire of Plants: People and Plants that Changed the World.* Chinese edition translated by Tong Hsiao-li (Taipei: Waltz, 2013), p. 72.

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Chapter 12
Resource Extraction as Imperial Power: Japan's Modern Mining Industry

Patricia Sippel

Abstract Although Japan's mining requirements are now generally met by imports, from the late nineteenth century through the first half of the twentieth, a rapidly modernized mining industry, particularly in coal and copper, played a vital role in supplying material resources and export income for Japan's industrial transformation. By the end of the nineteenth century, coal had become its third biggest export item; copper was its fourth. In 1915, Japan was the world's number two copper producer, second only to the United States. Achievements in mining were driven by a single-minded focus on productivity, an aggressive use of modern technology, a relentless pursuit of economic and military goals, and a relative indifference to social and environmental impacts.

Resource exploitation – for minerals, coal, food, and other resources – was also an important component of Japanese imperial expansion. As in the homeland, government and large companies cooperated to invest capital and technology in resource development for national objectives. And, as in the homeland, the results were remarkable, notably in Korea, where mining was more intensive than in Taiwan and lasted longer than in northeastern China, and where Western companies had begun modern mining even before Japanese annexation in 1910. Especially after Japan invaded Manchuria in 1931, Korea became the key strategic location for its military push southward through China and the development of heavy industry, including mining, became an essential policy goal. Between 1918 and 1940, mineral extraction grew 21.1 times in value, much of it from mines in what is now North Korea. In the 1910–45 colonial era, Japanese companies extracted three-quarters of total Korean mineral output. The government-produced New Japan Year Book of 1941 stated that mining was the foundation of Japan's efforts to build a new East Asian order. By transforming imperial Japan into a land of abundant resources, Korea had laid the basis for the success of its mission in East Asia.

This paper examines the exploitation of the physical environment through mining in Japan's era of imperial expansion. It is divided into two parts. The first part outlines the goals, methods, and outcomes of modern mining in the Japanese homeland from the 1870s, with a focus on copper. The second part examines Korea's

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experience of extractive colonization in the first half of the twentieth century, focusing on the role of gold mining in support of Japan's expansionist agenda. Since Korean mining in the colonial era focused geographically on what is now North Korea, there is little way of grasping the ongoing environmental and social consequences damage to the environment. However, some indications may be obtained from Japan, where mineral extraction is no longer significant but where some of Japan's most successful copper and coalmining locations carried the social and environmental consequences of prewar mineral exploitation well into the postwar era.

12.1 Introduction

In 1914, as part of its preparation for the Panama–Pacific International Exposition to be held the following year in San Francisco, the Japanese government published a booklet that pointed to two important developments in Japanese mining (Japan Noshomusho Kozankyoku 1914). First, there had been a remarkable increase in output – some 24 times in total production by value – in the 40 years since the government of the Meiji era (1868–1912) embarked on an aggressive promotion of mining as part of its policy of national modernization. Second, since the closing years of the Meiji era, the mineral output of Japan's home islands had been augmented by that of its two main colonies: Korea, which had become a colony in 1910, and Taiwan, which had become a colony in 1895.

That a Japanese government was giving an elaborate report on its mineral resources may come as a surprise to some observers of contemporary Japan. It is common today even for specialists to begin a discussion of Japanese energy needs with the assertion that Japan has virtually no natural resources. Such assertions are, of course, incorrect. Japan is rich in rainwater, forests, and marine resources, and new possibilities for energy, such as natural gas production from deep-ocean methane hydrate, continue to emerge. Even in metals and fossil fuels, which today are largely secured by imports, Japan has a long history of domestic production. Indeed, a vigorous mining industry played a transformational role in the Japanese economy at least twice: the first for a hundred years or so beginning in the mid-sixteenth century and the second for about 60 years beginning in the mid-nineteenth century. The first was set in motion by the arrival of European merchants in East Asia in the mid-sixteenth century, when abundant supplies of Japanese silver and gold supported a thriving foreign trade that lasted until international communications were curtailed a century later. At the end of the sixteenth century, Japan was the biggest exporter of silver in Asia.

Japan's second mining boom – and the one celebrated in the 1914 government report – was triggered by its re-engagement with Western nations from the mid-nineteenth century. Responding to the challenges of an imperialist international environment, the newly-formed Meiji government embarked on a policy of economic and military modernization, and it looked to mining, particularly in coal and

copper, to supply the necessary material resources and export income. By the end of the nineteenth century, coal was Japan's third biggest export item; copper was its fourth. Achievements in mining were driven by a single-minded focus on productivity, an aggressive use of modern technology, a relentless pursuit of economic and military goals, and an indifference to social and environmental impacts.

Resource exploitation was also an important component of Japanese imperial expansion. Responding to Western pressure with its own expansionist agenda, Japan broadened its territorial reach during more than half a century to include Hokkaido (1869), Okinawa (1872), Taiwan (1895), Korea (1910), South Sakhalin (1905), Liaodong (1905) and Manchukuo (1932). From the 1930s, it expanded into China and southeastern Asia in successive campaigns that culminated in the attack on Pearl Harbor (1941) and the outbreak of the Pacific War. Increasingly, it was to its colonial settlements, especially Taiwan, Korea, and Manchukuo, that Japan looked to supply the food, minerals, coal, and other resources necessary to support national goals.

Mining in the colonies took off at the end of the nineteenth century, picked up pace in the late 1920s, and advanced at full throttle after Japan invaded China in the 1930s. As in the homeland, government and large companies cooperated to invest capital and technology in resource development for national objectives. And, as in the homeland, the results were remarkable, notably in Korea, where mining was more intensive than in Taiwan and began earlier than in northeastern China. Between 1913 and 1936, for instance, the total value of mineral production in Korea more than quadrupled, increasing from 25,415 to 110, 430 yen (The Far East year book 1941). Clearly, Korea had become a crucial commodity frontier essential for Japan's imperialist expansion.

Although mining thus extends deeply and broadly into the history of modern Japan, not all of that history has been adequately studied. Economic historians (for example, Sugiyama 1989; Yamamoto and Oku 1990) have taken note of the importance of mining in the early decades of Japanese industrialization. Social historians (for example, Notehelfer 1975) have investigated its negative impacts, including environmental degradation and labor abuses that blighted Japan well into the post-World War II. However, most of these accounts focus on territorial Japan as we know it today: little attention has been paid to mining, including its human, economic and environmental impacts, in Japan as empire.

This article takes one step toward filling that gap. Focusing on leading mining sectors in the Japanese home islands and in Korea, it examines resource development as Japan expanded from industrializing nation to extractive imperial state. Specifically, it aims to answer the following questions: What were the goals, methods, and outcomes of domestic mining during Japan's modern era? How did the commodification of Korean resources support Japan's expansionist agenda in the decades leading to World War II? The article is divided roughly into two parts: The first traces the development of modern mining, notably copper, in the Japanese home islands from the 1870s until World War I. The second focuses on Japanese efforts to exploit gold resources in colonial Korea until about 1940. The article thus highlights the shift from an era (to around 1914) in which mineral resources served

as a mark of Japan's successful transformation into an industrial economy to an era (from the late 1920s) in which Japan's growing self-perception as a country "not having" resources made the quest for Korean minerals, especially gold, a requisite of national security. As primary sources, it relies especially on government reports and yearbooks, issued in English for international readers.

12.2 Resource Exploitation for Modern Development

12.2.1 Modern Mining in Japan, 1870–1885

Although gold, silver, and copper were mined on a large scale during Japan's early modern era, mineral extraction gained new prominence as part of the modernizing agenda of the Meiji government formed in 1868. Between 1870 and 1885, the government bought a total of three coalmines, two ironworks, and six gold, silver, and copper mines, managing them directly through a Bureau of Mines (Kozankyoku) set up in a new Ministry of Engineering. During this same period, as much as 31.5 % of ordinary expenditures in the Ministry of Engineering were devoted to mining, second only to the 49.9 % devoted to railways. Between 1877 and 1881, government-owned mines produced more than half of Japan's gold and silver (though less than 10 % of its copper) (Sippel 2006).

Government management focused on the introduction of Western technology by inviting foreign engineers to serve as mine advisors (Uchida 1990). Between 1870 and 1885, some 74 British, French, and German experts oversaw the modernization of Japanese mining. At Kosaka silver mine in northern Akita Prefecture, for instance, Curt Netto (1847–1909), a university-trained engineer from Freiburg who worked as advisor between 1873 and 1877, built new furnaces and introduced the latest European treatments, including the Ziervogel process (to extract silver from silver sulfate) and the Hunt and Douglas process (to extract copper from slag). He built a new plant with 400 tons of equipment and firebricks brought by ship and overland from Yokohama. After it began operations in 1877, Netto achieved extraction levels for silver and copper that were three times higher than before his arrival (Sippel 2006).

Although foreign engineers worked to develop the modern potential of a country they knew to have a strong mining tradition, Figs. 12.1a and 12.1b (Japan Noshomusho Kozankyoku 1909) show that gold and silver output gains in the 1870s were unimpressive. Moreover, although Fig. 12.1c (Japan Noshomusho Kozankyoku 1909) indicates a significant increase in copper production, this came mostly from private mines that had not yet been modernized. Netto, who left Kosaka in 1879 to become professor of mining and metallurgy at Tokyo University, warned in a booklet published that same year that the mining industry needed more money, more modern technology, better transportation, and better management. Netto also suggested (1879) that Japan's mining potential lay not in its traditional strengths of gold and silver but in the newer areas of copper and coal.

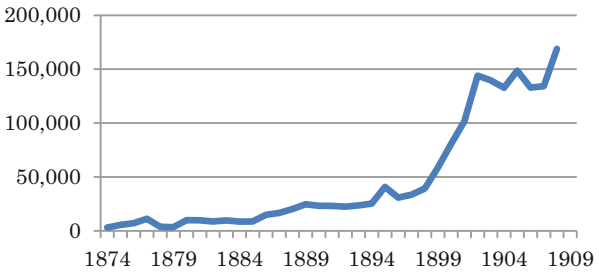

Fig. 12.1a Gold output in Japan, 1874–1908 (in troy ozs) (Japan Noshomusho Kozankyoku 1909)

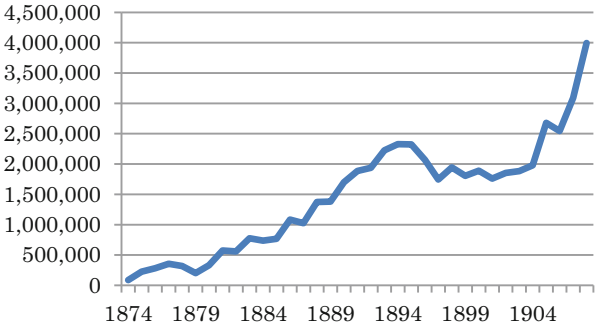

Fig. 12.1b Silver output in Japan, 1874–1908 (in troy ozs) (Japan Noshomusho Kozankyoku 1909)

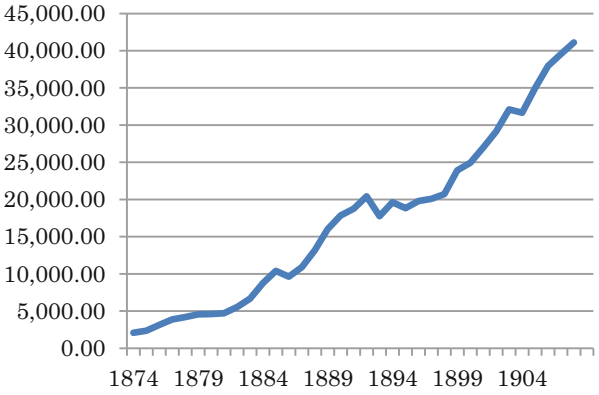

Fig. 12.1c Copper output in Japan, 1874–1908 (in long tons) (Japan Noshomusho Kozankyoku 1909)

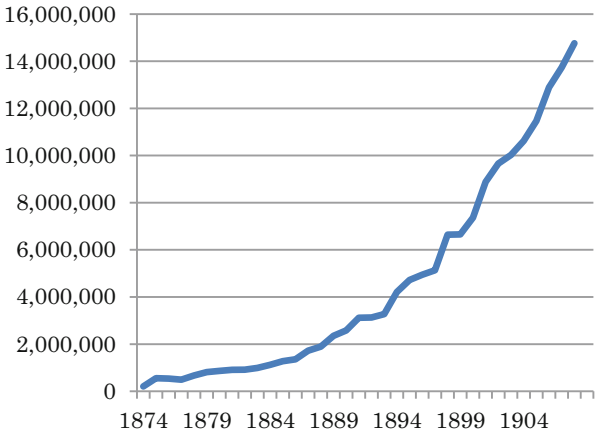

Fig. 12.1d Coal output in Japan, 1874–1908 (in long tons) (Japan Noshomusho Kozankyoku 1909)

Netto's published advice coincided with two major changes in government mining policy. First, it ended the large-scale hire of foreign experts, replacing them with Japanese engineers. Some had studied mining metallurgy abroad; most had attended newly established Japanese engineering schools, such as the Kobu Daigakko, which had been set up with British advice in 1873 and was later incorporated into Tokyo University. Second, the government abandoned direct mine management. In 1885 it disbanded the Ministry of Engineering, transferring the Bureau of Mines to the Ministry of Agriculture and Commerce (Noshomusho). Around the same time, it sold its mines at attractive prices to private companies, several of which were to dominate Japanese mining into the post-World War II era. Fujita-gumi Company (forerunner of the present-day Dowa Mining Company) bought the Kosaka mine in 1884. Furukawa Ichibei (1832–1903), who had already purchased a copper mine at Ashio in Tochigi Prefecture, bought two additional mines in 1885. The centuries-old Ikuno silver mine and the Sado gold and silver mine remained in government hands until 1896, when both were sold to Mitsubishi.

12.2.2 An International Mineral Producer, 1885–1914

With the shift from public to private ownership and from foreign to Japanese leadership, companies such as Fujita-gumi, Furukawa, and Mitsubishi competed to expand production and establish Japan as a player in the international minerals market. The result was a sharp upturn in mine output. Figures 12.1a, 12.1b and 12.1c (Japan Noshomusho Kozankyoku 1909) show that gold, silver, and copper output accelerated, especially after about 1885. Coal, as shown in Fig. 12.1d (Japan Noshomusho Kozankyoku 1909), had increased steadily from the 1870s. Murakami and Hara (1982)

Table 12.1 Exports of copper and coal 1868–1895 (in 1000s of yen and as % of total exports) (Sugiyama 1989)

Year	Copper	Coal
1868–1870	119 (1)	188 (1)
1871–1875	740 (4)	571 (3)
1876–1880	615 (2)	852 (3)
1881–1885	1093 (3)	1485 (4)
1886–1890	3218 (5)	3375 (6)
1891–1895	4906 (5)	5665 (6)

calculated that between 1880 and 1900 alone, output of gold increased 6.8 times, silver 5.7 times, copper 5.2 times, and coal as much as 8.5 times.

Significantly, Table 12.1 shows that, in the barely developed export environment of the 1880s, Japan's natural resources had already emerged as income earners. For the 10 years from 1886, coal was responsible for 6 % of Japanese exports by value and copper 5 %. With a combined 11 % of exports by value, mineral resources became Japan's number 2 export earner in 1891–1895, second only to raw silk and ahead of tea. Copper alone became Japan's sixth most valuable export item in 1898, rising to third in 1908, and fifth in 1913 (Yamamoto and Oku 1990). Coal was ranked third in export value in 1898, fourth in 1908, and sixth in 1913. Modern mineral extraction thus helped to finance the purchases from abroad that were necessary to promote industrial growth.

Japan's progress in mining was reported in a series of English-language publications issued by the Bureau of Mines. In 1893, Wada Tsunashiro (1856–1920), former University of Tokyo professor and current Bureau director, published a 25-year history of modern mining (Wada 1893). Wada praised the industry's technological and managerial transformation and declared Japan's mineral resources to be "almost inexhaustible." Between 1881 and 1890, he reported, output had increased 2.4 times for gold, three times for silver, 3.8 times for copper, 2.8 times for coal, and as much as 38.4 times for sulfur.

Wada's optimistic assessment was echoed in successive official reports issued to support Japanese participation in international events: a 1904 report prepared for the Louisiana Purchase Exposition held in St. Louis (Japan Noshomusho Kozankyoku 1904); a 1909 report, prepared for the Alaska-Yukon-Pacific Exposition held in Seattle in 1909 (Japan Noshomusho Kozankyoku 1909); and the report prepared for the 1915 Panama-Pacific International Exposition mentioned in the Introduction. Each of the publications detailed the remarkable progress of mining during Japan's modernizing era, with sections on geology, main mines, recent trends, and output. The 1904 report emphasized Japan's "immense resources." The 1909 report spoke of mineral resources dating back to "remote antiquity" that were being released with new technology. At Kosaka, a Fujita-gumi engineer had in 1900 succeeded in extracting copper by accessing the *kuroko* ("black ore") deep in the mine. Kosaka mine changed its focus from silver to copper, and in 1907 replaced Ashio as Japan's top copper producer.

The Bureau of Mines reports offered little sign of sensitivity to the negative environmental impacts of mining. While the Kosaka mine, for example, drew heav-

Table 12.2 Output of Japanese mines (in yen) (Japan Noshomusho Kozankyoku 1914)

	Total output	Index
1874–1883	47,233,216	100
1884–1893	117,584,292	249
1894–1903	421,979,213	893
1904–1913	1,134,614,401	2403

ily on surrounding forest resources to meet its charcoal and lumber needs, the 1909 report noted merely that the newly established Kosaka Railway was transporting "good timber from an inexhaustable [sic] forest." It also observed that the chimney for the ore-smelting furnaces was 200 ft high, and that the discharge of smoke could be seen from 8 miles away. Moreover, while the report stated that open cut mining would replace underground out of concern for the health of miners, it did not mention that Kosaka residents had in the previous year submitted to their prefectural government the first in a series of protests regarding their sulfur dioxide poisoned air (Kosaka-chō Shi Hensan Iinkai 1975). At Ashio copper mine, the problems were even worse. Modernized by Furukawa Ichibei from the 1880s, it was the first Japanese mine to use hydroelectricity, and its advanced smelting processes allowed the highest levels of extraction. However, residue from the Ashio plant escaped into the nearby Watarase River, poisoning fish, sickening those who ate the fish, and turning irrigated rice fields into a wilderness. It took a decade of petitions, protests and national publicity from 1891 for a minimal settlement to be reached in what became Japan's first major incident of industrial pollution (Notehelfer 1975).

A detailed view of Japanese mining on the eve of World War I can be seen in the report prepared in 1914 for the 1915 Panama–Pacific International Exposition. Setting a baseline of 100 for the years 1874–1883, the report calculated that the annual value of mine output had risen to 249 in 1884–93, to 893 in 1894–1903, and to as much as 2402 in 1904–1913 (Table 12.2). Output for 1913 reached 172 million yen, reflecting a remarkable increase of 175 % in just 10 years. Most valuable were the new industries of coal (73 million yen) and copper (43 million yen), followed by gold (15.5 million), petroleum (13 million), iron (14.5 million) and silver (5.7 million). Total output value as of 1913 was 172 million yen, led by the new industries of coal (72 million yen) and copper (43 million yen), and followed by iron, petroleum, gold, and silver. Copper was the object of particular pride. As of 1913, there were 66 copper mines in the Japanese empire, almost all of them in the Japanese home islands. Although most had barely operated before the modern era, advanced technology and aggressive management had transformed them and kept them profitable despite a significant price drop in the world market. In 1918 Japan would become the world's second largest copper producer.

Amid the positive reviews of progress, however, the 1914 report prepared for the Panama–Pacific International Exposition offers two indications of the limits in Japanese mineral resources. First, despite strong exports of coal and copper, Japan was a net importer of minerals, especially in iron ore, petroleum, phosphate, zinc, and lead. Moreover, the import-export gap had increased significantly, even in space

Table 12.3 Total Japanese mineral imports and exports, 1909–1913 (Japan Noshomusho Kozankyoku 1914)

Year	Total mineral imports in yen (A)	Total mineral exports in yen (B)	B-A
1909	58,014,427	43,221,316	101,237,652
1910	73,296,029	42,674,238	115,972,177
1911	88,816,671	41,976,411	130,794,993
1912	109,714,488	49,455,319	159,171,719
1913	109,374,169	57,612,495	168,988,577

of the 5 years 1909–1913 (Table 12.3). The report notes as a "matter of constant regret" that a scarcity of capital hampered mining development, leaving a "good many mines" to lie idle; unsurprisingly, it makes no mention of "inexhaustable" or "immense" resources. Indeed, Yamamoto and Oku (1990) have shown that between 1885 and 1913 raw material imports, including raw cotton, soybean cake, ferrous metals (iron ore, pig iron, steel stock, coke), and machinery had increased from a bare 5.4 % of total imports in 1885 to 32.9 in 1910–1905, and as much as 48.5 in 1913. Together the data underscores the observation of Nakamura Takafusa (1994) that by the early twentieth century, the Japanese economy had emerged as one built on the "processing trade": the export of goods manufactured from raw materials, including metals, that could not be obtained in the home islands.

A second concern related specifically to gold. The 1914 report could boast that the surge in output noted in earlier publications had accelerated. Table 12.4 shows, for instance, that between 1902 and 1913 total output from the top-producing gold mines had more than doubled, growing from 99,250 to 267,981 troy ounces. However, the table also shows that the increase came almost entirely from four mines in newly annexed Korea. Only 4 years earlier, the 1909 report had referred to increases in productivity and the opening of new mines in Japan proper; in Table 12.4 one can find no more than modest increases in the home island mines; in several (including Ushio, Ikuno, and Hashidate), output had declined significantly. Table 12.5 shows that of the 15.5 million yen value of gold production in 1912–1913, Japanese home islands produced less than half. Korean mines were responsible for about 43 %, and Taiwan another 10 %. Increasingly, Japan would look to its colonies to expand its access to mineral resources; in the case of Korea, the principal mineral resource was gold.

12.3 Extractive Imperialism in Korea

12.3.1 The First Phase, 1890s–1920

Well before the modern era, Korea was known for the abundance of its gold, silver, copper, coal, zinc, tungsten and other minerals. Placer gold mining was conducted especially in the northern provinces lining the Yalu River on its eastern side, in what

Table 12.4 Top-producing gold mines in imperial Japan, 1902 and 1913 (Japan Noshomusho Kozankyoku 1904, 1914)

1902			1913		
Mine	Location	Output (troy oz.)	Mine	Location	Output (troy oz)
Kinkaseki (Jinguashi)	Taiwan	18,370	Unsan	Korea	66,473
Sado	Niigata	12,574	Hitachi	Ibaraki	47,570
Ushio	Kagoshima	11,925	Kinkaseki (Jinguashi)	Taiwan	27,819
Yamagano	Kagoshima	9404	Suan	Korea	25,089
Ikuno	Hyogo	6814	Sado	Niigata	14,124
Hashidate	Niigata	6696	Yamagano	Kagoshima	13,238
Shintotsugawa	Hokkaido	6616	Chiksan	Korea	12,937
Zuiho (Ruifang)	Taiwan	6025	Syunan	Korea	12,121
Okuchi	Kagoshima	4628	Kosaka	Akita	11,850
Botan (Mudan)	Taiwan	4502	Zuiho (Ruifang)	Taiwan	8430
Usotannai	Hokkaido	4074	Kamaishi	Iwate	7842
Kuratani	Ishikawa	2196	Matsuoka	Akita	5722
Peichan (Esashi)	Hokkaido	2196	Hasami	Nagasaki	5146
Innai	Akita	2199	Serigano	Kagoshima	5036
Kosaka	Akita	1031	Poropetsu (Esashi)	Hokkaido	4584
		99,250			267,981

Table 12.5 Gold Output Value in the Japanese Empire, 1912–1913 (yen) (Japan Noshomusho Kozankyoku 1914)

Hokkaido	399,409	
Honshu	5,012,025	
Shikoku	3390	
Kyushu	1,836,830	
Japan proper total	7,251,654	46.6
Taiwan	1,555,426	10.0
Korea	6,741,818	43.3
Japanese empire total	15,548,898	100

is now the Democratic People's Republic of Korea (DPRK) (Kondo 1943). From the late nineteenth century, those resources had attracted Western investors, especially after the opening of Korea to international relations in 1876 and the establishment of formal relations with the United States, Germany, and Great Britain in 1883 (Kondo 1943; Mills 1916). After new mining laws were issued in 1895, foreign companies competed to secure mining concessions. In 1896, an American businessman, James R. Morse, secured the concession rights for the Unsan gold mine (in North Pyongan Province) and, within the next few years, concessions were granted to British, German, French, Russian, Italian, and Japanese investors. Like their counterparts in Japan at the same time, mine operators in Korea modernized and

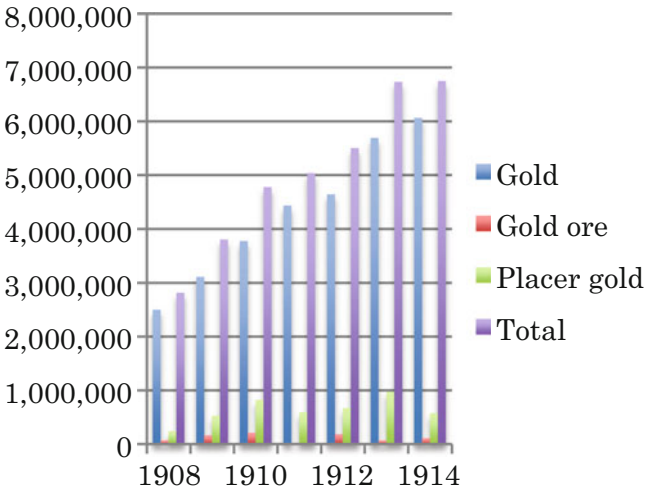

Fig. 12.2 Gold output in Korea, 1908–1914 (yen) (Mills 1916)

expanded their holdings, switching from old-fashioned placer to the more profitable lode mining. Gold output levels in Fig. 12.2 (Mills 1916) show a steady increase from 1908 through 1914. In 1914, gold was produced in every one of Korea's 13 provinces.

Among the foreign entrepreneurs who engaged in Korean mining, the most successful were American, even after Japan's annexation of Korea in 1910. Having obtained the rights to the Unsan concession in 1897, the newly formed Oriental Consolidated Mining Company introduced modern stamp mills and turned Unsan into Korea's most productive gold mine. Second and third places, though well below Unsan, were also occupied by American operations: Suan (in North Hwanghae Province, run by Henry Collbran) and Jiksan/Chiksan (in North Chuncheon Province, run by E. E. Martin). In 1914, American companies were responsible for some 75% of total mineral output in Korea. North Pyongan Province, in which Unsan was located, produced by far the most gold in Korea: more than 4.3 million yen value out of a total 6.7 million yen (Kondo 1943; Mills 1916). It was the gold from these mines, measured in yen but shipped out of Korea with little profit to the Japanese colonial government, that had so boosted the gold production figures in Japan's report prepared for the Panama–Pacific International Exposition. Not until 1915 did the colonial government pass a Mining Ordinance that restricted foreign access to new mineral concessions, prompting most Western mining companies to withdraw gradually.

Of course, Japanese companies were not entirely absent from Korean mining. With government encouragement, several of the biggest mining companies, including Furukawa (from Ashio), Fujita-gumi (from Kosaka), and Kuhara (from Hitachi), had made modest early moves into Korea (Dowa Kogyo 1955; Kondo 1943; Sato 2007). In 1900, a partnership between the entrepreneur Shibusawa Eichi and Asano

Soichiro, founder of the future Asano Cement company, secured the promising Jiksan concession. However, Japanese mining enterprises, unable to match the technological and management superiority of American competitors, were not particularly successful in Korea during the first two decades of the twentieth century (Cumings 1994). The Jiksan mine failed to flourish, and in 1911 the Shibusawa-Asano group handed the management over to the Chiksan Mining Company, an American group. In the difficult business conditions that followed World War I, several Japanese companies suspended their Korean operations.

Even after the 1915 restrictions on foreign operations, Japanese companies did not move immediately to exploit Korean mining resources. One reason was the chronic shortage of Japanese investment capital that the 1914 Panama–Pacific International Exposition report had noted. The basic reason, however, lay in Japanese colonial policy (Ho 2008). Japan's initial aim for Korea was similar to that for Taiwan, acquired 15 years earlier: to develop it as a self-sufficient agricultural colony. Colonial laws discouraged industrial development in Korea, apparently to avoid competition with businesses at home. Moreover, Japan was able to import necessary resources, particularly during the export boom prompted by World War I. Lacking strong economic or political incentives to continue, several Japanese companies had suspended their Korean mining operations by the early 1920s.

Modern mining in Korea thus developed in a two-layered imperialist environment. Western companies, aggressive from the outset, held a firm grip on mine management, technological advance, and profits through the early years of the twentieth century. They continued to control Korea's mineral resources even after Japan replaced Western powers as the controlling political and military power.

12.3.2 Japanese Colonial Exploitation from the Late 1920s

Two related trends stimulated active Japanese interest in exploiting Korean mineral resources from the late 1920s. First was a sense of resource insecurity prompted by changes in the international environment from the late 1920s (Dinmore 2006; Sato 2011). Japan's increasing need to import food for a growing population and raw materials for industry came at the very time global economic instability, competition for natural resources, and criticism of its expansion in Asia made Japanese dependence on world markets seem risky. In 1926 Ugaki Kazushige (1868–1956), minister of war and twice governor-general of Korea, wrote that, although Japan had technology, capital, and labour, because it lacked resources, its economy was not whole. Government concern was reflected in its establishment in 1927 of a Resources Bureau, along with a commission to investigate problems of population and food supply. The sense of vulnerability was reflected in the emergence of new phrases to describe Japan. It was "in any case, a small country blessed with few natural resources and occupied by a large population or, more starkly, a "have-not country" (Sato 2011). In such an environment, exploitation of colonial resources became the indispensable answer to the problem of Japan's survival.

A second factor supporting Japanese interest in Korean mining from the late 1920s was an across-the-board surge of interest in Korean heavy industry (Ho 1984; Ho 2008; McNamara 1990). Facing strong international competition, Japanese entrepreneurs saw Korea as an important market, a source of cheap labor, the home of abundant mineral resources, and an attractive base for expansion into China. Their interest reflected a major shift in Japanese government economic and military goals for Korea. Especially after Japan invaded Manchuria in 1931, Korea became the key strategic location for its military push southward through China; developing heavy industry in Korea thus became an essential policy goal. Moreover, Korea was part of a projected trading and financial bloc that the Japanese government aimed to build as a means of countering the protectionist trends that had emerged after the Great Depression. With the opening of war against China in 1937, an aggressive industrial policy in Korea became even more necessary to meet Japanese military needs. The Korean colonial government offered strong tax and other incentives for Japanese companies willing to do business there. By 1940, of the largest 2000 firms registered in Korea, 68 % were Japanese-owned and another 27 % were joint Japanese-Korean investments led by Japanese. Of the Japanese firms registered in Korea, 15 % were in mining.

The push for resource development in Korea meant that the mining industry was increasingly Japanese-owned (Chung 2006; Kondo 1943; McNamara 1990). After the Mining Ordinance of 1915 restricted their access to new mineral concessions, most Western mining companies had gradually withdrawn. In 1921, 11 companies remained in Korea, and in 1931 just two (Chung 2006). (One of the two was Oriental Consolidated Mining Company.) The Western share of Korean mineral production declined accordingly: from a high of 75 % in 1914, to around 20–25 % between 1918 and 1924, and to less than 10 % in 1932. By 1939, even Oriental Consolidated Mining Company, unable to repatriate profits, felt obliged to sell Unsan Mine to a Japanese company. In 1941 there were no Western-operated mines in Korea.

Some mining opportunities were taken up by Koreans, particularly those who saw possibilities in their own landholdings. The number of Korean-owned mines increased through the 1920s, totaling 3512 in 1937. Overall, however, the Korean-owned enterprises were small, poorly financed, and inefficient; many license holders lacked the capital even to begin operations. At their numerical peak in the 1930s, Korean-owned mines contributed no more than 10.5 % of total mineral output.

The mining industry was increasingly Japanese-owned (Chung 2006; Kondo 1943; McNamara 1990). In 1936 Japanese companies owned 72 % of the mining licenses for gold and silver ore and 85 % for placer gold. In 1938 they were responsible for 93 % of all paid-in capital in the mining industry. Their share of total mineral output in Korea rose from about 25 % in 1915, to 82 % in 1933, to 90 % in 1936, and above 90 % in the 1940s. Even with their sluggish activity in the early twentieth century, Japanese companies produced three-quarters of the total mineral output of Korea in the 1910–1945 colonial era.

Most of the leading Japanese mining companies joined the push into Korea in the 1930s. Fujita-gumi, which had pursued its Korean interests only sporadically during the 1920s, reopened idle mines and purchased new ones in 1932–1933, giving itself

nine Korean operations as of 1933 (Dowa Kogyo 1955). More active were the mining affiliates of zaibatsu such as Mitsui and Mitsubishi. Mitsui, Japan's biggest domestic coalmine operator, moved into mining in 1929, when its Mitsui Mining affiliate bought a gold mine from the Korean Samyang Company. Mitsubishi invested in Korean coal (from 1927) and iron (from 1939). Most aggressive of all were the new Japanese conglomerates, such as Nissan and Nichitsu, which were founded by engineers and focused on heavy and chemical industries. Their close ties with the government and strong support of its expansionist policies gave them access to funds and investment possibilities, especially in Korea and Manchukuo (Miyazaki and Ito 1999. Economic data show the growing importance of mining. Between 1918 and 1940, output value grew 21.1 times, compared with 8.4 times for industry and a mere 1.7 times for agriculture; most of the increase was in the 1930s (Ho 2008).

Among Korea's mineral resources, gold, in particular, was needed for currency; in view of Japan's deteriorating balance of payments, "possession of gold was our country's most pressing business" (Kondo 1943). The Japanese government offered subsidies and loans for gold mining and the construction of refineries, including support for transportation and advanced equipment (Inahara 1943). In 1938 it announced a 5-year plan aimed at increasing gold output in Japan, Korea, and Taiwan. In the same year the Diet approved the formation of a semi-governmental corporation to provide funds for gold mining, promote efficiency in the gold industry, and activate dormant (mainly Korean-owned) mines. The revised Mining Law of 1938 regulated the issue of licenses, tightened government supervision of mining enterprises, and ordered the improvement and shared use of mine facilities. All gold and silver output was to be sold to the Bank of Chosen or other specified institutions.

Aikawa (Ayukawa) Yoshisuke (1880–1967), former president of the Kuhara copper mine at Hitachi and founder of the Nissan conglomerate in 1928, was particularly concerned with the need for gold to meet international payments. In 1937, through his Japan/Nihon Mining Company, Aikawa purchased Taeyu-dong, located near Unsan in North Pyongan Province and Korea's second most productive gold mine. When Oriental Consolidated Mining Company, unable to repatriate profits from its Unsan mine, was forced to sell, it was Aikawa's Japan Mining Company that made the purchase in 1939.

In the years leading up to the Pacific War, Japanese authorities continued to detail their mining achievements at home and in the colonies, in reports issued annually in English and Japanese by the colonial government of Korea (Annual report on administration of Chosen 1936–1937 (1938), Chosen Sotokufu (ed.) 1942) and in English-language yearbooks intended for an international readership. These publications offer an overview of laws, available minerals, and output trends in Korea. The English-language materials emphasize progress and expressed pride in Japanese achievements, though they also reflected a concern with world mineral output rankings and a stubborn awareness of Japan's difficult international position. For instance, The Far East year book (1941), an English-language version of a booklet originally published in 1938, emphasized the prodigious increase in mineral output

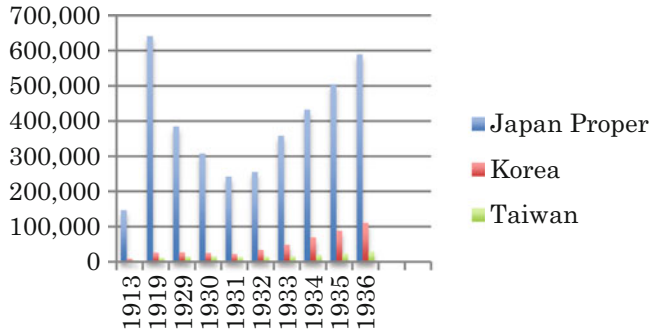

Fig. 12.3 Mineral output in the Japanese empire, 1913–1936 (in 1000 yen) (The Far East year book 1941)

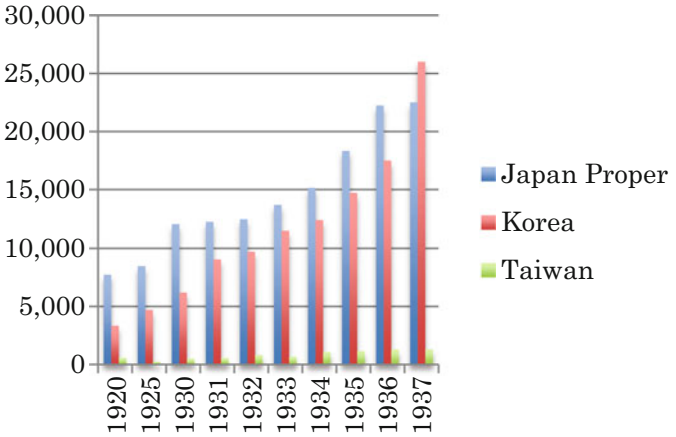

Fig. 12.4 Gold output in the Japanese Empire, 1920–1937 (in kg) (The Far East year book 1941)

in the Japanese empire. The figures, shown in Fig. 12.3, indicate a tripling of output in yen terms between 1931 and 1936.

The Far East year book also identified the specific contribution of Japan's colonies, especially Korea and Taiwan. While Fig. 12.3 shows that mineral output totals for Korea and Taiwan were well below those of Japan proper, Fig. 12.4 shows that in gold output Korea excelled, outstripping Japan proper for the first time – and by a considerable margin – in 1937.

The *New Japan year book* (1941) also explained that, as the basis of national defense industries, mineral exploitation was the foundation of Japan's efforts to build a new East Asian order:

> … Japan, which is embarking in the great work of building a new order in Eastern Asia,… must devote all its efforts for extending the productive power of the various lines of industry, which are essential for national defence. The mining industry must be most urgently developed and extended ahead all other industrial expectations; for it is the centre of all national defensive industries ….

It also offered a rare recognition of the importance of Korea's natural resources, particularly gold, in enhancing Japanese security:

> Prospecting made since the outbreak of the Chinese Incident has… resulted in the discovery of many good mineral veins and deposits….and the epochmaking progress of mining engineering, brought about by the necessity of waging a war, has changed Japan suddenly from a country not having to a country having, as far as the mining industry is concerned. As an instance of it, the writer may point out the fact that Chosen has come out as a leading gold producing country in the world, having no districts in it, which have not produce [sic] gold, after the past few years' prospecting.

By transforming Japan from a country "not having" to a "country having", the colonial exploitation of Korea's natural environment had thus set the foundation for Japan's imperial mission in East Asia. Unsurprisingly, the report makes no reference to benefits for the Korean people.

12.4 Conclusion

This article is intended as a first step toward an understanding of the context, extent, and impacts of mineral extraction for modern Japan, first as the condition of its own survival in the hostile environment of nineteenth century Western imperialism and, second, as a means of promoting its own imperialist and colonial agenda in the first half of the twentieth century. Measured in terms of the resources extracted, it is clear that Japanese efforts were remarkably successful. Propelled by aggressive entrepreneurs with access to Western technology and strong government support, Japan developed a domestic mining industry that into the second decade of the twentieth century supplied material resources for industrialization, while also generating valuable export income in coal and copper. Then, as domestic resources proved inadequate, Japan looked to its colonies. In the case of Korea, Japanese companies replaced Western competitors from the late 1920s, taking advantage of the installed technology and well-trained workforce to extract gold and other minerals. Transformed into a Japanese commodity frontier, colonial Korea became a necessary foundation of Japan's military expansion into continental Asia.

Although largely outside the scope of this article, there were, of course, human and physical costs. Japan's goal in Korea was to meet its own resource needs rather than to empower or enriching the colonized. Koreans had little ownership of the mining industry, had little opportunity to engage in technical education, and therefore received little more than a minimum wage from their mining activities. Since Korean mining in the colonial era focused geographically on what is now North Korea, there is little way of grasping the overall damage to the environment. A Nautilus Institute report on North Korea saw the legacy of the prewar mining industry in degraded land and riverine systems; it found little rehabilitation of afflicted areas (http://nautilus.org/staff-publications/enduring-legacies-economic-dimensions-of-restoring-north-koreas-environment/#ixzz363cGwcHD, accessed Dec. 29, 2014)

In Japan, too, there were health costs, borne by Japanese, Chinese and Korean mine workers and others who suffered from the surrounding air, water, and noise pollution. Specific costs to the environment included soil, groundwater, and surface waters by chemicals from the mining process; exposure of hillsides, soil erosion, and the consequent increase of flood damage; air pollution from smoke, fumes and all forms of emissions. The social and environmental damage caused by prewar mining lingered in its most apparently successful sectors, especially in places such as the former Ashio copper mine and the Miike coalmine in northern Kyushu (Ui 1992).

Defeat in World War II brought an end to Japan's quest to use colonial expansion as a means of transforming itself into a country "having" mineral, food and other resources. How could Japan secure the resources to support a peacetime economy and a postwar population boom? The basic answer, determined by Allied Occupation authorities and continued under successive postwar Japanese governments, was to abandon the goal of self-sufficiency in favor of economic interdependence. Japan would resume the "processing" model of paying for necessary imported raw materials, including minerals, fertilizers, food and timber, with high-quality processed exports.

In mining, this meant that, despite immense efforts to support the domestic coal industry in the immediate postwar era, cheaper imported oil, coal, and later uranium, largely replaced domestic coal from the 1960s. Domestic gold, copper, and other mining declined in the face of high costs and reduced supplies. Examination of mining data prepared by the Ministry of Economy, Trade and Industry indicate that Japan's mining industry today consists of small-scale extraction and high-value-added mineral and metal processing. It no longer contributes significantly to the national economy, and Japan consumes more minerals and metals from imports than it produces (www.meti.go.jp/english/statistics/tyo/honpouko/).

Although the decision for economic interdependence has underpinned some 70 years of high-level economic growth, resource anxiety – the sense of being a "not-having" country – remains strong among Japanese policymakers and the general public. Raising levels of self-sufficiency in food and energy, in particular, are key government goals. Whether this should be viewed as a failure to understand Japan's historic role as a trading nation or as a commonsense response to an insecure global environment is difficult to judge. Sato Jun (2011) has, however, suggested that if it can move the notion of resources beyond things, such as metals and foods, to include the power of human intellect and creativity, then perhaps Japan can finally escape its self-identification as a country "non-having" resources.

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Chapter 13
Revealing Hidden Forest Dialogs: Species Introduction, Charcoal Production and the Environmental History of Rio de Janeiro's Urban Forests

Alexandro Solórzano, D. C. Cabral, and R. R. Oliveira

> *The forest stirs, hovers, twists and shakes itself!*
> *The forest today has something to say.*
> *And it ululates, writhes itself, as the actress of a tragic pantomime.*
>
> *– Manuel Bandeira, 1921 ("A mata agita-se, revoluteia, contorce-se toda e sacode-se!/A mata hoje tem alguma coisa para dizer./E ulula, e contorce-se toda, como a atriz de uma pantomima trágica" (Bandeira 2008[1924], p. 163))*

Abstract In recent decades, ecosystem theory has revisited the meaning of human action. There is a growing tendency to recognize that, once "left alone", human modified ecosystems do not return to their primitive state. Recently, this notion has been radically advocated by a group of ecologists who propose the concept of "emerging" or "novel" ecosystems. Emerging ecosystems are the direct result of either intense human modification of preserved ecosystems or the abandonment of established land uses (crops, pastures, planted forests etc.). These ecosystems present locally unprecedented patterns of species composition and dominance that don't depend on human intervention for its maintenance. Therefore these novel ecosystems "exist as a non-regressive consequence of human activity".

In addressing the current manifestations of novel ecosystems, we adopt the retrospective method of historical geography, taking the landscape not only as a means but

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also as an end; more than mere instrument of knowledge, it is the object of knowledge. In this case, we visit the past only to fetch the explanatory elements of the present. Adopting this strategy, we proceed in the same way that natural scientists working in the evolutionary field (geologists, paleontologists, etc.): performing a "remote sensing of processes through surviving structures". More specifically, we use present residual structures (e.g. novel ecosystems) to reconstruct the past processes of landscape transformation. In this article, we aim to reconstruct the processes that produced two of the largest urban forests of today's world, both located in granite-gneiss massifs of Rio de Janeiro city, southeastern Brazil: Tijuca Massif and Pedra Branca Massif, both comprising, respectively, a National Park and a State Park.

Currently, these two forest areas have particular ecological characteristics. Hiking on the slopes of Tijuca, it is easy to find whole tracts dominated by the exotic jackfruit (Artocarpus heterophyllus Lam.), which had been originally introduced in those slopes in the mid-nineteenth century, when a reforestation project began to reclaim the lands degraded by coffee plantation and timber extraction. More hardly noticeable are the small plateaus of blackened soil, evidence of an ancient industry, essential to the past urban economy: charcoal manufacture. The residues of this activity, however, are much more common in the west, in Pedra Branca. There, one of the authors has discovered, through archaeological work, over a thousand old charcoal kilns with a local influence in species composition and dominance. To notice the conspicuous presence of the banana (*Musa paradisiaca* L.), however, one needs no digging. Planted decades ago in any place accessible by a mule – on the backs of which the succulent and nutritious fruits traveled to less rugged terrain, where they were collected by trucks – many of these herbs-that-want-to-be-trees remain in the landscape after being abandoned by their growers, generating hybrid banana-forest systems.

These are examples of how human societies as they spatialize themselves – a necessary condition of their existence in time –, leave behind the clues to their own historical intelligibility. However, this dynamic of social reproduction and understanding would never be possible if only humans were involved. Human beings and their societies emerge as such only in an open and dynamic relationship with what is non-human – other animals, plants, minerals etc., and their particular ways of being. In other words, these are more-than-human social regimes whose development is dependent on both human agency and earth systems. Thus, the emerging ecosystem approach constitutes a new way of "reading" the landscape, one that weaves together the human and non-human worlds into a coherent environmental history of the present social-ecological system.

13.1 Introduction

In the classic dichotomy between nature and culture, few ecosystems receive so intensely the natural stigma as tropical forests. The natural side of the nature-culture axis is so powerful to the point of erasing any human trace, semantically equating

"forest" and "nature". This common sense is present in numerous environmental issues today, such as biodiversity conservation (Oliveira 2008; Oliveira and Solórzano 2014).

