Landscape Series

Antonella Contin *Editor*

Metropolitan Landscapes

Towards a Shared Construction of the Resilient City of the Future

Springer

Landscape Series

Volume 28

Springer's innovative Landscape Series is committed to publishing high quality manuscripts that approach the concept of landscape and land systems from a broad range of perspectives and disciplines. Encouraging contributions that are scientifically-grounded, solutions-oriented and introduce innovative concepts, the series attracts outstanding research from the natural and social sciences, and from the humanities and the arts. It also provides a leading forum for publications from interdisciplinary and transdisciplinary teams across the globe.
The Landscape Series particularly welcomes contributions around several globally significant areas for landscape research, which are anyhow non