Recent findings suggest human transformation of different ecosystems is dated to well before the industrial revolution, Erle Ellis and collaborators put this as following:

> Broad evidence from archaeology, paleoecology, environmental history, and other disciplines suggests that direct human alteration of terrestrial ecosystems by hunting, foraging, land clearing, agriculture, and other activities has been profound in some regions at least since the late Pleistocene, with long-term impacts from forest clearing, increased fire frequencies, megafaunal extinctions, species invasions, soil erosion, and others. (Ellis et al. 2013)

Thus, based on this premise, it becomes increasingly difficult to understand nature free of social processes and understand society separate of ecological processes, in various scales. The adaptive landscape in which species interact has been modified in its basic structure and composition, thereby altering the evolutionary trajectories of communities affecting ecosystem processes and their biotic and abiotic components (Westley et al. 2002). Humans can now be considered an Earth transforming agent, interfering in the flows and stocks of various chemical elements in the energy balance of the earth's surface, from erosive processes in the lithosphere and leading to mass extinction of biodiversity, equivalent to previous geological events (Steffen et al. 2007).

When A.G. Tansley proposed the ecosystem concept as a complex system composed of organisms and their physical environment he also questioned the general tendency to separate humans from nature, and thus being part of the ecosystem, criticizing the rather arbitrary boundary that separates humans from nature (Tansley 1935 p. 303):

> (…) it would be difficult, not to say impossible, to draw a natural line between the activities of the human tribes which presumably fitted into and formed parts of "biotic communities" and the destructive human activities of the modern world. Is man part of "nature" or not? (…) Regarded as an exceptionally powerful biotic factor which increasingly upsets the equilibrium of preexisting ecosystems and eventually destroys them, at the same time forming new ones of very different nature, human activity finds its proper place in ecology.

Currently, within a systems theory framework these two components – society and nature – are seen as parts of a more complex whole now known as socio-ecological systems (SES). This stems from the more ecological notion of humans as a dominant species on Earth capable of determining ecological processes, but also complemented by the understanding of nature as a cultural concept in that any aspect of nature is seen as a social construct and is widely used as a form of political discourse to ensure the use of natural resources by different social groups (Westely et al. 2002).

There is a growing tendency to recognize that, once "left alone", human modified ecosystems do not return to their primitive state. Recently, this notion has been advocated by a group of ecologists who propose the concept of "emerging" or "novel" ecosystems. Emerging ecosystems are the direct result of either intense

human modification of preserved ecosystems or the abandonment of established land uses (crops, pastures, planted forests etc.). These ecosystems present locally unprecedented patterns of species composition and dominance that don't depend on human intervention for its maintenance and that have crossed some form of socio-ecological threshold (Hobbs et al. 2006; Hallet et al. 2013).

The city of Rio de Janeiro, as seen through an interdisciplinary approach, can be considered a socialecologial system composed of large forest tracts and a dense urban structure. In fact, if Rio is today a city full of forests, these forests, on close inspection, reveal themselves as full of urban history. Hiking in these forests it is easy to find whole tracts dominated by the exotic jackfruit (*Artocarpus heterophyllus* Lam.), which had been originally introduced in those slopes in the nineteenth century, before a reforestation project began to reclaim the lands degraded by coffee plantation and timber extraction. More hardly noticeable are the small plateaus of blackened soil, evidence of an ancient industry, essential to the past urban economy: charcoal manufacture. The residues of this activity, however, are much more common in the west, in Pedra Branca. There, one of the authors has discovered, through archaeological work, over a thousand old charcoal kilns with a local influence in species composition and dominance.

In this article, we study two of these landscapes, approaching them as historical documents: the sites dominated by jackfruit in the Tijuca Massif and the charcoal kilns in the Pedra Branca Massif. Guided by the reading of these "surviving structures" we plunge into the past, seeking to reconstruct – using primary written sources and iconography, in addition to the relevant historiography – the processes that produced them. These processes originate and operate in various scales. Thus, our narratives mobilize social-environmental developments ranging from the rhythms and scopes of the global market to the local *événementielle* scale of the actions of important individuals, although the emphasis is mainly on urban spatial responses to population and economic growth, as well as technological change. But let us start from the "end", that is, from the landscapes that we find today.

13.2 Wanderings Through the Forest 'Archives': Picturing the Present

Almost all of the forest remnants in the city of Rio de Janeiro have been modified in its structure and composition in varying degrees. Simple classification of these forest remnants into well preserved, secondary and degraded forests misses much of the nuances of the history of human-forest interactions. Much of the remaining forest cover can be classified as "new" or "emerging" ecosystems, derived from land previously used and managed that shifted toward unprecedented directions (Hobbs et al. 2006; Mascaro et al. 2013). Rio has been intensely used, exploited and cultivated over its 450 years of neo-European history. With the exception of gold mining, the whole range of economic activities through which Europeans and their

descendants conquered and worked the land around the world was carried out in the territory that is now the municipality of Rio de Janeiro: large monocultures for export, small peasant farming, ranching, logging, extraction of granite for building material. Through these and other activities, the city grew and built its history, though not simply devastating the local forests; it incorporated them, metabolizing constructively its materials and resources and, in certain contexts, rebuilding and protecting them as part of its territory and ecological life.

Because rugged terrain is more difficult to use for agriculture and urban development the two largest and most developed forest patches are in coastal massifs composed of metamorphic rocks forming small mountain ranges over a thousand meters high, with very steep slopes: Pedra Branca State Park (12,500 ha) and Tijuca National Park (4000 ha) (Fig. 13.1).

The southern portion of the Tijuca forest is best preserved due to better regeneration of the humid south facing slopes. The northern portion is partially invaded by *Megathyrsus maximus* (Jacq.) B. K. Simon and S.W.L. Jacobs, a wild African grass that occupies open areas, generally abandoned lands, making the system fire prone especially in the dry season. The Carioca range, in the southern portion is bordered by most of the southern zone of Rio de Janeiro, close to the botanical garden. The slopes are composed of evergreen broadleaf tropical forest, ranging from lowland and alluvial areas to submontane sub-formations (IBGE 2012).

This forested landscape is dissected by valleys of perennial and ephemeral rivers and streams with many of the drainage axes harboring dense populations of the exotic jackfruit (*Artocarpus heterophyllus* Lam.), especially in the fringes of the forest where human population slowly encroaches on the forest. These tracts, dominated by jackfruit, are a good way of understanding how novel species composition emerges in the landscape as new ecosystems. Since this species has only a small part of its life history attached to the city, having evolved and developed as a species in India, it presents a novel composition to the city's environment, especially when it presents high population densities. In fact these jackfruit dominated forests, may diminish local diversity simply by recruiting more rapidly jackfruit seedlings and saplings, due to a yearlong phenology producing many fruits and seeds. These seeds mainly disperse and germinate around the adult fruit baring trees or roll downhill, concentrating along the drainage axes. The historical process of the introduction of jackfruit in Brazil will be further discussed.

The Pedra Branca massif currently presents a complex landscape that reflects the long history of human use and current occupation. Since it is more distant form the city's core area is remained until the middle of the twentieth century a place of natural resource reserve and of agricultural production, considered the cityś hinterland (Correa 1936). All though a state park one can find the conspicuous presence of the banana (*Musa paradisiaca* L.), planted on the south facing slopes. Planted decades ago in any place accessible by a mule – on the backs of which the nutritious fruits traveled to less rugged terrain, where they were collected by trucks – many of these remain in the landscape after being abandoned by their growers, generating hybrid banana-forest systems. The Japanese persimmon tree (*Dysopiros kaki* Thunb.) that produces a sweet and savory fruit is also abundant in some parts of the Pedra Branca,

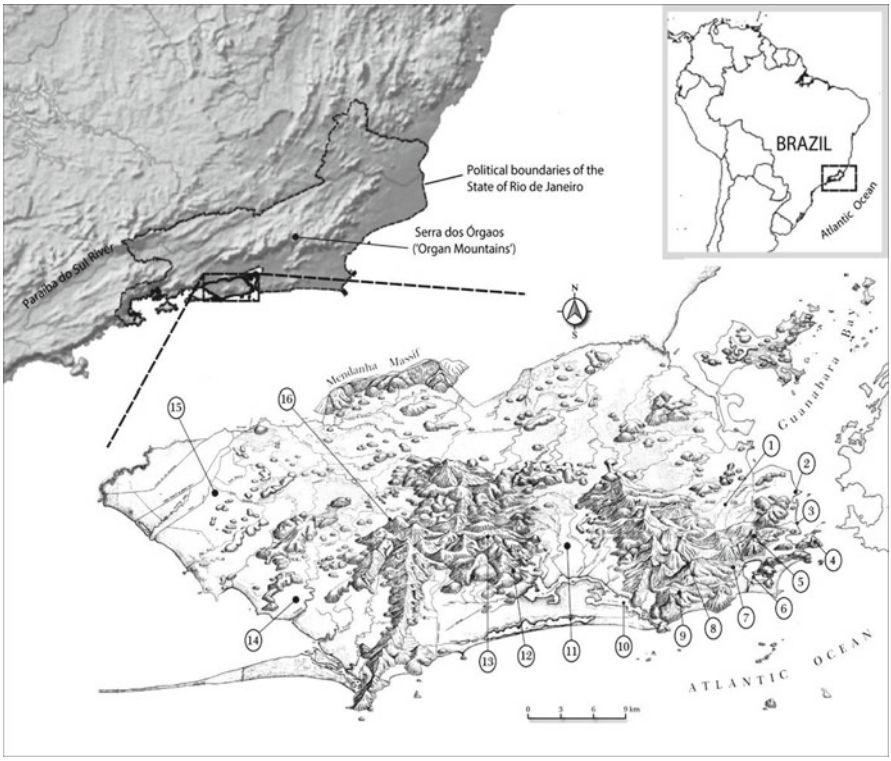

Fig. 13.1 General appearance of the relief of the city of Rio de Janeiro. The Tijuca Massif is in the east, near the Guanabara Bay; the Pedra Branca Massif is immediately to the west. Places marked on the map: *1* Macaranã River; *2 Morro do Castelo*, where the city definitely settled; *3* Carioca River; *4* Pão de Açúcar ("Sugar Loaf"); *5 Serra da Carioca* (Carioca Ridge); *6 Lagoa Rodrigo de Freitas* (lagoon); *7* Botanical Garden; *8* Gávea Pequena River; *9* Pedra Bonita Peak; *10 Lagoa da Tijuca* (Tijuca lagoon); *11* Jacarepagua Plain; *12* Camorim sugar mill; *13 Serra do Quilombo* (Quilombo Ridge); *14* Guaratiba Plain; *15* Santa Cruz Plain; *16* Archer's rural property (Figure credits: Natural Earth [http://www.naturalearthdata.com/], "Gray Earth with Shaded Relief, Hypsography, Ocean Bottom, and Drainages"; IBGE, "Estado da Guanabara: Relevo e Hidrografia", 1965)

together with a small scale of horticulture, produced for the local markets. These hybrid cultivated-forest systems only tell a more contemporary history of land use change. Some jackfruit can be sighted, but not with the same level of dominance found in Tijuca.

However, the dense evergreen forest hides from the untrained eye a complex system of roads, used to connect the abandoned stone built homes and to transport the immense charcoal production that once was carried out at the Pedra Branca. Some of these former charcoal production sites somehow modified the successional regeneration of the forest, currently presenting a high dominance of a native species, *Guarea guidonia* (L.) Sleumer, not seen elsewhere. This new pattern of species

composition and dominance has been stated an important aspect defining novel ecosystems (Hobbs et al. 2006).

It is still common to find forest tracts, traditionally classified as well preserved or remnant primary forest harboring climax species such as *Cariniana legalis* (Mart.) Kuntze and *C. estrellensis* (Raddi) Kuntze, locally known as *jequitibá*. However a closer inspection reveals that, even in these well preserved tracts, with trees bearing diameter of 2 m, one can charcoal indicative of a former charcoal production site (charcoal kiln). What happened is that due to the size of these trees, they were simply spared from cutting, if for no other reason due to the difficulty of felling and managing the tree trunk for charcoal production, the labor invested simply not worth the return (Sales et al. 2014). Also spared from felling, due to cultural practices of religious background, are large specimens of fig trees (*Ficus* spp.) altering successional structuring of the community (Solórzano et al. 2009, 2012) This process of leaving behind large trees seems to be a pattern adopted by charcoal workers that produced a complex landscape with remnant trees helping forest regeneration and charcoal workers selecting smaller diameter trees cyclically in different parts of the forest (Sales et al. 2014).

13.3 Leaping into the Past: Chronicling Forest Ecogenesis

13.3.1 Introduction and Devastation: Coffee Monoculture and Water Crisis in Tijuca

Until the seventeenth century, the human occupation of the Tijuca Massif was limited to the foothills. The medium slopes and, at some points, the higher slopes were reached in the next century (Beltrão et al. 1997). But communication with those mountains was still precarious and hampered a denser human settlement. Passing a few weeks in Rio at the end of 1792, John Barrow, steward of a British diplomatic mission, reported that "ten miles [16 km] beyond the city suburbs, the paths cannot be driven by a carriage". Not surprisingly, deforestation in Tijuca was barely perceptible: according to Barrow, "one does not see a single piece of bare ground" (França 1999, pp. 224–225). In part this is due to the intense process of ecological succession that occurs in tropical areas without a severe dry season.

The arrival of the Portuguese Royal Family, fleeing from Napoleon's troops in 1808, began to change that. The sudden elevation to the condition of capital of the Portuguese monarchy demanded deep urban transformations, including the transportation system. In the 1810s, the government improved the road linking the city to Tijuca, stimulating the natural resource use of those mountains (Viana 1892). Better traffic conditions and an increasing demand stimulated firewood and charcoal production. Another important point on the relations between the city and its mountains was the expansion of the herd of horses, mules and cows. Although these animals are herbivores, the Atlantic forest has no edible grasses, at least for these

animals. So there was the need to transform its unpalatable biomass in food for cattle by the establishment of pastures in vast areas of the city and its surroundings, according to the livestock development. In most cases exotic species of grasses were employed.

In 1821, on the eve of political independence, a statistical survey indicated that the city had 112,695 inhabitants (Mapa 1870), perhaps twice that which the Prince Regent and his entourage had found when arrived in Rio. The British naturalist George Gardner noted, near the top of Pedra Bonita, a landowner "clearing away the forest" and "converting the larger trees into charcoal" (Gardner 1849, p. 24). In the late 1810 Luccock had noticed the spatial relationship between this kind of deforestation and the process of urban growth:

> We should regret the change in these, till lately everlasting, woods, did we not recollect that they have contributed their portion to the wants of man; furnished to the city below them the valuable article of fuel, and still are employed in producing the necessaries, and many of the luxuries, of life. Enough of wood-land, also, is still left to please; and nature here can never disgust, though in scenes unaided by artificial ornament. (Luccock 1820, p. 34)

It is likely that Luccock would have changed his mind had he remained a few more years in Rio. As an insidious and aggressive "artificial ornament", coffee plantations were expanding, especially in the Tijuca landscape, and in a short time one could no longer glimpse its primitive vegetation. A shrub of the Rubiaceae family, *Coffea arabica* is native from the understory of the Ethiopian plateau forests, from whose roasted and ground beans was made a stimulating infusion, increasingly appreciated by Europeans (Dean 1995). Brought to Rio around 1760, it soon began to be planted on the small hills that emerge from the urban plain. Encouraged by the government, coffee cultivation gained scale and finally reached Tijuca, whose rainy and mild climate was conducive to the plant. The first large plantations were established in the Gávea Pequena river basin, which drains into the Tijuca Lagoon (Martins 2008; Marquese 2009).

However, some elements of this plantation system – notably the denser planting in chess pattern – could not be deployed in steep terrain, as in Tijuca. For convenience, farmers planted in rows up the hill, a method that favored soil erosion (Taunay 2001[1839]) (Fig. 13.2). Although a perennial crop, coffee plantations were not usually replanted, the old ones being simply abandoned; new forest tracks were cleared to continue cultivation. In addition, growers ignored the advantages of the shading system and used to clearcut the forest (Dean 1995).

Deforestation unbalanced the hydrological and geomorphological regimes of the Tijuca massif. The most affected were certainly the south facing slopes, where orographic rain violently tumbled on unprotected soil parched by sun exposure (Bernardes 1959). The reduction of soil's capacity to absorb water increased runoff intensity towards the drainage channels, increasing the frequency of overflow and flooding. Due to the surface flow of the rainfall it failed to replenish the water table, reducing the supply of drinking water. Moreover, this process substantially changed the urban climate below. In the 5 year period between 1851 and 1855, average rain-

Fig. 13.2 Coffee planted in rows up the hill (Escravos na colheita de café Vale do Paraíba, Marc Ferrez 1882)

fall in Rio was almost 20% lower than 70 years before; average temperature had obviously accompanied it, increasing by almost 2 °C (Los Rios Filho 2000 [1946]).

"The climate of Rio has been very much modified by the clearing away of the forests in the neighborhood", noted George Gardner in 1836 (Gardner 1849, p. 9). According to this naturalist, deforestation was seasonalizing the local climate: the summer was becoming increasingly dry. There were droughts in 1824, 1829, 1833, 1843, 1861 and 1868, with progressive increase in their severity. The last three episodes gained especially dramatic contours.

At this point, the water crisis was already unsustainable, even because the urban population kept growing. On the eve of the first great epidemic of yellow fever, occurred in 1850, the city had a population of not less than 250,000, an increase of more than 5% per year over the previous decade (DGE 1923). In this emergency situation, the imperial government decided to expropriate private land for reforestation. Consolidated in 1861, the reclaimed lands began to receive seedlings of native and exotic species, some of them grown in the Botanical Garden at the foot of the Carioca Ridge, to the south. Many seedlings were provided by the director himself of the reforestation program, Major Manuel Gomes Archer, who brought them from his farm in the western foothills of the Pedra Branca Massif. Until the early 1890s, almost 130,000 seedlings had been planted, covering an estimated area of 170 ha

(Atala 1966; Castro Maya 1967; Drummond 1996; Oliveira 2007). These plantations, which were called "Forests of Tijuca and Paineiras", can be considered the first protected area of Brazil (Medeiros 2006). Although the mature vegetation that had survived coffee expansion, in the higher and steeper areas, played a major role in the regeneration process, the Archer plantations were the seeds of what would officially become, in 1961, Tijuca National Park.

13.3.2 Introduction and Restoration: Reforestation Program and the Acclimatization of the Jackfruit

After being devastated for the commercial growth of an African species, Tijuca forest ecosystem was partially restored with the help of other exotics, among them the jackfruit (*Artocarpus heterophyllus* Lam.). Native to the region encompassing the south-southeast Asia and Oceania (Zerega et al. 2010), the jackfruit was part of an agricultural experimentation plan with which the Portuguese crown tried to recover its imperial economy, given the declining prices for sugar. Launched in 1680, the plan was to introduce in South America certain Asian species as complementary food source in its colonies, with potential market value in Europe. Capital of the once huge network of trading posts that the Portuguese kept in South and Southeast Asia, the Indian city of Goa was the mediator in the transfer of specimens and technical knowledge to Salvador, Bahia, which acted as local redistributor. As dehydrated seeds of jackfruit lose their ability to germinate within 60 days (Silva et al. 2007), the transfer had to be made by means of seedlings (in the sailboats of the time, the journey from Goa to Salvador never lasted less than 6 months). One of the first shipments came on the vessel São Francisco Xavier, which arrived in Salvador in 1683, bringing 35–40 seedlings, together with instructions for planting (Anthony 2013). Vilhena reports that were mostly the poor who fed on *jacas*[1], "for it is sold in portions that they can buy, in the proportion of the money they have" (Vilhena 1969, p. 711). In addition to feeding the less affluent, the tree had a wood of interesting properties for shipbuilding. As it is not oxidized in contact with metals, jackfruit timber was suitable for the manufacture of the curved pieces that made up the skeleton of the vessels (Hutter 2005).

But the species became popular essentially as a yard and garden tree. In addition to being visually graceful, it served as a windbreak (Pio Correa 1969). The jackfruit became very common in *chácaras*, summer residences that rural nobles and wealthy merchants kept on the outskirts of major cities. A century and a half after being introduced, Charles Darwin was able to observe how the species had mastered the peri-urban scene, in the northeast. In 1832, the naturalist noted in his diary that the landscape on the suburbs of Salvador "almost takes its character" from the jackfruit and mango trees (Darwin 1909, p. 42).

[1] Portuguese word for the jackfruit.

From Salvador, the jackfruit spread to the rest of the Atlantic Forest biome, both north and south. This continental sprawl was easier, as it could be done with seeds and even by vegetative means, using branches previously treated with wet mud, wrapped in cloth and periodically watered (Weech 1992 [1828]). The environmental adaptation was so perfect that people of the time, without the current concern with the "indigeneity" of species, treated the jackfruit as an equally Brazilian and Asian tree. Late eighteenth century dictionaries, like that of Moraes Silva, mark in the entry "Jaca" that it is an "Asian and Brazilian fruit", without distinction (Moraes Silva 1789, p. 740). According to Pio Correa (1969, p. 439), there were botanists who went so far as to classify it as *Artocarpus brasiliensis*.

It is not known when exactly the jackfruit was introduced in Rio de Janeiro, but there is strong evidence indicating that it happened around 1780. None of the eighteenth century reports included in the collections organized by Jean Marcel França (1999, 2000) mention the species. Without citing their sources, Chaves et al. (1967 *apud* Abreu and Rodrigues 2010) claim that in 1803 the city had already a few "naturalized" individuals – which is plausible. Bernardino Antonio Gomes (1812), in the first direct account of the local existence of jackfruit, describes the anatomy of the jackfruit based on a tree that was growing in Rio. "Blooms in July and August, in the city's *chácaras*" wrote Gomes, "where it is grown and is still rare; it is trivial in Bahia, where I could not verify whether it is indigenous" (Gomes 1812, p. 89).

As already mentioned, Gomes Archer, director of the reforestation program of the Tijuca massif, provided himself many seedlings of jackfruit. Fond of botany, he used to cultivate various native and exotic species on their property, located at the foot of Cabuçu Hill, a western spur of Pedra Branca Massif. Years after Archer's death, environmentalist Armando Magalhães Corrêa visited his farm, where he found many species also found in Tijuca, among them jackfruit (Corrêa 1936). Another source of genetic material was probably the Botanical Garden, an institution created by the Prince Regent in 1808 with the mission to acclimatize exotic species potentially useful to the country. In 1809, the first jackfruit seedlings were planted; they came from Mauritius Island, French colony in the southern Indian Ocean. Arrested by the French, the Portuguese merchant Luís Vieira de Abreu e Silva took the opportunity to get various seedlings and seeds from the Pamplemousses Botanical Garden in the north of the island; once released, he came to Rio and donated the material to the Prince Regent, who ordered it to be planted in the newly created Botanical Garden (Araújo and Silva 2010).

The list of species chosen by Archer indicates that he was not willing to wait for the "normal" process of secondary succession (Drummond 1996). If, on the one hand, he used many native species typical of mature forest, he sought, on the other hand, to help this colonization with other species that did not bother too much sun and grew fast in gap conditions, especially exotic ones such as eucalyptus and jackfruit. Archer may have noticed that, compared to most native species, jackfruit seedlings better tolerate desiccation, which would help them colonize the devastated slopes (Fontes 2013). In fact, in its native habitat, jackfruit trees had to deal with a seasonally dry monsoon climate.

Reforestation was paying off. According to the last report that Archer wrote, in 1874, "[all] stream headwaters covered with trees have released more water or

remained at a stable level [as compared to the period before 1862]" (*apud* Drummond 1996, p. 95). Although it had lost much of its original purpose, reforestation had already substantially transformed the hydro-ecology of Tijuca. The slopes were no longer naked, and the jackfruit trees were probably bearing fruit.

With the progressive normalization of rainfall, constant throughout the year, fruiting became continuous and asynchronous (cf. Abreu and Rodrigues 2010). With a barochoric dispersion syndrome, jackfruits of 40, 50, 60 kg would roll downhill, especially along drainage axes, contributing to its dispersion from their initial planting locations. It was the first time that the jackfruit reached the mountains. Until then, it had been planted on the plains and small hills (like that one depicted in B. Mary's picture). This change in altitude enhanced the barochoric dispersion syndrome. But this was not the only way jackfruit engaged the local environment. Throughout its residence in Tijuca, jackfruit trees have been visited by several species of animals in search of food, including exotics.

It is currently not possible to know whether the jackfruit has become an invasive or an opportunistic species in Tijuca. For this we would need long-term phytosociological monitoring records, the kind of data which obviously does not exist, even because the concern about biodiversity is very recent. In general, the spread of exotics was not a problem for nineteenth and early-twentieth century managers. In addition, some of these managers tended to view the protected areas essentially as places of recreation and aesthetic appreciation and did not pay much attention to conservation questions. This was the case of Gaston Louis Escragnolle, a high-patent military and influential courtier who replaced Archer as director of the forest reserve in 1874. While continuing the forestry work, his main concern was to beautifying the area. With the help of the French landscaper Auguste François Glaziou, Escragnolle turned the forests of Tijuca into a true promenade: he built bridges, panels, alleys, gazebos and various other implements appropriate for a "aristocratic English park" (Taunay 1921, p. 110).

This kind of administration and conception of the Tijuca forest lasted a long time, at least until the official creation of the National Park in 1961. It was only at the end of this decade that began the first conservation biology management program, a project for local wildlife restoration (Freitas et al. 2006). Although all had started with plants, scholars and practitioners of the local flora were slow to incorporate a concern with active management, especially of exotics. In a broad floristic survey published in 1979, for example, jackfruit is erroneously described as occurring "in almost the entire park" without any further comment to its distribution (Santos 1979, p. 73). The fact is that jackfruit has increased its population without any kind of human control for almost a century and a half. The effective management began only at the end of the twentieth century, when the foresters Henrique Guerreiro and Luiz Fernando Silva started a project for the "restoration of native vegetation by reducing the species *Artocarpus heterophyllus*". Between 2000 and 2005, the technicians cut 1571 trees and barkringing another 813, besides uprooting almost 40,000 shoots (Guerreiro and Silva 2005).

However, the invasiveness of jackfruit has not been proven to occur in the Tijuca forest to the lack of any monitoring effort to document local biodiversity displace-

ment. It could have simply occupied previously cleared areas, rendering it more opportunistic rather than invasive. Furthermore, this species has a long history of human usage and value, being incorporated in the early restoration project of the Tijuca forest, and being used as important food source by past slave populations and current favela communities. It is very likely that the tracts of forest dominated by this species offer important ecosystem services such a soil erosion contention, and enhancing hydrological functionality of the landscape. Not to mention the fact that it serves as resource for many animal species.

13.3.3 Charcoal Manufacture on the Slopes of Pedra Branca

There was a great demand for charcoal in civil construction, especially stonework, as all tools were sharpened in charcoal-fed forges. Additionally, charcoal was consumed for domestic and industrial uses, for powering locomotives, and in numerous shops that fashioned metal tools and other utilitarian and decorative objects made from European iron ingots. These forges consumed great quantities of charcoal – the principal energy source for the growing city of Rio de Janeiro in the nineteenth century and the only material available for the country's iron production until the late twentieth century. Therefore, clear and direct links exist among energy use, the Atlantic Forest, and charcoal makers.

Slavery was abolished in Brazil on May 13, 1888, immediately creating a mass of miserable, unemployed, and under-educated ex-slaves without any skilled professional capacities. Charcoal production represented an activity that allowed them relative economic independence. This activity was a natural labor option, as most ex-slaves – those who purchased their freedom, were liberated by the Catholic Church, or were finally freed through the abolition statutes – were deprived of the regular subsistence that their owners had provided and had to (more or less suddenly) independently sustain themselves and their families (Schwartz 2001). Without land or access to normal production means, ex-slaves regarded making charcoal as the most obvious alternative activity among very limited possibilities. Charcoal makers spread into uninhabited areas throughout the mountains surrounding Rio de Janeiro, as this activity required little more than an axe and a hoe (Fig. 13.3).

Our research in the forests surrounding the Pedra Branca Massif indicated the existence of numerous ruins of charcoal makers' houses and former charcoal kiln sites (Fraga and Oliveira 2012). Presently it was verified the existence of 81 ruins and 1035 abandoned charcoal kiln sites in what is now dense forest. Despite extensive clear-cutting by charcoal makers and woodcutters, the forests slowly returned after the exploitative use of these regions ended. Presently, kilns and ruins are covered by a dense secondary forest and are almost unrecognizable. Despite its very intensive past usage, the forest landscape has almost completely recovered through ecological succession. Nevertheless, these historic ruins' spatial patterns testify to ex-slaves' intense use and occupation of the mountain landscape. Charcoal kilns were found at altitudes of up to 890 m above sea level, and these charcoal makers'

Fig. 13.3 A charcoal kiln in the forest (Percy Lau Source: Conselho Nacional de Geografia, Tipos e aspectos do Brasil (Rio de Janeiro: IBGE, 1966): 234:237)

homestead ruins were likewise encountered far away from the sugarcane plantations in neighboring lowlands.

The forest landscape reflects an additional element of this ancestral relationship, manifested through its floristic structure and composition. Despite the forest's recovery through ecological succession processes after the abandonment of these economic activities, the ecosystems still show marks of their historical occupation. The presence of exotic species used in Afro-Brazilian rituals, such as comigo-ninguém-pode (*Dieffenbachia seguine* (Jacq.) Schott.), espada-de-são-jorge (*Sansevieria trifasciata* Hort. ex Prain), abre-caminho (*Lygodium volubile* Sw.), and pau-d'água (*Dracaena fragrans* (L.) Ker Gawl.), marks the ecosystem in this way. There are also a number of exotic fruit species, such as abacate (*Persea amerincana* (Mill.), and laranja-da-terra» (*Citrus aurantium* L.), peppered throughout the Atlantic Forest of the Pedra Branca Massif, as well as a number of utilitarian plants, such as gourds (*Crescentia cujete* L.) that can be used as bowls and common bamboo (*Bambusa tuldoides* Munro) that can be used to make baskets and sieves.

Although charcoal production was more intense in the Pedra Branca Massif, most recent studies (Solórzano unpublished data) have found forty charcoal kiln sites just in the Carioca Ridge south facing slopes of the Tijuca Massif. What is noticeable about this evidence is that most of the jackfruit populations found in this area has a high spatial overlap with these charcoal production sites. This is furthermore another indication of the link of jackfruit with previously used and occupied sites. It is very

likely that in this case the charcoal producers consumed jackfruit in their work place and left its remains to germinate and occupy these managed forests tracts.

Charcoal makers benefited very little from their labors, while others benefited greatly from what they produced. These people were, and still are, essentially invisible from a social perspective. The only historical «documentation» they left behind are features that can still be recognized in the landscape, a landscape now transformed into a beautiful park in a dense forest that holds a rich but forgotten history of injustice and inequality.

13.4 Concluding Remarks

Most local inhabitants would be surprised to learn that Tijuca forests have life stories as stirred as their own, and with so much human participation. Most of those who actually know Tijuca was reforested think, however, that this process was entirely "artificial", a direct and exclusive result of human endeavor. However, the truth is that only a tiny part of the Massif was replanted, less than 200 ha, or 5 % of the current park area. While this effort has not been small or irrelevant – quite the contrary – is part of the environmental historian's craft to highlight the role of non-human forces in the reforestation of the Tijuca slopes. More important, perhaps, than the tree planting itself, was the discontinuation of farming, especially coffee plantations. This is what really allowed ecological succession, probably with seeds "sent" by the remnants of mature forest, through animal dispersers. The introduction of the jackfruit, although at first a conscious policy, was engulfed by the local dynamics of life, which always eludes human design.

If the history of Tijuca is little known by the locals, the history of Pedra Branca is simply nonexistent. Farther away from the early city, its ecological life has always been kind of invisible to the inhabitants of Rio. Part of the city's hinterland the Jacarepagua plain was, from the beginning of the Portuguese rule, occupied by pastures and sugar plantations worked by slaves. Sugar mills were installed on the Pedra Branca foothills, taking advantage of the power of the rivers descending towards Lagoa da Tijuca and the wood fuel from the hillside forests. The slaves fleeing these farms had a close shelter in the mountains. These *quilombos* were probably the germ of the black communities who throughout the nineteenth and early twentieth century made a living making charcoal for sale in the city. Changes in urban energy matrix, along with greater state control – which culminated in the official protection of the entire area of the Massif in 1974 – put an end in charcoal production, leading to spontaneous plant recolonization.

An important factor in understanding, at least in part, the different environmental histories of Tijuca and Pedra Branca is the geographic relation of distance of these forests to city's core area. The Tijuca massif, being adjacent to the city's core area, was first sought out for the demand of natural resources. Once resources of the Tijuca forests where depleted and coffee replaced native vegetation, hydrological functionality was lost, directly affecting an important ecosystem service: water. On

the other hand the Pedra Branca massif remained until mid-twentieth century as hinterland being further away from the central economy and dethatched from international markets. This physical distance, established a socio-spacial gap that was appropriated by the local ex-slave and *quilombola* populations. Thus Pedra Branca was kept as a natural resource reserve, feeding the growing city with a flux of energy and matter in the form of charcoal.

Environmental historians have an important job to do in the society-nature relationship debate and should contribute on discussion of urban forest management, such as the landscapes of Tijuca and Pedra Branca. The use of emerging concepts, such as novel ecosystems, and an interdisciplinary framework, such as the integrated approach of socioecological systems, should be historically contextualized by environmental historians through examples of these coupled human-environment interactions in different historical periods and in different special scales. This approach would shed some important light on the complexities of contemporary socioecological systems, and challenges of the modern environmental crisis. Although nothing restricts or discourages a more technical/pragmatic action – participating in environmental impact assessment teams, taking part in the formulation of public policies – perhaps their most important contribution is to expand the range of ways of thinking and acting available to our fellow citizens, including the hard scientists (Cabral 2014). To the consternation of management authorities, environmental historians offer accounts of fluid, highly dynamic landscapes – and worst, unpredictably responsive to human actions. While this kind of material may seem useless to the personnel involved in the daily hard-work life of a national park, the social construction of protected areas must be grounded in a broad public debate that goes beyond technical decisions and reach the very meaning of "protection" and of *what* should be protected. Are our protection efforts valid only when the targets are "virgin", "wild", "pristine"? Isn't it also justifiable, after all, to protect the legacies of our past efforts, no matter how clumsy and myopic, to better adapt to local ecologies? It is with these legacies, full of vicissitude and "stochasticity", we have to deal in the present – the heritage of a promiscuous life in the heart of the earth.

While it obviously constitutes a complex socioecological system the city is far from a desert to other forms of life; deliberately or not, it creates a variety of environments that are attractive to other creatures (Drew 1983), many of which end up becoming very important for human residents. In fact, the city should be reconceptualized as a hub of relationships, a "place" where different beings-in-flux meet, mingle and change. Locally attracted by particular environmental settings and cultural-historical demands, the foundation and development of a city spatially focuses the human utilization of the earth and its resources, creating niches, extinguishing and introducing species, transforming native ecosystems. However, it is not about "humanizing" or "culturalizing" wild environments – in the sense of a total dominance of intentionality and technology – but of inscribing humans into the local, regional and global histories of the biosphere.

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Part IV
Conscience of Loss and Improving – Present Awareness of How We Have Arrived Where We Are, Undoing Inappropriate Territorial Policies With Environmental Impact

Chapter 14
Regulating the Environment of the River Tyne's Estuary, 1530–1800

Leona Jayne Skelton

Abstract Between 1530 and 1800, the River Tyne and its tributaries, known as 'creeks' or 'rivulets', were utilised for their strategic facilities and commercial benefits: as vast drains for paper mills, glassworks, breweries, collieries and tanneries; as a source of fluvial power to turn mill wheels; as a liquid highway for shipping imports and exports; and as productive fisheries. The regulators of the river estuary, the mayor and burgesses of Newcastle, were confirmed as 'conservators' by an Act of Parliament in 1530, with a jurisdiction between Sparrow-Hawk and Hedwin Streams, marking the Tyne's estuary. It is true that Newcastle Corporation would certainly not win a conservation prize for sensitive river management today, but what this paper argues is that nor were they by any means completely ignorant towards protecting the Tyne from 'harm', as they defined it, to the best of their knowledge. The stereotypical image of early modern people pouring their waste into the river without any consideration of the consequences of their actions is an enduring but an inaccurate one, as the extant documents demonstrate amply. The disposal of solid human, agricultural and industrial waste was highly regulated, especially on riparian property and even more so on wharves or jetties. Open sewers were designed to carry only rainwater and small amounts of liquid waste to the river and the majority of households used dry privy pits and sold agricultural manure and solid human waste to local farmers as fertiliser.

This topic is currently under-researched, and consequently misunderstood, almost certainly as a result of its explicitly unsavoury connotations and perceived repulsive details, particularly in relation to waste-disposal. There are some excellent environmental river histories, White's *The Organic Machine*, Pritchard's *Confluence*, Barca's *Enclosing Water*, and Cioc's *The Rhine: An Eco-Biography*, to name a few, but none of their start dates precede 1796. Only Smout and Stewart's *The Firth of Forth: An Environmental History*, published in 2012, tackles environmental attitudes towards a British river in the pre-modern period in two of its eleven chapters. There is a lamentable gap in the literature in the shape of in-depth environmental histories of rivers in the pre-modern period.

The men who managed the River Tyne's estuary in the pre-modern period did not understand the chemical changes they caused by permitting urban sewers and ripar-

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ian businesses to discharge their untreated liquid waste into the river water. But they considered in breath taking detail and depth the consequences of each and every structural change to the bed and channel of the river and they expressly forbade the deposition of any solid waste into the river, either directly or indirectly, something which required substantial and sustained effort to regulate. Their motivations were not environmental. But although Newcastle Corporation was driven primarily to prevent the choking up of their great liquid highway that was crucial to trade and their revenues, they did think carefully about the proposals they sanctioned and they were concerned about the impact of human activity on the River Tyne in a pre-modern context.

Using the detailed minutes of Newcastle's weekly River Court (extant from 1644 to 1834), and the twenty-one river by-laws it enforced, the paper reveals early modern attitudes towards river management and protection. Their systems were basic, their technology rudimentary, and their understanding of river systems was in its infancy, but this is precisely why they acted with so much enthusiasm to protect the river; they were explicitly aware that they could only reverse such damage very slowly and inefficiently, using shovels powered by the labour of keelmen. The paper concludes that the Tyne's pre-modern conservators were in touch with their environment, they were concerned about hurting the river, damaging the river, spoiling the river, and even potentially destroying the river, all their own words, and they went to considerable lengths to protect the River Tyne as a result of their concerns.

14.1 Introduction

Understanding early modern attitudes towards the natural resources, systems and landscapes which framed and interwove their way through people's lives, livelihoods and communities and the values which they attached to them is challenging, but not impossible. Superficial semantic searches for words such as 'environment', 'pollution' and 'sustainability', which were not used before 1800, and for words such as 'conservation' and 'nature', which were used in different historical contexts – in documents such as travel literature, poetry, religious texts, elite correspondence, diaries and charters – will never facilitate deep analysis. As Fiona Watson (1997) explains, with regard to Scottish woodland management, those who consider pre-modern environmental history in the context of 'professionalism in the modern world perhaps have a tendency to regard the effectiveness of such [pre-modern] amateurs, however gifted, as limited'. Watson (1997) warns historians to be 'very wary of transporting such values to the early modern world', highlighting that early modern people, faced with having to 'stay and face the consequences of their inefficiency' were highly driven to work with, rather than to plunder, their environment. There are no specific nature essays, written by the men who managed British rivers in the early modern period, describing explicitly their attitudes towards and valuation of river systems and regarding the risks, benefits and adverse effects of altering

such systems in order to boost the efficiency of trade, industry and profit. As Barbara Hanawalt and Lisa Kiser (2008) observe, 'for many writing in these early periods, "nature" was arguably not even a discursive category; it simply went without saying'. Keith Thomas (1984) explained the developing relationship between human societies and the natural world between 1500 and 1800, concluding that there was a move from 'exploitation' increasingly towards 'stewardship'. The *Oxford English Dictionary* provides two distinct definitions of the word 'conservation': 'the action of keeping from harm, decay, loss or waste' or the 'official charge and care of rivers, sewers, forests etc'. In the early modern period, 'conservation' pointed more so, but not exclusively, to the latter definition. Motivations were not environmental in modern-day terms, but the basic spirit of environmentalism was certainly there well before 1800, albeit *avant la lettre*. Joel Kaye (2008) argued that although between 1250 and 1350 the precise 'phrase and the concept' of a balance of nature was unknown, 'the sense conveyed by the phrase balance of nature was very much alive and active in scientific speculation'. From the earliest pre-Socratic speculations right through to the present day, Kaye (2008) elaborates, 'where there is science one almost always finds at the least the assumption of a continuous and ordered (often cyclical) process of reciprocal interchange along with the recognition of an overarching conservation in the system of nature'. Underlining Kaye's argument, Watson (1997) found 'little evidence' to suggest that contemporaries 'regarded timber as a resource to be plundered at will'.

Environmental history has been largely pre-occupied with industrial and post-industrial case studies, primarily as a result of the larger scale of environmental damage and overuse of natural resources after 1800, and even more so after 1880 (Mosley 2001; Rome 1996). As John McNeill (2003) admitted, 'Pharaonic Egypt or Song China undeniably had policies toward the natural world, and disputes over the use of resources', but the 'systematic study of how states approached nature, how interest groups struggled over it, and how explicitly environmentalist organizations joined the fray is essentially confined to the era since 1880'. Early modern, and indeed all pre-modern, societies have at best been vastly under-researched and at worst have been completely ignored. As Sverker Sorlin and Paul Warde (2009) observe, 'there is a peculiar gap' between the 'relatively recent and limited discipline-based historiography and the omnipresence of nature and natural resources as fundamentals of human societies that goes back to the very roots of human existence'. Consequently, the relationships between pre-modern societies and their environments are currently misunderstood. As Martin Schmid (2014) highlights, "we speak of 'regulated' or 'systematically trained' rivers from the early nineteenth century, but many rivers in Europe were by no means unregulated before that time". Despite the undeniable qualitative differences between 'the regulations of the sixteenth century and the work of a Tulla on the Rhine in the nineteenth century', Schmid (2014) elaborates, describing early modern European rivers as "'largely unregulated' or even 'natural' rivers" is unjustified. Although the scale of early modern industrial development should not be played down, as it has hitherto been, neither should the fact that its scale was significantly smaller be ignored or denied. Pierre-Claude Reynard (2002) encourages environmental historians to fol-

low his lead in demonstrating that 'early modern concerns about industrial effluents were not marginal or nascent, haphazard or weak' but rather they were 'full-fledged and central to the preoccupations of those who thought about a liveable environment and acted to defend it'. As a result of future research into early modern environmental regulation, in particular, Reynard (2002) believes that 'a solid core' of continuities will be revealed which connect pre-modern environmental attitudes with modern-day environmental impact assessments. William Cavert (2014), seeking to address the 'vast gulf' separating the pre-modern and modern worlds, has revealed that, between 1624 and 1640, Charles I deliberately excluded smoky industries from the area around his court in London to improve the quality of the air. Cavert (2014) concludes that 'it is misleading to claim, as many environmental historians have done, that air pollution specifically, and the pollution of natural and built environments more generally, are intrinsically modern problems and concepts, meaningless before large-scale industrialization'. Understanding the evolving relationship between human societies and the environment over a longer period of time, well before 1800, is an urgent and potentially fruitful task for environmental historians.

In embracing this worthy challenge, attention needs to be paid to the dovetailed and strong connections which link medieval, early modern and modern attitudes and values in relation to the environment, rather than developing mutually exclusive, pigeon-holed research within respective epochs, as has been the pronounced pattern in the development of many other sub-disciplines of history. Indeed, as Schmid (2014) comments, 'environmental historians should not take the epochal boundaries too seriously'. In relation to the environmental history of rivers, remarkable and insightful progress has been made in relation to the post-1800 period. Richard White (1995) led the way with *The Organic Machine* on the Columbia, followed by Cioc's (2002) *The Rhine*: *An Eco-Biography*, Matthew Evenden's (2004) *Fish* versus *Power* on the Fraser River, Stefania Barca's (2010) *Enclosing Water* on Italy's Liri, Sara Pritchard's (2011) *Confluence* on the French Rhône, Smout and Stewart's (2012) *The Firth of Forth* and Peter Coates' (2013) *A Story of Six Rivers*, to name the major contributions to the field; but only Smout and Stewart (2012) and Coates (2013) refer to the period preceding 1796. Of all of these contributors, only Smout and Stewart (2012) discuss the early modern period in any significant depth, in two of eleven chapters, but they focus almost exclusively on the regulation of commercial fishing rather than direct interactions between early modern society and the river's water, channel and bed. There are a few published articles (Ciriacono 2006; Appuhn 2006; Reynard 2002, 2003) which engage directly, and in some depth, with early modern rivers, in Venice, Holland and France, but the field lacks detailed monographs. This lamentable gap in pre-modern environmental river literature is merely part of an even wider gap in the shape of pre-modern environmental history as a whole, although there has been some remarkable progress by several productive early modernists in the field (Smout 2000; Hanawalt and Kiser 2008; Skelton 2014; Knoll and Reith 2014; Newell 1997; Reynard 2002, 2003; Coney 1992; Oram 2011; Warde 2009, 2011, 2013; Warde and Williamson 2014; Cavert 2014).

By far, the largest body of evidence delineating historical and cultural standards in relation to natural systems is national and local legislation and the associated court records which explain in detail how such legislation was enforced, challenged and modified over time (Watson 1997). This essay draws on the minutes of the River Tyne Court proceedings, extant from 1644, as well as national court depositions, petitions, a published book, council minutes and financial records, to provide a useful case study of how the people who lived around the River Tyne's estuarine environment between 1530 and 1800 interacted with the natural system of their river estuary. The members of Newcastle Corporation, as official 'conservators' of the river, had a duty to preserve the condition of the river. In an age when land transport was inherently difficult and slow, such conservation pertained largely to preventing the choking up of the great liquid highway which was crucial to trade and thereby the corporation's monopolistic revenues from shipping tolls. Smout (2000) highlights how those living on Scotland's eastern coast in the seventeenth and eighteenth centuries preferred to import the abundant pine of Ryfylke and Sunnhordland from Norway, which was only about 3 days' sail from the Firth of Forth, because it involved much lower transport costs than wood extracted from the Highlands. At this time, carrying coal over land doubled the commodity's price for every 2 miles travelled and shipping was the prime method of transport (Levine and Wrightson 1991). Newcastle Corporation did not understand the chemical changes they caused by permitting urban sewers and riparian businesses to discharge untreated liquid waste into the river water; but they considered in breath taking detail and depth the consequences of each and every structural change they sanctioned to the bed and channel of the river and the many applications they received to construct projections into it. Moreover, they expressly forbade the deposition of any solid waste or ballast into the river water, either directly or indirectly, something which required substantial and sustained effort to regulate.

In many respects, this chapter argues, their 'conservation' in practice often leaned at least somewhat towards a more modern definition of 'conservation'. Early modern attitudes and values in relation to the environment should be appreciated as part of the process of developing the character of more recent attitudes. Early modern societies created important political and legal frameworks within which they could and did purposely protect natural resources, systems and landscapes from harm, as they perceived it, before in-depth scientific experimentation confirmed exactly what could and could not damage natural systems in the long and short term. The popular ecology and environmental movement of the late 1960s and 1970s was unprecedented and it is rightly esteemed as an important landmark and turning point in British environmental history. It is also important to listen to the pre-modern and early modern voices which survive intact in archival documents, explaining a different relationship with the environment, in a very different context, on the shoulders of which current environmental attitudes at least partly stand. The form of this chapter is tripartite, discussing the need for regulation, the foundations and organisation of regulation and the manner and extent of regulation. It concludes that the Tyne's pre-modern conservators were in touch with their environment and its limita-

tions and potential abuse, and that the Tyne River Court was an efficient system of environmental regulation.

14.2 Sources of Environmental 'Harm' and the Need for Regulation

The misconception that it was only the relatively smaller scale of industrialisation during this period which limited environmental damage to negligible levels implies that, had the scale been larger, early modern societies would have damaged the environment much more seriously. But close analysis of the methods, character and extent of early modern environmental regulations suggests that this would not necessarily have been the case. An anachronistic misconception has developed that pre-modern societies did not pose a noteworthy threat to the environment. Therefore, it is further assumed, pre-modern societies developed neither the need nor the desire to regulate the human impact on the environment because they extracted resources and utilised natural systems on a negligible scale in comparison to a subsequently more industrialised epoch. This misconception should be challenged more vociferously by early modern environmental historians who are well aware of the already significantly large and increasing scale of industrialisation between 1500 and 1800 and the consequently necessary environmental regulation of the era.

Smout (1997) pushed the chronology of the human destruction of the Great Wood of Caledon back to well before the Romans arrival, from about 1700 BC, far earlier than is commonly believed. In a similar vein, far from a 'natural', undamaged environment, protected by the negligent scale of trade and industry, the River Tyne's early modern estuary increasingly resembled a hive of trade, industry and busy life activities, especially below the Tyne Bridge which connected Newcastle and Gateshead, acting as an impenetrable barrier to large sailing ships (Wright 2014). William Ellis (1651) proudly emphasised the large scale and consequently national importance of Newcastle's coal exports by comparing it to Peru: 'England's a perfect world! Has Indies too!/Correct your maps: Newcastle is Peru'. The Tyne and its tributaries, known as 'creeks' or 'rivulets', were utilised for their strategic facilities and commercial benefits: as vast sinks for liquid waste drained from mills, glassworks, breweries, collieries and tanneries; as a source of fluvial power to turn mill wheels; as a liquid highway for shipping imports and exports; and as profitable fisheries (Clavering and Rounding 1995). John Nef (1932) conjures up a well-informed, albeit imaginative, picture, demonstrating the need for environmental regulation:

> Picture the mouth of the muddy, narrow River Tyne, jammed with four or five hundred keels and two or three hundred ships … think of the hilly slopes to the north and south covered with hundreds of small carts and wagons, leaving behind them trails of black refuse on the green countryside; and then think of a time when this same countryside was at rest … when the only evidence of the coal industry was a few pits at the water's edge … In this compari-

> son you have … a view of the change wrought around the town of Newcastle in the century following the accession of Elizabeth. [i.e. 1558]

The drive to install infrastructure into the estuary's bed and channel, to facilitate the more efficient transfer of coal from the river banks into keels or colliers for export, had to be kept in check. In 1621, the largest Tyne Island near Elswick, King's Meadow, was a Crown possession 'demised by a custody lease' to Sir George Moore for 40 years in 'some good hope that coals may be gained in the foresaid meadowe whereby a profit may be raised to the Crowne' (Exchequer 1621). In the context of the increasing drive to extract ever more coal, Newcastle Corporation could, and sometimes did, order the demolition of constructions which they felt posed a threat to the river. Between 1679 and 1680, for example, Newcastle Corporation fought the south bank's owners, Durham's Dean and Chapter, which governed Durham as a County Palatinate, through Charles II's Exchequer Court to successfully prevent the construction of a large coal staith and ballast shore at Jarrow Slakes, land which they believed was not sufficiently firm to support the structures (Exchequer 1679–1680). According to one witness in the case, Arthur Elliot, a Newcastle Waterman of 83 years who could remember the river 'since infancy',

> several of the river jury … were sent down by the mayor and burgesses to search view and try whether the ground … were firme ground and whether the same might be built without prejudice or damage to the river and to that purpose the said jury did take & carry with them … instruments wherewith to search the ground. (Exchequer 1679–1680)

In 1695, Hugh Liddle, a 62 year old waterman of Hebburn on the south bank recalled having 'tried the said place called Jarrow slake with a long poll of fower fathome length and the s[ai]d poll sunk in the s[ai]d ground called Jarrow slake soe deep that … [he] could not recover the same but lost the said poll in the Jarrow Slake' (Exchequer 1695–1696). The Corporation won the case; clearly, Jarrow Slake was unsuitable for development. The Tyne estuary needed to be regulated in order to protect such sites from inappropriate, fiscally-motivated and indeed dangerous overdevelopment.

It is important to analyse closely how the Victorian industrialists' ancestors perceived and protected the environment. Robert MacFarlane (2003) explains, in his history of attitudes towards mountains, 'each of us is in fact heir to a complex and largely invisible dynasty of feelings: we see through the eyes of innumerable and anonymous predecessors'. This, too, can be applied to attitudes towards the environment, conservation and sustainability, misconceived by many as a modern invention. As Ronald Zupko and Robert Laures (1996) warn, it is misleading to perceive 'environmental awareness' as a completely modern movement, 'arising out of the tumult of a half-century of war and depression like some Venus given birth in the crashing surf of a Mediterranean shore'. Sixteenth-century concerns were, of course, born out of medieval concerns which had developed in similar veins. Richard Hoffmann (2008) 'seeks to encourage medievalists to think about the interactions between medieval society and its natural environment and to explore the ecological connections which shaped those changes', and he is keen to restore 'lost agency to

natural systems which some, though not all, medievalists have tended to describe passively as objects of human action' (Hoffmann 2010; Hoffman and Winiwarter 2010; Zupko and Laures 1996; Rawcliffe 2013). One article (White 1967) attributed in the long term the twentieth-century conservation crisis to medieval societies for having forged such deep anthropocentric religious beliefs, which led them to feel entitled to overuse natural resources.

Despite the relatively rudimentary and limited nature of available technologies, motivation to alter the Tyne's channel and to construct projections into it, in order to facilitate and boost industry, trade and profit, was high. In 1695, the abovementioned Hugh Liddle recalled that an angular rock projection, Bill Point, 'was cut at the charge of … [Newcastle Corporation] aboute fowerteene yeares agoe [i.e. 1681] and that the s[ai]d river was made more navigable and deeper in that place by that charge' (Exchequer 1695–1696). Such structural changes at the hands of the river's conservators were relatively rare, but they did occur. Several Newcastle salt-makers petitioned Parliament in 1655, complaining about heavy expenditure incurred by altering and preparing the channel for salt production and export originally, and subsequently spending 1000 pounds to replace their wharfs which were destroyed by Royalists in the British Civil Wars:

> Considering the great charge, cost and pains bestowed and disbursed before that Manufacture [i.e. saltmaking] could be brought to perfection; as first, out of a waste and rockie piece of ground adjoyning upon the River of Tyne, in taking up the said rocks and stones, and in building wharfs and staiths along the said river, and after in placing salt pans thereupon; the removing of which rocks hath made the river thereabouts far better navigable than before, though with great charge to them. (Anon 1655)

Salt and coal were big business on the Tyne's riverbanks (Ellis 1980). By 1652, Richard Hutchinson pleaded to the Court of Chancery that unless he was granted the continued 'wayleave and liberty for leading of coles with waines waggons [and] horses of the carriages' to staiths on the river's north bank for export near Monkseaton and also to 'certaine salt pans at north sheles', that he would have to 'deprive many hundreds of people set on worke in digging sinking and trading of the said coles & in making of salt of there meanes of subsistance' (Chancery 1652). The first glass works were founded by Admiral Sir Robert Mansell in 1619 at a site to the east of the Ouseburn tributary on the north bank (Campbell 1969). By 1736, there were six substantial glass works, developed by the Henzells and the Tyzacks, stretching from the Ouseburn to St Peter's downriver, all using readily available ballast sand as well as significant quantities of mud from Jarrow Slakes on the south bank, which contained sand, limestone and salt in desirable proportions (Campbell 1969; Ridley 1962). Soap works were also developed on the banks of the Tyne estuary from at least 1712, and potentially much earlier (Campbell 1969). John Warburton established the first pottery in Pandon Dene around 1730, and many more were established throughout the eighteenth century (Linsley2000a).

Dams and weirs were popular as means of facilitating fishing and water power for manufacture. In 1599, there was a 'weir or dam across the River of Tyne, commonly called Bywell Dam' which increased the yields from fishing rights between Bywell and 'Hovingham [i.e. Ovingham] Burn' (Exchequer 1599). And, between

1583 and 1603, a 'p[ar]cel of a fishing in the water of Tyne' was leased in Queen Elizabeth I's manor of Tynemouth (Chancery 1583–1603). There was also a substantial salmon fishery leased by the Crown to William Liddell at Newburn for four pounds annually, described in 1649 as 'all that the Salmon fishing had gained … and caught by nett or otherwise out of … the River of Tyne … knowne by the name of Crooke fishing' (Exhequer 1649). Derwenthaugh Dam, situated above the tributary River Derwent's tidal limit, was constructed in the eighteenth century to power a brewery, paper mill and engineering workshops. And in August 1702, Jeremiah Hunter was ordered by the river court to remove within 1 month the 'damme or sluce att Boggell hole' recently constructed which 'damnifies the river' (Tyne River Court 1695–1755). Another presentment in July 1723 details how Charles Montague, Esquire,

> had sunk some old keels and made a Rise and Stake hedge and casten great quantities of ballast into the hedge and on the sand there above the island called the [Dunston] Batts & seemed to be joyning the same to the King's Meadows [island] & thereby altered the course of the river which is a great nuzance and incroachment on the liberties of the river and may tend to the great prejudice not only of the river but to the creeks of the river. (Tyne River Court 1695–1755)

In the context of substantial and growing riparian industries, environmental regulation to protect the natural functions of the river estuary was essential.

The eight-mile route upriver from Tynemouth to Newcastle was complex, often requiring a Newcastle Trinity House pilot to deliver ships safely to the monopolistic port of Newcastle, in return for a fee, past shoals, angular rock projections, sunken and wrecked ships awaiting removal and sand bars. One might assume that steam ships motivated a heightened desire to maintain a wide river, but sail ships required even greater room for error than their steam-powered descendants. By 1700, almost half of England's coal came from Northumberland and Durham (Levine and Wrightson 1991). In only 3 months of 1699, 250 ships exported coal from the Tyne and many others transported salt, lead, cinders, fish, corn, glass, iron, tallow, tobacco, nails, wool and stores (Linsley 2000a, b). Of the 268 ships which arrived in the Tyne during those 6 months, 232 were carrying only ballast (Linsley 2000a, b). Consequently, huge quantities of ballast, in the form of sand or gravel, usually extracted from the Norfolk coast, Kings Lynn and the Wash (Linsley 2000a, b), were used to weigh down the plethora of coal-carrying colliers on their return journeys from London and the Baltic back to the Tyne. Stage masters of several official ballast shores unloaded ballast for a fee paid to Newcastle Corporation, so ship masters were fiscally motivated to dump their ballast directly into the river. Maintaining a sufficiently deep and wide channel to facilitate the constant reception and dispatching of large sail ships 8 miles inland was a high priority with a huge economic value. As Watson (1997) observes, 'the care taken' in woodland management was 'very much dependent on the commercial value placed on the trees themselves'. Similarly, the motivation for regulating the disposal of ballast into the Tyne's estuary was commensurate with its high economic and commercial value; rigorous regulation directly underpinned income from shipping tolls. That technology was relatively rudimentary and engineers' comprehension of river systems was

in its infancy is precisely why regulation was essential. The corporation was only too aware that they could only reverse a severe reduction in the depth and width of the river very slowly and inefficiently, using shovels powered by the labour of keelmen. Therefore the Tyne's early modern conservators were perhaps significantly more motivated to protect the river from damage through waste disposal than their post-1800 descendants, who managed the river safely in the knowledge that they possessed the requisite technology, in the form of steam-powered dredgers, to reverse significant reductions in the river water's depth.

In relation to domestic waste disposal, it is much more important to appreciate the manner of the methods and processes which were employed in their own right rather than merely the scale of the waste produced. Before the mass dissemination of the technology of water closets from the late-nineteenth century, solid waste was shovelled out of stables and dry privy pits, heaped into middens and either carted away to be sold to local farmers or collected from wharves and jetties and rowed away on keels or wherries to be dumped in the North Sea or loaded onto larger ships in the mouth of the river. A small proportion of riparian domestic and industrial middens was washed into the river, either as a result of their wilful placement below the water mark or accidentally. However, early modern Tynesiders certainly disposed of a far smaller proportion of their oxygen-hungry organic waste into the river than that of their descendants as late as the 1970s, still flushing untreated waste from their near-universal water closets via over 270 sewers directly into the Tyne. Early modern open sewers were designed to carry rainwater and small amounts of liquid waste to the river, and no solid waste. In this case, the scale of waste produced becomes far less relevant and indeed incomparable because the style and manner of the process itself was so different before and after 1800. The pre-1800 method of waste disposal could not have functioned without rigorous and effective environmental regulation and frequent inspections of the riverbanks.

The use of the estuary for water supply provides yet another large motivating factor for rigorous environmental regulation of the estuary. As Smout (2000) argues, in relation to northern England and Scotland, when river water was commonly used as drinking water, before the construction of large-scale upland reservoirs provided preferable supplies, ensuring the cleanliness of river water, as far as technology and resources allowed, was a serious priority in local government. Similarly stringent enforcement of local bylaws designed to protect the purity of river water supplies can be seen in the legal records of sixteenth- and seventeenth-century Inverness, Darlington, Berwick upon Tweed and Stirling (Skelton 2015). As Smout (2000) elaborates, it was only after towns stopped relying on rivers for their water supply that industries and municipalities then 'felt free to pour greatly increased quantities of foul water into the rivers without giving the consequences much thought', by which time the 'convenience' of having 'a river in which to dump waste quickly outweighed complaints'. This is certainly born out in relation to the Tyne, where the disposal of liquid and solid untreated industrial and domestic waste into the Tyne increased significantly after the Newcastle and Gateshead Water Company constructed several upland reservoirs from 1845 onwards (Rennison 1979). By the late 1600s and throughout the eighteenth century, water was drawn directly from the

River Tyne, using the Crowley Water works at Winlaton and the Hawks works at Gateshead (Rennison 1979). In 1680, Cuthbert Dykes installed an engine to draw water directly from the Tyne at Sandgate, Newcastle (Archer 2000). Protecting the river from unlimited corruption through domestic and industrial waste was a logical and obvious priority when water supplies were abstracted directly from the river. For many crucially important reasons, the motivation to regulate the environment of the River Tyne's estuary throughout the period 1530–1800 remained consistently high.

14.3 The Legal and Administrative Foundations of Regulation

After having fought against the Bishops of Durham for the conservatorship of the Tyne estuary throughout the fourteenth century, the mayor and burgesses of Newcastle were confirmed officially as conservators by an Act of Parliament in 1530, at the height of the Reformation when King Henry VIII favoured town over clerical government. This Act gave the corporation the authority on behalf of the Crown to pull down all wears, gores and engines in the river Tyne, between Sparrow-Hawk and Hedwin Streams, which marked the Tyne's estuary. Subsequently, several successive Acts reconfirmed their conservancy. Newcastle's Trinity House was established in 1505 and it managed the weighing and retrieval of sunken ships, the provision of pilots to escort ships from Tynemouth to Newcastle, poor payments and hospitality for aged mariners and pilots and the maintenance of buoys and eventually leading lights to guide ships, but it did not regulate the river. Though they worked closely with Newcastle Corporation on overlapping areas of river management, such as the production of river surveys, and its representatives sometimes reported encroachments which they noticed on the river, Trinity House were not Tyne conservators.

The sixteenth-century corporation used some of the shipping toll income to maintain the estuary. In October 1574, it paid 4d to the Bellman for his work 'goinge 2 times aboute the towne, for charging the commons to sende downe the river for helping to git up the shippe that is sonke at Hawkes Nest' (Anon 1847). Similarly, a record was made in May 1591, when 8d was paid to John Belman for 'going aboute to warn the towne 2 times to helpe wey a ship which was over throwne' (Anon 1847). In January 1593, Newcastle Corporation paid William Graie 2s 6d per week for effectively inspecting the river, 'looking for casting ballist into the river or other rubbish eyther above the bridge or below or in Gateshide' (Anon 1847). Although William Graie was not a sworn and elected official, he was a paid civic employee responsible for reporting those who cast ballast into the river. From 1530 to 1613, Newcastle Corporation maintained and inspected the river using individuals employed on an ad hoc basis, seeking out those who threw rubbish or ballast into the river and presenting and fining them at the weekly Town Court. They also paid

various watermen on an irregular basis to lift sand, gravel, rocks and rubbish from the river using shovels and keel boats. During the period 1530–1613, Newcastle Corporation's maintenance of the estuary was characterised by informality, irregularity and reactive efforts.

On 29th January 1613, a set of 21 Tyne-specific bylaws was passed in relation to river management at the Trinity House in London, to be enforced by Newcastle Corporation. Henceforth, the ad hoc, reactive system gave way to a much more proactive, centralised and regular system which enforced specific bylaws efficiently. The motivation and efforts to regulate the Tyne's estuary grew concomitantly with, and reflected, the increasing scale of industry and trade which threatened to damage it. The bylaws were surprisingly comprehensive, designed to regulate many different aspects of industrial development and waste-disposal on the river and riverbanks. One of the bylaws stipulated that riparian saltpan owners 'doe within 6 months build up their wharfs and keyes sufficiently above a full sea mark in height of the water' so that 'neither coals nor rubbish do fall into the river' and to 'carry away their pan rubbish every forty days' (Anon 1847). Others forbade using ballast to dam and back wharfs and quays 'in all parts of the river', casting ballast on wharfs below high water mark or casting ballast at North or South Shields (Anon 1847). Another instructed the corporation to inflict 'strict and severe punishment' upon masters of ships or keels who cast ballast into the river (Anon 1847). Extending the jurisdiction of Newcastle Corporation to the Tyne's tributary rivers too, they expressly forbade the construction of 'wyers, dams, or other stoppage, or casting of ballast in or near the said river or creeks', and the movement of ships during the 'night tyde' was banned outright (Anon 1847). Waste disposal high above the river in Newcastle's streets was regulated too. One bylaw ordered 'that strangers shall be appointed every week to cleanse the streets in Newcastle of their ashes and other rubbish, to prevent the rain from washing the same into the river through Loadbourn', which demonstrates a clear understanding of the connected and consequential flows from private to main open sewers, to tributary rivers and eventually into the main river (Anon 1847). Another bylaw ensured 'that all the gates on the town key be locked up every night, except one or two to stand open for the masters and seamen to go too and from to their ships, which will prevent servants casting ashes and other rubbish into the river' and that the gates should be watched throughout the night (Anon 1847). One bylaw ordered that 'some trusty truly substantial men, burgesses of Newcastle, be appointed to view the river every week, and to make oath for the abuses and wrongs done unto the same'; they were to be truly objective, possessing no coals, mines nor ballast shores (Anon 1847). Every year from 1613, the corporation elected twelve River Jurors to present and fine individuals who contravened the river bylaws at a weekly River Court each Monday and they appointed one dedicated, sworn officer, known as the Water Bailiff, to report offences done in the river. According to Arthur Elliot, an 83 year old Newcastle Keelman speaking in 1679, 'most of them … [were] seamen' (Exchequer 1679–1680). Ralph Tailor, a River Juror in various years after 1649, had trained as a Scrivener and by 1649 was a successful Notary Public; in such a capacity, he would have enjoyed the respect of

Newcastle's inhabitants as a member of the middling sort, but he never served on Newcastle Corporation (Wrightson 2011).

The Tyne River Court convened every Monday morning from January 1613, however the court minutes are only extant from 1644, due to the violent and destructive sacking of Newcastle in October 1644, after a lengthy siege from February 1644 by the Scots Army led by General Leslie as part of the British Civil Wars. Indeed, in 1695, 84 year old Jane Roxby recalled 'the place where the evidences and writings belonging to the mayor and burgesses of Newcastle were lodged was burnt … and … the ashes of the books and papers burnt in the s[ai]d fire lay in great heaps upon the sandhill in Newcastle as high as a mans waste' (Exchequer 1695–1696). Throughout the seventeenth century, the annually elected Water Bailiff and River Jurors inspected the river, attended particular sites to assess applications and encroachments in depth, enforced the river bylaws and presented and fined offenders at their weekly court. The River Jurors dealt with most of the applications to erect projections into the river such as wharves, jetties and galleries or weirs, but Newcastle Corporation still dealt with some river applications. However, by the eighteenth century, the latter task had been delegated to the River Jurors in almost every case. A delegation or committee of between three and twelve jurors visited the site in each case and provided a detailed report to the next court, which ultimately decided whether or not to grant permission for the works to commence. In April 1701, they recorded that at Willington Shore, 'they have viewed & prickt the same with javelings & have found a good foundation about forty yards below the jettie and key formerly built', having reported that 'they find nothing but slake & sand to the height of a javelin about seaven foot' and it was ordered that 'speedy care be taken' in repairing the key (Tyne River Court 1695–1755). The River Jurors were practical men who knew their river well; they were as actively involved in regulation on the river and riverbanks as they were inside their court room. The tripartite system, of environmental regulation, river maintenance work and assessments of planning applications, continued until the mid-nineteenth century. The Tyne River Court continued to regulate the river estuary and crucially to 'conserve' its natural functions until the Corporation Act of 1835 forced major administrative changes and a River Committee took over the management of the river, still on behalf of Newcastle Corporation.

14.4 The Manner and Extent of Regulation

The Tyne River Jurors consistently pursued their aim of protecting the river from overdevelopment, solid waste and impediments to its flow. Considering that the 1613 bylaws were designed by London's Trinity House, to be enforced top-down in relation to a distant river, the bylaws were remarkably in tune with Tyne issues. This reveals that communication between Newcastle and London in relation to river management was effective and it underlines London's heavy reliance on crucial exports of coal from the Tyne into the Thames. The Tyne's regulation was perhaps

more urgent than that of the neighbouring town of Sunderland's River Wear, where Commissioners were not appointed until 1717 by an Act of Parliament to hold their own regulatory court. The authors of the Tyne bylaws had a clear understanding of how river systems worked and of how to protect a river's natural functions from human damage. Time and again, the River Jurors record contraventions to their bylaws as having hurt, damaged or spoiled the river itself, rather than Newcastle Corporation's income through tolls, and rather than the interests of a particular private landowner. Whereas Paul Warde (2009) argues that pre-industrial regulators of agricultural practices 'did think that their neighbours' actions could affect their fortunes' and consequently agricultural 'by-laws and manorial records were preoccupied with neighbourly relations rather than ecological management' and should be considered as a "'social system'", the regulators of the Tyne estuary were concerned with the impact of human activities on the river itself. This explains why the River Jurors always describe the Tyne explicitly as the object, and indeed sufferer, of human damage and even hurt. In October 1723, they ordered that the 'wears and every thing done for diverting this ancient channel or course of the said river be forthwith removed and taken away so that the water may flow with its usual freedom into its natural receptacle' (Tyne River Court 1695–1755). Even if they conceptualised the river primarily as a commercial system or facility, 'a great liquid highway', rather than as an element of nature to be admired and protected purely in its own right, the river is the focus of all of their presentments and regulations, rather than landowners; indeed, conversely, it was often the landowners who were punished for having offended or damaged the river.

The River Jurors were interested in educating rather than merely punishing contravenors. An 'antient custom in Newcastle' publicly educated ship masters who were found guilty of having dumped ballast into the river 'to the hurt of the said river', as they were 'brought into the town chamber and there in the presence of the people had a knife put into his hand' the ship master was 'constrained to cut a purse with monies in it as who should say he had offended in as high a degree as if he cut a purse from the person of a man whereby he might be so ashamed that he should never offend again therein' (Anon 1847). By comparing the disposal of ballast into the river to the act of cutting someone's purse strings, the corporation demonstrated explicitly that offences against the river were serious, and that natural river systems could be hurt as well as people.

One 1613 bylaw stipulated that all servants living in Gateshead, Sandgate and the Close had to swear in court annually that they would not cast rubbish into the river (Anon 1847). Servants were typically responsible for waste disposal in most other towns too, but most of their counterparts, certainly servants living in contemporary Carlisle, Edinburgh, Berwick and York, were not presented in court for contravening waste-disposal bylaws; elsewhere, householders were presented and fined on their servants' behalves (Skelton 2014, 2015). Servants living around the Tyne estuary were made responsible for their own actions, which must surely have improved the efficacy of environmental regulation. Notably, households lacking servants were represented by either the householder's wife or widow who swore the oath alongside neighbouring servants (Tyne River Court 1644–1834). This proactive bylaw

clearly demonstrates that proactively protecting the river from rubbish was the priority and raising fines was merely a resultant by-product of that regulation.

In August 1647, Newcastle Corporation, which still decided some applications for riparian development, agreed for Mr Harris and Mr Haynes to have joint interest in a 21 year lease of some glasshouses on the riverbank at Newcastle, on condition that 'they should cast no rubbish from their furnace forward but only backward' (Newcastle Common Council 1645–1650). Clearly, this clause was included specifically to protect the river from the dumping of rubbish into it by stipulating that such rubbish had to be removed directly from the back of the property well away from the river frontage. In February 1644, Anthony Davis was presented at the River Court because 'his key a great parte of it [is] ruinated & a dunghill made upon it the tide flowing amongst it to the hurt & damage of the river'; and in October 1647, Mr Martin Fenwicke of Denton was presented 'for having his manure which was cast upon Mr Lancelott Erringtons staith at Lemington so badly cast that part of it falls off into the river' (Tyne River Court 1647–1650). These two presentments are typical of the many others recorded in the river court minute books. The contemporary method of waste disposal required frequent inspection and management in order to prevent significant volumes of waste from entering the river water. Although sewers in this period were supposed to be limited to liquid waste and rainwater, a minority of inhabitants did dispose of solid waste into these channels, which all ultimately drained into the Tyne. In November 1648, Nicholl Pickeringe, a Butcher of Newcastle, was presented because his servant 'swept the durt and filth of the street to the conduit and then opened the cocke of the conduit and let the water wash it downe the Banke into the river' (Tyne River Court 1647–1650). Had he lived nearer to the river, in Sandgate, the Close or Gateshead, his servant would have been responsible for this offence. This presentment of someone living high above the river demonstrates a clear understanding of the connected flow pathways from private and main street sewers to the Tyne.

The eighteenth-century River Jurors introduced some imaginative innovation to boost the court's efficacy by rewarding witnesses who reported contraventions by paying to them part of the fine eventually levied from the offender. In August 1767, the river jurors received a complaint from John Turnbull, a keelman, against Richard Todd of Thistley House in the County of Durham, that he witnessed Richard casting 'a large quantity six cart loads and upwards of stones broken bricks, lime rubbish and dirt into the River Tyne to the great damage and prejudice of the same' (Tyne River Court 1766–1772). And, in August 1780, Mr John Craister informed the court that he saw William Hatfield and John Hall, labourers, 'with rakes in their hands raking and putting the soils and mud of the said river from its place where the tide had left it … to the prejudice of the same' (Tyne River Court 1766–1772). The words 'where the tide had left it' provide an insight into the direct way in which the River Jurors perceived the river as a living agent with its own capacity to move sediment. In this case, John Summers, who employed the labourers to do the work, was fined 1s and ordered to cease the activity immediately. Another case, submitted in June 1771, only 7 months before a severe flood swept away most edifices in the river, was the application of John Moses, esquire, of Hull, to build up his stone wear

on King's Meadows, a Tyne island which he owned, as it had 'lately failed by means whereof the depth of water there hath been reduced and the fishery greatly prejudiced' (Tyne River Court 1766–1772). The next month, after the Jurors had visited the island, they granted permission, having given very detailed consideration to the consequences of their decision. They recorded that the weir 'being composed of loose stones laid together is an improper one' because 'such stones for want of a proper fixture will be liable to be driven by the tides further into the said river', but a stronger weir 'would be of service to the river as well as to the fishery by giving such a check to the rapidity of the current there' and this would 'save some parts of the said island beneath from being washed into the river' (Tyne River Court 1766–1772). Throughout the eighteenth century, fiscally motivated witnesses were potentially powerful, and indeed ubiquitous, arms of river bylaw enforcement. Watson also attributes the success of pre-modern Baron Courts to regulate Scottish woodland management to 'the fact that the community as a whole was actively involved in it' as foresters and as "'sufficient witnesses' in any case requiring further investigation" (Watson 1997).

One obvious omission in the 1613 river bylaws was the impact of human activities on the river's wildlife, and on fish in particular, despite the operation of several substantial fisheries on the Tyne. However, the river court did sometimes regulate specifically to protect fish even without a relevant bylaw. In February 1786, Matthew Harrison swore that he witnessed Joseph Simpson, a fisherman of Ryton, on the southern bank of the Tyne, at a place called Pig's Hole 'take and kill two kipper or kidder salmons the same not being in season to the great destruction of the breed of salmons in the said river to the evil example of all others' (Tyne River Court 1772–1795). And Ralph Gardner highlighted that in November 1649, when Captain Robert Wyard's ship was in the Tyne, 'one of his ships company … cast two or three straw mats out of one of his ships port holes'; during the case, it was assumed that this 'could do no harm to the river by reason its swimming to sea … other than endanger the choaking of the fish' (Gardner 1655). Although the potential damage to fish was played down, the fact that it is mentioned at all demonstrates that it was on the court jurors' minds. As Thomas (1984) observes, 'long before the coming of pesticides and chemical fertilizers, pollution of the rivers killed the barbell, trout, bream, dace, gudgeon, flounders and other fish which had in Elizabethan times swum in the London Thames', noting 'since the thirteenth century there had been numerous attempts by statute, proclamation or forest law to prescribe a close season and to protect red and fallow deer, otters, hares, salmon, hawks and wild fowl during the breeding period'. The lack of fishing regulations in the Tyne estuary contrasts sharply with the situation in the Firth of Forth in the same period, where fishing was tightly regulated (Smout and Stewart 2012). Perhaps the Tyne River Jurors for the most part excluded wildlife from their conception of the estuary they protected.

Ballast heaps stored below the high water mark were vulnerable to being washed into the river and riparian residents and business owners were ordered to fence their properties to 'prevent the banks from falling and washing into the river, with the great floods, flashes and raines' (Anon 1847). In November 1646, Mrs Alnei's 'ballast shore was the worst & two heaps of ballast were washed off the said shore – one 19 yards long containing 100 tons of ballast above the water and the other 17 yards

long containing 200 tons at least' (Newcastle Common Council 1645–1650). But not all riparian ballast heaps were unstable. In 1698, Mr Rawling had been heaping ballast onto his holding area at Heworth Shore on the Tyne's south bank 'soe long unconveyed that the grass grows thereon' (Tyne River Court 1695–1755). Rawling should have conveyed it more frequently, but he was clearly capable of heaping his ballast so stably that grass was able to take root and flourish from its stable structure. Contemporaries feared ballast falling into the river, warning in one bylaw that ballast quays must be kept in good order 'otherwise a hundred thousand tuns of ballast will fall into the river, to the destruction thereof' (Anon 1847). To counteract the inevitable silting up from fallen ballast, 'every winter season the poor keelmen and shewelmen' dug up and loaded into their keels large volumes of ballast and sand from the bed of the river (Anon 1847). This was a slow, laborious and expensive process, thus making rigorous environmental regulation which could reduce such work essential.

14.5 Conclusion

Environmental regulation in the early modern Tyne estuary became increasingly regularised, more proactive and ultimately more efficient over the course of three centuries. Without the Water Bailiff, the River Jurors and their weekly River Court, the Tyne estuary would certainly have become much more problematically overdeveloped, the Tyne water would have received more oxygen-hungry organic waste and complex webs of impediments to its flow would surely have been constructed to the river's detriment. Newcastle Corporation took full ownership of the premodern Tyne's estuary and certainly considered it to be a resource and a facility with which to generate profit and employment. Even when they used the words damage, destruction, hurt and spoil, they were referring to damage done to the efficiency of the river for trade, first and foremost. But their proactive regulation, and the time and effort they invested into controlling and ultimately limiting the adverse impacts of human activities on the river did have a positive effect on the river's condition. Newcastle's local governors clearly understood the river, how it functioned and the physical, if not the chemical and biological, impacts of waste disposal and ballast disposal on its flow speed and tide levels. Newcastle Corporation and Trinity House worked together to complete detailed surveys of the river and they were able to navigate ships from Shields to Newcastle and back because they understood every inch of the river's channel and bed. The River Jury regulated waste disposal relatively tightly at a weekly court. Contemporaries clearly feared 'damage' to the river, 'hurt' done to the river and 'spoiling' the river, all their own words. One might say that their systems were basic, their technology rudimentary, and their understanding of river systems was in its infancy, but this is precisely why they acted with so much enthusiasm to protect the river. They relied on it increasingly for trade, shipping and tolls and they feared harm done to the river because they were explicitly aware that they could only reverse such damage very slowly and inefficiently, using shovels powered by the labour of keelmen. Pollution was

certainly substantially less serious in terms of scale between 1500 and 1800 than it became after 1800. But scale alone does not provide a satisfactory explanation as to why it was less serious; the manner, extent and efficacy of environmental regulation, which laid the foundations of subsequent more modern legislative frameworks and environmental attitudes, is as, if not more, important.

Although the river court could not possibly have prevented all of the contraventions of river bylaws, it was an effective legal facility, and became increasingly so over the course of the early modern period. Established in Newcastle in 1613, over a century before the Wear River Court was established in nearby Sunderland, entrusted with increasing responsibilities to visit riparian sites, producing detailed site reports and making well considered decisions, this court certainly cannot be described as unimportant, unnecessary or irrelevant. It represents an important development in environmental history, demonstrating a clear progression from the ad hoc and reactive management of the sixteenth century, to the regular and centralised regulation of the seventeenth century, to the imaginative and more inclusive innovations of the eighteenth century which widened the community's participation in enforcing regulations. The importance and relevance of the extant, detailed Tyne River Court minute books within the context of environmental history cannot be exaggerated. The careful considerations and heartfelt concern of the Tyne River Court Jurors are heavily woven into the minute books which they created, an important testament to their positive relationship with the River Tyne estuary of which they were so proud and on which they relied so heavily. Early modern people were not passive victims of nature, but nor were they active, wilful and irresponsible destroyers of it, as many of their nineteenth-century descendants became. Interactions with natural systems were certainly perceived as a two-way process; the River Jurors knew what the river could do to them as well as, and sometimes because of, what they had done to the river. Records of early modern environmental regulation, of which there are many more under-researched examples, are no less important than seminal environmental texts from the age of environmentalism, such as *Silent Spring*.

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Chapter 15
Narratives of Scarcity: Colonial State Responses to Water Scarcity in Southern Rhodesia, 1890–1965

Muchaparara Musemwa

Abstract In 1965, the Southern Rhodesia colonial state was forced to accede to the demands of an array of economic interests whose enterprises had been severely affected by the continuing droughts in south-western Matabeleland culminating in the devastating drought of 1964–1965. After protracted appeals, the colonial state agreed to establish a water authority, named the Matabeleland Development Council. Why, only then, did the state accede to these economic interests' demands? It turns out that there had been a whole history of the colonial state's reluctance to develop a long-term water conservation management regime dating back to the early days of colonial settlement in the 1890s and 1900s. This chapter unravels this story and how narratives about imagined and looming water crises became the basis for the appeals to the state to plan water development on a larger-scale. Since the days of early white settlement in Southern Rhodesia in the 1890s, growing fears of a real/imagined water scarcity crisis and the potential harm it could unleash on the white settler society produced a powerful conviction that every effort should be made to 'retard the journey of the raindrop to the sea'. These fears engendered intense public calls on the colonial state to take a leading role in the development of large water schemes in order to harness as much water as possible for domestic and industrial purposes. Engineers, civil servants, conservationists, farmers and politicians began to clamor for the creation of a single national water authority (a hydraulic bureaucracy) which would mobilize, regulate and control all the colony's water resources. Their views entailed most of the elements identified by Molle, Mollinga et al. i.e. the need to implement scientific irrigation, the "'let the desert bloom' utopia", and the 'biblical/messianic overtone of the call for creating new Edens in deserts or arid places'. This chapter argues that despite various emphases on the plausibility of developing a water authority not only by these classes but also from a series of commissions of enquiry (1930–1953), the colonial state was eventually forced to change course when a devastating drought in 1964–1965 afflicted the already semi-arid region of south-western Matabeleland. It also argues that this

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drought unraveled the underlying tensions within the central state, and between itself and the various interest groups who agitated for the creation of a structure to control the region's waters. This study exemplifies how droughts gave a renewed impetus to robust colonial water development initiatives in the post-War era in Southern Rhodesia. Taking a cue from D'Souza's (2006) scintillating discussion on the making of a 'colonial hydrology' in British India, argues that just as the rationale around 'scientific forestry', or the politics of land in Zimbabwe Alexander (2006), colonial environmental, economic and political concerns not only defined and impacted the south-west Matabeleland's 'fluvial endowments' in specific and unprecedented ways but that the politics over water development was equally central in the making of the Rhodesian colonial state.

15.1 Introduction

15.1.1 Colonial Occupation of Southern Rhodesia and How Water Scarcity Became a Dominant Motif

As in other settler British colonies such as South Africa, Australia and India, water availability robustly shaped forms of European settlement and agriculture in Southern Rhodesia (now Zimbabwe since 1980). At the advent of colonial rule in 1890, water requirements in the nascent colony were relatively minor as agriculture was still confined to small areas. Streams, springs and *vleis* provided the budding towns with adequate water for most general uses. However, from the late 1920s, the precipitous growth of population, livestock, the rise of heavy concentrations of people in towns and cities, as well as the development of agriculture, mining and the manufacturing industries all caused 'a radical change in almost every aspect in the country's condition, and in none more so than in the water position'.[1] For example, by the 1940s, the biggest towns such as Bulawayo and Salisbury were already drawing their water 'from distances varying up to over 35 miles away …'[2] As these transformations pertaining to founding a capitalist colony proceeded, Southern Rhodesia's terrain and landscape were increasingly perceived by some as assets to be utilized for the sake of progress and the creation of a modern colonial and industrial state. The need for water control and landscape transformation increased as competing water demands between urban, agricultural, mining and manufacturing interests arose amidst fears of future water insecurity if the resource was not scientifically harnessed and managed. These uncertainties were exacerbated by the biophysical and semi-arid conditions as well as intermittent droughts which obtained

[1] J. H. R. Savory, 'A Water Plan for Southern Rhodesia', Appendix A in *Southern Rhodesia*: *Report of the Director of Irrigation and Secretary for Lands For the Year Ended 31st December*, *1959* (Printed by the Government Printer, Salisbury, C.S.R. 6-1960), p. 6.

[2] Savory, 'A Water Plan for Southern Rhodesia', p. 6.

in Southern Rhodesia. From this point onwards until 1980, when colonial rule ended, water and how its control was to be planned became a particular focus of contestation once it had been identified as the limiting resource for economic growth[3] rather than land which had proved to be bounteous as a result of a series of violent land expropriations from indigenous Africans. As a result, the period, 1930–1963, witnessed the production and rise of a discourse which presented water resource scarcity as an established fact in Southern Rhodesia and the necessity for, and importance of long-term national planning of water resource conservation in the face of this imagined looming water crisis. Growing fears of a real/imagined water scarcity crisis and the potential harm it could unleash on the white settler society produced a powerful conviction that every effort should be made to 'retard the journey of the raindrop to the sea' – making this a popular rhetorical device for their appeals. These fears engendered intense public calls on the colonial state to take a leading role in the development of large water schemes in order to harness as much water as possible for domestic, agricultural and industrial purposes. This discourse was, however, not state-driven but came from different sectional interests of engineers, civil servants, conservationists, farmers and politicians who all, motivated by their specific interests, began to clamor for the creation of a single national water authority (a hydraulic bureaucracy) which would mobilize, regulate and control all the colony's water resources. They were largely irked by the failure or seeming disinterestedness by the colonial state to take charge over the provision of large-scale irrigation schemes or to come up with a centralized policy-making institution for the management of water at a national scale. Thus, between 1930 and 1963 water governance became a matter of rising concern to an array of actors which included urban municipalities, farmers, industries, engineers and senior civil servants. The received wisdom that Southern Rhodesia was prone to water scarcity given its climatic conditions as well as its altitude which encouraged run-off of rainfall ultimately to the sea became the dominant explanation around which the discourse of long-term planning for water resources coalesced. Yet, despite the prevalence of the water scarcity discourse as settler colonial rule took root, scholars of colonial Zimbabwe's history have not found it compelling to document these narratives as part of the history of the making of the colonial-state and as an integral aspect of the historical basis and rational behind water development in Southern Rhodesia.

This chapter proceeds first by briefly surveying the historiographical landscape on water within and outside Zimbabwe in order to situate this study. It argues that despite various emphases on the plausibility of developing a water authority not only by these classes but also from a series of commissions of enquiry (1930–1953), the colonial state was eventually forced to change course when a devastating drought in 1964–1965 afflicted the already semi-arid region of south-western Matabeleland. The chapter also argues that this drought unraveled the underlying tensions within

[3] National Archives of Zimbabwe (hereafter, NAZ) S2651 Appendix IV dated 15 September 1952, by R. H Roberts, Department of Irrigation, Chairman of the Central water Co-ordinating Committee.

the central state, and between itself and the various interest groups who agitated for the creation of a structure to control the region's waters. As the second part of the chapter demonstrates, this study exemplifies how droughts gave a renewed impetus to robust colonial water development initiatives in the post-War era in Southern Rhodesia.

This study was inspired by the observations a number of environmental historians made on other parts of the African continent. For example, assessing the growth of South African environmental historiography, William Beinart once remarked that despite the fact that South Africa was, by the twentieth century, an 'increasingly dammed society with a high proportion of its water channeled to irrigate farmlands', 'there is very limited historical writing on this key resource'.[4] This observation, made over a decade ago, is still as true of, but not only confined to, South Africa. It is perhaps truer of Zimbabwe. There is, indeed, a dearth of historical writing on colonial (and even post-colonial) water development in Zimbabwe. In particular, this chapter was spurred by Beinart's exhortation that there was 'still a great deal to be discovered both about settler appropriation of natural resources, and about the interrelationship between settlers, African people and nature'.[5]

Over the past several decades and as recent as the 2000s, thanks to the Fast-track Land Reform programme that was violently implemented in Zimbabwe, 'the history of colonial land alienation, the grievances fuelling the liberation war, and post-independence land reforms have all been grist to the mill of recent scholarship'.[6] A large body of historical writings by Robin Palmer,[7] Jocelyn Alexander,[8] Rory Pilossof,[9] among others, has emerged precisely focusing on the relationship between white settlers and their land and African labour and appropriation of other natural resources.[10] What passes for environmental history in Zimbabwe has been perceived and expressed through the lens of land and related struggles to its appropriation and redistribution. Water has hardly been a part of it given its 'silent' or 'silenced' flows in such analyses. However, with the exception of Frances Cleaver[11] and the

[4] William Beinart, 'South African environmental history in an African context', in Stephen Dovers, Ruth Edgecombe and Bill Guest (eds.) *South Africa's Environmental History*: *Cases and Comparisons* (Athens: Ohio University Press, 2002), p. 216.

[5] Beinart, 'South African environmental history', p. 216.

[6] Pilossof, *The Unbearable Whiteness of Being*, see blurb on back cover of the book.

[7] Robin Palmer, *Land and Racial Domination in Rhodesia* (London: Heinemann, 1977).

[8] Jocelyn Alexander, *The Unsettled Land*: *State-making and the Politics of Land in Zimbabwe*, *1893–2003* (Oxford: James Currey, 2006).

[9] Rory Pilossof, *The Unbearable Whiteness of Being*: *Farmers' Voices from Zimbabwe* (Harare, Weaver Press, 2012).

[10] M. Musemwa, "Contestation over resources: The miners-farmers dispute in colonial Zimbabwe, 1903–1939', *Environment and History*, 15 (2009): 79–107. See also, Jocelyn Alexander, *The Unsettled Land*.

[11] Frances Cleaver, 'Water as a Weapon: The History of Water Supply in Nkayi District, Zimbabwe', *Environment and History*, volume 1 (1995), pp. 313–333.

environmental anthropologist, David McDermott Hughes,[12] as well as my own works which have largely been limited to the history and politics of water in urban areas,[13] historians of Zimbabwe have hardly begun to explore how white settler acquisition and extraction of water resources in Southern Rhodesia (and even in post-colonial Zimbabwe) developed as a dominant colonial 'high modernism' practice which alongside the extraction of other natural resources assisted in the making of the colonial state (a practice which, evidently continued as an essential aspect in the making of the post-colonial state). In reconstructing the history of Zimbabwe, historians have discussed water merely in passing rather than explored it in any historical detail, thus, often portraying the erroneous view that water, as a resource, is merely an adjunct to land and its meaning can be understood only in relation to land and not on its own terms. Given the several episodes during which Southern Rhodesia experienced water crises mostly as a result of climate change, manifested partly by perennial droughts, it is difficult to imagine how early and later white settlers, especially large-scale commercial farmers, could not have been concerned with water or could not have had a special relationship with this finite resource, as John Richard Wagner recently remarked in general in the introduction of his newly edited book, *The Social Life of Water* (2013): 'It is now impossible to think globally about the human relation to water without recognizing the extent to which that relation is conditioned by a sense of crisis'.[14] In Southern Rhodesia, the dry climate, perennial droughts, and demographic growth meant an intensifying need for guaranteed water supplies for agricultural, industrial and domestic requirements. As such, the various capitalist interests and institutions in the fledgling colonial society sought to make their drylands wetter and to reduce the risks of droughts by conserving water through overturning what Geoffrey Petts has called 'the spectacle of fresh water running to the oceans' and preventing the colony from discharging its natural riches into the sea.[15]

Hughes' work has come closest to elaborating what Petts is intimating here. Critically relevant for this study is Hughes' portrayal of how large-scale commercial farmers in the tobacco-growing region of Virginia near Marondera in Mashonaland East sought to belong to the landscape in post-independence Zimbabwe and began transforming the environment in a manner that made possible that sense of belonging.[16] He argues that 'on the semi-arid highlands, they manipulated the most

[12] David McDermot Hughes, 'Hydrology of Hope: Farm Dams, Conservation and Whiteness in Zimbabwe', *American Ethnologist*, volume 33, number 2, pp. 269–287.

[13] See for example, M. Musemwa, "Disciplining a "Dissident" City: Hydro-politics in the City of Bulawayo, Matabeleland, Zimbabwe, 1980–1994', *Journal of Southern African Studies*, Volume 32, No. 2, (2006), pp. 239–254.

[14] John R. Wagner (ed.) *The Social Life of Water* (New York: Berghahn, 2013), p. 2.

[15] Geoffrey Petts, 'Water, engineering and landscape: development, protection and restoration', in Denis Cosgrove and Geoff Petts (eds.) *Water*, *Engineering and Landscape*: *Water control and landscape transformation in the modern period* (London: Belhaven Press, 1990), p. 203.

[16] Hughes, 'Hydrology of Hope', p. ???

manipulable of environmental variables – *water* (my emphasis)'.[17] They constructed dams and reservoirs as an expression of the 'continued efficacy of white land ownership and its associated property lines and labour hierarchies' and also served as 'multipurpose fetishes of white belonging – an aquatic fix to whites' political dilemmas'.[18] As useful and important as Hughes' work is especially in its searing insights into the complex mixture of white aesthetics, politics, visions of nature and an environmentalist form of identity shaped by reactions to the emergence of a black government in 1980 and its subsequent rule, it lacks a well-heeled historical depth to allow us to appreciate how water control and landscape transformation were performed during a period free from the perceived threat of black nationalism – in other words, within this colonial society farmers did not have to prove to anyone that they 'belonged' to Rhodesia.

While Hughes' work is important for this study, especially his idea of 'belonging' which is both conceptually and metaphorically played out in my narrative, my study extends the pioneering work of Cleaver on the history of water supply development in Nkayi District in Matabeleland, Zimbabwe. Cleaver powerfully demonstrated how water was used as a weapon of social and political control by both the colonial and post-colonial states to rein in opposition to their legitimacy by rural peasants. Precisely, my study responds to Cleaver's challenge that for understandable reasons there has recently been a preponderant focus on land issues in historical writing in Zimbabwe to the expense of an equally important resource without which analyses of the history of land struggles would be complete. Even Alexander's powerful analysis of the politics of land and state-making in Zimbabwe makes fleeting anecdotal references to irrigation schemes yet the issue of water was as important as land itself since it critically influenced patterns of white settlement and agriculture on the central watershed in Zimbabwe, and did much more. Elsewhere, this preoccupation with the soil among historians has received censure. Water historian, Heather Hoag, has criticized the tendency among a majority of scholars to write about the African environment solely in terms of landscape as if the environmental history of Africa has been 'as dry as the term landscape connotes'.[19] Hoag further argues that 'this land-centric view of the environment errs in portraying Africa's rivers, lakes, wetlands, and estuaries as adjuncts to the soil'.[20] Yet, closer scrutiny of the extant evidence reveals that water development in the face of severe droughts in colonial Zimbabwe and, more so, in semi-arid Southwestern Matabeleland, assumed a life of its own by summoning the attention of the state – requiring the construction of a body of scientific and hydrological and ecological knowledge. This became the basis not only of state power but also 'the legitimating

[17] Hughes, 'Hydrology of Hope', p. ???

[18] Hughes, 'Hydrology of Hope'.

[19] Heather Hoag, 'The Damming of Africa: The Spread of River Basin Planning in Post-War Africa', in Johan W. N. Tempelhoff (ed.) *African Water Histories*: *Trans-boundary Discourses* (Vanderbijlpark: North-West University, 2005), pp. 176.

[20] Hoag, 'The Damming of Africa', p. 176.

metaphor for an intensification of administrative intervention'[21] in African reserves and the site of struggle among colonial officials.

Thus, taking a cue from D'Souza's scintillating discussion on the making of a 'colonial hydrology' in British India,[22] this chapter argues that just as the rationale around 'scientific forestry', or the politics of land in Zimbabwe,[23] colonial environmental, economic and political concerns not only defined and impacted Southwestern Matabeleland's 'fluvial endowments' in specific and unprecedented ways but that the politics over water development was equally central in the making of the Rhodesian colonial state and how it was implicated in the environmental transformation of the colony as it mobilized 'nature' to conserve water resources.

Examining the history of the colonial responses to water scarcity, how the construction of 'water resource scarcity were established as "fact"' and how different societal interests campaigned for the creation of centralized water management structures as the 'most "efficient"' and 'centralised technologies as "appropriate" and the 'national scale of water management as "necessary" to exercise control over water the colony's water resources – to borrow from Samer Alatout,[24] fills an existing lacunae in our knowledge and sets the stage for our understanding of the interwoven relationship between water control, hydraulic engineering and landscape transformation in Southern Rhodesia. As the case discussed in this chapter demonstrates, debates about water resource scarcity and the centralization of water control and management under a national body are critical moments during which a range of standpoints unravel and give us insights into how diverse ideas, technologies and power relations were brought to bear on the colonial state's water plans for Southern Rhodesia. In so doing, the chapter renders visible one of the critical lens through which to understand the environmental history of Zimbabwe, namely water scarcity.

15.2 Water and the Southern Rhodesian Landscape: The Basis of Narratives of Water Resource Scarcity

As soon as the British South Africa Company's directors realized that Southern Rhodesia was not as endowed with mineral resources that rivaled the Transvaal, they were compelled to elevate agriculture to a status where it, alongside mining, became a prime agent for laying the economic foundations of the new colonial state. But it was the BSAC's successor, 'Responsible Government' which from the 1930s

[21] Fiona D. Mackenzie, 'Contested Ground: Colonial Narratives and the Kenyan Environment, 1920–1945', *Journal of Southern African Studies*, vol. 26, no. 4 (2000), p. 698.

[22] Rohan D'Souza, 'Water in British India: The Making of a "'Colonial Hydrology"', *History Compass*, volume 4, number 4 (2006), 621–628.

[23] Jocelyn Alexander, *The Unsettled Land*: *State-making and the Politics of Land in Zimbabwe*, *1893–2003* (Oxford: James Currey, 2006).

[24] Alatout, "'States" of Scarcity', p. 959.

onwards, following the economic disaster occasioned by the 1929 Depression, sought to revive agriculture as one of the pillars of colonial economic development. On their part, European farmers whose livelihoods were heavily dependent upon agriculture regarded this sector of the economy as critically important to their survival.[25] But, critical to the success of agriculture or any other industry (mining, manufacturing, etc.) was the availability of water. Yet, characteristically Southern Rhodesia was not abundantly endowed with copious water resources given the nature of its climate and how it affects the reliability of rainfall patterns.

As such, water scarcity has been the dominant motif in numerous descriptions of the colonial state's climatological make-up. Unreliable rainfall and the nature of Southern Rhodesia's topography are some of the twin problems identified as the major factors influencing the agricultural potential of Southern Rhodesia. For example, Thompson and Woodruff, waxed lyrical about the fitful nature of the rainfall patterns in the colony, thus: 'it behaves erratically in three respects: it is erratic in total amount, it is erratic in its onset and it is erratic in its consistency'.[26] Indeed, it is an established fact of this country's profile that for a long time until recently, thanks to climate change, traditionally close to half a year or slightly more, i.e. from about April to October, the entire country of Southern Rhodesia experienced a severe dearth in rainfall. As the dry season tapered off at the end of the dry season, the weather ushered in humid conditions which were only terminated by the outbreak of rains in November.[27] In addition, the result of the sporadic nature of the rainy season was the disproportionate distribution of the rainfall over the country. While a mere one-third of Southern Rhodesia (i.e. the east and north-east regions) received an average annual rainfall of above 28 in. (712 mm), the western and south-western regions receive between 10 and 24 in. (254 mm and 610 mm), making them semi-arid. Thus, it was from these regions of high elevation (from 3000 to 5000 ft), good and fairly reliable rainfall and rich soils that the early white settlers ejected indigenous Africans, settled and established their towns and cities as well as the main railroads along the watershed zone.[28] In geological and physiographic terms, Southern Rhodesia was described as a massive 'anticline draining to the Zambezi and Limpopo Rivers', compelling, A. C. Jennings, one of the long standing colonial administrators involved in the history of water and land development in the colony, to remark that: 'we are living practically on the summit'.[29] In addition, the colony's geological structure was said to be 'by and large, unfavourable to underground storage of water' as 'three-fifths of the country is covered by granites and a further

[25] Murray, *The Governmental System in Southern Rhodesia*, 59.

[26] C. H. Thompson and H. W. Woodruff, *Economic Development in Rhodesia and Nyasaland* (London: Dennis Dobson Limited, 1953), 42.

[27] Thompson and Woodruff, *Economic Development in Rhodesia and Nyasaland*, 42.

[28] *Southern Rhodesia*: *Handbook for the Use of Prospective Settlers on the Land* ('Issued by direction of the Hon. The Minister of Agriculture and Lands: Sixth Edition, 1935), 42.

[29] A. C. Jennings, 'Irrigation and Water Supplies in Southern Rhodesia', *South African Journal of Science*, Vol. 24 (Dec. 1927), 21.

portion by other crystalline rocks of low-water bearing potential'.[30] The implication of this characterization of the topography of the country would shape settler fears about perceived water insecurity because significant volumes of the country's rainfall of approximately 65 % were lost to run-off. Aridity or semi-aridity due to frequent droughts over time has also been a marked and perennial feature of the Southern Rhodesian landscape. A report on the development of the economic resources of Southern Rhodesia summed up the situation regarding water scarcity in the colony as follows: 'A study of the maps of the bioclimatic regions …, rainfall in amount, seasonal distribution, and reliability …, of vegetation …, and of major soil types …, leads inevitably to the conclusion that about two-thirds of Southern Rhodesia are *arid* to *sub-arid*, that the remainder is largely mild *sub-arid* with but a small portion that is *sub-humid*, and a still smaller one relatively *humid*'.[31] This ecological and climatological profile of Southern Rhodesia, especially as it pertains to water scarcity, permeated every discussion on water resources whenever and wherever it was raised in the colony during the period under the spotlight. As the same report concedes, it became 'natural that for many years for various interests – and notably engineering, agricultural, economic, sociological and political – have given thought to the possibilities of a gradual development of irrigation, having as its main objective the introduction of a much greater degree of certainty into crop and livestock production'.[32]

15.3 Early Development of Irrigation in Southern Rhodesia, 1904–1927

Both the impervious nature of the colony's geological structure underground water storage and its semi-arid climate did not seem serious enough to nudge the colonial state into making any significant investments into the search for a lasting water conservation programmes for most of the first three decades of colonial occupation. The fact that initial European settlement took place along the headwaters of the main rivers – these being the high altitude areas of the country – also seems to have influenced the slow pace of the development of irrigation schemes during the first two decades of colonial occupation. Furthermore, the areas which were densely settled happened to be in those environments where there was a reasonably fair amount of summer rainfall. This seems to have undercut the necessity for irrigation. In short, in areas where relatively adequate rainfall was received, irrigation was not needed for summer crops, but was certainly required for winter crop farming and in

[30] Savory, 'A Water Plan for Southern Rhodesia', p. 6.

[31] Southern Rhodesia: *A Report of the Advisory Committee on the Development of the Economic Resources of Southern Rhodesia with Particular Reference to the Role of African Agriculture* (1962).

[32] *A Report of the Advisory Committee on the Development of the Economic Resources of Southern Rhodesia*, 309.

places such as Mashonaland where some farms did not have even a tiny perennial spring or stream to allow the development of a small-sized irrigation scheme. Thus, in 1904, some small irrigation schemes were initiated on farms owned predominantly by individual white farmers. These were supported by funds provided by the colonial state.[33] The colonial state's lack of concern for the construction of large-scale irrigation schemes may very well have been influenced by the resolutions made at the three South African Irrigation Congresses held in South Africa in 1909, 1910, and 1911 respectively – to which Southern Rhodesia sent some delegates. A resolution at the first Congress stressed that 'large State schemes are not considered workable and that a more profitable policy is the State-aided small irrigation scheme'.[34] Thus for some time to come the colonial state would remain attuned to this 'small is better' policy and continued to set up rudimentary structures, purchasing of equipment and the appointment of personnel for the development of small irrigation water schemes. The conversations at the third Congress influenced certain changes to a draft Water Ordinance that was under consideration by the Legislative Council of Southern Rhodesia. This draft was finally passed as the Water Ordinance of 1913. This Ordinance underpinned all successive water laws and among other things inaugurated the norm that all water, except privately owned water, be conferred in the Governor.[35] Therefore, between 1911 and 1927, gradual steps were made to expand small-scale irrigation and to institutionalize the process with the appointment of an Irrigation Engineer and his assistant (1913); the construction of the Odzani irrigation scheme of 1000 acres was initiated in 1915; while in 1916 a survey for a plan to irrigate 500 acres of land was carried out. By 1918, the development of irrigation was discerned to be leaning towards two priorities, i.e. (a) the irrigation of citrus on a massive scale and, (b) the growing of green fodder for feeding stock.[36] The first priority witnessed the construction of the biggest irrigation scheme – the Mazoe Poort scheme – a large storage dam to irrigate 6000 acres of land on the Mazoe Citrus Estate (about 30 miles from the capital city – Salisbury then and Harare, now) in 1919.[37] But this was a scheme built by the BSAC to further its own commercial interests rather than those of the Colony at large. In the 1920s, an Irrigation Branch with a total of three civil engineers was created and placed under the Department of Agriculture and dealt with all issues pertaining to 'irrigation, farm water supplies, and general farm engineering'.[38] To emphasize the *laissez faire* attitude of the colonial state in water irrigation schemes during this period, one simply has to look at the decentralized functions of irrigation boards such as the

[33] *Official Year Book of the Colony of Southern Rhodesia*, No. 2, 398.

[34] *Official Year Book of the Colony of Southern Rhodesia*, No. 2, 398.

[35] Mr. Justice McILwaine, 'Notes on the Water Law of Southern Rhodesia', *The Rhodesia Agricultural Journal*, no. 1, vol. 33 (Jan. 1936), 788.

[36] *Official Year Book of the Colony of Southern Rhodesia*, No. 2, 398–399.

[37] Southern Rhodesia: *Handbook For the Use of Prospective Settlers on the Land* (Issued by the direction of the Minister of Agriculture and Lands, Sixth Edition, 1935), 42.

[38] *Official Year Book of the Colony of Southern Rhodesia*, No. 1, 122.

Odzani River Irrigation Board, Umtali River Irrigation Board and Old Umtali Irrigation. Their major tasks were to control and approve the establishment of combined irrigation schemes where two or more owners sought to embark on works for their common usage.[39] As was the case with mining,[40] there was a lack of sophisticated state bureaucracy. The bureaucratic machinery set up to realize the objectives of agriculture, especially as regards water resource development, was not fundamentally contingent on the functions of government per se. A law was passed to regulate water provision and to provide for the appointment of a small staff complement to apply it. Thus the Irrigation Branch rendered a restricted service to individual farmers and organizations in need of designs of water schemes and offered to supervise the works under construction at a fee charged by the government.[41] In addition, the government offered loans – with generous periods of repayment – to individual farmers to encourage and enable them to erect irrigation schemes.[42] The scope of irrigation development was expanded to include, for the first time, African areas when an irrigation scheme was constructed in the arid Sabi Valley in 1926. Subsequently, many more, such as the Mutema Furrow (1928), the Nyanyadzi Furrow (1933), the Mvumvumvu Furrow (1936), etc. were also established.[43] State development of irrigation in African reserves had much to do with its social engineering policies which had seen indigenous Africans removed from areas since the late 1890s, especially the high altitude places where early European settlement was concentrated than the magnanimity of state. As Cleaver has discussed in her case study of water development in Nkayi district in Matabeleland, this was as much about providing water to an arid area as it was about using water as a weapon of social and political control.[44] In 1927, a new Water Act was passed. The Act vested all water in the Governor of Southern Rhodesia and sought to equitably deal with the 'mutually incompatible grants' of water by bringing the rights, not only of farmers and miners, but also urban authorities requiring water within the compass of one general law'.[45] Clearly, one of the cases resolved by this Water Act was the

[39] *Official Year Book of the Colony of Southern Rhodesia*, No. 1, 122.

[40] Murray, *The Governmental System in Southern Rhodesia*, p. 121.

[41] *Official Year Book of the Colony of Southern Rhodesia*, No. 1, 122.

[42] *Official Year Book of the Colony of Southern Rhodesia*, No. 1, 123.

[43] For more discussion on the rapid development of these irrigation projects in African areas see, Annual Report of the Director of Native Agriculture for the Year 1946', in Southern Rhodesia: *Report of the Secretary for Native Affairs*, *Chief Native Commissioner*, *and Director of Native Development for the Year 1946* presented to the Legislative Assembly, 1947 (Printed by the Rhodesian Printing and Publishing Co., Ltd. Salisbury), 41; and M. Rukuni, 'The Evolution of Small-holder Irrigation Policy in Zimbabwe: 1928–1986', *Irrigation and Drainage Systems*, 2 (1988), 199–210.

[44] F. Cleaver, 'Water as a Weapon: The History of Water Supply Development in Nkayi District, Zimbabwe', *Environment and History*, Vol. 1, No. 3 (October, 1995), 313–333.

[45] Mr. Justice McIlwaine, 'Notes on the Water Law of Southern Rhodesia', *The Rhodesia Agricultural Journal*, no. 1, vol. 33 (Jan. 1936), 789.

long-drawn-out conflict over water rights between miners and farmers.[46] Thus, despite all these initiatives taken by the state to develop irrigation, the state continued to explore this question of water development as a minor part of the overall economic development of Southern Rhodesia – creating mounting displeasure over time from different water users and important pillars of the economy. Information culled from a series of commissions set up between the 1930s and 1950s evidently demonstrates the uneasiness of a range of people and organization with early water conservation schemes.

15.4 1930–1950: The Era of Commissions of Inquiry and Their Positions on Water Control

From the 1930s, it had become increasingly evident that the Irrigation Department lacked the vision and capacity to plan and provide major national water schemes for the Colony. As indicated earlier in this chapter, when the 'Responsible' settler government succeeded the BSAC in 1923, the success of the agricultural sector was predicated on the individual entrepreneurial competences of farmers as well as farming enterprises. As Murray rightly noted, the government's involvement was primarily circumscribed to peripheral activities such as gathering and propagating information, rendering an advisory service and carrying out research.[47] From the end of the 1920s, especially following the depredations of the 1929 Great Depression, and the beginning of the 1930s, however, the government had realized that it needed to play a central role in the agricultural enterprise of the country by restructuring this sector. But this was not a result of the state's proactive response to a growing problem in this sector.

Farmers vexed by the government's lethargy with respect to agriculture, as Murray demonstrates in his book, overtly chastised the Department of Agriculture, in which the Irrigation Branch was tucked, for being ineffective to the point of being almost irrelevant.[48] The farmers' worries forced the government to restructure the Department of Agriculture to become more amenable to farmers' concerns and to offer them meaningful support and make sure that it was managed proficiently by especially paying particular attention to the preservation of the natural resources of the country.[49]

For all its reformist attempts, however, the colonial state left the powers and responsibilities of the Irrigation Branch circumscribed within the Department of Agriculture, leaving many to wonder about its preparedness to deal with water con-

[46] For a full discussion on the farmer-miner controversies over natural resources see, M. Musemwa, 'Contestation over Resources: The Farmer-Miner Dispute in Colonial Zimbabwe, 1903–1939', *Environment and History*, 15 (2009), 79–107.

[47] Murray, *The Governmental System in Southern Rhodesia*, 80 and 116.

[48] Murray, *The Governmental System in Southern Rhodesia*, 80.

[49] Murray, *The Governmental System in Southern Rhodesia*, 116.

servation among other resources. It had to be goaded into action by various interest groups and a number of commissions of inquiry which, one after another, emphasized the dire consequences for the country if no large-scale water conservation schemes were developed. The twin problems identified as affecting the economy of Southern Rhodesia were soil erosion and water scarcity. It was argued by several bodies, as we shall see in the ensuing discussion that so much water was being lost to the sea through run-off and it was this same water that was washing away the fertile top soil which also landed in the sea. The simultaneous loss of these two resources, both crucial for agriculture and the economy of the country, was generally perceived as being dangerously detrimental to the colony's food and water security. If agriculture – which had been accepted as the main industry that would underpin the development of a settler society and economy – was to flourish, these intertwined ecological and anthropogenic problems had to be arrested before they began to severely threaten the environmental and economic sustainability of the colony.

The first warning to the colonial government about the need to act decisively on the storage of water came from the *Committee of Enquiry into the Economic Position of the Agricultural Industry*, chaired by Max Danziger – set up in 1933 by the colonial government in response to the economic crisis that had debilitated the farming operations of white agricultural community from the end of the 1920s and the beginning of the 1930s. Out of the eighteen 'causes of the state of the farming industry' identified in the Committee's report (hereafter referred to as the Danziger Report), two loomed large, namely 'lack of adequate water supplies' and 'soil erosion and loss of fertility of soil'.[50] Alleging that the government had not done enough before on the water and soil conservation fronts, the Committee unequivocally asserted that 'the question of water conservation and the prevention of soil erosion should be in the forefront of the Government's agricultural policy and should be the subject of intensive propaganda on the part of the officers'.[51] To legitimize their claims to the government, the Committee restated the climatic and ecological conditions that were conventionally known to influence water scarcity in Southern Rhodesia. The Committee reminded the government that although the colony received relatively good rainfall, the main setback was that 'it is not evenly distributed and falls in a few months of the year'. There was no question that the rainfall was, by and large, adequate for the requirements of agriculture as well as the general water needs of the country. But it was good only insofar as it had been conserved and 'not allowed to run off to the sea', argued the report.[52] The Committee members bewailed the extent to which 'the water level [had] sunk dangerously low' and cau-

[50] *Southern Rhodesia*: *Report of the Committee of Enquiry into the Economic Position of the Agricultural Industry* [chaired by Mr. Max Danziger], (CSR – 16 – 1934). The Committee attributed the poor condition of the European farming industry to eighteen causes, among which were a heavy slump in the value of farming commodities on export and local markets, redundant creameries, competition from Africans, unregulated imports of agricultural commodities, etc. For a detailed list of the causes, see pages 2–3 of the Danziger Report.

[51] The Danziger Report, 22.

[52] The Danziger Report, 22.

tioned that 'this will continue, unless active steps are taken by conservation of water and prevention of soil erosion'. To stress the importance of water conservation, the Committee proposed (a) that the government was obliged to construct small storage dams on different suitable rivers and *spurts* to store water thereby conserving the water level and providing facilities for watering livestock, (b) the construction of dams for small-scale irrigation to enable the small farmer to raise a monthly income from dairy products and other goods and, (c) the erection of large dams for the purposes of irrigation for cultivating wheat, lucerne, as well as the growing of fodder for cattle for export and dairy stock. The Committee rationalized large-dams as guaranteed sources of water which would allow the growing of food all-year-round and not have to rely on dry land farming only. The Committee also acknowledged that there were certain areas of the country where because of the 'configuration of and nature of the soil', it was not feasible to conserve surface water, at all. It therefore urged the government to provide aid, with guidance from Irrigation Engineers, in sinking boreholes and wells.[53]

The concerns and resolutions raised in the Danziger Report, urging the government to take stern action found even greater resonance with yet another commission of enquiry, appointed in 1938, namely *the Commission to Enquire into the Deterioration and Preservation of the Natural Resources of Southern Rhodesia*, and chaired by Mr. Justice McIlwaine[54] was specifically asked to enquire into the degree to which the natural resources of the Colony were diminishing or were being squandered through such activities as soil erosion, wanton destruction of trees, and the choking of 'natural courses, catchment areas, swamps or other sources of streams or rivers'.[55] The section on 'Water Resources' in the Natural Resources Commission Report is unequivocal in its condemnation of the government's lackluster attention to water conservation in the colony. The Commission pointed out that the colony's water resources had been deteriorating since the days of early white settlement but not much had been done to arrest this state of affairs.[56]

In much the same way as the Danziger Commission, the McIlwaine Commission also reinforced the same point that rainfall in Southern Rhodesia was 'erratic in its distribution' and that regular periods of drought were experienced especially in regions such as Matabeleland and Mashonaland. For the Commissioners, scarcity of water in Southern Rhodesia was a result of 'the evaporation which takes place during these periods of drought and the run-off from rains have an important relation-

[53] The Danziger Report, 22.

[54] Justice McIlwaine was the first Judge of the Water Court created under the under the new Water Act, 1927, to adjudicate cases involving conflicts over water.

[55] *Southern Rhodesia*: *Report of Commission to Enquire into the Preservation*, etc., *of the Natural Resources of the Colony*, *April 1939* (Chaired by Mr. Justice McIlwaine), 1.

[56] C. L. Robertson, 'Memorandum on Conservation of Natural Resources', Appendix IV, in *Southern Rhodesia*: *Report of the Commission to Enquire into the Preservation*, etc. *of the Natural Resources of the Colony*, *April 1939*, 69.

ship to the quantity of water actually available where it falls'.[57] They conceded that the foremost factors that induced the run-off were the general gradient of the Colony, the magnitude of precipitation as well as the extent to which the soil soaked up the water – a process regulated not simply by the 'absorptive character' of the soil per se but also by 'the presence or absence of a vegetal covering and by the density of such covering'. As a result, the Commission concluded that it was apparent that 'the general relief of the country and intensity of the rains provide conditions favorable to rapid run-off'.[58] This biophysical reality, for the McIlwaine Commission, demanded the action of no lesser power than that of the State. It urged the State to capture all ground water, 'other than that which has been stored' after the rains and cessation of run-off. It strongly implored the government to introduce anti-soil erosion measures 'which will retard the run-off from the rains' and to persuade every landowner or occupier 'whether it be a town stand, suburban lot, farm or ranch', to erect anti-erosion works and to 'take all reasonable measures to coax the water into the soil and provide storage dams on all suitable sites where water can be profitably used, to safeguard not only his own but also the country's interests'.[59]

While the State responded positively to a number of the recommendations proposed by both the Danziger and McIlwaine Commissions by, for example, establishing the Dairy Control Board, the Maize Control Board, the Cotton Marketing Board, the Natural Resources Board and the Electricity Supply Commission, it clearly was not persuaded to rethink its position and institute a central water planning or conservation authority styled along the lines of these existing resource management bodies. This simply raised the ire of many sections of the white settler population. An editorial commentary which appeared in the periodical, *Rhodesian Mines and Industries* (Aug. 1944), themed 'Foundations of our Future', candidly registered its utmost displeasure at the lack of large-scale water development in Southern Rhodesia. The editorial opened with a reminder that water was 'the keystone of our future as a nation' without which Southern Rhodesia was destined to become 'an extension of the Kalahari (desert)' but added that if water conservation was practiced 'we shall blossom as the flower of Africa'.[60] While it did not belittle the work that the Department of Irrigation had already done, the editorial, written at a time when there was a parliamentary election about to take place in 1944, urged those 'now preparing to seek our suffrages to show that they are capable of thinking in terms of Rhodesia'.[61] Having invoked the settler nationalistic/patriotic feeling, the editorial was unremitting in its swipe at the government:

[57] *Report of Commission to Enquire into the Preservation*, etc., *of the Natural Resources of the Colony*, 26.

[58] *Report of Commission to Enquire into the Preservation*, etc., *of the Natural Resources of the Colony*, 26.

[59] *Report of Commission to Enquire into the Preservation*, etc., *of the Natural Resources of the Colony*, 28–29.

[60] *Rhodesian Mines and Industries* (Salisbury: The Industrial Press, August 1944), 25.

[61] *Rhodesian Mines and Industries* (Salisbury: The Industrial Press, August 1944), 25.

> We have the examples of the Electricity Supply Commission and the Natural Resources Board; we suggest that the obvious extension is the creation of a Water Conservation Commission. With these three bodies we shall have the complete co-ordination of the foundations of our future – water, power, and our natural resources, the latter as yet only scratched on the surface.[62]

This editorial commentary expressed a firm conviction in the construction of a series of dams dispersed across the Colony as a cure-all that would not only provide for the needs of Southern Rhodesia but dispel any anxieties about 'retarded progress' that often accompanies a drought spell. While the colonial state had elected to control many aspects of the colonial economy, this particular editorial was arguing for non-state control of water management but advocating for an autonomous body that would be 'outside the varying fortunes of political warfare and impervious to the whims of changing government'.[63] If this body was founded and '*there must be no further delay*' (*journal editor's emphasis*), it would secure the colonial citizens a range of benefits: 'our most urgent and our most valuable national need – water – would be met; our capacity to survive and multiply assured; and our reconstruction and rehabilitation problems reduced to a minimum'.[64] The editorial ended with a strong appeal to politicians campaigning in the 1944 general election to elevate what it called the national questions of water conservation and extricate them from the amphitheater of party politics for 'thus, and thus only, shall we lay the Foundations of the Future'.[65]

This emphasis on ensuring that water, power, etc. – the 'mechanics of progress'[66] – were firmly in place to build a modern capitalist colonial state received renewed emphasis when greater importance was laid on the economic development of Southern Rhodesia in the late 1940s and especially in the wake of the end of World War II. More commissions of inquiry were set up to investigate and advise the state on any number of issues that affected the proper functioning of the economy with a view to rectifying any aspects deemed dysfunctional. As the Danziger and McIlwaine Commissions had amply demonstrated, those established between 1945 and 1953 likewise all firmly located water at the center of Southern Rhodesia's economic growth and expansion. 'Without water, no plan of development in Southern Rhodesia can succeed unless water conservation is placed among the highest priorities',[67] stated the *Development Coordinating Commission* (chaired by Sir Miles Thomas) in the first of three interim reports released on 8 March 1948.

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[62] *Rhodesian Mines and Industries* (Salisbury: The Industrial Press, August 1944), 25.

[63] *Rhodesian Mines and Industries*, 25.

[64] *Rhodesian Mines and Industries*, 25.

[65] *Rhodesian Mines and Industries*, 27.

[66] Prys Gruffudd, '"Uncivil Engineering': Nature, Nationalism and Hydro-electrics in North Wales', in Denis Cosgrove and Geoff Petts (eds.) *Water*, *Engineering and Landscape*: *Water Control and Landscape Transformation in the Modern Period* (London: Belhaven Press, 1990), p. 159.

[67] Southern Rhodesia: *Development Coordinating Commission*: *First Interim Report*, chaired by Sir Miles Thomas (published by the Government Stationery Office as a White Paper, Salisbury, 8th March, 1948), 9.

Appointed by the Southern Rhodesia government and chaired by Sir Miles Thomas, the *Development Coordinating Commission* went straight to the heart of what it considered the main impediments to the development of the colony. Its narrative of scarcity reiterated the received wisdom about Southern Rhodesia's climatic conditions which have been discussed at the beginning of this chapter. The Commission contended that water conservation 'in an area like Southern Rhodesia where sharp rainfalls are commonplace – sometimes exceeding 3 in. in an hour over a comparatively short period of the year of the year – is of vital importance'.[68] It deprecated the Irrigation Department for the 'woefully insufficient detailed local knowledge of water supplies in the Colony'; the poor maintenance of records of water flows and stated how this dearth of information simply stifled the development of new industrial projects.[69] For this reason the Commission proposed the creation of a Central Economic and Planning Advisory – emphasizing that the future advancement of Southern Rhodesia was patently contingent upon scientific water conservation and called on the government to confer on the Irrigation Department significant autonomous powers in the hiring and payment of qualified specialists who would execute the tasks more proficiently.[70] The Commission spoke vehemently against any haphazard sectional planning and usage of water and, echoing the editorial content of the *Rhodesia Mines and Industries*, counseled the state to treat the water of Southern Rhodesia as a national asset which necessarily had to be 'planned on a national basis'.[71] It condemned a way of planning which would set Municipal and Governmental water schemes on a collision course and reminded the colonial state that poor and narrow-minded planning could only engender an ecological crisis: 'If dams are sited with only parochial objects in view, the whole flow of a river can be adversely affected, particularly when developments in later years are contemplated. All water schemes are, by nature, interrelated and should be viewed in that light'.[72] The Commission impressed upon the government to act urgently and do away with 'outdated practices' pertaining to the issue of staff engagements. These 'should not be allowed to jeopardize the Colony's resources', it stated.[73]

Since it had been established that guaranteed water resources were an essential element in laying the 'Foundations of the Future', the Commission of Inquiry into Town and Country Planning appointed on 19th July 1949 by the Governor of the Colony of Southern Rhodesia, Sir Robert James Hudson,[74] wasted no time in fortifying this view in its recommendations. Appointed to 'consider and recommend whether planning control should be exercised centrally by the Government through-

[68] *Development Coordinating Commission*: *First Interim Report*, 9.

[69] *Development Coordinating Commission*: *First Interim Report*, 9.

[70] *Development Coordinating Commission*: *First Interim Report*, 9.

[71] *Development Coordinating Commission*: *First Interim Report*, 9.

[72] *Development Coordinating Commission*: *First Interim Report*, 9.

[73] *Development Coordinating Commission*: *First Interim Report*, 9.

[74] Southern Rhodesia: *Report of the Commission Appointed on the 19th July*, *1949 to Inquire and Make Recommendations on Town and Country Planning Control and Matters Relevant Thereto*, 12.

out the Colony or should be de-centralized to local authorities in urban areas, etc.' the Commission spent some time focusing on the vexed question of water development and the need for centralized planning and control. As the preceding commissions had also noted, the Commission lamented the extent to which the state of water in the Colony had become a severe crisis – a concern that the commissioners admitted had equally been shared by 'all witnesses' they had interviewed. The Commissioners perceived this crisis as a patently human induced and state-centric problem for 'it has long been the practice for private individuals and industries to sink bore-holes at their pleasure in order to obtain water, and this is one of the reasons why the water table in various parts of the country has been considerably lowered'.[75] The Commissioners also stressed that the 'direct use and distribution of the water available and the provision of further sources of supply in the country', was an urgent matter deserving the state's serious attention'.[76] The Commissioners ascribed these widespread practices that gave rise to the water crisis to the lack of a clear-cut Government policy on water allocation and advocated for greater Government visibility and assertiveness in water supply matters: 'We must emphasize that it is not possible to make the best use of land unless the policy with regard to water supplies has been determined by the Government and all decisions of policy in this connection transmitted to the Government Planning Office'.[77] In striking resonance to the *Development Coordinating Commission's* earlier observations, witnesses, in turn, attributed the problem partly to the limited local knowledge about the extent and quantity of the Colony's water resources. They, together with the Commissioners, urged the Government to undertake a water survey forthwith so that a complete picture of the country's water resources could be determined and on the basis of that knowledge, forward planning of water schemes could be made way ahead of the time they were actually required, and in addition that a water distribution infrastructure to meet the needs of domestic, industrial, agricultural and irrigational users could be planned.[78] Because water was a shared resource which had to be apportioned to a variety of users such as domestic, industrial, agricultural and irrigation consumers, the Commissioners implored the Government to ensure the 'correct use of the water which is available or can be made available', as this was a matter that struck to the core of long-term planning in Southern Rhodesia. For this very reason this was a matter which, the Commissioners argued, they had had to 'take very seriously into account'.[79] The Commission declared that the time had now arrived for the state to review the governmental system it had adopted since the 1930s as it was now in need of an overhaul in view of the post-WWII long-term development Southern Rhodesia was poised to begin.[80] It also insisted that it was the government's bounden duty to centrally plan and control if it was to be proficient in

[75] Report of the Commission of Inquiry into Town and Country Planning, 1949, 12.
[76] Report of the Commission of Inquiry into Town and Country Planning, 1949, 12.
[77] Report of the Commission of Inquiry into Town and Country Planning, 1949, 12.
[78] Report of the Commission of Inquiry into Town and Country Planning, 1949, 12.
[79] Report of the Commission of Inquiry into Town and Country Planning, 1949, 12.
[80] Report of the Commission of Inquiry into Town and Country Planning, 1949, 16.

safeguarding the optimum use of the land and resources of the Colony.[81] Notable among the resources the Commission sought to have the Government bring under control was the water resources of the Colony:

> We cannot emphasize too strongly that the question of future water supplies calls for immediate decision and action. It is not within our terms of reference to make recommendations upon this matter, but we must refer to it and point out that planning in the sense of the best use of the land available is impossible in this Colony unless the Government Town Planning Office is furnished with the fullest information, not only of the existing sources of supply and all future projects, but also of the decisions of the Government regarding the allocation of available water supplies.[82]

The Commission deemed state control over the water resources of the Colony as a critical strategy because water pervaded all forms of town and country planning, industry or urban infrastructural development, domestic or private spheres, mining and agricultural sectors. In the Commission's considered view, water conservation could not be efficiently executed without centralized control over the catchment areas and headwaters of rivers. Such control had to be exerted by a planning authority guided by those involved with agriculture and water supply.[83]

Despite all the recommendations raised by the different commissions of inquiry, it would seem that the colonial state remained unfazed by the cumulative effect of the criticisms leveled against it. If there seemed to be enthusiasm to implement the recommendations of these commissions in the upper echelons of the government, there were a number of public state and private officials who felt very strongly about the need to come up with a long-term plan to develop the colony's water resources by creating a body to begin to formally address this question at last. This body was led by the Director of Irrigation who was vehemently critical of the failings and incapacities of his department to be entrusted with leading the task of national water control and management.

15.5 The Creation of the Central Water Coordinating Committee, 1950–1951

Concerned about getting to the bottom of the intrinsic difficulties in the planning of long-term water development, R. H. Roberts, the Director of Irrigation, hatched the idea to establish a number of committees to investigate this question in June 1950.[84] This effort culminated in the formation of a Central Water Coordinating Committee

[81] Report of the Commission of Inquiry into Town and Country Planning, 1949, 16.

[82] Report of the Commission of Inquiry into Town and Country Planning, 1949, 16.

[83] Report of the Commission of Inquiry into Town and Country Planning, 1949, 16.

[84] Bulawayo Municipal Minutes (hereafter BMC – NB: These records of minutes of the Bulawayo City Council are kept at Large City Hall, Bulawayo, Zimbabwe), 1953: 'Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, Bulawayo', 20th March 1953, 1.

(CWCC) in Salisbury, the capital city of Southern Rhodesia. The CWCC comprised a central committee and four regional committees, namely Bulawayo, Midlands, Salisbury and Umtali. The members of the central committee were representatives of different government departments and private/public and industrial organizations, the Director of Irrigation (Chairman), the Chief Town Planning Officer, the Department of Native Agriculture, the Municipal Association of Southern Rhodesia, Electricity Supply Commission, Rhodesia Railways, Federation of Regional Development Associations, Department of Trade and Industrial Development, Natural Resources Board and the Food Production Committee. The regional committees replicated the same kind of representation as the central committee with the exception that representatives were drawn from regional bodies or associations instead of central bodies.[85]

Following its founding an immediate attempt was made to gauge the enormity of the crisis facing the Committee. A wide-ranging survey involving all local government bodies, farming associations and other large consumers of water was conducted. A specific request was that they needed to pronounce their views, as much as possible, to the development of their regions and the water that they required over a period of 25 years. Their responses were considered by the Committee to be an indication of the existence of 'a very formidable problem confronting the whole country in view of the known limited resources of water'.[86] The CWCC expressed its disappointment with the performance of the Irrigation Department.

But it did not take much time before the CWCC and the Regional Committees became disillusioned about their role and effectiveness. They felt that the various regional committees had separately become disenchanted by, for example, the few meetings held for a few hours in the course of every 2–3 months. This, they deemed inadequate if they had to apply themselves productively to what was a 'momentous and highly complicated problem requiring intensive and continuous study'. This was aggravated by the fact that the central committee of the CWCC had no control over anything, its proposals were of no consequence and finally it neither had the financial wherewithal nor a basic financial policy, thus making it difficult for them to plan ahead meaningfully.[87] Furthermore, the Committee stated that it had regularly witnessed works being done by the Irrigation Department remaining uncompleted because of financial cuts, 'deletions and cutting of requirements to meet the needs of the Minister of Finance in balancing his budget'.[88] As a result, the CWCC came to the conclusion that this 'unsatisfactory state of affairs would continue

[85] BMC Minutes: Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, 1.

[86] BMC Minutes: Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, 1.

[87] BMC Minutes: 'Memorandum on Long Term Water Requirements', Annexure C in Bulawayo Municipal, 1953, 1. This document is also found in the National Archives of Zimbabwe, Harare, (hereafter NAZ): NAZS2651, Appendix IV, 15 September 1952.

[88] BMC Minutes: Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, 2.

unless some statutory measures were taken leading to long-term planning and to the granting of block financial sums for the orderly development of water and for the replacement of the present hap-hazard and hit-and-miss methods'.[89]

The response to these criticisms and proposals were, as had become typically customary of the state, simply repudiated by the Minister of Agriculture under whose portfolio the Irrigation Department and all water affairs fell – only pointing out that the complications necessitating such calls for water control were insurmountable.[90] Repeated attempts to take the matter back to the Minister by the CWCC's representatives yielded nothing. A proposal by the Director of Irrigation to use the Natural Resources Board, a statutory body, to lead the campaign, instead of the CWCC since it already dealt with limited water issues, was rejected by committee members.[91] Many thought that using such an indirect approach was synonymous with an admission of defeat. Yet another attempt was made to invite the Minister to one of the Committee's meetings where 'the whole question was put to him in very plain language'.[92] It was at this meeting that the Minister was finally persuaded to take some action – but his response was typically a sign of the times – setting up another commission of enquiry but never quite implementing some of the recommendations considered by many sections of the society as significant. The Minister agreed to appoint a Commission of Inquiry to investigate 'whether or not statutory control of water resources was desirable, and if it was, what methods should be adopted to implement that control, etc.'[93]

15.6 The Water Resources Commission, 1953

For the most part, evidence presented before the *Commission of Inquiry into the Formation of a Statutory Body to Plan*, *Finance*, *Control and Execute the Major Development of Water Resources of the Colony*, established in 1953, reads like a summation of all the arguments and criticisms leveled at the colonial state by the predecessors of this new commission between 1933 and 1949. Representations made before the Commission by a total of 72 witnesses was generally unanimous in calling upon the colonial state to establish, once and for all, a statutory water

[89] BMC Minutes: Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, 2.

[90] BMC Minutes: Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, 2.

[91] BMC Minutes: Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, 2.

[92] BMC Minutes: Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, 3.

[93] BMC Minutes: Memorandum by Councilor C. M. Newman (Mayor of Bulawayo) to the Municipal Association of Southern Rhodesia, 3.

planning authority.[94] As hinted at above, R. H. Roberts, the Director of Irrigation, continued to be one of the government's sharpest critics of the government's *laissez faire* policy when it came to water control and management issues. His detailed *Memorandum on Water Development*, (written September 1952)[95] in which, he too, like every other witness made a powerful plea for the creation of a statutory national water authority and reiterated the same attacks on the ineptitude Irrigation Department he headed, etc. became something of a blue-print for the *Report of the Commission of Inquiry into the Formation of a Statutory Body to Plan*, *Finance*, *Control and Execute the Major Development of Water Resources of the Colony*. Clearly it had provided the impetus and rationale not only for the setting up of a Commission of Inquiry into the Development of Water Resources in the Colony in February 1953 but, by and large, its salient arguments reverberated in the final report.

Among the several arguments he made, Roberts reiterated a view that many before him had already stated, namely that 'water will without doubt prove to be one of the major limiting factors in the economic development of Southern Rhodesia'. Echoing the contents of the *Rhodesian Mines and Industries* editorial discussed above, Roberts argued that for this reason alone, the significance of devising the best methods of making use of the scarce water resources could not be overemphasized because it was clear that it would impinge on the precise features that form the crux of economic and societal development:

> It affects practically every major development, whether it be the growth of towns, the generation of electricity, the development of railways and other communications, the essential supply of water to major industries and mines, or, last but not least, the attainment of a reasonable self-sufficiency in the production of food.[96]

In Roberts's scheme of things, the moment had to be seized before it proved too late because failure to manage the presumed water crisis within a reasonable time would end in 'chaos, and in waste of money on expedients and hasty make-shifts and ill-considered schemes. Time is therefore vital, and must not be wasted'.[97] For this reason, Roberts stressed that it was imperative to establish a statutory planning and controlling body. In his scheme of things *control* was not just a vital tool in sorting out the uncertain state of the Colony's water resources, it was 'a matter of urgent national concern'.[98] He also spoke on behalf of 'the various authorities and bodies concerned with water' and told the Commissioners how they 'feel strongly that their development cannot be planned under existing conditions, and that the various

[94] For more on the different submissions not covered in this chapter, see Edmore Mufema, 'The Role and Significance of Zimbabwe's Water Resources Commission, 1953–54', in Johan W. N. Tempelhoff (ed.) *African Water Histories*: *Transdisciplinary Discourses* (Vanderbijlpark: North-West University, 2005), pp. 25–30.

[95] BMC Minutes: 'Memorandum on Long Term Water Requirements', 1.

[96] 'Memorandum on Long Term Water Requirements', 1.

[97] 'Memorandum on Long Term Water Requirements', 1.

[98] 'Memorandum on Long Term Water Requirements', 2.

expedients to which they are driven are interfering with future development, and are costly and wasteful'.[99]

But Roberts was not a lone voice as the views he had expressed in the memorandum received widespread support from diverse large water users who also made submissions to the Commission of Inquiry. Regional committees of the CWCC separately passed resolutions throwing their full weight behind Robertson's proposals. For instance, the Bulawayo and Midlands Regional Committees urged the commission to reflect on the desirability of establishing a full time authority to take charge and manage the development and funding of water resources. The Midlands Regional Committee went slightly further to highlight its own particular experience of water scarcity: 'The Midlands felt that they were at a disadvantage as regards water supplies and had suffered badly over the past few years and were strongly of the opinion that some planning and controlling body was needed'.[100] Yet another body, the Municipal Association of Southern Rhodesia, an organization representing the interests of urban municipalities, stressed that municipalities, 'no doubt bulk consumers of water in the colony', firmly believed that some kind of statutory control of water resources was urgently required as 'it was rapidly becoming obvious that some sort of control and coordination must be introduced'.[101] On its part the Bulawayo City Council – a city which, from the time of its establishment had faced unremitting water scarcity challenges, and had a long-standing policy of long-term planning for water resources,[102] comprehended, all-too-well, perhaps better than any other city in the colony, the profound value of having a water authority dedicated to water resource control and long term planning.

Despite acknowledging the logical arguments made by the vast array of witnesses and, for the most part, concurring with them, the Commission's findings were a blow to the enthusiasts and advocates for a statutory water body. Much to the relief of the government, which all along had remained averse to the idea of centralizing water management that was being propagated for nearly three decades, the Commission of Inquiry concluded that it was neither practicable nor necessary to establish such a body to plan, finance, control, and execute the key development of water resources of Southern Rhodesia.[103] Instead, the Commission simply recommended the upgrading of the Irrigation Department to a full-fledged Ministry, thus giving it powers to have its own budget and to higher its own staff, etc.

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[99] 'Memorandum on Long Term Water Requirements', 2.

[100] NAZ S2651: *Report of the Commission of Inquiry into the Major Development of Water Resources of the Colony of Southern Rhodesia*, *1953.*

[101] NAZ S2651: *Report of the Commission of Inquiry into the Major Development of Water Resources of the Colony of Southern Rhodesia*, *1953.*

[102] M. Musemwa, 'Early Struggles over Water: From Private to Public Water Utility in the City of Bulawayo, Zimbabwe, 1894–1924', *Journal of Southern African Studies*, 34, 4 (December 2008), 881–898.

[103] NAZ S2651: *Report of the Commission of Inquiry into the Formation of a Statutory Body to Plan*, *Finance*, *Control and Execute the Major Development of Water Resources of the Colony*, *1953.*

This was pleasant news for the Government whose position was well-articulated by Andrew Strachan, the Secretary to Treasury, who had protested against the idea of instituting a statutory water commission. What had, all along peeved the colonial government was the idea of creating an all-too-powerful, financially autonomous central water authority which, as Strachan argued would be immune from Treasury and Parliamentary control over its activities including its budgetary expenditure.[104] Nor did the Government concur with the argument that the proposed water planning authority would be operated on commercial lines. The recommendation of the Commission was accepted by the Government but could not be implemented immediately because in the same year, 1953, the Federation of Rhodesia and Nyasaland came into being and only ended in 1963.[105] The Southern Rhodesian Territorial Government's freedom to reform was stymied as it could not continue with water resource planning programs and the reconfiguration of a department as important as the Department of Irrigation without the approval of the Federal Government. This had to wait until 1963 when Federation collapsed as a result of the interplay of internal and external political and economic pressures.

At the beginning of 1963, the Southern Rhodesia Government changed the designation 'Departments' or 'Divisions' to 'Ministries', following the recommendations of yet another commission – the *Commission of Inquiry into the Organization and Development of the Southern Rhodesia Public Services*, 1962 (i.e. also referred to as the Patterson Commission after its chairman).[106] This way, the Department of Irrigation was appropriately named the Ministry of Water Development and the functions of this newly-created Ministry were reallocated to the Minister as Minister of Water Development, so too was the administration of the Water Act assigned to him. By so doing, the hegemonic control over the water resources of the country was almost complete and set to begin in earnest as reflected in the new stance taken by the Rhodesian Front Government which came to power in 1962 and immediately accepted one of two principles (and only the first one is germane to this chapter) couched in water scarcity language appropriated from previous commissions of inquiry:

> That Government should own and control all major dams in the country. The reason for this is that in due course water may well become a limiting factor in the development of

[104] NAZ S2650/2 Water Resources Department, verbatim script of evidence submitted by Andrew Henry Strachan, Secretary to Treasury, 1953.

[105] For the period 1953–1963, three white settler countries, Southern Rhodesia, Northern Rhodesia and Nyasaland were joined in a Federation and governed by a Federal Government, but with each country (also known as a territory) having its own Territorial Government which reported to the Federal Government based in Salisbury, the capital of Southern Rhodesia which was the richest of the three territories and had a preponderant white settler community than the other two.

[106] Southern Rhodesia: *Report of the Director of the Ministry of Water Development for the Year ended 31 December 1963*, presented to the Legislative Assembly, 1964 (Printed by the Government Printer, Salisbury), 3.

> Rhodesia, and certainly of specific areas, and it is highly desirable that the Government should be in a position to ensure that such a vital resource is used to best advantage …[107]

But as I have argued elsewhere, the Rhodesian state's commitment to this new principle of water development, governance and control was to be tested when a prolonged drought hit the colony at large, but more severely, the semi-arid region of Southwestern Matebeleland in 1964–1965.[108] This drought which led to the decimation of about 100,000 cattle which belonged to both African peasants and white commercial farmers in 1964 had differential deleterious consequences for both groups. For example, Africans who were historically subsistence farmers who engaged in dryland farming and their cattle depended on natural grazing suffered the most, only managing to salvage a few dollars from cattle the colonial state forced them to sell for a song. Commercial farmers, often had options ranging from having their cattle shipped to provinces such as Mashonaland which was not badly affected by the drought and had better and richer grazing than its arid counterpart, to selling them under weight to the state's main *abbatoir*, the Cold Storage Commission.[109] But the ravages of the drought did not only adverse affect the economy of the country's leading beef-producing region, but also affected a much wider range of people and institutions. As such, the water crisis attracted motley mix groups of politicians, the City of Bulawayo managers, conservationists, local mining industries and other businessmen, all of whom despite their contrasting uses for water, were united by a common plight water scarcity. They all came together to castigate the colonial state which they accused of having done very little in the past to alleviate the hardships they experienced as a result of lack of conserved water to be used when droughts such as the current one struck.[110] While the state had seemed content with intervening short-term relief measures every time a water crisis set in, this time around, these economic interests demanded much more long-lasting solutions to this recurring problem. A day-long conference organized by the Natural Resources Board and held on 21 April 1965, a statutory body set up in 1941 to police and manage the preservation and conservation of natural resources such as water and soil, resolved after a protracted debate about the best and enduring solution to be adopted, to recommend to the government a regional water authority, the Matebeleland Development Council. Having listened to the compelling arguments made for the this proposition, the state acceded to the demands made at this conference.[111]

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[107] *Report of the Director of the Ministry of Water Development for the Year ended 31 December 1963*, 3.

[108] Muchaparara Musemwa, 'Water Scarcity and the Colonial State: The Emergence of a hydraulic bureaucracy in Southwestern Matabeleland, Zimbabwe, 1964–1972', Leila M. Harris, J. A. Goldin and C. Sneddon (eds.) *Contemporary Water Governance in the Global South*: *Scarcity*, *Marketization and Participation* (London: Rutledge, 2013), pp. 79–94.

[109] Musemwa, 'Water Scarcity and the Colonial State', pp. 83–85.

[110] Musemwa, 'Water Scarcity and the Colonial State', pp. 86–87.

[111] Musemwa', 'Water Scarcity and the Colonial State', pp. 88–90.

Although the Southwestern Matebeleland case seemed to signal a new type of discourse about water control, nowhere in the colony was such a water management structure replicated. The MDC remained a decidedly regional water authority whose jurisdiction remained within Matabeleand. In fact, developments a few years after the MDC's formation demonstrated the state's lack of seriousness about such authorities and made sure that this new body had no requisite capacity to become autonomous and thus compelling it to remain dependent for its operations on state funding and direction.[112] But what the state could no longer shy away from, as indicated above, was its assumption of a central role in water provision, management and control. The continuing serial droughts resulting in acute water scarcity crises in Matebeleland in subsequent years (1967–1968 and 1970–1971) and often leading to overall poor agricultural performance compelled the state to conduct far-reaching solutions, without involving the MDC. In 1972, the Rhodesian Front-led government appointed the Agricultural Authority (ADA) to launch an agro-economic survey of Southwestern Matebeleland. In contrast to the pressure that had been exerted on it by the variegated economic interests of Southwestern Matebeleland to demand a lasting water solution, the state was the first to ask ADA to inquire into the question of long-term plans for the mobilization of water to undergird sustained future water development in the region. However, by the time ADA released the Report on the Agro-Economic Survey of South-Western Matebeleland, it was too late to implement some of its proposed state-managed large-scale water development schemes as the Rhodesian government was soon locked into a protracted civil war with the two African nationalist parties, ZANU (PF) and PF-ZAPU, both led by Robert G. Mugabe and Joshua M. Nkomo, respectively from 1972 till 1980. This development distorted state capacity to control and manage water resources for economic development in such a politically-charged and security-risk milieu.

15.7 Conclusion

This chapter has examined how successive narratives of water scarcity by different sectors, albeit a restatement of an almost generic and accepted (but unchallenged version) explanation of the arid nature of the Colony of Southern Rhodesia, spurred a mounting campaign to prod the colonial state to plan, finance, allocate and control the country's resources. It has argued and demonstrated that contrary to assertions that during the period 1930 till 1953, the colonial state assumed central hegemonic control in nearly every aspect of the economic life of the Colony. Conceding that the state did, indeed, assume control over the management of mostly agricultural resources such as cotton, beef, maize, tobacco and energy resources such as electricity, the chapter has argued that this was not quite the case with regards to water

[112] Musemwa, 'Water Scarcity and the Colonial State', p. 90. After giving the MDC an initial capital outlay of £3 million for dam construction, within 2 years, many planned dam schemes were cancelled for 'economic reasons'.

resources. Instead, it took a sustained effort on the part of large water users and some determined officials such as the Director of Irrigation to proactively campaign for an autonomous water planning authority or commission to manage the country's resources. There is very little doubt that these different parties that were involved in this exercise against the state clearly wanted to safeguard their own economic interests by ensuring that the existence of an authority would guarantee reliable and sustainable water resources in times of crises. The different actors in the unfolding saga, clearly set the parameters and agenda of what the colonial state ought to do, but just at the time that these economic forces seemed to be triumphalist, the state stepped in and took central control of this critical resource without which no development of the colonial society could be achieved. Once it had established its dominance in the water sector, the colonial state embarked on massive dam-projects which were not without their own environmental, political and cultural challenges.

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Chapter 16
Global Governance of Natural Resources and the British Empire: A Study on the United Nations Scientific Conference on the Conservation and Utilization of Resources, 1949

Shoko Mizuno

Abstract A great deal of research has been conducted on the development of resource management and conservation in the British Empire. However, few studies explain how much and in what way colonial science impacted the beginning of the global governance of natural resources. This paper explores the process by which the global resource management scheme was designed in the United Nations and considers the impact of conservation ideas and practices in the British Empire. It mainly deals with the United Nations Scientific Conference on the Conservation and Utilization of Resources (hereafter UNSCCUR), which was held at Lake Success, New York in 1949. This conference brought together over 700 experts from 52 countries.

Examining the agendas of the conference, this study suggests that the principal purpose of the UNSCCUR was an international exchange of ideas and experiences among experts, and the application of advanced scientific technologies to resource management all over the world. One of the critical points of this conference was the argument about natural resources in tropical, less-developed countries. There are two reasons why this topic was emphasized in the framework of global resource management and conservation. First, most natural resources in tropical regions were still under-developed, therefore it was essential, both nationally and internationally, to devise controls for long-term, efficient use. Secondly, Neo-Malthusian arguments and apocalyptic narratives, which were based on the rapid population growth in the less-developed countries, were widespread in scientific societies.

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Specifically, I pay attention to the discourse of the British and other European colonial and ex-colonial scientists in technical departments or research institutes, and explore how they recognized the local conditions, results and limits of the applied conservation measures. Their perspectives and experiences were utilized for preparing the blueprint for the technical assistance programs to the less-developed countries, on which the UN embarked.

16.1 Introduction

A great deal of research has been conducted on the development of resource management and conservation in the British Empire. Scientists and technical officers played a significant part in colonial development from the mid-nineteenth century. They tried to establish a management and conservation system of natural resources that aimed at maintaining the use of resources for the long term. In the history of environment and empire, much attention has been paid to the ideas and practices of these scientists and technical officers, as well as their role in colonial development schemes (e.g., Drayton 2000; MacLeod 2000; Anker 2001; Beinart and Hughes 2007). These development initiatives, though disrupted by the Great Depression and the Second World War, were reinforced after the war. At the same time, international organisations that were set up after the war began their involvement in resource management on a global scale.

Recently, a few studies have examined the interactions between imperial and international concerns about natural resource management. Vandergeest and Peluso (2006) suggest that colonial forestry networks in Southeast Asia were reconstituted into post-colonial organizations such as the Food and Agriculture Organization of the United Nations (FAO), which became the key international institution supporting forestry for development in the emerging nation states. Hodge (2007) finds that quite a few colonial agricultural experts went to work for international aid agencies such as the FAO and the World Bank, and suggests that their developmental and environmental narratives and practices were embedded in international technical assistance programmes for the newly independent countries. Gold (2011) investigates the transfer of the British colonial foresters to the FAO as natural resource specialists in the 1950s and 1960s, and shows that this recruitment generated political tensions between the Colonial Office and the FAO.

These previous studies have shown scientific networks beyond the framework of the empire and noted the legacies of colonial science in the various international institutions. However, there is a need for further empirical investigation into their arguments on global resource management to better understand how much and in what ways the colonial scientists impacted the beginning of the global governance of natural resources. This study, therefore, investigates the process by which the global resource management scheme was designed in the United Nations and considers the impact of conservation ideas and practices in the British Empire.

Specifically, this paper focuses on a forum for international technical assistance, the United Nations Scientific Conference on the Conservation and Utilization of Resources (UNSCCUR), which was held at Lake Success, New York, from 17 August to 6 September in 1949. This conference was the first occasion in which the UN had brought together more than 700 experts from 52 countries (See Table 16.1) for an exchange of ideas and experiences, and the application of advanced scientific technologies to resource management all over the world. This conference has received little empirical evaluation since it was considered only to have been an opportunity for preliminary practical negotiations. However, we should not underestimate the significance of this conference because it sheds light on how natural resource management became an international issue, and illuminates the role of colonial scientists in creating and developing technical assistant programmes for less developed countries.

Table 16.1 The number of contributors and participants to the UNSCCUR

	Author of a conference paper	Participant presented at the conference	Author presented at the conference
Argentina	11	4	0
Australia	11	1	2
Austria	8	0	0
Belgium	9	4	2
Bolivia	2	4	0
Brazil	5	3	1
Burma	2	3	1
Canada	14	18	16
Chile	4	6	1
China	1	4	0
Colombia	0	6	1
Costa Rica	1	1	1
Cuba	1	3	2
Czechoslovakia	8	0	0
Denmark	6	6	2
Ecuador	0	2	0
Egypt	3	9	1
El Salvador	0	0	1
Finland	2	2	2
France	47	12	8
French Union	2	2	1
Greece	0	1	2
Guatemala	0	0	1
Haiti	2	2	0
India	17	9	5
Indonesia	1	2	0

(continued)

Table 16.1 (continued)

	Author of a conference paper	Participant presented at the conference	Author presented at the conference
Iran	1	2	0
Iraq	0	1	1
Israel	4	7	2
Italy	4	1	0
Japan	2	0	0
Korea	0	1	0
Lebanon	0	2	0
Liberia	0	2	1
Mexico	2	6	1
Netherlands	19	1	5
New Zealand	12	2	1
Nicaragua	1	1	0
Norway	9	3	2
Pakistan	12	1	1
Panama	0	1	0
Peru	1	2	0
Philippines	3	3	1
Poland	2	0	0
Portugal	0	1	0
Sweden	19	5	2
Switzerland	7	4	0
Thailand	1	1	0
Turkey	0	1	0
Union of South Africa	2	4	0
United Kingdom	46	16	16
United Kingdom Possessions	16	1	1
United States	34	297	110
Uruguay	0	5	0
Venezuela	3	12	2
Yugoslavia	4	1	1
International Organizations	3	21	9

Source: UN 1950, Proceedings of the United Nations Scientific Conference on the Conservation and Utilization of Resources, 17 August–6 September 1949, Lake Success, New York, vol.1, Plenary Meetings, UN, New York

In the first part of this study, I explain how the UNSCCUR was designed just after the Second World War. I also examine the conference agendas that show the anxiety about the global resource crisis and the concerns about technical assistance to less developed countries. Then, I analyse the arguments of the British and other European colonial and ex-colonial scientists in technical departments or research institutes and discuss how they recognized the problems of resource management in less developed countries. Moreover, I investigate several agricultural programmes

in the British colonies to find the nature of colonial development. Finally, I summarize the results from the conference and show the significant role of the colonial scientists in the evolving technical assistance programmes, which characterised the early history of global resource management.

16.2 The Beginning of Global Resource Management

16.2.1 Background and Preparation for the UNSCCUR

A proposal of this conference came from the United States government. In a letter dated 4 September 1946, US President Truman suggested that J. S. Winant, US representative to the United Nations Economic and Social Council (ECOSOC), propose a motion at the next session of the council that an international scientific conference on the conservation and utilization of natural resources should be held in the US. Winant asked for the proposal to be placed on the agenda, and the US proposal was introduced at the third session of the ECOSOC on 21 September 1946. The council decided to retain the item on the agenda but to postpone a decision on the proposal until the next session. Until then, UN Secretary-General Trygve Lie had heard opinions from the member governments of the UN and its specialised agencies (UN 1950, p. vii).

At the fourth session on 28 March 1947, the ECOSOC decided to call a UNSCCUR for the purpose of exchanging ideas and experiences on these matters among engineers, resource technicians, economists and other experts in related fields. It also authorized the Secretary-General to call a preparatory committee of experts who would assist him in carrying out the work related to the planning of the programme and the selection of speakers (UN 1950, p. viii). The preparatory committee consisted of experts nominated by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Labour Organization (ILO), FAO and the Interim Commission of the World Health Organization (WHO), as well as an Economic Consultant to the UN and secretariats of the UN Department of Economic Affairs. The committee also included experts from nine countries that were appointed by the Secretary-General to serve in their individual capacities.[1] The chairman of the preparatory committee was Cater Goodrich, a professor of economics at Columbia University.

The preparatory committee undertook the preparation of the provisional programme, which was considered by the ECOSOC at its seventh session in July and August 1948. A revised programme was prepared on 6 October 1948, and the preparatory committee used this revised programme for selecting experts appropriate to present papers at the conference. In addition, member governments of the UN were invited to nominate authors for papers on specified subjects. All member governments of the

[1] Four experts from the US and one each from Lebanon, Venezuela, Sweden, France, India, Chile, Poland and the UK were appointed (UN 1950, p. xxv).

UN and other governments participating in the regional economic commissions of the UN were asked to arrange attendance at the conference for the participants selected by the member governments in March 1949. In addition, representatives of scientific societies, interested international organizations and other specifically qualified individuals were invited by the Secretary-General (UN 1950, p. ix). The range of expertise was very wide and included scientists working at universities, institutions and industries, and leaders of conservation movements as well as very large numbers of technical and administrative officers of technical departments (UN 1950 pp. xxix–liv).

From the early stage of the preparation for the conference, the ECOSOC decided that the UNSCCUR was to be limited to the exchange of ideas and experience in the techniques of the conservation and utilization of resources. Therefore, the conference was not commissioned by the ECOSOC to make formal recommendations. According to Goodrich, it was because 'delegates were not chosen as political representatives but as individuals for their technical or administrative expertise and were expected to freely tell what they knew and what they believed (UN 1950, p. 406)'. What the ECOSOC needed for the conference was 'the widest possible statement of the various points of view on this extremely important problem of the utilization and conservation of resources' (UN 1950 p. 323).

Notwithstanding the attempt to depoliticize the conference, the Soviet Union did not take part in the preparatory committee or the conference itself. Although a number of papers from Czechoslovakia and Poland were contributed, no national delegation from the Soviet bloc attended the conference. On the other hand, the US took initiatives to prepare this conference. This partly stemmed from the American conservation movement and the New Deal concern with resource planning (Goodrich 1951, p. 49). After the Second World War, domestic interest in resource conservation and utilization was expanded into international technical aid for the development of natural resources in underdeveloped countries, which was suggested in US President Truman's inaugural address in January 1949, known as Point Four. The Point Four Program was often considered as an attempt to make newly independent states economically and socially viable and keep the states in the anti-communist camp (Ekbladh 2010, pp. 77–79).

Britain and other European powers also showed positive attitudes toward the idea of technical cooperation. After the war, the commercial potential of tropical Africa was emphasised and closer collaboration for the development of natural resources in Africa began to take shape in colonial scientists and administrators. In 1946, British colonial scientific experts began to discuss the possibility of inter-imperial technical collaboration for the development of Africa at the Royal Society's Empire Scientific Conference (The Royal Society Empire Scientific Conference 1948, pp. 495–525). In 1950, the Scientific Council for Africa South of the Sahara (CSA) and the Commission for Technical Cooperation in Africa South of the Sahara (CCTA) were established as the first multinational organizations for technical cooperation in Africa among the UK, France, Belgium, Portugal, the Union of South Africa and Southern Rhodesia (Worthington 1958, p. 49). Anti-colonialism might encourage cooperation among the European colonial powers. The discourse of

technical assistance for the development of African colonies often worked as a tool for depoliticizing and justifying the role of colonial scientific experts in Africa (Bonneuil 2001, p. 266).

The plan of the UNSCCUR can be argued in the context of the Cold War as well as the 'Second Colonial Occupation' (Low and Lonsdale 1976). However, we cannot overlook more essential motivation behind the international development aid, that is, the idea of conservation of natural resources, which were based on the anxiety about the global resource crisis from the mid-1930s. In the latter half of the 1930s, British colonial scientists and administrators began to share the anxiety about soil erosion widespread in the empire, partly influenced by the news on the Dust Bowl, large-scale dust storm and soil erosion in the US (Anderson 1984; Beinart 1984). We can find the similar view that related soil erosion in the world to the deterioration of fertility and consequently the decline of civilization in reports and articles written by distinguished colonial scientists (Stebbing 1935; Stockdale 1937; Gorrie 1938). As E. P. Stebbing, professor of forestry at the University of Edinburgh, disseminated the discourse of 'man-made desert' (Stebbing 1938) in the British Empire, American ecologist Paul B. Sears's *Deserts on the March* (1935) helped to spread in American society anxiety about the human capacity to induce the collapse of civilization. Moreover, an influential book titled *The Rape of the Earth: A World Survey of Soil Erosion* (Jacks and Whyte 1939) suggested that soil erosion in almost every country led to world food shortage and consequently the decline of civilization. This global anxiety, intensified by the devastating damage in the Second World War, provided a driving force to international cooperation for conservation and utilization of natural resources.

16.2.2 Technical Assistance for Global Resource

The UNSCCUR was the first and the largest international scientific conference on the development and conservation of natural resources after the Second World War. The primary concern was the practical application of science to resource management and use, rather than refinements in research and scientific methodology. The authors and other participants were invited to discuss economic possibilities and practical opportunities for the further application of their special techniques, and the factors limiting such application as well (UN 1950, p. xii).

The programme for the conference was divided into six major sections: minerals, forests, fuels and energy, water, land, and fish and wildlife resources. At each section meeting, more professional and technical matters were discussed (UN 1950, p. x). In addition, there were 18 plenary meetings that considered broader problems of resource development and also provided a common purpose to the entire conference. This paper will focus on the discussion of renewable resources, especially soil, and therefore, I will analyse the meetings of the Land Resources Section, as well as the plenary meetings concerned. The reason for the need to focus on this section is that soil had been one of the main concerns for scientific and administrative people

in the world since the mid-1930s as I mentioned before, and soil resources were the subject of the largest group of section meetings.

The fundamental question shared by most participants in this conference was how humanity in the future could go through development without waste of its natural resources, and therefore, conservation and utilization of the natural resources in this globalising world was 'the big problem that confronts us in the twentieth century' as Egbert De Vries, Counsellor for Economic Affairs to the Ministry of Overseas Territories, Netherlands, rightly indicated (UN 1950, p. 229).

Through the arguments in the plenary meetings of the World Resources Situation, World Review of Critical Shortages and Interdependence of Resources, we realise a shared anxiety about the threat of a global resource crisis caused by population growth, the wasteful use of resources, as well as devastation by the Second World War. Hugh H. Bennett, Chief of the Soil Conservation Service in the US Department of Agriculture, quoted a declaration of the Inter-American Conference on Conservation of Renewable Natural Resources in 1948, which he believed to be a valid statement for the UNSCCUR:

> Everywhere in the world, natural resources have been depleted by ignorant and reckless exploitation that has ignored the inexorable natural laws which maintain them, and this depletion was disastrously accelerated by the recent world war. Throughout the world steadily increasing populations have put an ever-increasing strain on the dwindling resources. These two forces, each of which reinforces the other, have now brought mankind to an almost critical point. The challenge of our time is that we must arrest and reverse them or face the fact that the very existence of civilization will be brought in peril. (Bennett 1950, p. 76)

The discourse that related international cooperation for development of resources to world peace was found here and there at the conference. At the introductory and welcoming addresses, Lie, as the chairman of the conference, declared that the purpose of the conference was to mobilize technical knowledge in support of one of the high purposes of the Charter, which was to raise the standard of living, and that purpose was of vital importance to world peace. He expected participants at the conference to teach and learn about the specific ways and means of solving the problems of *how to develop* and, in developing, *how to conserve the earth's resources* (UN 1950, p. 2). (italics added)

One of the top priorities of the conference agendas was the arguments about natural resources in tropical, less developed countries. The reason this topic was emphasised in the framework of global resource management was that the conference realised that one of the main resources for future development was in the tropical, less developed countries. Uncultivated land in Africa and South America was expected to produce more food and resources for an increasing global population (Clark 1950, p. 19). However, the conference participants thought that Africans and South Americans did not have sufficient skill for sound development (UN 1948 p. 5). Therefore it was essential, both locally and internationally, to devise controls for the long term, efficient use of resources. That is, technical assistance for less developed countries meant support for producing steady food and resources for the world economy, as well as improving the living standards for people in those countries (UN

1950, pp. 307–323). Positive arguments were put forward in favour of aid for underdeveloped areas in the tropics. In the following section, I discuss how the participants to this conference argued for methods to bring balanced development into less developed countries.

16.3 The Role of Colonial Scientists in the UNSCCUR

16.3.1 Different Views on Technical Assistance

In the first part of this section, I focus on the arguments at the plenary meeting of Soils and Forests to make clear the different points of view between the American and British colonial scientists. The speakers at this meeting were dominated by American agriculturalists, such as Charles Brannan, the Secretary of Agriculture; Robert M. Salter of the US Department of Agriculture; A. B. Lewis of the FAO (formerly worked at the US Department of Agriculture) and Bennett who was previously mentioned. They reported modern techniques for soil conservation and increasing agricultural production (Bennett 1950; Lewis and Harrison 1950; Salter 1950). The US Agricultural Department had developed these techniques in the struggle with the Dust Bowl, which had an exceptionally influential impact on farmers in the Great Plains in the 1930s (Great Plains Committee 1936; Bennett 1939). They expected themselves and their colleagues in the US to practice the idea of Point Four. Its fundamental concept, as was briefly mentioned in the previous section, was to provide international aid to bring modern technical developments to the underdeveloped countries to enable them to make better use of their natural resources for improvement and growth. Therefore, Brannan, Salter, Lewis and Bennett argued for the transfer of advanced methods of protecting soils, which had been developed in the US.

American agriculturalists suggested that fundamental knowledge and technology of soil science could be universally transferred. Salter admitted that social and ecological conditions in the tropics were considerably different from those in Europe and North America, but stated that ‘fundamental principles of the chemistry of soils or of plant breeding are applicable. These principles can be used in devising techniques that will be successful’ (Salter 1950, pp. 87–88). In general, American scientists showed positive attitudes about the potentialities of transferring Western technology to underdeveloped countries.

However, commentators at this session, who had work experience as tropical agriculturalists in the Dutch, French and British colonies, were quite suspicious of the efficacy of the introduction of modern science into tropical, less developed regions. C. H. Edelman, the Professor of Soils at Agricultural University of Wageningen and Maurice Guillaume, Director of Agricultural Services for the French Overseas Ministry explored how social and ecological conditions restrained the application of modern agricultural techniques into the Dutch and French tropical

colonies. Geoffrey F. Clay, Agricultural Advisor for the Secretary of State for the Colonies of the UK, pointed out that indigenous peasants could not easily accept modern agricultural and conservation techniques that the officers of the US Agricultural Department advocated. From his experience, the biggest factor that colonial scientific officers had to face in the expansion of production in underdeveloped countries was the position of peasant producers. Clay declared that 'in my view, it is *not a question of new experimental techniques, but rather the application to existing communities of the results of experimentation* which have been achieved throughout the world (UN 1950, p. 91)'. (italics added)

Clay and other scientists who worked in the tropical, less developed countries participated in a symposium named Resource Techniques for Less-developed Countries as discussants and clarified two issues as obstacles to application of technology. First, as Professor Albert Rhoad of the Inter-American Institute of Agricultural Science in Costa Rica indicated, it was not easy task to make the scientific principles and practices that were learned at American and European universities adjust to the distinctly different ecological conditions of the tropics. The composition, classification and character of tropical soils were much less known than that of temperate conditions (UN 1950, pp. 313–316). The other issue concerned social factors such as indigenous customs, land tenure systems, poverty and overpopulation, which represented the difficulties of applying scientific methods to less developed countries. Clay identified the significance of this conference as follows:

> I believe that one of the most important contributions which this Conference can make is to obtain a clear appreciation of the conditions and problems which exist in the underdeveloped countries, and of the limitations, human, physical and financial, which, by the very nature of their under-development, impose severe restrictions upon the techniques and the scope of the efforts they can make in the development, conservation and utilization of their resources. (UN 1950, p. 314)

16.3.2 Colonial Agricultural Development as Experimental Planning

Colonial scientists endeavoured to devise an agricultural development plan designed for each local condition. The papers presented at the Land Resource Section meetings provided numerous case studies on the conservation of soil fertility and land use programmes in the colonies. A trial and error process, which I will describe in the following part, showed how optimistic and unrealistic the US officers' prospects for technical aid towards less developed countries were.[2]

Concerning rural development plans, most colonial and ex-colonial scientists recognised soil erosion and deterioration, primarily caused by population pressure,

[2] For example, Julius A. Krug, US Secretary of the Interior, stated that 'resources plus technical and scientific skill plus capital investment equal economic development' (UN 1950, p. 5).

as a common problem. Colonial scientists in the 1930s began to realise that tropical soils were fragile and easily suffered from erosion (Tilley 2011). As I mentioned above, the condition of tropical soil still remained less known than the condition of temperate soil after the war. Therefore, the importance of soil surveys in tropical countries was often emphasised at the conference.[3] British colonial scientists usually required basic surveys to classify the general zones of soil to define the farming system, which was suitable for each of these classified zones and then, to test and demonstrate methods in pilot schemes (UN 1950, p. 91).

A subject of the investigation sometimes expanded into local society. For example, a village survey that was launched in 1947 at Mlalo basin in Tanganyika drew considerable attention. The village survey consisted of the collection of vital statistics and a census,[4] which was carried out by a team of native surveyors as well as African officers seconded from the medical and veterinary departments. The expectation was that studying the habits and customs of the people by means of this survey would contribute to formulating a development policy for the future. But in reality, there were as yet minimal results obtained in those few years (UN 1951, p. 110). In addition to a village survey, this Mlalo Rehabilitation Scheme introduced new land-use methods in a demonstration area to prevent soil deterioration. In this selected area, 650 acres in extent, cultivation methods with soil conservation measures, such as ridges and terraces, were carried out by 363 people through paid labour (Clegg 1951).

Another agricultural development plan, known as the Sukumaland Development Scheme, in Tanganyika indicated a different approach to preserve soil fertility and improve the living standard. According to Norman Rounce, Senior Agricultural Officer, overcrowded conditions had led to serious deterioration of the productivity of this land. This scheme consisted of the redistribution of the people and their livestock into unoccupied land and the rehabilitation of degraded land by reducing population pressure and applying soil and water conservation methods, as well as manuring. This scheme was directed by the Sukumaland Development Team, which was experts who worked in Agricultural, Forestry, Veterinary and Water Development Departments. The Native Authorities were expected to work as collaborators with indigenous communities. However, the shortage of field officers and constant friction among the departments concerned were obstacles to the scheme from the beginning (Rounce 1951).

The small-scale agricultural system was also considered one of the common problems of less developed countries because the system produced just enough to feed a farmer's family, which was always on the verge of starvation. It was also condemned as a barrier to soil conservation work, as well as mechanization of

[3] See especially the papers and discussion at the session on 'Soil Survey and Research in Relation to Soil Conservation' (UN 1951, pp. 113–171).

[4] The questionnaire covers the following points: constitution of the family, and age, sex, clan, tribe and religion of its members; medical data; housing, sanitation and water supplies; movements; income and expenditures; food grown on family holdings; land tenure, utilization and agriculture; livestock; education, marketing and labour employed by the sample family (Clegg 1951).

agriculture. Accordingly, a method termed ‘planned group farming’, which aimed at cooperative action for conservation and proper utilization of land, was advocated in Nyanza province in Kenya and launched as a result of agreement of the Provincial Team, the District Teams and the Local Native Councils in 1948. Basically this required that similar use be made of contour strips by neighbours, who retained individual user right of their strips. Mutual trust was essential among members of a group, who would usually be relatives. This system was expected to form cooperative societies for better farming that would control their members, obtain loans, acquire implements and market their products. It was reported that 24 groups had been formed with 540 members covering some 7805 acres in the Central Nyanza, and that more groups had been extended to other parts of Nyanza (Chambers 1951).

The methods of introducing improvements into agricultural systems in less developed areas were also intensively argued at this conference. At the session for Education for Conservation, most of the background papers were contributed by the technical or administrative officers in British and other European colonies. Many emphasized the necessity of education and propaganda rather than compulsory approaches and regarded collaborators as essential tools for propaganda (Gille 1950, pp. 258–261).

W. J. Badcock, Chief Soil Conservation Officer of the Department of Agriculture in Nyasaland, presented soil conservation propaganda, which was conducted in two phases. In the first phase, touring administrative and other departmental officers spread information about the danger of soil erosion among chiefs, community leaders and school teachers. The second phase consisted of applying conservation methods more directly. Native Authority Councils were invited to introduce rules to enforce improved methods of cultivating. Indigenous soil conservation supervisors were trained by the Agricultural Department. Then, field operations started and were supervised by African field staff of the Agricultural, Forestry and Veterinary Departments. In cases where cultivators or stock-owners broke any of the applicable rules, Native Authority Courts were in charge of exercising the power for dealing with offenders (Badcock 1950).

From his experience in Uganda, Robin Kingsford Kerkham concluded that ‘agricultural propaganda must be based on sound knowledge of local farming systems and economics’. He proposed adequate means of propaganda as follows. First, it was essential to get the full cooperation of the leaders of the people and to get this ‘they must have a real say in the direction of projects’. Second, Kerkham recommended a group system of education, which gave training to groups of people from one village where the people were keen on new ideas and practices, rather than training courses at experimental farms for selected small farmers. The latter had not proved successful because small holders trained at experimental farms were expected to go back to their villages and act as demonstrators, but in reality, village leaders and neighbours looked upon the trained farmers with suspicion (Kerkham 1950).

On the other hand, some senior officers seemed to have a different opinion. Harold A. Tempany, the former Agricultural Advisor for the Secretary of State for the Colonies of the UK, suggested that arbitrary powers might be necessary at times

among primitive communities, although he admitted that experience showed that often the best approach was through the native tribal authorities. Besides the influence of education and propaganda on the spread of soil conservation, he referred to the use of penalties and sanctions as a means of dealing effectively with a 'recalcitrant minority'. This is because he realized that subversive propaganda occurred in Kenya, which had retarded and destroyed conservation work in native areas (Tempany 1951). Guillaume supported Tempany's paper and argued that it was often difficult to impose soil conservation practices despite persuasion and intensive propaganda. He concluded that the need for effective legislation and its enforcement became imperative, even if great caution should be exercised in introducing regulations (UN 1951, p. 52).

16.4 Conclusion

This study contributed to understanding how and why the conservation and utilization of global resources had become a critical issue for international societies after the Second World War. The goals of this paper were twofold. First, I explored the way in which natural resource management was recognized as one of the international agendas, focusing on the arguments at the UNSCCUR. On the ground of the anxiety about global shortage of food, energy, materials, international technical cooperation for resource management was favourably argued. The idea of technical assistance to less developed countries for the development and conservation of natural resources was the focus as a new type of development aid. While delegations of the United States took a leading role at the conference, scientists of European Powers showed positive attitudes to share information of their colonial experiences. Some of the colonial scientists expected the UN to finance their projects (Guillaume 1951), and others looked for the FAO to take the role in collecting and distributing information all over the world.[5] Scientists from less developed countries including newly independent countries such as India and Burma welcomed technical assistance, and requested what they needed: training and acquisition of technical personnel, procurements of literature, equipment and machinery (e.g., UN 1950, pp. 310–313; Myint 1951).

In previous research, the UN Conference on the Human Environment held in Stockholm in 1972 was considered as a major milestone for global resource management (Schrijver 2010, pp. 48–50), and therefore, less attention has been paid to the process in which conservation of world natural resources had developed before the 1960s. However, the UNSCCUR set the direction for international development aid programmes that could be compatible with conservation. Participants at the conference suggested that the social cost of scarcity of resources could far exceed the present cost of conservation, even though they recognized that it was very difficult

[5] Some British delegates emphasised the significance of the British institutions as international information centres, and showed rather negative attitude toward the FAO (UN 1951, p. 267).

to reconcile conservation and development, in other words, the future and the present (Raushenbush 1950).

The UNSCCUR did not adopt any resolutions that had effects on governmental decision-making. C. B. Pinchot, successor to her husband, Gifford Pinchot, criticised this point at the conference (UN 1950, pp. 318–321), but H.S. Cruz, a member of the ECOSOC, explained as follows:

> The purpose of the Economic and Social Council was to convene this first Conference of scientists with due regard to the fact that there should be the widest possible scope for discussion and the largest possible number of scientists represented in order to set forth their varying points of view. In a conference of this nature, it would have been impossible to contemplate recommendations; in order to arrive at recommendations, a limited number of specific delegates is required. (UN 1950, p. 323)

This remark rightly pointed out the limits and advantages of the UNSCCUR. The conference called attention to various resource management issues, but did not resolve them. However, it provided a world-wide database for reference to deal with these issues. The proceedings and the papers presented to the plenary and section meetings and the records of discussion were published so that the work of the conference received wider circulation in government departments and specialists concerned in the world including those who were unable to attend the conference.[6] The UNSCCUR worked as a pool of knowledge and experience concerning global resource use and conservation.

Second, I revealed how conservation ideas and practices developed in the British Empire worked in planning technical aid programmes for less developed countries. We cannot underestimate the American contribution to this conference. However, it was the British and other European colonial scientists who could provide results of a variety of experiments, which could suggest a more realistic approach to introduce new methods in the tropical countries. The colonial scientists indicated the present local conditions and constraints generated by local ecology and society, and showed what the problems were in technical assistance to the less developed countries.

In the concluding address, James Thorp, President of the ECOSOC, appreciated that the conference had a very important impact on the work of the UN and particularly on its technical assistance. He especially emphasised that many of the scientific papers discussed at this conference provided a set of preliminary, working blueprints for creating certain vital phases of the UN programme of technical aid to underdeveloped countries (UN 1950, p. 427). The UN was preparing the Expanded Programme of Technical Assistance (EPTA), which was funded by voluntary donations from the UN member governments and began to provide technical assistance in 1950. The primary focus of the EPTA was transfer of expertise, usually by sending experts to advise on technical problem, organise pilot projects and help to establish educational institutions. The EPTA also awarded fellowships for specialised studies abroad (UN 1964, pp. 4–17).

[6] Proceedings of plenary meetings and six section meetings as well as the index were published between 1950 and 1953.

Table 16.2 Top 5 EPTA donor countries (1950–1964)

Country	Contributions (US dollars)
USA	216,236,200
UK	34,308,800
Canada	23,722,700
France	21,090,100
USSR	16,000,000

Source: UN 1965, *15 years and 150,000 skills: An Anniversary Review of the United Nations Expanded Programme of Technical Assistance*, UN, New York

Table 16.3 Expert nationalities, 1950–1964 (Top 5)

Nationality	Number of experts
UK	4811
USA	3966
France	3215
Netherlands	1675
India	1336

UN 1965, *15 years and 150,000 skills: An Anniversary Review of the United Nations Expanded Programme of Technical Assistance*, UN, New York

Between 1950 and 1964,[7] approximately $457 million was contributed by 109 countries, and the US was the most important single donor (See Table 16.2). However, the number of experts who were assigned to work for the EPTA indicated the different dimensions. As is shown in Table 16.3, the UK, France and Netherlands as well as the US played a significant role in providing human resources (UN 1965, pp. 136–7). This figure supports the assumption that European scientists who had colonial experience were expected to offer a variety of information and expertise based on experimental cases in tropical countries, which could be utilized as the methods of conservation and utilization of natural resources on a global basis. Goodrich summarised the achievement of the UNSCCUR and argued that colonial scientists made significant contributions to the pooling of knowledge and experience in the less developed countries, which were suggestive to those engaged in the continuing programmes of technical assistance to underdeveloped countries. He further stated that 'the precedents of respect for local skills and knowledge and of the realistic adaptation of technical methods to the economic and social conditions of the country concerned remain relevant; and those who go out to render technical assistance will do well to bear them in mind' (Goodrich 1951, p. 60).

[7] The EPTA merged with the Special Fund to become the United Nations Development Programme (UNDP) in 1966 although the decision to merge was made in 1965.

In fact, many experimental projects in the British colonies including those which I referred to in this paper, did not produce expected results and were stopped by the mid-1950s. Various reasons why the plans produced less satisfactory results were given: administrative problems, the shortage of funds, the growth of nationalism and above all the increasing lack of cooperation of the local people (e.g., Mackenzie 1998; Hodge 2007; Carswell 2007; Schuknecht 2010; Mulwafu 2011). However, in the trial and error process, amended methods were possibly devised and applied in the later period. For example, the group farming in Nyanza province in Kenya ended in 1954, but revised schemes were widespread in the early 1960s (de Wilde 1967, p. 141).

In the late 1950s and early 1960s, many nationalist leaders who led the former colonies to independence as well as international aid agencies preferred rapid economic growth to long-term development with conservation (Schrijver 2010, pp. 38–43). On the other hand, remarkable similarities were found between the colonial models of rural development in the late 1930s, 1940s and early 1950s and the rural development strategies of the 1970s and 1980s, which aimed to take ecological principles much more closely into account (Hodge 2011, pp. 313–4). How can we understand this situation? To answer this question, we need further research into the varied and sometimes contradictory nature of the development ideas that colonial and ex-colonial scientists proposed, and their roles in the international development aid programmes to less developed countries.

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Chapter 17
Upwelling: The Rise of Ecological Consciousness in the Southern Ocean

Joy McCann

Abstract In 1904 an eminent Australian geographer, JW Gregory, gave an address in New Zealand on the effects of ocean currents on climate in the Southern Hemisphere. The newly-federated nation of Australia was emerging from a catastrophic eight-year drought, and climatic extremes were fresh in Gregory's mind when he arrived amongst the green hills of Dunedin to give his address. He argued for the establishment of a United Meteorological Service for Australasia, modelled on the successful Indian service and drawing on contemporary knowledge about the way in which oceans controlled climate in the region. Our 'crude knowledge' of the Southern Ocean, he said, demanded that we study it more closely. If 'our weather be determined by the remote upwelling of water from the deep seas', then the fledgling science of meteorology was ill-equipped for the task of predicting climate patterns without an understanding the currents and winds that regulated them.

The Southern Ocean, an immense, remote ocean in the high southern latitudes, is the world's youngest ocean. Its waters separate the southern coast and islands of Australia from Antarctica, the two driest and most climatically-extreme continents on Earth. The ocean has deep ecological, political and cultural significance to Australia, yet its history continues to be defined by imperial narratives of heroic maritime exploration and Antarctic exploration.

At the time of Professor Gregory's address, the Southern Ocean had become notorious amongst mariners for its ferocious 'Roaring Forties' winds and powerful eastward-flowing currents that encircled the globe. Over the course of the next century, the Southern Ocean would shift dramatically in our consciousness as the new field of oceanography focused scientific attention on its deep ocean currents, revealing them to be a 'crucial cog' in the world's climatic patterns.

In this chapter I seek to historicize the Southern Ocean by recasting the traditional narratives of the high southern latitudes within the larger and more complex story of our changing environmental relationships with the ocean. The discovery and exploration of the deep ocean of the high southern latitudes has received little attention from environmental historians. Yet the rise of an ecological consciousness

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of the Southern Ocean has had profound consequences for our understanding of the Earth's changing climate, and the impact of the ocean on the lives of those who inhabit the region.

> It is not possible to measure the full extent of that sea except with the eye of fantasy. No one will ever delve to the bottom of that sea except by plunging into the waves of his wildest dreams (O'Kane 1972, p. 163).[1]

The Southern Ocean, sometimes called the Antarctic Ocean, encircles the globe in the high southern latitudes south of Australia, New Zealand, South America and South Africa. This chapter seeks to historicize the Southern Ocean, drawing on an Australian perspective to examine different local and global knowledge systems that have shaped, and continue to shape, our understanding of this remote, tempestuous and globally significant marine environment.

17.1 The 'Beneficent Sea'

In 1901, as Australians celebrated Federation, the new nation's agricultural heartland was being ravaged by an 8-year drought. The entire wheat harvest had failed and sheep and cattle lay dead in their millions (Garden 2010). It was the worst drought in living memory for this settler society, and the fulfilment of nationhood was inextricably linked to the knowledge of Australia's climate and ability to forecast its weather patterns. The Federation Drought was fresh in Professor JW Gregory's mind as he arrived in the verdant hills of Dunedin, New Zealand to address the Australasian Association for the Advancement of Science. He noted that the *Challenger* scientific expedition (1872–76) had produced conclusive evidence of the 'oceanic control of the climate of the lands in the southern hemisphere'. Our 'crude knowledge' of the Southern Ocean demanded that we study it more closely, he argued, urging his colleagues to support the establishment of a United Meteorological Service for Australasia modelled on the successful Indian service.[2] If 'our weather be determined by the remote upwelling of water from the deep seas', then the fledging science of meteorology was ill-equipped for the task without an understanding of the currents and winds that regulated them. Australia, he declared, was bounded by ocean and its 'national prosperity and welfare' profoundly shaped by it. '[T]he beneficent sea … restores the equilibrium which is necessary to our existence' (Gregory 1904, p. 30).

[1] From an account of a voyage to Siam by a seventeenth century Persian traveller.

[2] The Australian Bureau of Meteorology began its operations in 1908.

17.2 Beyond the Known World

The Southern Ocean is the youngest of the world's five ocean basins, formed about 30 million years ago as the last of the major continental plates separated. Its physical boundaries are fluid and contested, defined in the south by the seasonally-shifting ice continent of Antarctica and in the north by a line of latitude 40° south.[3] At its northernmost reach, the ocean breaks along the southern coastlines and islands of Australia, New Zealand, South America and South Africa, once the southern outposts of northern empires. Remote from the historical centres of European civilisation and sparsely settled along its shores, the Southern Ocean has come to exist more in imagination than reality, conceptualised through the writings, maps and measurements created by the few – maritime explorers, scientists and settlers – who have voyaged, worked or lived with its reach. In the European imagination, the Southern Ocean was 'brought into history' during the seventeenth century as Portuguese and Spanish ships ventured into the southern latitudes as far west as Brazil in their imperial quests for new territories and trade (Pearson 2003, p. 3). Dutch, French and British ships came in their wake but gained even swifter passage to the trade routes of Asia by rounding the Cape of Good Hope in the thrall of the strong winds that propelled their vessels eastward. In the process they began populating the 'empty' spaces of ocean on their charts. Australia's western coastline took shape from 1627 when Dutch explorers mapped the coastal features of a land they called 'New Holland' (Western Australia). These previously 'uncharted' waters were not empty, however. For thousands of years the ocean off southern Australia was the traditional country of Indigenous saltwater people.

> [The ocean] contained sacred sites … and it contained tracks, or Songlines along which mythological beings travelled during the Dreamtime. The sea, like the land, was integral to the identity of each clan, and clan members had a kin relationship to the important marine animals, plants, tides and currents (Smyth 2012).

The philosopher Ptolemy had imagined in the second century AD that a Great Southern Land existed beyond the edge of the known world, theorising that it counter-balanced the continental masses of the northern hemisphere. *Geography*, his cartographic thesis of the world published during the Roman Empire, influenced European thinking for centuries and his ideas attracted renewed interest during the fifteenth century as ships ventured beyond the world of the Mediterranean. In 1570 Abraham Ortelius produced one of the earliest maps depicting the mythological Unknown South Land, *Terra Australis nondum cognita*, anchoring the Earth at its southern extremity (Woods and Helman 2013; Pearson 2005; Mann and Phaf-Rheinberger 2014). Scottish-born Alexander Dalrymple, the British Admiralty's first hydrographer and a passionate advocate of Ptolemy's theory in the eighteenth century, published a hypothesis about the Great Southern Land (Dalrymple 1767). At Dalrymple's behest, the British Admiralty appointed Lieutenant (later Captain)

[3] The northern extent of the Southern Ocean which was established in 2000 by the International Hydrographic Organization is still contested by some nations.

James Cook to command a voyage to the southern seas, and in 1768 Cook sailed from England on the first of three forays into the high southern latitudes. Ostensibly, his mission was to observe the transit of Venus in Tahiti, but he also received secondary orders – the so-called 'secret instructions' handed to him under seal – to sail south from Tahiti to latitude 40 ° south. His orders were to determine whether a Great Southern Land existed at the bottom of the world and, if so, to claim it in the name of the King of Great Britain (Beaglehole 1974, p. 149).

17.3 Into the Roaring Forties

The southern end of the Earth was about to shift from imagined realm to tumultuous reality. On average, the winds of the Southern Ocean are the strongest found anywhere on Earth. At these latitudes they blow around the Earth unimpeded by any land mass. 'If you could master those winds', Tom Griffiths has written in his history of voyaging to Antarctica, 'you could dominate the world' (Griffiths 2007, p. 38). Sailors christened them the 'roaring forties'. Further south lay the realm of the 'furious fifties' and 'screaming sixties'. Here also were the 'albatross latitudes', named after the majestic birds that sailed effortlessly in the invisible currents of air above their ships while their vessels heaved in the turbulent waves below (Hince 2000, p. 3; Griffiths 2007, p. 36). Sailors described how their ships, caught in the thrall of the roaring forties, would 'run the easting down' (Dear and Kemp 2007; Mack 2011). The 'clipper route' around the Cape of Good Hope is still regarded as the fastest sailing route around the world. Departing from Plymouth in 1772 with the *Resolution* and *Adventure* under his command, Cook criss-crossed the Southern Ocean and circumnavigated the Earth, making the first recorded crossing of the Antarctic Circle in January 1773 reaching 71° 10′ south, sailing 'Farthest South' than any other European and encountering a vast sea of ice, and unwittingly passed close to the Antarctic mainland. He recorded in his journal that, if *Terra Australis* did exist,

> no man will never venture farther than I have done and that the lands which must lie to the South will never be explored. Thick fogs, snow-storms, intense cold, and every other thing that can render navigation dangerous, must be encountered (Beaglehole 1961, II, pp. 637–8).

Cook, who first used the name 'Southern Ocean', had attempted to sail south via the less favoured route westward from Cape Horn, but his experience of the power of the westerly winds convinced him to reverse the route on his second voyage. Thirteen years after Cook's third and final voyage the HMS *Sirius*, flagship of the First Fleet that had deposited its human cargo of convicts and guards at Botany Bay in 1788, set sail for the Cape of Good Hope to obtain provisions for the starving penal colony. The colony's Governor, Arthur Phillip, urged Captain John Hunter to head westward from Van Diemen's Land so as to head directly to the Cape, but Hunter expressed his doubts about the impractical nature of the westward route.

'[F]rom my own experience of the prevalence of strong westerly winds across that vast ocean, I am inclined to think it must be a long and tedious voyage' for which the *Sirius*, already showing the strain of the 8-month voyage from Britain, was ill-equipped. Instead he chose to sail eastwards around the globe via Cape Horn, taking more than 7 months to complete the journey back to Australia before being wrecked off the coast of Norfolk Island in the Pacific in 1790 (Hunter 1793; Wotherspoon 2010).

For the next century navigating the stormy Southern Ocean demanded close attention to changes in surface conditions and the appearance of whatever floated or flew that might give early indications of land or ice. In these latitudes it was possible for sailing vessels to circumnavigate the globe from Cape Horn or the Cape of Good Hope without ever sighting land although, in practice, many foundered where the massive winds and currents drove them onto rocks and shoals. Tierra del Fuego, at the southern tip of South America, earned a fearful reputation as the shipwreck coast. Here the Southern Ocean currents surge through the narrow Drake Passage between the Antarctic and South American continents. Lord Bryce considered there to be none 'more terrible than this', while Charles Darwin wrote that '[o]ne sight of such a coast is enough to make a landsman dream for a week about shipwreck, peril, and death' (Darwin 1839, p. 307). By the end of the nineteenth century Antarctica was being heralded as the final frontier, attracting a new breed of explorer for whom the Southern Ocean was a rite of passage to the heroic national quest to be the first to the South Pole (Griffiths 2007). On board Edmund Scott's expedition ship *Discovery* (1901–1904), assistant surgeon Dr Edward Wilson spent long stints on deck sketching and painting new species of birds as the vessel rolled incessantly in the grip of the roaring forties. The *Discovery* was 'bowling along' at 200 miles a day with huge waves regularly deluging his cabin and paints, but this artistic soul was enthralled:

> The beauty of this wild ocean down here is indescribable. The colouring and lights and shadows, the heavy black snow squalls, are all so in keeping with the rush and the roar of the wind that is driving us on, and the heavy thud of the seas as they break against our sides or on our deck and the swish swosh to and fro of the water that is always coming in over the bulwarks (Wilson 1966, p. 68).

Others were less enthusiastic. As Ernest Shackleton contemplated a 720-mile voyage from Elephant Island to the South Georgia whaling stations in the tiny lifeboat *James Caird* after his ship became trapped in pack ice on his last Antarctic expedition (1914–1917), he wrote that this ocean was 'the most tempestuous storm swept area of water in the world' (Shackleton 1970, p. 134). For Belgrave Ninnis, who was in charge of the sledge dogs on Douglas Mawson's expedition to the South Pole (1911–1914), the experience of voyaging across the Southern Ocean was utterly miserable:

> Hell, grim Hell, sodden watery Hell. Perchance you have heard of the 'Roaring Forties'. Well, for eleven days they've been roaring … This is famed as the roughest place on God's earth, and, by Jove, it has lived up to its reputation … Things are coming to a pass when one comes to a meal in oilskins & sea boots (Belgrave Ninnis correspondence cited in Griffiths 2007, p. 36).

17.4 Mapping the Deep

While the roaring forties defined the Southern Ocean above the surface, sailors also had tantalising glimpses of the forces that lay beneath. Even before Cook embarked on his three voyages to the southern latitudes, British astronomer Edmond Halley had recorded detecting a massive eastward-flowing current during his 1699–1700 survey aboard the HMS *Paramore*. Cook noted the current in 1775 on his second voyage to the Southern Ocean, as did Thaddeus Bellingshausen (1819–1821) and James Clark Ross, who concluded that a strong eastward-flowing current conspired with the roaring forties to explain why his position was consistently further east than he reckoned. The current was known to sailors in these southern latitudes as the 'West Wind Drift'. Now known as the Antarctic Circumpolar Current, it is the world's largest ocean current carrying a massive volume of water equivalent to 1,200 times the flow of all the world's rivers combined, and measuring up to 200 km wide and 4 km deep (Smith et al. 2014; Stewart 2011, p. 30; Ford 2014). It circles slowly eastward around the globe for 14,913 miles (or 24,000 km) unimpeded by any landmass (Stewart 2011, p. 30).

The first book on ocean navigation in the northern oceans published in 1836 by an American naval officer, climatologist and statistician Matthew Fontaine Maury drew together disparate information from early log books, charts and stories, marking the beginning of a systematic approach to gathering knowledge about the ocean (Cowen 1960, p. 23). By the late nineteenth century the emerging science of oceanography was offering insights into how ocean currents circulated and influenced the climate of adjacent landmasses in the Southern Hemisphere. Benjamin Thompson (Count Rumford), who had a particular interest in the properties of heat, had speculated in 1757 that freezing surface water found off the coast of Brazil had been carried northward from Antarctica by deep ocean currents, and 'overturned' as it moved from the surface to the deep and back again.

> [D]eprived of a great part of its heat by cold winds, [it] descends to the bottom of the sea [and] cannot be warmed where it descends [and] as its specific gravity is greater than that of water at the same depth in warmer latitudes, it will immediately begin to spread on the bottom of the sea, and to flow towards the equator; and this must necessarily produce a current at the surface in an opposite direction. There are most indubitable proofs of the existence of both these currents (Benjamin, Count of Rumford 1757).

Bottle floats provided a simple if unreliable method for tracking speed and direction of surface currents over expansive areas of stormy ocean. In 1907, for example, a number of bottles were thrown overboard into the waters south of Australia from the Scottish National Antarctic Expedition ship *Scotia*. Each bottle contained a numbered paper requesting the finder to return it to the British Admiralty 'in the interests of oceanographical research' ('Ocean currents', *North Western Advocate and the Emu Bay Times* 1907, p. 3). Two of the floats recovered along the coast of Victoria had enabled scientists to estimate that they had travelled between 9 and 10,000 miles. One of the earliest and most significant expeditions to examine the currents of the Southern Ocean took place between 1872 and 1876 when the British

Challenger, fitted with dredging equipment and specialised instruments for measuring current flow, air and water temperature, spent 4 years establishing over 360 scientific stations in the Southern Ocean and accumulating massive amounts of data about the ocean's depths sufficient to fill 50 volumes. *Challenger* scientists found that sea-bottom waters at the equator off Brazil were almost freezing and deduced that the water circulated northward from the Antarctic via a deep ocean current. They already knew that when very cold deep ocean water flowed along the coastline of a warm landmass, it produced dry conditions on adjacent landmasses. The phenomenon could be observed in Chili and Peru under the influence of the Humboldt and Peru Currents in the eastern Pacific, and was also found in the Indian Ocean where offshore winds off the Western Australian coastline in summer sucked up ice-cold water drawn from 'the abysses of the Indian Ocean', chilling the surface temperature along the Somalian coastline and bringing dry conditions to the land (Gregory 1904, pp. 39–40). The *Challenger*'s success provided the inspiration for other national expeditions to explore the abyssal regions of the Southern Ocean. Two years later, for example, the German Deep Sea *Valdivia* Expedition funded by Kaiser Wilhem II and led by marine biologist Carl Chun collected biological samples from the depths of the Indian and Southern Oceans. In the process Chun's team recorded variations in water temperature and density indicating the massive scale of horizontal and vertical circulation that would later be conceptualised by Wallace Broeker, Henry Stommel and other physical scientists as a 'global ocean conveyor' (Mills 2007, p. 115).

17.5 The Convergence of Science and Commerce

This scientific quest to chart the elusive movements of the Southern Ocean's depths and decipher their influence on the atmosphere had profound significance for the settler societies of the Southern Hemisphere. By the time Gregory gave his address in New Zealand in 1904, however, the quest to understand the nature of the Southern Ocean's depths was being driven by powerful interests in the Southern Hemisphere that had little to do with drought conditions in southern settler societies. In addition to dredging marine life and measurements from the deep ocean to satisfy scientific curiosity, polar oceanography also carried strong national territorial and commercial ambitions. Exploitation of the Southern Ocean's biological resources had begun in earnest in the mid-eighteenth century with small groups of sealers from Europe and North America inhabiting remote coastlines and islands on the margins of colonial Australian society. They were targeting the southern fur seals whose soft skins were highly sought after in the markets of Canton. Sealing activities escalated in the wake of Cook's favourable reports of seal colonies in the waters around the sub-Antarctic islands, and by the 1830s southern fur seals were all but extinct. The larger elephant seals, prized for their oil, faced a similar fate. According to Ellis (2004, p. 177) the number of seals harvested in the Southern Ocean by North American sealers alone was estimated at 5.2 million. With competition increasing

for depleted whale fisheries in the Arctic, commercial whaling interests from Britain, Europe and North America began their assaults off the southern shores of Australia. Here, as Rozwadowski (2001, p. 221) has observed in relation to the northern oceans, whalers were the first visitors to regard the open ocean as a destination 'rather than a highways to get to other lands'. One of the more distinctive characteristics encountered in these high latitudes was a sharp drop in air and sea temperature. Mariners noticed that the change in temperature was accompanied by dense fog and a strong current that set their vessels eastward. They were crossing the distinctive 'biogeographical frontier' known as the Antarctic Convergence where the cold dense Antarctic waters from the south meet and slide beneath the less dense warmer waters from the north, creating a smorgasbord of nutrients and marine life below the surface. In these border regions of the Southern Ocean, whalers discovered rich veins of deep water where whales gathered to travel along their ancient migration routes (Mason 2006–2007; Stewart 2011, p. 30).

By the early twentieth century whale numbers had declined alarmingly in the Southern Ocean, and whaling enterprises demanded greater knowledge about their prey in order to secure a future for the ailing industry. The quest for scientific knowledge of the Southern Ocean merged seamlessly with the quest for commercial advantage. One of the most ambitious and significant scientific expeditions was mounted in 1929 by the British Government. Its mission was to develop a better understanding of whale biology utilising the latest scientific equipment and methods to collect data on their breeding methods and migration patterns. The expedition was led by South Australian geologist and Antarctic explorer Sir Douglas Mawson, who had first come to public attention as the leader of the Australasian Antarctic Expedition in 1911–1914. Mawson was supplied with two purpose-built steamships. The RRS *Discovery II* was named in honour of Scott's pioneering 1901 British Antarctic expedition, and the *William Scoresby* after the British whaling captain. *Discovery II* was fitted with two scientific laboratories and gear for sampling surface water or the 'greatest depths of the sea'. The smaller craft was to be used as a whale-chaser. For the next decade, the two ships 'zig-zagged across the stormy seas surrounding Antarctica' collecting a massive store of data. The expedition, according to the Australian zoologist, Professor William Dakin, was 'one of the most successful efforts made by science to solve some of the problems of the sea'. Much more remained to be done to understand how ocean circulation supported marine life and how it influenced Australia's weather, but the expedition had 'enabled the story of the breeding and growth of the most valuable whale species of the Antarctic to be revealed'.

> Once upon a time explorers visited the Arctic and Antarctic Seas for the excitement and for the honor and glory of discovering new land – now it is the turn of the scientist. Let us hope to the advantage and peace of mankind (Dakin 1947, p. 1).

The Second World War brought a temporary halt to oceanographic research in the Southern Ocean, but it recommenced in earnest after the war spurred by the development of new wartime technologies that offered ocean scientists a window to the deep sea. In 1950, regional newspapers in south-eastern Australia reported to

their readers that the British Admiralty-sponsored research ship was sailing to the high southern latitudes to 'complete the general survey of the Southern Ocean' ('Charting currents of Antarctic Ocean', *Border Watch* (Mount Gambier, SA), 17 June 1950, p. 4). The *Discovery II*'s postwar expedition aimed to map currents and sea temperatures at different levels, examine the nature of the ocean floor and determine the biological and chemical character of its waters. The science of weather prediction would also benefit from an improved knowledge of the Antarctic Convergence, the 'meeting place of warm and cold seas' which was thought to be the source of most weather in the Southern Hemisphere. In addition to collecting information that would be 'of cardinal importance to the science of oceanography' and meteorology, the expedition was also expected to contribute to knowledge of the 'habits of whales and other marine life'.

17.6 Sea Life

Mid-century scientific efforts to gain a better understanding of ocean circulation and whale behaviour was also feeding into an increasingly popular fascination amongst Australians with the ocean at their doorstep. New technologies were transforming the Southern Ocean from a two-dimensional place of winds and fog and ice to a dynamic undersea world teeming with marine life. Early efforts to explore the deep ocean had already demonstrated the potential of new technologies to open up this new frontier to scientific and popular curiosity (Rozwadowski 2005, p. 62). Otis Barton's dive off Bermuda in his 'Benthoscope' vessel in 1934, for example, had reached a record depth of 4,500 ft or 1,371 m (Matsen 2005).

> From far below this level, nets and scoops have brought up strange and fantastic creatures, and from this evidence scientists have begun to mortice together a theory that horizontal zones or 'communities' of sea life populate the depths, living parasitically on each other and all ultimately dependent on a slow rain of food particles and plant life from above ('Rare studies of the sea', *Sydney Morning Herald*, 2 August 1952, p. 7).

Reports of monstrous sea creatures dredged up from the deep or discovered washed up on beaches invariably aroused great excitement amongst Australians who, despite being immersed in heroic settler narratives of colonising the harsh arid inland, preferred for the most part to live near the coast and harboured a fascination with narratives of ocean voyaging and exploration. Classic sea novels such as Moby Dick were popular in Australia as elsewhere, and sightings of sea 'monsters' as far away as Scotland regularly featured in local newspapers. Occasionally, they had glimpses of the creatures that inhabited the ocean depths closer to home. In 1913, for example, Launceston's *Daily Telegraph* reported a strange animal encountered by two men while walking along a remote beach in western Tasmania. They described it as having chestnut-coloured fur and measuring about fifteen feet long. It had the head of a dog and a thick, arched neck although, they maintained, it 'bore no resemblance to seals or sea leopards'. When they approached it, the creature

reared up on his four legs and bounded into the sea (‘Sea monster on the coast of Tasmania’, *Daily Telegraph* (Launceston, Tas.), 26 May 1813, p. 5).

In the same year as the British Admiralty’s survey of the Southern Ocean, the Launceston *Examiner* announced that a Danish deep-sea expedition would spend 2 years exploring the depths of nearly every sea and ocean of the world in order to ‘clear up once and for all’ whether or not sea monsters existed (‘Scientists to hunt sea monsters’, *Examiner* (Tas.), 20 March 1950, p. 3). The *Galathea* Expedition’s primary objective was to determine if there was any life present at the greatest ocean depths, so the vessel was fitted with an exceptionally long 22-ton steel wire rope that, once paid out, took up to 3 days to wind in again. There was also an assortment of nets, trawls, grabs and other instruments to ‘sweep the sea bottom to a depth greater than the height of Mt. Everest’. The expedition leader, Dr Anton Bruun of the Copenhagen Zoological Museum, stated that the expedition’s aim was to gather data about the extreme depths of the world’s oceans – the only ‘white spots’ still left on the map of the world. They would record sea temperatures and currents and collect data on plant life, as well as determine whether there was any truth in the ‘old belief’ in sea monsters or sea serpents. ‘Just think what might be down there – unknown and unseen by human beings since the beginning of time itself.’ At the time of the *Galathea* Expedition, scientists had a reasonably detailed understanding of the ocean and marine life between 1000 and 4000 m. However, they had little reliable knowledge of whether living organisms would be able to survive below 4000 m, and knew ‘virtually nothing’ of fauna below depths of 6000–8000 m. The expedition’s findings, gathered over 21 months and 63,700 miles (102,515 km), astounded the ocean scientific community. Brunn’s own vivid account of ‘Life of the deep sea bottom’ revealed that samples of abyssal mud taken by the quantitative Petersen grab in the ‘alleged azoic zone’ were found to contain bacterial flora on the ocean floor at depths ranging from 7,000 to 10,000 m. Steemann Nielsen attempted to estimate the productivity of oceanic waters in different regions, finding high fertility in the upwelled waters in the Southern Ocean off South Africa, and concluding that the ocean was likely to have a similar productive capacity as that of the land (Carruthers 1957, pp. 39–40).

17.7 A Sense of Wonder

As Franziska Torma (2012, p. 14) notes, ‘people were “discovering” the ocean as a three-dimensional space’ where cultural perceptions of deep sea monsters suddenly became entangled with new scientific constructions of the undersea world. It was around this time that American marine biologist Rachel Carson published the second of her three books on the sea. *The sea around us* introduced a general reading public to a poetic sensibility of the scientific realm of marine science, and cast light on the forces at work in the great depths of the ocean as well as on its surface. Carson began with the observation that humans, unable to return to their own marine origins, could draw on their skill and ingenuity accompanied by a sense of wonder,

in order to 're-enter [the ocean] mentally and imaginatively' (Carson 1951, p. 5). While the roaring forties scoured the ocean's surface, the giant current below moved 'pondorously slow, the measured creep of icy, heavy water' on its 8-year circumnavigation of the globe (Carson 1951, p. 128). These permanent ocean currents, she mused, were

> … in a way, the most majestic of her phenomena. Reflecting upon them, our minds are at once taken out from the earth so that we can regard as from another planet, the spinning of the globe, the winds that deeply trouble its surface or gently encompass it, and the influence of the sun and the moon. For all these cosmic forces are closely linked with the great currents of the ocean, earning for them the adjective I like best of all those applied to them – the planetary currents (Carson 1951, p. 128).

When Carson's book reached Australian shores, the *Sydney Morning Herald*'s reviewer declared that, while humans had mapped and catalogued almost every corner of the Earth's surface, 'beneath the oceans, there is an immense territory into which scientists are only now beginning to probe' (SJ Baker, 'Rare studies of the sea', *Sydney Morning Herald*, 2 August 1952, p. 7). Carson's gifts as both writer and marine biologist enabled her to bring a distinctive 'ecological aesthetic' to her books with a heady mix of science and a sense of wonder in the forces at work in the deep-sea environment (Hagood 2013). The phenomenon known as upwelling was one of her favourites. Upwelling occurs where cold nutrient-rich waters rise from the deep, spawning a thick soup of phytoplankton in the warmer, nutrient-depleted surface water. This process, Carson explained, would 'set off orgies of devouring and being devoured' (Carson 1951, p. 138), producing massive concentrations of marine life. With its large-scale upwelling and biologically-rich Antarctic Convergence, the Southern Ocean was home to some of the largest concentrations of whales in the world. By the time a second edition of Carson's classic book was published in 1960, however, the ocean world that she had described as 'inviolate, beyond man's ability to change and to despoil' was proving to be as vulnerable to human exploitation as the land (Carson 1951, p. xxi). Most of the wealth generated from the highly lucrative whaling industry over the previous century had flowed north to Britain, Europe and North America, although small coastal communities on the southern coasts and islands of Australia also reaped its benefits. The gory business of flensing and boiling down whale blubber was the lifeblood of coastal settlements from Hobart in Tasmania to Albany in Western Australia although, by the twentieth century, there were indications of an emerging environmental ethic. In 1914, the *Eastern Districts Chronicle* (WA) published an article critical of modern whaling methods and apparatus that enabled whalers to target species previously considered unprofitable and hunt them to extinction. As war loomed in Europe, the writer noted, the British Colonial Office had dispatched one Major Barrett-Hamilton to the whaling station in South Georgia in order to determine whether the whales of the Southern Ocean 'stand in danger of extermination'. He was accompanied by a taxidermist tasked with collecting specimens for the British Museum ('Southern Ocean', *Eastern Districts Chronicle*, 17 July 1914, p. 7). By the time Carson's book appeared in Australia, writers were reflecting on the deeply conflicted legacy that these industries had left behind. One writer wrote that the 'rocks ran red with blood'

on the 'islands and desolate shorelines from the Leeuwin to Flinders Island' during the heyday of sealing in the Southern Ocean, and towns like Portland on the Victorian coast had grown wealthy on the spoils of whaling. Locals had even enjoyed the spectacle from vantage points on clifftops and specially-built grandstands as the 'sea giants' and whaling teams battled for supremacy in Portland bay:

> In a country accustomed to the grim tale of squandered resources, it still comes as a shock to learn that the Australian sealeries were exhausted before the Blue Mountains were crossed, and whales killed off or driven from these waters before the opening of the gold rush (SMS 1953, p. 10).

17.8 The Last Frontier

By the 1970s books on the contribution of the ocean sciences to global prosperity proliferated, and the deep sea rivalled Antarctica as the last frontier. Cowen (1960, p. 20), for example, predicted that with modern technology and science the ocean would yield 'a virtually inexhaustible supply of minerals and metals' as well as contributing to the world's food supply, while Lucas (1973, p. 377) declared that the growth of international scientific collaboration in marine research would make the ocean 'available to all mankind … the seas are the world's last great resource to be relatively unexploited, and all countries have much to gain from their exploitation' (Lucas 1973, p. 377). It was also becoming clear, as Gregory had predicted in 1904, that the Southern Ocean's currents and winds exerted a powerful force on global as well as local weather patterns. In this tryst lay the answer to the question of weather prediction that had long preoccupied the settler societies of the drought-prone southern continents, and also had profound implications for the rest of the world. During the International Geophysical Year of 1957–1958, 12 nations with scientific bases in Antarctica agreed to collaborate in an international scientific programme in order to build up a picture of Antarctic weather and climate and how it impacted on global conditions. In the following year they signed up to the Antarctic Treaty, committing to international scientific co-operation, peaceful exploration activities, a ban on nuclear weapons testing, and the suspension of territorial claims in Antarctica.[4] In the following decade, concern was mounting over the rapid escalation of commercial fishing in the sub-Antarctic region and the exploitation of Antarctic krill (*Euphausia superba*), the enginehouse of the Southern Ocean ecosystem (Australian Antarctic Division 2012). At the same time, the idea of the ocean as a marine ecosystem was gaining momentum. International agreements designed to manage the resources of the south polar region followed in quick succession: the 1964 Agreed Measures for the Conservation of Antarctic Fauna and Flora; the 1972 Convention for the Conservation of Antarctic Seals; the Woods Hole symposium in 1976 where ocean scientists considered how to address this 'new episode of exploitation of marine living resources in the Southern Ocean' (Priddle et al. 1994, p. 331).

[4] There are now 52 signatures to the Antarctic Treaty.

Then came a 10-year Biological Investigation of Marine Antarctic Systems and Stocks (BIOMASS), established in 1977 to develop a 'sound ecological strategy for the exploitation of the living resources'. Finally, in the following decade, the Antarctic Treaty Parties negotiated the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR 2014), giving expression to the concept of the Southern Ocean as an ecosystem of global significance.

Over the course of the twentieth century scientific knowledge came to define the Southern Ocean. A combination of developments in undersea surveillance technology after World War Two, together with the decline of whaling and the rise of a new ecological consciousness, created the conditions for such efforts to flourish (Rozwadowski 2010). The construction of scientific knowledge about the physical and biological nature of the Southern Ocean continues to evolve, as does the story of people's engagement – real or imagined – with this remote and tempestuous realm of wind, water and ice. In 2010, for example, scientists from Australia and the United States published their joint research findings that winds blowing on the Southern Ocean were strengthening, creating changes in the surface layer of sea water with implications for the way in which the ocean and atmosphere exchange heat and carbon dioxide (CSIRO 2010, 2012a). The International Hydrographic Organization and the United Nations Educational, Science and Cultural Organization (UNESCO) produced the first International Bathymetric Chart of the Southern Ocean seabed in 2011, charting the pathways of deep ocean currents as well as providing a database for new navigation charts (IBCSO 2014). In 2012 an international team of oceanographers announced the creation of a Southern Ocean Observing System to plot the circulation of the deep currents and their role in shaping global climate patterns and cycling carbon and nutrients (Rintoul et al. 2012). In recent years, small robotic Argo floats have been deployed to measure temperature and salinity from the deepest water – the so-called Antarctic Bottom Water. The floats have enabled oceanographers to gather data all year round. After 10 years of collecting data beamed from the deep ocean via satellites, researchers have concluded that the normally dense bottom water had become less dense since the 1970s, reducing the capacity of the ocean to store CO2 (CSIRO 2012b). Biological studies of phytoplankton in the Southern Ocean reveal that these microscopic organisms at the bottom of the marine food chain are responsible for almost half of the photosynthesis on Earth, regulating climate by controlling the amount of greenhouse gas in the atmosphere. The fate of Carson's beloved phytoplankton is more deeply connected to the fate of our world than the nineteenth century whalers could ever have imagined (Chisholm 2000).

17.9 Conclusion

The oceanic realm at the southern end of the world has exerted a powerful force on Western imagination. Remote from the northern centres of European civilisation and on the margins of its history, the idea of a Great Southern Land persisted for

centuries until mariners venturing into the high southern latitudes mapped two great lands of desert and ice separated by a stormy, tempestuous ocean. They found rich whaling 'grounds' in the Antarctic Circumpolar Current where the southern whales migrated along ancestral pathways. The prospect of a new frontier at the South Pole fuelled epic voyages of Antarctic science and exploration, and nations sought to impose order on the wild ocean that surrounded it by mapping its surface features in order to render it knowable. New tools and methods of the oceanographic and biological sciences opened windows to the deep sea, transforming the Southern Ocean from a stormy moat to be crossed into a 'global scientific laboratory' exploring the interplay of ocean and atmosphere, the 'two great masses of fluid on the surface of the earth' (Reidy 2007, p. 6; Mills 2007, p. 108). Satellite and sonar technologies plotted the shifting contours of ocean and air and mapped the invisible pathways linking this polar region to the rest of the planet. There are many different ways of knowing the ocean and, like the ocean itself, they are forever shifting and converging. The ocean is a place, as Gillis notes, 'where earth, wind, and water are in constant interaction and mankind plays a significant role' (Gillis 2011, p. 18).

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Part V
Civic and Political Agency – History as Memory of Social Process, Knowing the Past Planning the Future

Chapter 18
Roots of Identity, Canopy of Collision: Re-Visioning Trees as an Evolving National Symbol Within the Israeli-Palestinian Conflict

Edna Gorney

Abstract Jewish immigrants settling Israel/Palestine since the end of the nineteenth century, with the objective of creating a national Jewish state, have strongly identified with trees. They perceived the planting of trees as an act of making the barren wilderness come to life and also as a symbol for planting themselves as permanent beings in their homeland from which they had been uprooted thousands of years ago. In a process of structured identity based on hierarchical binaries, they perceived the Palestinians as the opposite of themselves – neglectful of the land and lacking strong ties to it. In the ensuing and ongoing Israeli/Palestinian conflict trees have become signifiers of progress as well as of dispossession, weapons in the escalating cycle of planting and uprooting. In this article I show that environmental policies have been co-opted and used by the State of Israel to further marginalize the Palestinians and take over lands, in what can be termed nationalistic/ethnic environmentalism or "Green" nationalism.

18.1 Introduction

I was born in Tel Aviv, Israel, on December 16th 1955. In May 1956, my parents received a certificate from the Municipality of Tel Aviv, informing them that a tree was planted in my honor in the Child Forest of the Keren Kayemet Le-Israel (KKL, the Hebrew name for the Jewish National Fund, JNF). I was neither a celebrity nor a dignitary. The Tel Aviv municipality planted a tree, as stated in the certificate: "for every boy and girl born to good luck within the limits of our city."[1]

In a second JNF certificate, from 1972, I donated the money for eleven trees that were planted in memory of the eleven Israeli athletes killed during the Munich 20th Olympic Games by terrorists from the Palestinian Black September group.[2]

[1] See also in the city of Jerusalem: Braverman 2009, p. 61.

[2] See: http://en.wikipedia.org/wiki/Black_September_Organization.

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These two certificates demonstrate the strong significance attached in Israel to tree planting, and the widespread perception of a tree as a personal as well as a national symbol of identity, rootedness and renewal of life, evoked in birth and when facing loss and death.

The tree planted in my name, may have been financed by the Tel Aviv Municipality, or by donations from children such as Simon Schama in faraway London. In the introduction of his book *Landscape and Memory* he recounts his memories: "I was gumming small green leaves to a paper tree pinned to the wall of my *cheder*, the Hebrew school. Every sixpence collected for the blue and white box of the Jewish National Fund merited another leaf. When the tree was throttled with foliage the whole box was sent off, and a sapling, we were promised, would be dug into the Galilean soil […] All over London, paper trees burst into leaf to the sound of jingling sixpences, and the forests of Zion thickened on happy response" (Schama 1995, p. 5). The personal significance is evident – if you live in exile, send a tree to Israel: "*The trees were our proxy immigrants*, the forests our implantation" (Ibid, p. 5). So is the collective-national symbolism: "[…] a rooted forest is the opposite landscape to a place of drifting sand […] The Diaspora was sand. So what should Israel be, if not a forest, fixed and tall?" (Ibid, p. 6).

The constructed parallel juxtaposition of the desert (sands) as the opposite of the forest, and the Diaspora as the opposite of the State of Israel, is based on the perception of desert, not just as a concrete arid landscape, but also "as a symbolic landscape that was defined as a symbolic void", a symbol not of nothingness but of the opposite of the Jewish settlement.[3] Similarly the long period of the Jewish exile was also portrayed as a symbolic void in Jewish history "that was contrasted with Jewish national life" (Zrubavel 2008, p. 203). Thus, the struggle to vanquish the desert was private and national, fought on the inside as well as the outside: "a revolutionary negation of the desert within the Jewish soul and upon the Jewish soil" (de-Shalit and Talias 1994, p. 289).

The Zionist revolution called for the creation of a national homeland for the Jewish people, which would in turn facilitate the transformation of the Jewish people to become 'a nation as all nations'. It also advocated the need to conquer and transform the landscape, and as such can be viewed also as an environmental revolution. In order to understand and resolve current environmental conflicts, we must "recognize the ways in which they reflect individual and group identities" (Clayton and Opotow 2003, p. 19). In the first part of this article I will trace the shifting symbolism of forestation and its concomitant implications for Israeli national and personal identity, within the Israeli-Palestinian conflict. I will review the history of identity structuring of Israeli Jews, via identification with trees, within the framework of the Zionist discourse of the return to the Promised Land and the ensuing and ongoing conflict with the Palestinians. I will also show how identification with trees resulted in the conscription of trees as fighting partners and brothers in arms, in the escalating territorial conflict.

[3] The construction of the desert and the settlement as opposing symbols was clearly influenced by European views of the Orient (Said 1995).

In the second part of the article I will demonstrate the implications of this deeply rooted identification with trees on the processes of planning and land appropriation and control by the State of Israel and show how planting is inextricably linked to uprooting. My analysis draws upon postcolonial and ecofeminist theories, as well as studies of identity structuring. I will critically analyze environmental policies, mainly afforestation by the Jewish National Fund (JNF) and declaration of National Parks by the Israel Nature and Parks Authority (INPA), with the aim of laying the groundwork for understanding the complex connections between the Israeli State domination of nature and of Palestinians, and the parallelism of power relations between culture and nature, and settlers and natives, as they are reflected in narratives of tree planting and nature conservation. I will conclude by demonstrating how the State of Israel uses environmental policies also as a tool by which to further marginalize, exclude and in some cases dispossess the Palestinian citizens of Israel, as well as Palestinians in the occupied territories.

The contribution of this article is the realization that every tree casts a shadow, i.e. planting has been connected to uprooting, from the early days of the Jewish return to Palestine/Israel, until the present. The novelty of this article is in exposing the use of environmental policies as another means by which the State of Israel controls Palestinian growth and development within Israel proper and within the occupied territories. Environmental policies are not always implemented for ecological reasons and for the good of all citizens, but sometimes as a tool to erase the memory of previous Palestinian culture, marginalize and curb the development of Palestinian communities, and even uproot them, while justifying these policies by portraying them as progressive environmental policies.

18.2 Clothing the Naked Hills: A Narrative of Civilizing Nature

Although it is difficult to assess historical tree coverage in the Holy Land, it is clear that successive occupying forces used deforestation as a warfare tool (Tal 2013, pp. 19–21). By the end of the Ottoman rule over Palestine (1516–1918), only small patches of woods were left, also as a result of grazing and using wood for cooking and heating (Ibid). During the 30 years of the British Mandate (1918–1948) in Palestine/Eretz Israel, the JNF worked closely with the afforestation activities of the Mandate Forests Department and has continued efforts following the end of the mandate. When the State of Israel was established in 1948, "planted stands and remnants of natural woodlands occupied less than 2 % of the area of the state. By 2005 that figure had increased to some 8.5 %" (Ibid, p. 5). Today, the JNF maintains in its official website that about 240 million trees (mostly pines[4]) have been planted with the aim of "greening Israel".[5]

[4] Pines have become associated with the Zionist project of conquering and afforesting the Promised Land (Braverman 2009).

[5] http://www.kkl.org.il/eng/forestry-and-ecology/afforestation-in-israel/retrieved 27.11.14.

Much of the planting by the JNF today still maintains a connection to tree planting practices by the British Authorities: "Mandate forestry program still resonates deeply among researchers, ecologists, and local Israeli foresters" (Ibid, 2013, p. 33). Forestation for the British was mainly an economic development initiative. However, the motivation was also to restore the Promised Land to its former green glory, influenced by the affinity to the green British landscapes (Ibid, p. 34).

As most of the early Zionist pioneers came from Europe, beginning in the end of the nineteenth century, they also felt an affinity to the green forested European landscapes (Schnell 1997). Furthermore, they viewed themselves as Europeans bringing progress, mediated by advanced technology and scientific methods, to the backward Orient (Gorney 2007; Said 1995; Shiva 1990; Zrubavel 2008). This sentiment is echoed in the words of Yosef Weitz,[6] a prominent JNF leader: "…developed agriculture in a *civilized country* is always accompanied by the *forest*. And similar to agriculture, also in a *civilized human society. One cannot describe such a society without the forest*" (Weitz 1995, p. 327, emphasis added). Even as late as 1987, when the JNF initiated tree planting in the Negev desert, it framed its goals by quoting the then late David Ben-Gurion, who called on young people to refuse to "accept the *disgrace* of the *bald* mountains and the *barren* dunes" (de-Shalit 1995, p. 86, endnote 16, emphasis added). This transformation was summarized as "The best environment […] was the one in which nature had become 'human', in which the desert was abolished and there were no untamed values, but rather human values" (Ibid, p. 80).

18.3 "Us and Them": The Self as the Opposite of the Other

Warren asserts that one of the basic tenets of ecofeminist philosophy is to expose how, within western patriarchy, a 'Logic of Domination' is created, a logic that provides both an explanation and a justification for the subordination of Nature, Woman and Native (2000). Plumwood describes how "a relation of separation and domination [is] inscribed and naturalized in culture and characterized by … distancing and opposition between orders constructed as systematically higher and lower… belonging to…different kinds…and hence not open to change" (1993, p. 47–48).

The Jews were perceived as rootless, and therefore as a threat, by western cultures (Schama 1995). "The enemies of the German forest – and hence of the German people alike – were explicitly specified to be […] the Jews as the 'offspring of the desert'" (Zechner 2011, p. 22). Ironically this perception was projected onto the Palestinians who were described as nomadic and therefore lacking strong ties to the land: "The Palestinians are **nomads** […] they have all of Arabia […] let them fold their tents and move on" (Zangwill 1920, p. 93). This assertion was made despite the fact that in the 1920s, out of approximately 700,000 Palestinians who lived in

[6] Director of JNF Land and Forestry from 1932 to 1972.

Palestine, most lived in towns and agricultural villages, while the semi-nomadic Bedouins were only a small proportion of these.[7]

Furthermore, the Palestinians were perceived as having neglected the land, which turned from "one of the most fertile lands in the world" into "a bereaved country that has only barren hills and stretches of sand" (a 1882 Jewish settler, cited by Zrubavel 2008, p. 205). A similar sentiment was also expressed by Yizhak Ben-Zvi, who later became the second president of the State of Israel. This selective view was obviously based on ignoring Palestinian towns, villages, fields and orchards. When taking note of orchards and olive groves that did exist around the Arab town of Gaza, Ben-Zvi and David Ben-Gurion, the first prime minister of Israel, maintained that these trees had been planted by Alexander the Great and that "since the Arab conquest not a single olive tree has been planted" (Zrubavel 2008, p. 207). Planting trees has become an indicator of the chasm between us and them: "Look how great is the distinction between our fields and theirs, our villages and theirs… Our villages are *green with trees*, surrounded by *a strong fence*, and built of *mortar*; their houses are *gray* – without windows and colorless, only *dusted olive trees* are seen in the village" (A Jewish pioneer, 1938, quoted in Zrubavel 2008, p. 209, emphasis added).

In summary, the Palestinians were perceived as primitive and unproductive 'natives' (Gorney 2007; Said 1995; Shiva 1990). As marginalized people, they were depicted as passive non-agents, part of the "invisible background conditions against which the 'foreground' achievements of reason or culture take place" (Plumwood 1993, p. 4).

18.4 Identity Construction: The Tree Is Like Me and I Am Like the Tree

The Jewish settlers perceived themselves as the trees they were planting and vice versa. A representative of the JNF instructed Jewish Israeli kids planting trees in the Forest of the Martyred Children: "Remember, children, that you do not plant trees, but people" (Zrubavel 1996, p. 62; see also Braverman 2009). Chasia Drori testified: "with every seedling I planted I felt I am also planting myself", and Shmuel Dayan described: "you see yourself as one of the trees in the garden, a body of their body, connected forever to this land" (cited in Neumann 2009, p. 111). The image of a garden is also evoked in a communal journal written by Jewish pioneers between 1921 and 1929. They planted a grove of trees which served as an allegory for the commune of people, each different yet together forming a harmonious combination between individuality and community (Ufaz 2003). Indeed trees can symbolize many positive traits and that undoubtedly facilitated the identification with trees: "The image of a tree has the capacity to raise human consciousness in expressing

[7] A 1920 League of Nations' Interim Report on the Civil Administration of Palestine http://unispal.un.org/UNISPAL.NSF/0/349B02280A930813052565E90048ED1C retrieved January 2015.

values such as permanence, stability, trustworthiness, fertility, and generosity" (Sommer 2003, p. 196).

The combined influences of seeking rootedness and permanence, of striving for the victory of culture over wild nature, of order over disorder, of rational science over chaos, of creating familiar European landscapes, and of the positive traits of trees, explain the strong personal and national identification with trees. "The reciprocity between anthropomorphic interpretations of nature [i.e. the tree is similar to me] and physiomorphic interpretations of self (i.e. I am similar to the tree) may provide a key to understanding how elaborated concepts of both self and nature can be constructed" (Gebbard et al. 2003, p. 105). Identification with trees symbolizes regaining sovereignty and achieving redemption of the land – the tree is perceived as a marker of land ownership and as a harbinger of renewal (Ophir 2000), and thus, becomes a symbol for the new Israeli Jew who grows roots in his ancestral homeland, a soldier in the struggle against desertification and desolation and the fight for a national state.

The flip side of the brave soldier is the helpless victim. The identity of the Israeli Jew as a victim was shaped in large part by persecutions, exile and loss of sovereignty and homeland that culminated during the Holocaust (Ophir 2000). The resulting traumas of uprootedness explain the preoccupation with tree planting in Israel/Palestine (Bardenstein 1998). The JNF Martyrs Forest, in the Jerusalem hills, was planted to commemorate the six million Jews murdered by the German Nazis. Between 1987 and 1989, the JNF planted the Forest of the Jewish Child in the Galilee, northern Israel. Children from Israel and abroad planted two trees each – one for oneself and another for a child who was murdered during the Holocaust.

Arab resistance to the idea of the Jewish State and the ensuing Arab aggression is perceived as a continuation of Jewish persecution. Consequently, trees have become symbols of the victims of Arab aggression, in what constructs their identity as a victim-hero (Ophir 2000, p. 183). One example is the Peace Forest that was planted by the JNF in south-east Jerusalem, which commemorates the 11 Israeli athletes killed by Black September terrorists in Munich in 1972, as well as Israeli soldiers killed during the October 1973 war.

The Jewish strong identification with the pine tree is mirrored in the Palestinians' resentment of this tree (Braverman 2009). Trees are targeted by arsonists and become victims too. When JNF forests were burnt during the Arab revolt of 1936–1939, the burnt trees were personified as dead martyrs (Zrubavel 1996). The use of arson was heavy during the summers of 1988 and 1989. The JNF referred to it as "the Intifada against Trees", and declared a new campaign, "a Tree for a Tree", echoing the biblical "eye for an eye" (Zrubavel 1996, p. 84). "Clearly, these two national narratives are mirror images of each other: a tree for a tree, they imply, dead or alive" (Braverman 2009, p. 105). In the summer of 2006, rockets were fired from southern Lebanon into Israel and many landed in open areas. The JNF website described that the rockets landed in forests and nature reserves and destroyed two million trees (cited in Braverman 2009, p. 108). Trees were presented in a newspaper article as innocent entities "unfairly suffering the cruelties of the heartless Arab enemy" (Ibid, p. 109).

18.5 Nationalism in the Shadows of the Trees

"The non-human environment…constitutes one of the most basically important ingredients of human psychological existence" and is therefore, highly relevant to the development of identity (Gebbard et al. 2003, p. 92). Trees can function, similarly to other national symbols, as "catalysts for the formation and maintenance of national identity" and in "fusing a nation to a state" (Geisler 2005, p. XV). Pine forestation in Europe for example, was viewed as both an instrument and expression of state power (Temple 2011, p. 15). In France, trees were perceived as a permanent landscape replacing the desolate aridity of deserts, and the forest as a "technology for both land reclamation and nation building." [The forest would] "civilize and modernize this backward corner of the nation" (Temple 2011, p. 19). In Germany, the forest was considered a central symbol of "German-ness" from the early nineteenth century onwards (Zechner 2011). In Israel, the strong identification with trees resulted in the forest becoming an Israeli Jewish National Icon (Zrubavel 1996).

18.6 Planting and Uprooting I: "Making the Barren Land Green"

Descriptions of wild, untamed nature resisting civilizing attempts by the Zionist pioneers were common, as demonstrated by this excerpt from 1932: "the wilderness will not give up the dominion it had for thousands of years, to be usurped by a new culture, the pioneer culture of an awakening people" (cited by Bar-Gal and Shamai 1983, p. 165). Haya Bar-Itzhak (1999) studied stories told by the Jewish founders of Kibbutz Genossar,[8] and revealed their dialogic framework. The founders uprooted the wild thorny Jujube Trees to make room for a vineyard and turn the "forest of thorns into a flourishing garden" (Ibid, p. 502). This agricultural endeavor was narrated as a war against the jujubes fought successfully by using technology (a tractor), typical to pioneering narratives that use a "proto-military rhetoric" to describe the efforts to create "a flourishing settlement as *a war that consists of successive battles* ultimately leading to a victory" (Zrubavel 2008, p. 210, emphasis added). Bar-Itzhak discusses the paradox of uprooting/planting in how "the founding of an agricultural community is symbolized by the uprooting of trees" (1999, p. 503). Furthermore, because forestation and tree planting in the Land of Israel were key elements of the Zionist ethos, it is ironic that uprooting of wild trees became a symbol of renewal and rebirth (Ibid). Another layer of the story is that the Palestinian Arabs were characterized by their integration with the landscape while the Jewish settlers by their war against it. The story of the uprooting of the jujubes is also

[8] Settled in 1937, on the western shore of the Sea of Galilee, on land purchased by the Palestine Jewish Colonization Association.

linked with the story of the uprooting of the local Arabs[9] (Bar-Itzhak 1999, p. 504). This multi-layered story, linked to the victory of culture and technology over nature and the Jewish settlers over the local Palestinians (Gorney 2007), has become a key symbol, summarizing the power relation system (Ortner 1973).

18.7 Planting and Uprooting II: "Planting A Forest and Uprooting Memories"

Trees are constructed as active agents[10] in the 1968 novella, *Facing the Forests*, written by A. B. Yehoshua. The novella tells the story of a forest planted on a site of a Palestinian village demolished after the 1948 war. The village ruins are concealed by the trees until a forest fire burns the vegetation and the remains of the buildings are revealed. The trees are portrayed by the writer as young soldiers: "The pines stand erect, slim, serious; like a company of new recruits awaiting their commander" (Yehoshua 1971, p. 146). The trees of the forest are the Zionist soldiers occupying the wilderness and the territory. They fail however. The forest did not replace barren wilderness, did not become a symbol of the transformation of death into life, but rather the opposite: "This isn't a rustling forest but a very small one, like a graveyard" and the pines shedding their needles are "arrayed in a garment of mingling life and death" (Ibid, p. 146). Furthermore, the trees did not rejuvenate the land but devoured it. One could hear: "the thin cry of the weary soil ceaselessly crushed by the teeth of young roots" (Ibid, p. 153). The forest physically buries the past existence of the Palestinian village and erases its memory in the present. As a result it harbors contrasting symbolism for Jews and Palestinians: "While (the forest) is the symbol of roots and renewal for the (Israeli Jew), it is a symbolic graveyard that represents death and destruction for the (Palestinian)" (Zrubavel 1996, p. 78). Thus, as Meron Benvenisti (2000) describes, the battle over the landscape has also become the battle over the 'signposts of memory'.[11]

[9] Most of the lands bought for Jewish agricultural settlements had been cultivated by tenant farmers who were uprooted. Further uprooting occurred in the wake of the 1948 war.

[10] See more examples: In children's books for example, springs of water created a swamp in mourning of the Jewish exile, only to become sources of life again upon the return of the Zionist pioneers and clumps of soil "jumped" into the revolving blades of the plough to aid in the hard toil (Zrubavel 2008, 206). The Israeli writer Meir Shalev reminisces about the Zionist political categorization of nature into enemies of Zionism (the Malaria bearing mosquito and various pests such as rodents, insects and weeds) and friends (the enemies' predators). He tells of teachers who instructed their students: "when you go outdoors and encounter a plant or an animal, ask it: 'are you with us or against us?'" (Shalev 1996, 32).

[11] Erasure of Palestinian presence and culture was also achieved by the actions of a governmental Names Commission (with Weitz as a member), appointed by Ben Gurion in 1949. Its task was erasing all Arabic names appearing in Mandatory maps and replacing them with Hebrew names, thus creating a Hebrew national map (Benvenisti 2000; Azaryahu and Golan 2001).

Planting trees over Palestinian villages is not a literary fiction. Yosef Weitz, who was in favor of transferring Palestinians as early as 1940, headed the transfer committee in 1948, and was instrumental in implementing the decision to demolish depopulated Palestinian villages in order to prevent return of refugees, and allocated JNF money for this purpose (Benvenisti 2000; Morris 2004). JNF forests were planted over 86 Palestinian villages (Kadman 2008). Of the 418 Palestinian villages depopulated and demolished during the 1948 and 1967 wars, almost half (149) are situated in parks, forests and nature reserves and their prior existence is usually neither mentioned in signs nor in publications and pamphlets (Kadman 2008, pp. 68–69). Forests, national parks and nature reserves function as constructs of national identity, by concealing the prior existence of Palestinian villages (Egoz and Merhav 2008; Kadman 2008), and thus contribute to the present regime placing a "great emphasis […] on the ethnicization of contested territory" (Yiftachel 2006, p. 44).

The burial of demolished villages under trees is also an attempt to erase the violent acts of conquest, uprooting and demolition but concomitantly it bears witness to the history of the struggle (Geisler 2005) and the failure of that attempt, as was noted by several Israeli writers and scholars (Benvenisti 2000; Hever 2000; Yehoshua 1971; Zrubavel 1996).

18.8 Planting and Uprooting III: "Bedouins and Nationalistic Afforestation"

The JNF since its inception in 1901 has performed "two crucial roles: acquiring lands in Palestine and settling these lands" (Braverman 2009, p. 48). The JNF stressed the planting of trees as means for achieving the double goal of securing land for the Jewish people and for conquering the wilderness. Over time, the latter reasoning has been replaced with ecological motivations such as mitigating desertification and climate change (Tal 2013). For these purposes, the JNF is extensively afforesting the northern Negev Desert, in the south of Israel, as part of the National Outline Plan for Forests and Afforestation (NOP 22) and also outside the NOP 22 zones (Rotem et al. 2014, pp. 16–17). However, the wisdom and sustainability of planting trees in a desert are being hotly contested (Ibid), while the centrality of afforestation activities conceals the fact that the JNF's legal status as a non-governmental organization is used by Israel to keep large tracts of land in Jewish hands,[12] without being accused of discriminating against the non-Jewish citizens of Israel – namely the Palestinian Arabs (Forman and Kedar 2004).

Attitudes towards land, as has been discussed earlier, are inseparably intertwined with attitudes towards the natives (Warren 2000). In the Negev case, the conceptualization of the local Bedouins as rootless nomads has had devastating conse-

[12] For further discussion see Braverman 2009, Chapter 1.

quences. At the beginning of the chapter *People and Trees*, Tal summarizes the history of the Negev Bedouins who numbered 65,000 before the 1948 war and about 11,000 following it. Tal explains: "Having sided with Arab forces during the war […] most thought it advisable to move on and join clan members in Jordan or Egypt" (Ibid, p. 186). Other more critical sources tell of an Israeli policy of clearing the Negev of all or most of the Bedouins, a policy supported by Yosef Weitz, JNF director of Land and Forestry (Morris 2004). Bedouins that were eventually allowed to remain in Israel were ordered by a military directive to leave their traditional villages, agricultural lands and pastures, and move to a restricted area, and this practice was continued for some years after the war was over (Noach 2009). In the 1960s, Israel began implementing policies of settling the Bedouins in planned townships while registering the lands as state property, as has been done in other settler states such as Australia and New Zealand (Shamir 1996). This move is portrayed by the state as stemming from the wish to modernize the Bedouins and offer them "the trappings of civilization and economic opportunity" (Tal 2013, p. 186) and not as a move to appropriate their lands (Shamir 1996).

Some Bedouins however, refused to move into the urban centers and they live today in about 150 villages unrecognized by the Israeli authorities, with no basic social and public services. Most Bedouin appeals to the Israeli courts to recognize their rights to their ancestral lands have been denied, and they are mostly considered trespassers and lawbreakers (Shamir 1996; Tal 2013). Indeed, when Tal (2013) explains conflicts arising between Bedouins and planted JNF trees he attributes the cause of conflicts to the Bedouins' wish to "acquire lucrative real estate […] by 'squatting' alongside the newly forested land" (Ibid, p. 188). Tal quotes experts maintaining that planting forests is done to protect national lands, however, he does not see it as a root cause leading to the Bedouin struggle: "Israel forests remain a controversial political matter. This is ironic because when trees are not planted for timber profits – *but only for public recreational and ecological objectives* – garnering support from society for forests and forestry should not constitute a 'hard sell'. Unrestricted, shaded parks and leafy canopies *ought to be well received* by all of the local inhabitants" (Ibid, p. 190, emphasis added). Tal proceeds to brand the Bedouins' attitudes as "the aggressive nationalistic opposition of a small minority […and as an] extreme example of the dissonance between the country's environmental and leisure-time agendas and the outlook of an embittered faction" (Ibid, p. 190). Tal's narrative mentions neither the Bedouins' strong sense of ownership and belonging to the land, nor the existence of a legal system of land ownership that existed prior to the establishment of the State of Israel. Indeed such accounts of the relationship between Bedouins and land are usually absent from canonical Zionist narratives (Shamir 1996). "Nomadism becomes an essentialist a-historical category that provides rational foundations for appropriating land on the one hand and for concentrating the Bedouins in designated planned townships on the other hand" (Ibid, p. 236).

In some cases Bedouins were uprooted from their lands, and while forced to stay in another area, their lands were registered as state property. When they were allowed to return to their original lands, they could not challenge the change of

ownership, and are therefore, considered trespassers. The dwellings they build for themselves and the shelters for their domestic grazing animals, mostly goats and sheep, are considered illegal under the provisions of the Law of Planning and Construction. "The Bedouins are trapped. From possible claimants in land ownership disputes between them and the government they are turned into criminal defendants […] The original lands from which the Bedouins were deported have been appropriated. They are denied the possibility of developing the lands on which they currently reside, and their refusal to cooperate with another forced transfer [into the townships] turns them into lawbreaking citizens" (Ibid, pp. 246–7).

The JNF plants forests in the Negev also because afforestation is seen as the best way to protect open areas, even if in the future the trees will be uprooted to make room for other proposes (The Israeli agriculture minister Shalom Simhon in 2010, cited by Algazi 2010, pp. 243–4). At the same time, and at times in the same localities, in unrecognized Bedouin villages dwellings are demolished and olive trees uprooted. In this way, the nationalistic agenda of the Israeli authorities is projected onto the Bedouins, who become the invaders while the trees are planted to prevent their further expansion. In due course the guardian trees will be uprooted to make room for Jewish communities (Algazi 2010, p. 244).[13]

Tal (2013) portrayed the Bedouin citizens as lawless and as opposing the State's environmental agenda. However, forcing the Bedouins into townships, supposedly in order to protect open spaces and create a green forest, a policy that Tal supports as essential in a small and crowded country, and champions as benefiting all citizens, is reversed in the case of Jewish citizens, who are encouraged to move to the Negev and settle in small rural communities and even in isolated single family farms or homesteads (Orenstein et al. 2009; Rinat 2007). As early as 1990, the Israel Land Authority decided to allow Jewish single families to settle outside of communities and in 2002, a resolution by the Committee of Ministers for the Development of the Galilee and the Negev asserted that the establishment of isolated [Jewish] homesteads is a means of protecting state lands. A law amendment, granting all of these homesteads a legal status post factum,[14] was ratified by the Knesset in 2010. Environmental organizations that opposed the Negev forestation policy for ecological reasons (e.g. the Society for the Protection of Nature in Israel, see Rotem et al. 2014), also oppose the establishment of homesteads for similar reasons – it damages and dissects open spaces and adversely affects ecosystems and wildlife.[15] Another reason for the opposition is based on the principal of distributive injustice – public lands become privatized and the general public is denied access to these lands

[13] More on using trees for guaranteeing control over land, see Weitz (1970), Cohen (1993).

[14] The establishments of many homesteads was actively aided by government ministries and organizations such as the JNF and the Jewish Agency, even though they did not obtain the appropriate building permits (Rinat 2007, 2009).

[15] In 1999 the Society for the Protection of Nature together with Adam Teva V'din, Israel Union for Environmental Defense, appealed to the Israeli Supreme Court to stop the construction of homesteads, because of the fragmentation of open spaces, damage to local flora and fauna due to domestic animals and the introduction of invasive species, wasteful use of land and the need for new infrastructure etc. Their appeal was rejected.

(Orenstein et al. 2009). Furthermore, while Bedouin citizens are forced into townships, and Jewish citizens mostly from Mizrachi origin[16] live in development towns, the Jewish citizens from mostly Ashkenazi origins[17] enjoy the privilege of life in rural communities and in homesteads. This example of land inequity between three main groups, the Jewish 'Founders' and 'Immigrants' and the Palestinian 'Natives', is present in other parts of Israel, as well as in other settler states (Yiftachel 1999).

This policy is similar to colonial processes that contain the parallel dialectics of development and primitivism, conservation and exploitation, settlement and dispossession (Randeria 2006). JNF forestation policy in the Negev demonstrates how nature protection is replaced by settlement and development, how people are pushed aside by trees and how the trees are used as the pioneers of settlement and dispossession (Algazi 2010).

18.9 Planting and Uprooting IV: Nonnative Trees and Native Species or INPA and SPNI Versus JNF

In 1998, Aviva Rabinovitch, the then chief scientist of the INPA, together with Adam Teva V'din, the Israel Union for Environmental Defense NGO, filed a suit against the JNF afforestation practices in Israel's High Court of Justice. In her affidavit, Rabinovitch criticized the JNF pine monoculture planting policies and their destructive and aggressive practices, namely the use of burning, herbicide spraying and bulldozing of lands prior to pine planting (Tal 2013). These practices result in "heavy damages to natural habitats, the systematic destruction of […] ecosystems, and the biodiversity and species they contain." Rabinovitch concluded that "the JNF acts within its forested lands as if it is a private holding" (Ibid, p. 194). In addition to these ecological considerations, the petition's legal arguments were based on the fact that the JNF did not submit detailed forestry plans for public scrutiny and evaluation, although since 1995, according to the National Outline Plan under the Planning and Building Law, prior to any development, a detailed plan has to be prepared and reviewed before it is approved. The senior presiding judge ruled that the JNF is not "a state within a state" but is subject to the law, just like any other person or body, and has to prepare and submit detailed forestry plans for approval (Ibid, p. 195).

Years later, the Society for the Protection of Nature in Israel noted in a report that the JNF still uses heavy machinery and chemical spraying when planting forests in the Negev desert. This afforestation is highly controversial ecologically, the report continues, because it radically changes the landscape, increases fragmentation of natural habitats, damages the fragile desert ecosystems and introduces nonnative trees with associated "immigrant" Mediterranean species at the expense of local desert species (Rotem et al. 2014, p. 26). The afforestation actions also impact natu-

[16] The majority of Mizrachi Jews immigrated into Israel, mostly from Arab and north African countries, after the state of Israel was established.

[17] Ashkenazi Jews immigrated to Palestine/Israel mostly from eastern and central Europe since the end of the nineteenth century and are considered the founders of the state.

ral assets protected by law. "The Israel Nature and Parks Authority generally refrains from enforcing the law in cases where JNF damages vulnerable natural assets, despite the fact that the JNF did not have a general permit or a special permit for damaging natural assets" (Ibid, p. 38).

These conflicts are a cause for concern, as was pointed out recently by an international committee invited by the INPA to evaluate the organization's work. The experts determined that one of the significant obstacles standing in the way of the INPA is that it has only partial responsibility for the protection of nature in Israel, because large areas are held by the army and by the JNF, "an organization governed by political entities, with one of its main objectives being the development of agriculture and settlements, which do not go hand in hand with nature conservation" (Rinat 2014).

18.10 Planting and Uprooting V: Israel Nature and Parks Authority (INPA) in the Occupied Territories: Wadi (Valley or Stream) Kana[18]

Palestinians have been living and cultivating plots of land in Wadi Kana for generations. Many farmers live in the nearby village of Dir Istya, while 50 families used to live in the valley itself, relying on spring water for irrigation and drinking. The first Jewish settlements around the wadi were built in the late 1970s and early 1980s. In 1982, a military edict declared Wadi Kana a nature reserve. The Palestinian farmers who own the land were not consulted and could not contest the decision.[19] Since then, more Jewish settlements have been built surrounding the reserve. Plans for the future separation wall threaten to include the wadi on the Israeli side and the village Dir Istya on the Palestinian side, thus disconnecting the farmers from their privately owned lands, used for farming and recreation.[20] During the 1990s, despite the fact that the wadi was a declared nature reserve, sewage from the Israeli settlements polluted the water and the Palestinians could not drink the water and could not grow vegetables. In addition, the pumping of water by Israel decreased the amount of water available to the Palestinian agriculture. Due to the dwindling amounts of water and its pollution, the Palestinian farmers who lived in the valley, had to move to the neighboring Dir Istya village, and switched to growing mainly olive trees that do not require watering after the first 2 or 3 years.[21] Eventually, the construction of

[18] The information concerning Wadi Kana was retrieved from the site of Engaged Dharma https://engagedharma.wordpress.com/about/.

[19] In the occupied West Bank, the Palestinians are under military rule.

[20] This is not a unique case. According to the plan for the separation wall, the village of al Walaja will remain on the Palestinian side while its water springs and unique traditional agricultural terraces will be on the Israeli side, to be declared a National Park for the recreation and pleasure of Israelis. See https://www.facebook.com/FriendsOfAlWalaja.

[21] Palestinians are motivated to plant olive trees also because the Israeli authorities make it increasingly harder for them to hold on to their lands if they are not cultivated intensively. Trees serve as

a sewage treatment plant prevented sewage pollution, however, about a hundred Jewish homes, in different settlements, were built inside the reserve boundaries. The INPA did not prosecute nor fine the Jewish settlers for the sewage pollution or for building houses inside the reserve boundaries. However, in 2011 the INPA uprooted about 1,000 olive trees planted by the Palestinian farmers and in 2012 issued a directive for the uprooting of 1,400 more olive trees. The INPA claimed that the reason is ecological – planting olive trees inside the boundaries of a nature reserve is prohibited. The Palestinians appealed to the Israeli Supreme Court, and in May 2013 the court ruled that only trees younger than 3 year old would be uprooted. In July 2013, INPA wardens marked 2,100 trees for uprooting, many of them older than the 3 year old limit, and altogether a higher number than the directive mentioned. Following complaints, wardens came again to mark trees and again ignored their age. On January 23, 2014, INPA wardens, accompanied by bulldozers and soldiers shooting tear gas canisters at protesters, uprooted between 500 and 800 trees which were taken to an unknown place.

The INPA claims that its actions are motivated only by nature conservation reasons. However, while ignoring damages caused by Israeli Jewish settlers, it is clearly acting to curtail Palestinian agricultural activities. Furthermore, the INPA is participating in the preparation of a master plan with the aim of turning the valley into a recreation area for the surrounding Jewish settlements,[22] while limiting access of the Palestinians to their own private lands. In August 2014, a new road into the heart of the reserve was bulldozed by Jewish settlers, with no permits. This road is in agreement with the master plan stipulating the connection of all the surrounding Jewish settlements in a ring road, with additional roads into the reserve, while blocking the existing road into the reserve, and thus, restricting the Palestinians from entering.[23]

18.11 Israel Nature and Parks Authority (INPA) in East Jerusalem: National Parks for Whom?

What Algazi (2010) terms as ‘colonial ecologism’ is evident during the last decade in East Jerusalem,[24] where the zoning category ‘National Park’ is used increasingly by the INPA. This issue is addressed in the report ‘From Public to National –

a marker for cultivation. See Braverman 2009, p. 172–177.

[22] Information about the systematic takeover of Palestinian water springs by Israeli settlers in the occupied west bank can be found in the report “How Dispossession Happens” in the site of the United Nations Office for the Coordination of Humanitarian Affairs http://www.ochaopt.org/documents/ocha_opt_springs_report_march_2012_english.pdf.

[23] In chapter 5 of his award winning book *Palestinian Walks*, the Palestinian writer and lawyer Raja Shehadeh tells how he monitored the Israeli military government declaration of nature reserves in the West Bank. At first he was pleased that these areas would be protected. However, the hope that these reserves were for the benefit of the Palestinians were dashed when in 1996 Palestinians were prohibited from entering all nature reserves in area C.

[24] Annexed to Israel following the 1967 war. The annexation is internationally controversial.

National Parks in East Jerusalem', published in 2012 by the alternative planning NGO Bimkom.[25]

> Despite the fact that the process of planning and declaring national parks presents *the semblance of a purely professional and apolitical* [process…] in certain cases, and in certain places, the process of planning and declaring national parks and nature reserves seems not only to further the protection of nature and heritage as well as high quality open spaces, but also to serve *as an instrument for limiting the development of the built environment in Palestinian communities*. […] Moreover, this planning trend contradicts the prevalent trends in sustainable planning, which seek to preserve the connections between the built environment and open spaces *for the benefit of the resident population* (Bimkom 2012, pp. 4–5, emphasis added).

The report reviews two national parks already declared (in 1974 and 2000), two in advanced stages of planning and three more in the early stages of planning. It maintains that this policy has two advantages from the point of view of the Jerusalem Municipality: "…declaring the area as a national park does not require expropriation of land, and therefore does not involve paying immediate compensation to its owners…In addition, responsibility for preservation, development and maintenance of such areas, as well as for law enforcement, is automatically transferred from the local authorities to the Israel Nature and Parks Authority (INPA), which, according to the law, *carries no obligations toward the residents*" (Ibid, p. 8, emphasis added). Even more disturbing is the fact that the local Palestinians are not allowed to participate in the planning process, even though this zoning tool is used only in the Arab part of Jerusalem:

> The formulation of the law permits expansive interpretation and grants broad discretion to the bodies which are appointed to execute it; yet it contains *no effective checks and balances* against its exploitation by extraneous motives that deviate from the spirit and purpose of the law […] Furthermore, the law grants special status to authorized plans and to the areas declared as national parks, but does not provide sufficient conditions *guaranteeing the transparency of the planning process*. It does not allow the public to monitor and influence the process in action, nor does it provide those who suffer damages from the process any recourse to defend themselves from or obtain compensation for any such damages (Ibid, pp. 9–10).

The lack of transparency is evident from the title of an INPA document, "Didn't know, didn't understand" detailing plans to demolish structures used by Palestinians, inside the limits of a planned national park in East Jerusalem. The document was leaked to the press and published in Ha'aretz daily newspaper (Hasson 2012). The journalist quoted Margalit, a city council member, referring to the INPA document: "The title has only one meaning – that the Palestinians won't know where it came from and won't understand how it happened…it is another proof that this organization [the INPA] doesn't care about nature but about how to dominate the Palestinians in Jerusalem in any possible way" (Hasson 2012). In a later article, an INPA worker admitted that this national park is promoted not for nature protection purposes but in order to prevent further expansion of Palestinian communities (Hasson 2013).

[25] Retrieved December 25, 2014 http://bimkom.org/eng/from-public-to-national-national-parks-in-east-jerusalem/ ", issued by Bimkom – Planners for Planning Rights 2012.

18.12 Conclusion

Within the ongoing Israeli-Palestinian conflict, identities are strongly attached to trees. As Mitchell (1994, p. 1) maintained, landscape should be viewed not just "as an object to be seen or a text to be read, but as a process by which social and subjective identities are formed". This identification has far-reaching consequences for planning processes in Israel, which are perceived "as tools for reform and modernization" [but] "can be systematically used for the opposite purpose of controlling a minority population" (Yiftachel 1995, p. 237). Environmental policies are developed and implemented not only for ecological reasons but have been co-opted by the JNF and the INPA to be used selectively to marginalize and in some cases uproot Palestinians,[26] whether Israeli citizens or in the occupied territories, as part of the process of Judeazing the space. Trees are continuing to cast their shadows and function as a symbol of rootedness and progress, as well as weapons of war. This is vividly articulated by 'Women in green – Women for Israel's Tomorrow' who plant trees in the occupied territories supposedly to prevent the Palestinians from 'stealing lands': "The tree that strikes roots in the soil determines whether it is ours. The tree is our *literal soldier* in the field, acting as a marker and stake in the earth and holding the ground for us."[27]

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[26] Palestinians are not just passive victims, however, they do not have at their disposal a powerful army and powerful organizations with state power behind them. According to a U.N. report 7,500 olive trees have been destroyed by Jewish settlers in the West Bank since the beginning of the occupation. In addition tens of thousands of olive trees have been uprooted during the construction of the separation wall, and in a few more years about a million trees will be caught in the no-go zone between it and the 1967 Armistice Line. http://latitude.blogs.nytimes.com/2012/11/13/the-plight-of-the-palestinian-olive-tree/. For a detailed account of Palestinian protest measures and the pitting of the pine against the olive tree see Braverman 2009.

[27] http://www.haaretz.com/print-edition/news/saplings-serve-as-weapons-in-battle-for-west-bank-land-1.412054. Retrieved January 2015.

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Chapter 19
Fields of Smooth Brome: History, Policy and Place-Making in the Post-Industrial Prairie

Elizabeth Walden and Kevin Lair

Abstract Our project engages environmental history as part of creative inquiry undertaken at the Westbrook Artists' Site, a collaborative arts venture in central Iowa, part of what was once the great North American tall grass prairie that stretched from Texas to Saskatchewan. The Westbrook Artists' Site (WAS) is located on a legacy farm of approximately 500 acres of land near Winterset, Iowa. Its mission centers on the post-industrial rural condition, with its ruined prairie heritage, as a problematic to be explored by participants, community members and visiting artists. We take on art critic Lucy Lippard's call for an art that is "of place" rather than "about place" (Lippard LR, The lure of the local: senses of place in a multicentered society. W. W. Norton and Company, New York, 1997, p. 292). To this end, we have undertaken to get to know this one place and the many forms of life that inhabit it – through lived and sensory engagement, through art and literature, natural and environmental history, anthropology and the natural sciences. We seek to re-establish a reciprocal bond with the land and its biotic community and to utilize all available fields of inquiry to contribute to an understanding of and engagement with the landscape irreducible to the existing expert discourses, which have hitherto shaped its use, and thereby to strengthen the communities–human and non-human–of which it is a part.

In this chapter we focus upon past and present U.S. Federal Farm Service Agency (FSA) policy regarding the invasive grass called Smooth Brome. Smooth Brome is the dominant "wild" grass at Westbrook; it flourishes in former agricultural fields set aside in conservation efforts. Its history draws into question easy assumptions about "global invasive species", the meaning of the natural and the wild, and the imputed timeless quality of native prairie and what it means to respect its legacy.

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Our investigation engages critically with conservation policy and forges a plan for an intervention on the site.

The story of Smooth Brome is in many ways the story of the American prairie from the 19th century to the present. Introduced by European settlers in the 1880s to repair an already degraded prairie it has flourished in central Iowa and elsewhere, serving as pasture for animals and in conservation efforts to protect against erosion in agricultural land. Like the native grasses of the prairie it has replaced, it is drought resistant, adaptable, and long lived. Federal policy for the Conservation Reserve Program (CRP), however, has shifted over time from attempts to stem erosion and preserve water quality, to building habitat. It now focuses upon native prairie restoration. As a result Brome is increasingly considered a scourge undermining restoration. The federal government presently encourages farmers who participate in the CRP to kill Smooth Brome with burns and herbicide and replant with native grasses and forbs.

We resist the tendency to make introduced species an alibi for neoliberal agricultural policy and poor land management. Less than .1 % of native prairie exists today in Iowa. While the dream of restoring the prairie is one we share, we believe it too needs to be "historicized" – ecologically, socially, and economically – and reviewed in relation to the specificity of the existing biotic community of the site, with its invasive species, migrants, "naturalized" inhabitants and native prairie flora. At the Westbrook Artists' Site the ends do not justify the means: as a result of our creative inquiry we have planned a community based burn event to educate and learn from local stakeholders, to involve ourselves in creative place-making, to rehabilitate the prairie and savannah ecosystems of the region and to celebrate the opportunity to care for the land.

We at the Westbrook Artists' Site engage environmental history as a critical part of the creative inquiry which drives our mission. We are a collaborative arts venture in central Iowa, part of what was once the great North American tall grass prairie that stretched from Texas to Saskatchewan. The Westbrook Artists' Site (WAS) is located on a legacy farm of approximately 500 acres of land near Winterset, Iowa. Its mission centers on the post-industrial rural condition, with its ruined prairie heritage, as a problematic to be explored by participants, community members and visiting artists. We take on art critic Lucy Lippard's call for an art that is "of place" rather than about place (292). To this end, we have undertaken to get to know this one place and the many forms of life that inhabit it – through lived and sensory engagement, through art and literature, natural and environmental history, anthropology and the natural sciences. We seek to re-establish a reciprocal bond with the land and its biotic community and to utilize all available fields of inquiry to contribute to an understanding of and engagement with the landscape irreducible to the existing expert discourses that have hitherto shaped its use and thereby to strengthen the communities – human and non-human – of which it is a part.

Westbrook is in a sense an experiential laboratory for understanding and reimagining the post-industrial rural condition. Its work consists of installations, events and the documentation (both visual and textual) of its work processes. Our method

is to synthesize existing ways of knowing the land, but also to explore the cracks and fissures of the technocratic discourses that have dominated both agricultural and conservation efforts in the former prairie in a quest to create a different sense of place. We see the land as more than a resource and its condition as more than a set of problems to be solved. We see it, rather, as consisting of what Jane Bennet calls "vibrant matter," referring to the agency and vitality that abides in non-human matter. We hold that the way we conceive of the land and the stories we tell about it change the nature of both it and us.

It is perhaps unavoidable to think of the Westbrook site within a grand historical narrative of the prairie. Carolyn Merchant, citing William Cronon, in *American Environmental History*, notes two dominant and conflicting such narratives. The first is "a story of progress": "a hostile environment, initially conceptualized as a Great American desert was gradually brought under control and transformed into a garden, making the Great Plains into a Garden of the World" (Merchant 100). On the other hand, is a "declensionist" narrative that relates the history of the prairie as one of environmental decline. "A pristine grassland, at first uninhabited, was then occupied by nomadic bands of Indians. White settlers who came into this Garden of Eden, nearly pristine nature, transformed it over a period of 150 years into a desert, exemplified by the Dust Bowl of the 1930s" (Merchant 100).

Despite the near inverse relation, the two grand narratives converge on certain matters. First, of course, both trace the demise of the tall grass prairie. Less than one tenth of 1 percent of the tall grass prairie that dominated the center of a vast continent remains. Central Iowa is perhaps the most intensively cultivated land in the world, most of which is dedicated to corn and soybeans, two non-native, typically genetically modified, crops dependent upon cycles of fertilizer and pesticides.

Second, both narratives diminish the significance of human presence on the prairie and within natural processes in general. Complex societies of Native Americans – the Oneota, the Ioway, the Oto and others – that lived on the prairie had a hand in altering it long before the European's arrival. It was Native Americans who first brought and cultivated corn in the region and introduced, by intention and accident, many other plants as well. They also consciously managed and even created prairie through its periodic burning.

Dislocations caused by European settlement brought many more tribal peoples through Iowa in the nineteenth century: the Meskawaki, the Sauk, Omaha, Ponca, Pawnee, Arikara, Potawatomi, Santee and Yankton Sioux and the Winnebago. Of all of these, "only the Meskwaki still have land in Iowa which they own and on which they reside as a distinct community" (Foster 103). Likewise, the history of rural Iowa since settlement is also one of diminished communities. The mechanization of agriculture throughout the twentieth century steadily decimated the rural labor force. The farm crisis of the 1980s reduced the number of small family farms. Even now as the value of agricultural land and products has grown the trend is toward consolidation of farms and reduction of rural populations (Vilsack). It is perhaps difficult to imagine the role that humans played in the landscape prior to settlement, because we associate human modified landscapes with industrialization and our

experience with the industrialized prairie encourages us to imagine it as having always been relatively devoid of people.

These issues are significant, not only for an accurate history of the tall grass prairie, but also to understand the context of the land that remains, which is neither simply what the progressive narrative suggests, a garden, or more accurately a factory, or what the declensionist narrative suggests, an absence, a wild land lost to greed and misuse. Like the Native Americans, the land that once was the tall grass prairie persists and it persists as a complex ecosystem of plants, animals and humans. Our narrative begins not with a projection of an original prairie from which we have deviated, but rather it begins with the land we find before us as a guide connecting us to its past and its possible futures.

What we know is that today many pastures are densely covered with Smooth Brome, *Bromus inermis*, the focus of this paper. Smooth Brome is a non-native, invasive grass, identified typically as "pasture grass" by farmers. In these days of mega-farms, profitable bio-fuel production and rising food prices less land is left uncultivated for any reason in Iowa and even small environmental gains like riparian buffers, used to preserve water quality and prevent erosion, are being plowed up to maximize crop yield. Under such conditions a field of Smooth Brome, a sign no doubt of the lost tall grass prairie, can be a welcome sight. It signals a field resting from production, or the existence of grazing animals in an intensively cropped region or sometimes, sadly, a foreclosed farm seized by the bank. It is for us an emblem of the complex situation of the post-industrial rural landscape, a landscape utterly altered by a century and a half of disregard for its biome, but one still fecund, vibrant and alive.

It has come as no surprise that most of the members of the biotic community at Westbrook are immigrants to this land like us. Native species remain – the oldest inhabitants are the Burr Oaks, but there is Walnut, Hornbeam, Red Cedar, Hickory, Honey Locust, Milkweed and Rye, among others, though many of the most prolific species are non-native and invasive, in addition to Smooth Brome, are thickets of Multiflora Rose, Honeysuckle, Buckthorn, Pokeweed, Crown Vetch and Thistle.

For good reason, the environmental narratives of this region are stories of radical change. But there is continuity through this change, as well. Iowa was and remains grassland. Most of its history could be conceived as a story of two grasses: Big Bluestem (*Andropogon gerardii*) that towered over the prairie for millennia, and Corn (*Zea mays)*, which dominates the global industrial agricultural monopoly. But when we walk around the fields at Westbrook, much of which is not currently under cultivation, it is this other grass that catches our attention, the grass that is ubiquitous, feral and seemingly beneath regard: Smooth Brome. Big Bluestem and Corn map easily onto the two grand narratives of the prairie, the declensionist and progressive narratives respectively. Smooth Brome would seem to offer an opportunity to tell a different sort of story.

Like the prairie itself, however, accounts of Smooth Brome tend toward two mutually exclusive narratives, one in which it is a highly successful immigrant that has become a fully naturalized and productive part of the community and one in which it is an invasive blight, an outsider, that prevents the restoration of a robust

native habitat. Just as with the dominant narratives of the prairie, however, neither Brome narrative is, in the end, adequate. They ignore the nuances of its history and exclude the human as an ongoing feature of the environment.

Smooth Brome (*Bromus inermis*) is a fast-growing, perennial, cool-season rhizomatic grass. Cool season grasses mature early in the season providing spring forage for animals and habitat for ground nesting birds. Most of the native prairie grasses are warm season grasses, which mature later in the season and are slower to establish themselves. Native grasses are often said in agricultural research literature to have a difficult time "competing" with other early emerging plants. Smooth Brome's competitive advantage is precisely what makes it tend toward monoculture. Native grasses flourish as part of a diverse biotic community. By maturing later they allow other species to flower and seed in the spring.

There are many ways in which plants, seemingly so rooted to place, visit new territories, some escape exotic gardens, some are castaways on ships or seed bags, others, like Smooth Brome, are intentionally and steadfastly promoted in their new environs. While Smooth Brome quietly volunteers in fallow fields, the fact that it does so is the result of intensive agricultural engineering. Its first documented importation to the United States was to the California Agriculture Station around 1880 as a candidate cold- and drought-tolerant forage species (Salesman and Thomsen 374). At the time of its first arrival, after the droughts of the 1870s and the sod-busting of the prairie, ecological disaster was already looming in North America and farmers recognized the need to return land to grass (Vogel 4.1).

"About 13 years later," according to P. H. Dunn, USDA research scientist, "another major introduction of smooth brome grass was made into the United States by N. E. Hansen who was a horticulturist and plant explorer for the U.S.D.A. working from the University of South Dakota at Brookings" (5). Later, writing about the expedition that was to radically alter the prairie ecosystem, Hansen clarifies the source of Smooth Brome, known variously as Hungarian brome, Austrian brome and Russian brome:

> In the 1897–98 tour, I resolved to clear up the question of Hungarian or Austrian brome grass which was beginning to attract favorable notice in the Prairie Northwest. But this region was too far south, I figured, to give us anything of value. I soon found out that this seed, although it came from the regions mentioned, really was grown in the Volga River region of Russia and that the entire available crop of seed for that year, 1897, was about 12 tons. I cabled Secretary of Agriculture James Wilson and the reply came quickly, 'Buy 12 tons;' this was later widely distributed" (Dunn 5).

These 12 tons of Smooth Brome seed were sent out to state research facilities around the U.S. These facilities developed Smooth Brome cultivars suitable for specific geographical regions, such development, indeed, continues today. Smooth Brome is now found in all Canadian provinces and all but three states in the U.S and is, unsurprisingly, well adapted to each region. Some of the most successful cultivars bare the boastful names Superior, Jubilee, Bravo, Polar (which grows in Alaska), Lincoln, Rebound and Beacon (USDA).

According to Kenneth P. Vogel, Professor at the University of Nebraska, researcher for the USDA and chief author of nearly everything about Smooth

Brome, Smooth Brome, along with Crested Wheatgrass are heroes of environmental preservation having bailed out farmers during the droughts of the nineteenth century and having "literally preserved the remaining topsoil on millions of hectares of land" by the 1930s (Vogel 4.1).

It should come as no surprise, then, that when the Conservation Reserve Program (CRP), the country's largest private lands conservation program, was initiated in 1985, it encouraged farmers to take highly erodible land out of crop production to be planted with grasses, often a sole species, Smooth Brome. While the CRP seemed to be an innovation in conservation policy, its action was in continuity with practices in place since the late 1800s.

As Vogel points out, Smooth Brome's good deeds extend beyond erosion control measures and watershed protection. It has been used for open pit mine reclamation, phytoremediation, and the stabilization of areas affected by fires. In Vogel's narrative, in keeping with the great frontier story of immigrant assimilation through trial and hard work, Smooth Brome's adaptability and usefulness in North America merits its recognition as a fully "naturalized" species.

The claim of Smooth Brome's naturalization has not been convincing to Departments of Natural Resources (DNR), however, many of which now consider Smooth Brome an invasive scourge. Vogel is derisive of what he calls "the alien problem," the growing tendency to condemn any use of non-crop plants that cannot establish native heritage (4.8). Vogel's argument here is worthy of serious consideration as the rhetoric of condemnation of alien plants troublingly echoes the rhetoric of anti-immigration sentiment in U.S. public discourse. In addition, ecosystems are dynamic and it is probably not even good science to select a moment from the past with which to evaluate the present. (Biologist Mark Davis makes a compelling case along this latter line.)

Vogel takes his defense of Smooth Brome in another direction, however, arguing not only that it is now naturalized, but that it was a native species all along. Pumpelly's Brome (*Bromus inermis Leyss ssp pumpellianus*) is native to Alaska called. Genetic studies, Vogel argues, "have demonstrated that it has the same nuclear and cytoplasmic genomes as smooth bromegrass with which it is fully fertile" (4.8) Vogel surmises that "Pumpelly's brome probably migrated during periods when Asia and North America were connected via a land bridge between Alaska and Siberia" (4.8). Based in part upon his research, Pumpelly's Brome has been reclassified as a subspecies of Smooth Brome.

Biotic communities are always local, however. A Brome grass in Alaska is a weak basis for its defense in Iowa. Though the industrial agriculture looks for generic solutions, ecological solutions must be attuned to the specificities of place. More important perhaps are questions about its ability to be a part of a resilient diverse biotic community. But this is a difficult question to answer. Vogel insists that Smooth Brome does not invade native grassland, but only flourishes in disturbed areas (4.7). This is nearly beside the point, however, given that so little tall grass prairie remains. Land is Iowa is by definition disturbed at this point in its history. There is some evidence that Smooth Brome can coexist with native grasses and forbs, especially if actively managed, but the question remains open.

Smooth Brome, like corn, depletes the soil of nitrogen. Local farmers rotate between soybeans, which fix nitrogen in the soil, and corn which depletes it. Native prairie with its mix of grasses and forbs had its own elegant system of coexisting nitrogen users and fixers. Monocultural Brome may well not be self-sustaining, despite fears of its detractors. Significant parts of Westbrook's Brome fields, for example, are being taken over by another invasive, Crown Vetch, a member of the pea family that fixes nitrogen. And, indeed, the area once covered with Vetch now contains Brome and other grasses. The replacement of one invasive with another may not fit a vision of native prairie restoration, but it suggests a more dynamic environment than is common to the rhetoric about invasive species.

As the focus of the Conservation Reserve Program moved from erosion abatement to habitat restoration, Smooth Brome was again seen as a solution. Smooth Brome does provide habitat for ground nesting birds. It turns out, however, that it does not provide good habitat for pheasants and the term "habitat" is conservation code for what makes for good hunting grounds. Thick stands of Brome tend to crowd out the forbs that attract the insects that young pheasants need to mature in the summer (Pheasants Forever). As a consequence, the CRP has come around to the idea that what it needs for high quality habitat is the diverse mix of prairie plants that were part of the native prairie.

This is an important moment in federal conservation policy. It would appear that Federal policy finally recognizes the importance of native prairie rehabilitation. Unfortunately, this is at least in part an illusion. The CRP now funds efforts to eliminate Smooth Brome in order to reestablish native habitat, but its conception of habitat, as we've seen, is quite narrow. It even encourage the use of fire, which is the tool used by both nature and Native American peoples to maintain the grassland. The problem is that in the case of land like Westbrook, which is in close proximity to buffers, woodland and neighbors – that is most of the land in Iowa that is part of the CRP program – there is a great deal of combustible debris. In such cases the CRP encourages, so called "chemical burns," the application of the herbicide glyphosate, better known through its brand name, "Round Up", to cleanse the land of Smooth Brome.

We don't have data on the success of prairie restoration through the means most associated with the devastation of native flora and fauna, but history would suggest that this method has more to do with corporate agricultures' lobbying efforts than a deep understanding of prairie restoration. Our observation of a section of CRP land recently treated does not give us hope. Two months after the chemical burn and reseeding Poison Ivy appears to be a big winner, taking the opportunity to creep from the forest edge into the vacant fields. The importance of bacteria and fungus for soil health is now widely recognized, but a debate rages over whether glyphosate protects soil microorganisms. Monsanto claims that it does, but many independent scientists disagree. While our gut instinct is that the application of glyphosate is not the best route to take, we are quite certain that to equate it with prairie fire is a travesty both of language and environmental policy.

In our telling of the prairie narrative we emphasize humans as members of the biotic community and as agents within the landscape. The notion of "chemical burn-

ing" implicitly continues a history that views the land as unpopulated and ideally constituted by non-human processes – and indeed, which depends upon technological solutions to ecological problems. Burning the prairie with fire, however, presents a model of human engagement in processes that promote healthy grassland.

According to plains historian, Julie Courtwright, fire was used by native people on the prairie for many reasons – warfare, communication, to control and attract the Buffalo and to maintain and even produce grassland. Settlers' conceptions of burning are virtually an index of their conceptions of Native Americans. Early settlers acknowledge and learned from the intentional use of fire by Native Americans. As the plains filled and Native Americans were increasingly vilified, their burning was often construed as wantonly destructive and barbarous. Once Native Americans had been decimated and marginalized and the tall grass prairie was plowed up, both became objects of romanticized nostalgia and the idea of intentional burning of the land seemed incongruous with the notion of the eco-friendly natives and the pristine nature they inhabited before colonization.

In keeping with our mission of creating an art of place, Westbrook Artist's site has decided the appropriate response to our inquiry regarding Smooth Brome is a controlled burn of its fields. We understand that fire itself cannot resurrect the tall grass prairie, but it is an important technique for creating the conditions for biodiversity in a grassland – and we see it as opportunity to create community around new ways of engaging the land. The CRP dependence on chemical burns, it must be said, was never simply about the dangers of fire. It also indicates much about the post-fordist rural economy, with its evacuated towns, aging populations and mechanized mega-farms. Controlling a fire takes many people. A chemical burn requires one independent contractor. While a number of parks utilize volunteers to enact seasonal burning, it is unlikely that a farmer would do so. Not only is it inefficient in a time of tight profit margins, but the highly mechanized modern farm does not have the labor force to do it. The goal of our present effort is not only to develop an infrastructure for small scale burning, but to involve artists, scholars and community members in the production of a different way to understand and contribute to the health of the land, to build new communities, and to celebrate the role that humans play in contributing to such as an intrinsic part of the natural world.

The burn at Westbrook Artists Site will take place in the spring of 2015. In addition to the burn the Artists' Site will host an exhibit of visual work that has emerged from the process and will host a roundtable of artists and stakeholders about art, the history and fate of the land, and the role of humans in the landscape. It is supported with a grant from the Farm Bureau and the cooperation of the Southern Iowa Oak Savanna Alliance *(*SIOSA*)* and a local landowners group. It is timed to coincide with the Madison County Covered Bridge Festival, a regional celebration. Joining the burn at Westbrook Artists' Site are visiting artists from across the region and the country. While the burn could be justified in the language of conservation ecology, we feel something further will be accomplished: the event brings a wide range of interested parties together – metropolitan artists and rural landowners, ecologists and farmers. The event is a rehabilitation effort, a social event and an art action that mindfully intervenes in the landscape understood through multiple points of access to build deeper understanding and a more resilient and diverse biotic community.

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Chapter 20
A Green City: Impossible Dream or Necessity?

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Abstract Two out of three Europeans live in towns and cities, and this number is (still) increasing. By attracting more inhabitants, urban areas are facing new challenges, particularly in terms of social and environmental issues. Meeting the challenges of increasing urban pressure may rest on citizens' active involvement and cross-commitment promoted by local authorities, simultaneously exploring and respecting the social, cultural and heritage structures – the city's identity. Some cities face more demanding challenges than others. There are other factors associated with the identity process, where the culture and history tend to be relevant indicators, especially in historic cities. Reinforcing the bonds of local identity may facilitate the citizens' engagement in the common effort to build an environmental and sustainable city. The city of Guimarães faces such challenges. In this context, the European Green Capital Award, which yearly distinguishes a European city based on its environmental, economics and life quality efforts, encouraging best practices sharing, corresponds to certifying a certain city management paradigm.

This chapter intends to report on the perspectives of four areas, education, landscape, urban and natural environment and economics, towards the process and the implications of applying to the Green City Award and the challenge of sustaining and developing this new management model (environmental education of young

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adults and children being a key for the development and sustainability of a green city way of being). These perspectives were discussed by the authors at the roundtable held under the II World Congress of Environmental History (July 2014, Guimarães) and constitute the basis for this paper. The paper elaborates on these perspectives reviewing the history of the urban development of the city, exploring the concept of green city and the criteria established for the award of European green city, and also by exploring a novel methodology to read the history of a city by identifying changing patterns. The paper concludes that Green cities can be viewed as new management paradigm. A paradigm that is inclusive, integrated and cohesive of people the natural environment.

20.1 Introduction

Through times, the fraction of Europeans living in urbanized areas has increased, posing difficult challenges to city managers. Higher concentration of population generates increased pressure on natural and environmental resources; more conflicts between alternative uses of urban area, particularly in historic cities; demanding a need for new approaches for water and wastewater managing; demands circular and intelligent waste management systems; and the active and involved participation of citizens; etc. To cope with the challenges posed, local authorities may adopt several strategies. The aim is to ensure quality of life to its citizens, respecting the environmental and cultural heritage in a sustainable fashion. The European Green Capital Award (EGCA), which yearly distinguishes European city corresponds to certifying a certain city management paradigm. Green cities are thus a necessity if sustainability is assumed as a priority by local and global managers.

During the 2nd World Conference on Environmental History in Guimarães in July 2014, a roundtable was composed to discuss the possibility or desirability for the city of Guimarães to apply for the EGCA. On the agenda was the discussion of preserving the cultural and historic heritage by promoting, for example, some industrial heritage infrastructures into useful spaces – The regeneration project implemented by the municipality of Guimarães, birth of the Portuguese nationality, was discussed. This project addressed the heritage legacy, by promoting the creation and restructuring of common usable urban equipment, promoting the revitalization of the natural systems, and therefore contributing for a better life in the urban environment – The Couros area is an example.

The fundamental axis discussed was civic participation, identity processes and cultural commitment. The framework proposed here may represent a new approach to the concept of "green city" by expanding it to dimensions not always considered in more technical evaluations, namely, recovery of historic urban heritage, the "historical/modern" dialogue and the narrative between urban and rural areas.

The present chapter results from the discussions at the roundtable and from posterior elaboration. The paper first presents a review of the history of Guimarães with

particular emphasis on the dynamics of soil occupation and also on urban water management, Sect. 20.2. Sections 20.3 and 20.4 present a discussion of the green city concept and on the criteria used to evaluate a green city proposal for the EGCA. Finally, a methodology to identify the evolution of the city and its trends is presented through its application to a case study, the city of Florence in Italy. Section 20.6, concludes the paper.

20.2 Past and Present of Guimarães

Guimarães is a northern Portuguese city formerly named Vimaranes at the time of its settlement in the ninth century. This denomination might have had its origin in Vímara Peres, a warrior and vassal of the King of Asturias Alfonso III, when he chose this area as the main government seat for the County of Portugal, a territory established between the rivers Minho and Douro that he conquered to the Moors (Arabs and Berbers) in circa 860 (Mattoso 1981).

There are records from 950 suggesting the existence of a religious settlement in Vimaranes that attracted pilgrims and fostered the development of a small population community (Oliveira 1966). But the foundation of a monastery in this place in 949 is usually committed to the countess Mumadona Dias, widow of Hermenegildo Mendes, a Galician count and governor (Amaral 2009). It is also committed to her the erection of the castle on a hill nearby for defending the monastery and the people living around it (the castle is first mentioned in records dating from 968 but it may have been built before that). This conducted to the development of two small population settlements, one living around the monastery (the downtown) and the other around the castle (the uptown), connected by the Saint Mary street.

In her will of 959, Mumadona provided the monastery with abundant means which gave it great importance and the ability to attract significant privileges and donations from nobles and county rulers following her. However, as time went by, the need for protection of the county declined and the monastery progressively lost its importance, until the Collegiate Church[1] of Guimarães was probably established in 1139, by Afonso I of Portugal, the first Portuguese King. The Collegiate acquired a great importance because of the significant privileges conferred by the king and because of the donations granted from the Portuguese nobles and successive kings. It also became a famous sanctuary attracting pilgrims wishing to pay their promises and demanding for divine protection (Fig. 20.1).

[1] A collegiate church, from the Latin collegium means a non-cathedral church possessing its own charter of canons, headed by a prior subject to the bishop's authority or independent from it and under the direct hierarchy of the pope. The Collegiate of Guimarães (Colegiada de Guimarães, in Portuguese) considered itself and from its origin nulius diocesis, therefore independent from the episcopal (bishop) authority and only subject to the Holy See for spiritual issues and to the Portuguese king for temporal issues.

Fig. 20.1 The bipolarization of the city (950–1279) (Source: Municipal archives of Guimarães)

The political importance of Guimarães may be recognized by its selection as the administrative seat of the County of Portugal by Henry of Burgundy who granted the city with the charter act, probably in 1093 (Reis 1996). Also Afonso I set in Guimarães the first capital of the kingdom and for this reason, the city is often referred to as the "the cradle city of the nation". However, due to the needs of the Christian Reconquest, the administrative centre was changed to Coimbra in 1129. Over the following century, the city continued to expand and due to its religious importance, managed to attract various mendicant orders (for example, the Franciscan brother Gualter probably arrived in the city shortly after 1217) that settled their convents in the surroundings. Due to its increasing religious and commercial importance, it was decided the construction of an encircling wall comprising the uptown and the downtown communities of Guimarães. The wall was completed before 1322 and served to protect the city and its inhabitants during various sieges in the fourteenth century. In 1389 the king João I ordered the unification of the two communities and the demolition of the wall separating each other took place in 1420 (Sereno and Dordio 1994).

Until the nineteenth century, the inner city (within walls) had little changes in its urban structure (except for the construction of the Misericórdia Square in the turn of the eighteenth century) although some churches and palaces were actually built and a considerable number of buildings were refurbished. The city started to expand outside the walls after the beginning of the fifteenth century and especially after the seventeenth century, when an area in the outskirts of the city's main entrance door was set up for cattle trade (Toural). The importance of Toural continued to grow over the eighteenth century and in 1791 the municipality authorized the construction of buildings attached to the wall and facing the Toural Square thereby prompting the transformation of this area into the central square of Guimarães nowadays.

The settlement of a military regiment and a hospital in the uptown at the beginning of the nineteenth century certainly contributed for the rehabilitation of this area which was almost abandoned for centuries in urbanistic terms.

The new urbanistic ideas of hygiene and symmetry of the nineteenth century were promoted by Queen Maria II after 1853 thereby conducting to significant changes in the expansion of the outer city. The complete demolition of the city walls was authorized following the royal recognition of their uselessness for defensive purposes in 1793. This allowed for the connection between the inner and outer city and prompted the expansion of the outer city, through the creation of new streets, avenues and squares. Aware of these developments the municipality ordered the first urban plan for the city in 1863. The plan was essentially conservative, mainly focusing on the existing urban fabric, but reflected the health concerns of this period and promoted the demolition of insalubrious buildings thus creating better living conditions for the inhabitants.

Parallel to this, the arrival of the train in1884 and the erection of the new railway station in a former rural area stimulated the urban development of the southern area of the city and its connection to the historic centre through the opening of two important new avenues: the Commerce Avenue and the Industries Avenue,[2] their initial names clearly evidencing the modernization forces acting in Guimarães in the second half of the nineteenth century when it was one of the most dynamic Portuguese urban centres.

The twentieth century brought to Guimarães the consolidation of its urban development, following the plan of 1863 and benefiting from the new road connections that gave the city a regional centrality. The industrial development also played a role as the industry units grew in number and size, abandoning the traditional typology of the lather factories of the eighteenth century and disseminating in the south and southwest areas of the city along the new avenues and the streets of the old urban fabric nearby. In view of this dynamics, a new urban plan was published in 1925 that contrary to its predecessor, forecasted an important expansion area eastwards. The urbanistic plan of 1955 continued to favour the eastern expansion but also contemplated the extension of the city to west, through the construction of the new bus station and the municipal sports stadium. Additionally, the plan revealed substantial concerns on infrastructures (water supply and sewage, mainly), on the creation of a continuous green area from the Toural square to the Saint Gualter Church, and on the deviation of traffic from the central area that "threatened to suffocate the city" (Fig. 20.3).

In the mid-1920s, the historic area in the upper city went through a substantial rehabilitation process because of the millennial celebrations of in 1953. Following this, attention was also driven to the historic inner city area leading to various improvements in the public space and to the installation of public services in rehabilitated buildings (e.g. the city hall in 1968). This has fostered the complete rehabilitation of the inner city and its recognition as a UNESCO World Heritage Site in

[2] These were later named Candido dos Reis and Miguel Bombarda Avenues respectively, as depicted on the bottom of Fig. 20.2.

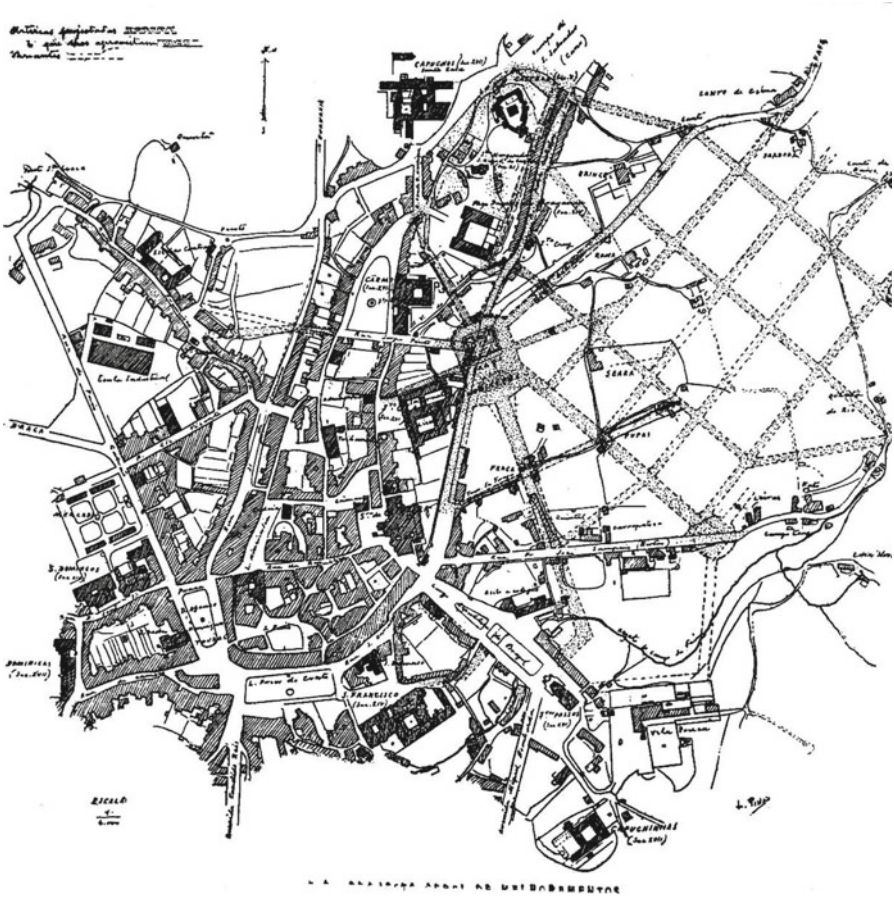

Fig. 20.2 The city of Guimarães in 1924 (Source: Municipal archives of Guimarães)

December 2001. Fortunately, the controlled process of urbanization briefly described above has permitted the preservation of part of the wall and the conservation of the city's magnificent historic centre until the current days.

The urbanistic plan of 1955 was revised in 1965 because the municipality considered it was dated in view of the strong economic development of the city and its surroundings. This revision considered the appropriate location of the new large industrial units in suburban areas and further contemplated new residential areas while respecting the historic and artistic values of the city. The plan for the expansion area was presented in 1970 and approved in 1971 after substantial changes. In view of this development, the municipality area was enlarged in 1972 for roughly twice as much the previous one. After this point, the original urban fabric of the city and that of its surroundings has become indistinct.

The installation of the University of Minho took place in 1975 and the first students arrived in the city shortly afterwards. The campus construction started in the

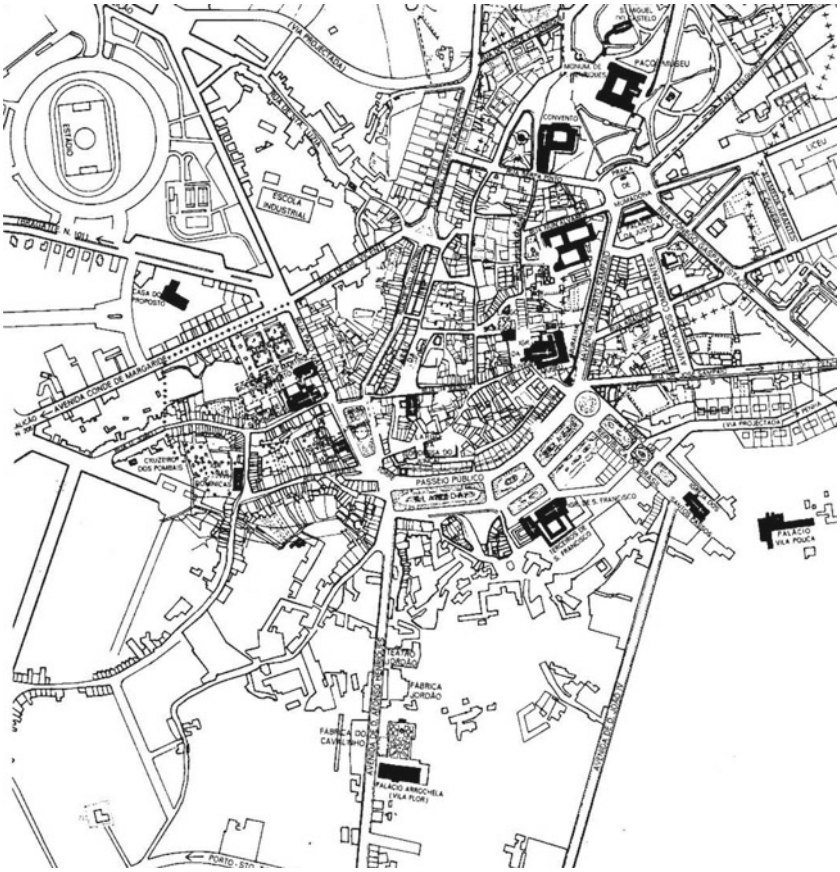

Fig. 20.3 The city of Guimarães in 1974 (Source: Municipal archives of Guimarães)

following years in a rural area northwest to the city centre. Soon it fostered urban development to that area and of the rest of the city, following the demand for housing and services from the university population. All this brought extensive urban expansion and substantial increase in the demand of services of various types and of cultural activities. The effects of these are quite perceptive nowadays and are an important support for the city's economy.

Jointly with Maribor, Slovenia, Guimarães was the European Capital of Culture in 2012. This has had strong impact because it constituted an opportunity for rehabilitation of a number of public spaces, mainly outside of the inner city. The Couros Area, located south of the city centre, has possibly been the most benefitted. This was an old industrial area, mostly devoted to the leather industry (*couros* meaning leather in Portuguese) with remnants from the twelve century that lasted until the end of the nineteenth century. The opening of the Commerce Avenue first divided it in the beginning of the twentieth century but it had been partially excluded from the city development until the twenty-first century, when all the old factories had

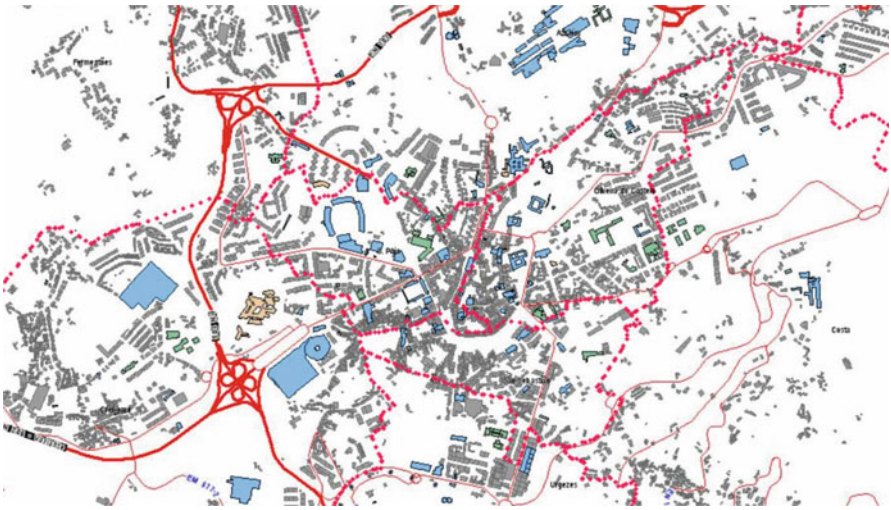

Fig. 20.4 Urban plan of Guimarães (Source: Camara Municipal de Guimarães)

already closed (Teixeira 2013). The project of the Capital of Culture has been the opportunity to rehabilitate the infrastructures and the public space as well as to refurbish buildings and give them new functions (namely through a partnership between the municipality and the university that decided to set up a new campus in Couros[3]). Other public spaces (e.g. the Toural and the S. Damaso Avenue) and buildings (e.g. the Municipal Market and its transformation in exhibition centre) have been included in the refurbishment process, largely increasing the attractiveness of the city.

Figure 20.4 depicts the extension of the urban area of Guimarães and documents the effects of the evolution process described in the preceding paragraphs.

The increased number of residents and the extension of the urban area through the last decades, aggregating suburban areas, contributed not only for the city growth, but also to increased environmental pressures. As in many other cities, the city of Guimarães grew along the riverside of its water stream – the Costa/Couros river, that served as a support for human and industrial activities. Therefore, it was natural that one of the highest impacts that resulted from the increased urban and industrial occupation was the environmental degradation of the Costa/Couros River, and an inadequate management of water systems.

In fact, until the middle of the twentieth century water supply and wastewater drainage systems where very limited. The 1990 census reports that only half of the

[3] Actually, the Municipality of Guimarães and the University of Minho, through its School of Engineering, formalized a partnership to implement the Campurbis Project, aiming at the urban requalification of part of the historic city through an urban campus in the historic center. With this strategic investment in knowledge, technology and innovation, the Campurbis Project emerged as an important component in the application of Guimarães to European Capital of Culture in 2012. The project was the predecessor to the Couros Campus as it is known now.

population had access to public water supply and only a quarter to wastewater drainage (Barros and Ramíso 1992). Furthermore, there was no wastewater treatment before the discharge to the receiving environment. As a result of institutional policies, and massive investments, the next decades where characterised by the design and implementation of efficient urban water supply and wastewater drainage and treatment systems. In 2001, approximately 60 % of the population was already served by public water supply, and around 70 % with access to public sewer system with some form of treatment (INE 2001). At this time all population was already served by waste collection and disposal systems, according to the European Framework (INE 2001).

As a result of this effort, the city has now new and efficient urban systems, with new infrastructures and efficient operational procedures. The drainage and treatment of domestic and industrial wastewater has a high coverage, reducing the pollution load to the environment.

Although the implementation and efficient management of these systems contributed greatly for significant environmental improvements, and better life quality, they did not focus on the control of non-organic and nonpoint-source pollution. An urban environmental assessment indicated that, as a result of the past industry pressure, but also due to recent diffuse pollution sources, the urban stream is still under a heavy environmental pressure. In fact, and due to normal urban activities, pollutants are continually released to the urban environment. These pollutants, in wet weather conditions, are leached to the urban water stream, increasing the pollutant load to this river. Since some of these pollutants have a conservative and biocumulative nature, there is an increase challenge for the definition of a sustainable management model for urban water streams. Due to these matters, the main challenges for an effective and sustainable urban water management, in order to correct the ecological imbalances in this urban watershed are now focused on the stormwater systems and the rehabilitation of the urban stream.

In this line, the Municipality of Guimarães (CMG) and University of Minho (UM), through its School of Engineering, formalized a partnership to implement the Project Campurbis, aimed at urban requalification of part of the historic town of Guimarães, with the integration of an urban campus in the historical center. With this strategic investment in knowledge, technology and innovation, the Project Campurbis emerged as an important supplement to the application of the "Guimarães, European Capital of Culture 2012", as formalized by Guimarães municipality. As an integrated part of the urban regeneration, a specific project focused on the revitalization and regeneration of the Costa/Couros river, that has always been part of the population's life. Beside this local strategy, the European Water Framework Directive demands a good ecological status for natural water bodies and, therefore, there is an urgent need for controlling the detected sources of pollution.

The rehabilitation of water resources in an urban environment has an added complexity not only because multidisciplinary approaches are needed, but also due to the strong historic constraints, the lack of space for the implementation of structural measures and the high value of the available land (Ramísio 2010).

Since a restoration program can only be effective when the main processes involved are fully understood, a preliminary study was done in this river, focusing on hydrology, hydrodynamics, morphology and ecology processes, at a watershed scale, incorporating insights from recent research, and developing connections between requalification strategies and physical actions.

This integrated approach included hydroinformatic tools, geographic information systems (GIS) and remote sensing, in order to include these data on an integrated decision support system (DSS), to provide better judgements and improved decisions by city managers. Based on these elements, the following short term objectives where established: to minimize the flooding of the downtown areas; to mitigate the negative effects of some canalized creek sections; to stabilize the riverbanks with higher erosion risk; to improve the creation of fluvial recreational areas; to eliminate pollutant from the remaining point-sources and to increase the control of diffuse pollution.

The control of urban runoff pollution seems to be the present biggest environmental challenge. In fact, despite the importance given to stormwater drainage systems, especially in urban environment, the overall progress found in this area was not significant over the last four millennia. Stormwater drainage networks have been designed mainly based on their quantitative nature. However, the concern for decision-making and integrated management for these systems is increasing, not only due to the deterioration and the consequent increase in the frequency of flooding at urban areas, but also related to the quality degradation of the environment, as result of the pollution loads from these systems. It is a proven fact that urban stormwater is characterized by the presence of small concentrations of pollutants, such as heavy metals and organic compounds, on big volumes of water, that can be responsible for acute or chronic effects (Ramísio 2007).

According to Van Dam et al. (1986), urban stormwater pollution results from the drag of pollutants present or deposited in roofs, pavements, streets, gutters, etc. to the drainage systems. In addition to these stationary sources, there should also be noted the great contribution of mobile sources, such as road traffic. In a similar way, Atassi et al. (2003) states that the pollution associated with stormwater in an urban environment, can arise from the following sources: runoff of stormwater; discharge of unitary systems; discharge of separate systems; wastewater systems and treatment facilities; industrial discharges; runoff. Due to the large number of mobile and stationary sources contributing to pollution loads in urban areas, it is important to identify and classify the relative importance assumed by each different source.

These systems can be responsible for diffuse, intermittent or cumulative pollution. Given the fact that pollutants are closely linked to the hydrological cycle, they can travel big distances from their sources, transported by wind or water. Therefore, the control of this type of pollution, in an open environment, presents unique challenges, being one of the biggest challenges that cities all over the world have to address in a near future.

20.3 Reflections on the Concept of Green City

Among the indicators that are commonly used to define the Green City concept, some are rather easy to perceive or quantify. Examples are: waste and water treatment; water management; eco innovation and sustainable employment; air and acoustic quality environment; waste production and management. Most of these indicators can be easily assessed, based on well-established analysis and quantification methods. However, there are others that are not so tangible and are very difficult to measure. This difficulty comes from the fact that cities are not closed systems, depending heavily of the neighbor urban and rural areas and, sometimes, from areas that are far beyond the city or even the country boundaries. Most of these impacts are related with the influx of products and services to keep a city a pleasant place to live. These products and services can go from the simplest basic needs of the inhabitants, such as nourishment, healthcare and education, to the building or maintenance of infrastructures or to the supply of city services and industry or even for personal and collective culture and leisure. For this reason, the assessment of the concept of Green City can be very difficult when we try to account for: the local contribution to global climate change; the impacts of local transport; green urban areas and sustainable land use; biodiversity; integrated environmental management. Probably new methods must be developed to correctly assess which are the real impacts of a city in each of these rather ambiguous indicators. A bigger challenge will be to define thresholds of sustainability for these indicators, to qualify a city as a Green City. It's not an impossible task but this assessment depends on an extensive knowledge of all the products influx and people behaviours, and the respective quantification of the environmental impact of each. This work is largely undone. It is impossible to account for the impacts generated by a city without study the complex network that it is established by all its inputs and outputs. Somehow, all the outsourcing of needs represent outsourcing of impacts, some of them very severe and not easily perceivable when we study the city within its administrative boundaries. The quantification of all the impacts generated by a city can be illustrated with countless examples that arise questions about the correct quantification and application of some indicators that, potentially, represent global impacts and how they must be taken into account.

A first example comes from the nourishment needs of city inhabitants. Most cities rely on the rural areas to obtain products for this purpose. The habits of consumption have a strong impact on the land use management of the rural areas, at a local or a more global scale, depending on the ability of the surrounding areas to produce these products. Depending mainly on local products has a general benefit in local economy and there is, usually, a reduced ecological footprint when compared to the importation. However, there are lots of nourishment products that are essential for health maintenance but are not produced locally. Some of these products come from remote parts of the world. All the impacts generated by the production, management, packing, transformation, transportation, etc. occur outside the destination city limits. The biggest impacts include waste production and disposal,

soil erosion, land use changes, overgrazing, drinking water depletion, water quality degradation, greenhouse gases emission and threats to biodiversity. A strong effort must be done to understand these relationships and to promote, by education, behaviours that can lead to the reduction of those impacts. This example has a strong relationship with the green city indicators: local contribution to global climate change; green urban areas and sustainable land use; biodiversity; integrated environmental management.

A second example comes from the need of raw materials for infrastructures building or maintenance or already embedded in converted products, such as electronic products, automobiles, clothing, etc. Guimarães is an example of a city that heavily relied, for centuries, in local materials for infrastructure building. The main product is Granite, which is the most abundant lithology around the city. Building with local products represent fewer needs for transportation and this represent fewer impacts on gases emissions. In a sustainability perspective, this is an effort that must be encouraged. However, for centuries, there were lots of quarries that were opened without the present day environmental standards, which still have a strong impact on the landscape. There are also lots of buildings that include concrete, which is an effective, secure and affordable construction material nowadays. The marlstone and limestone needed for concrete production come, mostly, from distant areas that have these lithologies available, like Souselas – Coimbra and Cape Mondego – Figueira da Foz, were the impacts of the use of these products in cities like Guimarães are discernable. The case of Cape Mondego is even more complex because the exploration is destroying important geological heritage that has a huge scientifically interest for the comprehension of the Mesozoic period. In this area there is an extensive paleontological registry, including dinosaur footprints, and there is layer of rocks, which is the world reference for the Aalenian-Bajocian time transition or a Global Boundary Stratotype Section and Point (GSSP) (Pavia and Enay 1997). This means that this concrete exploration is posing a threat to one of the two GSSP's existent in Portugal. How can this impact be measured and how much can be attributed to all the cities that benefited from this quarry is an open question.

Considering transformed products, such as consumer electronics, industrial machinery or automobiles, there are lots of chemical elements used that imply the mining of the earth's crust worldwide. All this extractive activity has severe impacts that are not measurable directly within most city boundaries. The conversion of these raw materials in final products has an extensive workflow that is also full of potential impacts. This workflow is, commonly, spread worldwide. The simple acquisition of a consumer electronic product has a cascade of impacts that are not easily perceived by the final buyer, both in magnitude and in space. Considering that most of the impacts related with the extraction of raw materials and the subsequent transformation into a final product are mostly related with people's consumption habits, an effort must be done to understand and quantify this relationship. The amount, life cycle of the acquired products and the potential for recycling are certainly important numbers to be considered. Gathering this data will make possible to have a better perspective of how much global impact a certain city has. Even a small city like Guimarães has a small effect in the air pollution in Beijing or in the

water degradation in New Delhi. This relationship must be clear through education. If a simple increase of 1 year in the average exchange cycle in electronic consumer products can be achieved, considering all the population of a certain city, this can have a very relevant effect in the environmental impacts worldwide.

A third example can come from the supply and demand of energy. One of the Green Cities indicators is energy performance. The calculation of the energy efficiency and consumption is an established procedure in most countries and it is used for taxation purposes. The use of energy in houses and in transportation can be easily optimized and a lot has been done in recent years to improve energy use. The existence of new technologies considering, for example, new types of lamps (mainly based on LED technology), motors efficiency, houses insulation, etc., also helped to lower the energy demand. The improvements in control of the supply network also were an important player, allowing a better management between the mixing of renewable and non-renewable sources of energy. In Portugal renewable sources of energy have been increasing in latest years, mainly based on wind, benefiting extensively from a better supply management technology. One of the main problems is that the wind and sun are not constant sources of energy. Without an efficient way of storing the energy produced by these sources, there is a need for the creating storage capability that can accumulate the excessive potential generated in lower demand periods. In Portugal, dams with reverse-pump capabilities ensure this storage capacity. These dams use the excess of energy to pump water upwards to the water reservoir, accumulating energy in the form of hydro-potential. The main problem is that, considering the extensive investment made in these renewable sources, more dams will be needed. Some are already under construction and others are planned. These structures have lots of benefits but also have negative impacts. Portugal has faced, in recent years, lots of problems with coastal erosion and inland migration of some coastal areas that are partially attributed to the reducing sediment supply caused by river dams (Taveira-Pinto et al. 2011). If we add to the equation that some of the energy consumed in Portugal comes from abroad, the real broad impacts of energy consumption get fuzzier. Considering transportation and energy use, although electric cars use in Portugal is still residual when compared to vehicles that use fossil fuels, this solution is generally presented as a possible solution for emission problems. Since electrical motors do not use combustion processes, they really reduce gases emissions contributing, in a decisive manner, to a local improvement of air quality and noise reduction. However, if this solution become more common, the sources of the energy used must be taken into account. If the energy comes primarily from renewable sources, electrical cars are very interesting sustainability solutions. If, by the contrary, the energy production comes mostly from burning fossil fuels elsewhere, electrical cars will be masking emissions that are needed to allow their energy supply and can represent no more than a way of masking and outsourcing pollution.

A fourth example is related with the indicators “local contribution to global climate change”, “biodiversity” and “green urban areas and sustainable land use”. It is generally accepted that the “greening” of the cities is positive. The use of plants in cities, isolated or organized in green areas, such as gardens or parks, have lots of

benefits that goes from general air quality improvement (Taha 1996) to the reduction of the Urban Heat Island effect (UHI) (Kurn et al. 1994) to benefits in the health condition of citizens (Maas et al. 2006; Mitchell and Popham 2007; de Vries et al. 2003) or increases in general city moisture with a net cooling effect and respective energy spare in refrigeration (Akbari et al. 1997). The garden areas also have the effect of becoming small niches for small animal food chains, including insects, small reptiles and birds. This allows the maintenance of some biodiversity and provides a pleasant environment for the inhabitants. Although the creation or maintenance of green areas in cities is strongly encouraged, there must be an extensive care in the selection of species that are used for this purpose (plants and animals). Preferable local species must be used. The use of alien or invasive species can pose a severe threat to the city or to the surrounding rural areas. These alien species are, sometimes, brought from other continents. Without the existence of a natural equilibrium with other local species, the alien ones can over-develop until a point that become a strong source of potential loss of biodiversity. Sometimes their extensive and uncontrolled growth implies the loss of local species. The problem can be worsened if a plant uses the wind for seed dispersion because, this way, they can travel several kilometers from city boundaries. In Portugal there are lots of problems related with several vegetable alien species that were introduced for ornamental purposes, mainly *Acacia dealbata*, *Acacia longifolia* and *Hakea sericea*. These three species have a concerning spatial dispersion, have several negative impacts and their eradication is costing many resources. For these reasons, green areas in cities must be carefully planned and the assemblage of species must be in equilibrium or pose small threats to the surrounding areas.

These examples make it clear that the concept of Green Cities must, inevitably, take into account all the impacts that any city induce locally or worldwide. The relation of the cities with these local or global impacts is not always easily discernible or quantifiable. An effort must be made to develop methodologies and new research that can provide understanding of these complex relationships, in order to arise the general awareness for real or potential problems. The awareness of these problems can lead to behaviour change towards a more sustainable way of life, which must be one of the main driven factors of the Green Cities concept. This concept must also take into account which where the errors that were inherited from the past and how much those errors were avoided or contained.

20.4 The European Green City Award: The Criteria

Although the concept of Green City is one broad subject, encompassing different themes related to the environment, sustainability, resources and quality of life, the evaluation process for the European Green Capital Award is based on a set of 12 indicators (local contribution to global climate change, local transport, green urban areas and sustainable land use, biodiversity, air and acoustic quality environment, waste production and management, water management, waste and water treatment,

eco innovation and sustainable employment, energy performance and integrated environmental management), which may be classified into four main areas: energy, mobility, urban systems and urban and natural environment.

The European Green Capital Award (EGCA) was launched in 2006 as an initiative of 15 European cities[4] and the Estonian Cities Association. The EGCA promoter cities drafted a memorandum to define the ecological and sustainable vision and to frame the award, enabling the recognition of all the cities that lead by example by being environmental and sustainability role models.

The main objective of EGCA is to encourage European cities to share projects, examples and best practices in terms of environment, sustainability and high standards of quality of life in urban spaces.

In addition, cities should set ambitious goals looking for environmental improvement and sustainable development, inspire European cities to promote and share best practices and, finally, cities should develop a communication strategy towards the development of a positive image, reputation and territorial notoriety.

Awarded annually, EGCA results of an application process formally submitted to a specialized committee, 4 years before the award decision.

It is acceptable that European urban societies may face future challenges with positive positioning aggregating all the benefits and advantages provided by the award namely increased tourism, positive international media coverage, international projection, new territorial alliances, foreign investors' attractiveness, employment increasing, greater emphasis on environmental projects through sponsorships and intensified citizens pride.

To be admitted as an EGCA candidate, the city must respect all the eligibility criteria, defined by the application protocol. Acceptance of cities to European Green Capital Award applications is triggered to specific geographic (member states of EU cities and candidate countries[5]), demographic (cities with more than 100,000 inhabitants) and administrative (cities governed by a city council or other democratically elected body) requirements.

The European Green Capital Award is given to a city that has improved the urban environment in general through specific activities such as cooperation and partnership between authorities, citizens, industry and others, development and improvement of urban living conditions, implementation of sustainable mobility solutions, creation and expansion of parks and leisure areas, modern waste management, innovative solutions to prevent noise pollution and integrated approach to urban management to ensure positive long-term effects.

Before the selection process, a candidate city to the EGCA must comply with 12 assessment indicators, specifically in terms of climate change, transports and local mobility, green urban areas and sustainable land use, nature and biodiversity, air quality, environment acoustic quality, production and waste management, water

[4] Tallinn, Helsinki, Riga, Vilnius, Berlin, Warsaw, Madrid, Ljubljana, Prague, Vienna, Kiel, Kotka, Dartford, Tartu and Glasgow.

[5] Macedonia, Iceland, Montenegro, Switzerland, Serbia and Turkey.

management, wastewater management, eco innovation and sustainable employment, energy performance and integrated environmental management.

The information is then evaluated by a panel of experts, followed by review processes, pre-selection, presentation of the shortlisted projects, decision and public announcement.

A significant part of community engagement with candidacy projects such as the application to EGCA is developed in the communicational level focusing on two distinct dimensions: strategic communication and territorial marketing. On one hand the involvement of citizens and their motivation to an active participation in the project depends crucially on effective communication modes. Indeed, the first stage of application requires community involvement around the ultimate goal – winning the prize – and represents the right setting to activate a community communication strategy focused on civic education with urbanity, sustainability and the environment issues as a formal basis.

On the other hand, it requires a permanent dialogue with the outside, considering the importance of territorial branding and marketing into a practical perspective of the "brand-city" concept (Gaio and Gouveia 2007). It must contribute to visibility assurance and enhancing the reputation of the city, that in the case of the city of Guimarães notes already a very relevant record on titles, awards, such as the title of UNESCO (World Heritage) and the fact that it was European Capital of Culture in 2012. By developing the communication plan and framing it in the application to the EGC award, the city of Guimarães may capitalize the identity attributes that distinguish and differentiate the city among medium-sized cities in Portugal and Europe. Thus becomes relevant the use of heritage, history and tourism, cultural, social and economic dynamic, natural and environmental attributes, that have contributed throughout the years to enhance the brand-city Guimarães.

Open cities where internal public (community) is more receptive and emotionally identified with the perceived image (Peruzzo and Krohling 2013; Cabestré and Graziadei 2010; Gaio and Gouveia 2007) tend to enhance the communicative management of its attributes converting it into an instrument for common project and adding territorial competitiveness and strengthening positive management around the city brand (Gaio and Gouveia 2007).

The popular association, organization and engagement in projects and issues that concern the communities in which citizens are part (Peruzzo and Krohling 2013) eventually converge with the territorial branding strategies, acting "on a *continuum* between the attributes of the territory and the recognition and public interest by these characteristics, namely, a *continuum* between the identity and the city's image" (Gaio and Gouveia 2007, p. 29).

It is thus essential to develop edu-communication (Peruzzo and Krohling 2013; Soares 2007). Within this strategic communication plan, citizens are seen as allies (Cabestré and Graziadei 2010), stakeholders (Gaio and Gouveia 2007) and social players (Duarte 2007). Moreover, the context in which the communication acts occur are carried out simultaneously in formal and informal education framework (Peruzzo 2007; Soares 2007; Duarte 2007) but united by a common and central goal that is "to make the society help to improve society itself" (Duarte 2007), contribut-

ing "to extend the educational spectrum around the exercise of citizenship" (Peruzzo and Krohling 2013). The exercise of citizenship and the participation of citizens in the decision process regarding cities management namely by transmitting their preferences is crucial for the development of societies and its endeavours.

In sum, effective communication channels between all stakeholders is a precondition for the success of projects such as the EGCA. The new management paradigm proposed depends on the involvement and active participation of the whole community, by for example, communicating their preferences or by taking advantage of the conditions offered. Cities should be not a set of buildings, infrastructures and equipment but a network of people using physical and natural capital in a healthy and sustainable fashion.

20.5 Green Spaces and Urban Planning: The Case of Florence (Italy)

This section proposes and applies an historical methodology suited to analyse the dynamics of urban landscape in time and space, with the aim to put into evidence not only changes but also trends and future requirements for an appropriate planning process. It presents the main results of the application of the HCEA methodology (Historical and Cultural Evaluation Approach) developed by the Laboratory for Landscape (CULTLAB), today applied in Italy in several national, regional and city planning processes, in order to support the urban plan developed by the Florence administration. The analysis focus on the city area including the perirurban green spaces within the administrative city limits.

The methodology is based on the comparison of the landscape at different times at high resolution (Agnoletti 2002). The result is the analyses of the transformations that have taken place during this period, identifying the significance and the vulnerabilities, as well as the role of this area through history. The land use change is evaluated together with social dynamics at three different years: 1832, 1954 and 2003, using cadastral maps and aerial photos. The study area extends for about 10,000 ha, and comprises the whole current municipality area, with the exception of the historical city centre as it was in the year 1832.

20.5.1 The Florentine Landscape in the Early Nineteenth Century

The reconstruction of land-use patterns in the nineteenth century shows that the city's agricultural landscape extended all around the central urban core. Cultivations occupied 68 % of the total area, while urbanized areas, only extended over the 10.2 % of the area, with a population of 150,864 inhabitants. Woodlands extended

on the 5 % of the municipality and meadows and pastures over the 1.9 %. The cultivated areas were almost equally divided between mixed cultivation (3,500 ha) and bare cereal fields (3,415 ha), while only a small surface is devoted to specialized vineyards, olive groves and orchards. Mixed cultivation involved the combination of vines trained on trees and ploughed fields, creating an aesthetically complex landscape, rich in biodiversity. Furthermore, it allowed the growing of several crops on the same plot, and hence used less land than monocultures. The extension of the farmland with vines trained on poplars, accounting by itself for 13 % of the whole surface of the study area, suggests that this was the most widespread form of mixed cultivation. Monocultural vineyards accounted for only 2 ha, but vine could be found in mixed cultivations over more than 5,110 ha, making it the most widespread cultivation in the first half of the 1800s. Olive trees were found on just over 17 % of cultivated areas, and always in mixed cultivation. Mulberry trees were grown on 107 ha, on 87 % of which it was associated with vines and poplars. The presence of mulberry trees were linked to the silk industry. Another significant aspect of the Florentine agricultural fabric are public owned vegetable gardens, which were commonly found around the urbanized clusters. This areas were mostly owned by Florentine citizens who start to build villas outside the city since the twelfth century.

20.5.2 The Florentine Landscape After the Second World War

In 1954, 30 % of the area was covered with bare arable land, 24 % with urbanized areas and almost 20 % with olive groves. The landscape was arranged around the relatively compact urban centre, which mainly extended along the western road axes. This is the result of the development that had been going on since the 1930s, which brought the population up to 374,625. In spite of the growth of the manufacturing industry and urban expansion, agriculture is still the most remarkable aspect of the area, with the cultivated areas extending over 64.3 % of the territory. This period marks the onset of a rapid process that was to transform Florence from the main centre of a wide rural areas into a “tertiary metropolis”, based on trading (Fei et al. 1995). The expansion of olive monoculture and specialized vineyards (7 % of the area), was especially significant in the 1950s, reflecting a trend documented over all of Tuscany.

20.5.3 The Modern Landscape

The situation of the Florentine landscape at the beginning of the twenty-first century shows a reversal of hierarchies as a result of the industrial and urban revolution occurred after World War II. The present distribution and extension of urbanized surfaces, accounting for more than 50 % of the municipal territory, indicates a functional subordination of the countryside to the city, although the population is

practically the same as in 1954: 375,041. In terms of macrocategories of land-use, 29.5 % is still occupied by farmland and 11.9 % by woodland. Meadows and pastures are less extensive, occupying only 6.4 % of the municipal territory. More than 15 % of the total surface areas consist of specialized olive monocultures, as they constitute the (agri)cultural matrix of the local hill landscape, both in quantitative and qualitative terms, while monocultural vineyards can be found only over 1 % of the total area. The remaining structural elements of the Florentine agricultural landscape are mixed arable land and bare arable land, respectively accounting for 5 % and 8 % of the surface.

20.5.4 The Main Changes in the Florentine Landscape from the 1800s to the Present Day

The most significant transformation occurred in the last two centuries is obviously the urbanization of the area, and the shift from a mainly agricultural landscape to a urbanized one. A first doubling of the urbanized area occurred over a little more than a century, while the second doubling took place in just half a century under the impulse of the acceleration and intensification of urbanization in the second postwar period, almost saturating the available spaces in the surrounding plain. It is highly significant that the current population of Florence, after peaking at 457,803 in 1971, today has gone back to the same figure as in 1954, but occupies twice of the urban surface. Although the population trend over the last 10 years has been upward, going from 356,118 to 375,041, the disproportion between urban expansion and demographic growth is glaring. Metropolitan growth has impacted the agricultural character of the periurban landscape, encouraging, on the one hand, the abandonment of cultivation and, on the other, the intensification of agriculture. One of the elements distinguishing the hills of Florence, as well as those of Tuscany in general, are the dry-stone terraces that have remodelled their slopes. About 286 km of dry-stone terraces characterized the hills of Florence, but 17 % of them are nowadays abandoned. This can cause problems related to the loss of a characteristic landscape feature, mainly linked with olive cultivation, but also to the loss of biodiversity and to the increase of hydrogeological risk, as terraces that are no longer subjected to regular maintenance can increase the instability of the slopes.

20.5.5 Lessons for Planning

The transformations of the Florentine landscape in the period under study where determined by three dynamic phenomena: urbanization, intensification and cultivation abandonment. As regards the agricultural landscape, the drastic decline of mixed cultivation confirms the gradual disappearance of one of the most important European historical landscapes (Meuus et al. 1990; Agnoletti 2010). The hills surrounding the city, north, south and east, are still largely cultivated with high

architectural value settlements, mostly originated in the renaissance and today included in the UNESCO World Heritage List together with the historical city centre. However, the quality of the rural landscapes would deserve equal attention, it is worth noting that more than 700 agricultural entrepreneurs are still active within the city limits. In the past, agriculture played an important role for the life of the city, while today food production has lost most of its role in favour of recreational and residential purposes. The great challenge today is the western plain where the city is rapidly expanding towards the nearby town of Prato creating a huge metropolitan area. The analysis developed suggested not only to stop further urbanization but also to create a rural park all around the city, rather than just a "green space", recovering the historical cultivations preserving the cultural identity of the area and producing food for the city. Presently the town plan has stopped further urbanization and a rural park is going to be created in the western area. The creation of a rural green belt around a city would also fit the indicators required for green cities in terms of sustainable land use, nature and biodiversity, climate change adaptation, as well as air quality.

20.6 Conclusion

The European Green City Award stresses the evolving nature of cities and the challenges it poses when the preservation of urban cultural landscapes is taken into account. As cities are living bodies, the sustainability of green cities relies on the individual actions of its citizens, firms and local authorities, which in turn depends on the degree of identification of stackholders with the goals and plans of city managers. As proposed, being a Green City requires a new management paradigm where participation and communication between all stakeholders are crucial. Active involvement and participation requires that all agents are convinced of the individual returns of the endeavour.

From the perspective of businesses, the adoption of green practices significantly contributes to improved environmental indicators but it may also contribute to better market and financial performances. In addition, the development of business producing green goods and services might contribute to attracting outside investors for similar types of businesses and tourism. Another area potentially benefitting is the agricultural sector, by developing more sustainable and higher quality products in addition to developing closer links between local producers and local consumers. The consumption of seasonal and local products significantly minimizes the environmental impacts of transporting the items from outside the city. The development of a low carbon economy might also present new business opportunities, by requiring the exploration of renewable energies in substitution of fossil fuels. One particular problem in cities is the sustainable management of water, wastewater and solid waste. In this respect, green cities promote a circular thinking, developing an integrated system of recovering value from the wastes produced. Green cities should thus be looked as opening opportunities and not as imposing restraints as they in fact require new lines of businesses.

From the perspective of individuals, the axes constituting opportunities for businesses also constitute advantages to citizens as they contribute to a healthier environment. In addition, the green city model promotes the integration of environmental and sustainable subjects into the curricula and activities of schools; and advocates the development of green urban spaces. The physical and natural environment of a green city sustain healthier life patterns which in turn bring qualitative and quantitative benefits to the population.

From the debate during the 2nd WCEH roundtable on green cities and from the history of the development of the city of Guimarães it is clear that the city has in recent years paved the way for a successful application to the EGCA. Examples are the restauration of significant parts of its urban landscape, particularly, the Industrial Couros area and its adaptation for active use; the refurbishment of several buildings in the city and their use for diversified cultural activities; the development of public urban agricultural areas; the development of several applied research projects with the University of Minho (Campurbis being the most significant example); the successful application of the historic centre to UNESCO Heritage site in 2001; the successful application and realization of European Capital of Culture 2012; and the possibility of citizen participation in the making of the municipality yearly budget since 2013 by proposing projects and voting for its selection, just to mention a few.

Despite the progress achieved, Guimarães faces, as any other living city, important challenges in the future. The history of the city suggests some trends from a predominantly agricultural economy, to a more industrial and third sector economy. It is also evident the dynamics of land occupation guided by the installation of important infrastructures such as the railway station and the bus station, the development of the leather industry and finally the installation of the Azurém campus of the University of Minho. The expansion of the city, conditioned by its morphology, has resulted in the integration of suburban and rural areas, creating a metropolis. The frontiers between rural and urban spaces are now blurred, commuting traffic has increased, residential areas migrate and the socio-demographic composition of the population is also affected, posing by itself important problems. Hence, the adoption of more integrated and sustainable management practices and priorities is a necessity, more than a dream, if the objective is the development of the city without compromising the quality of life of its citizens, and the sustainability of its path.

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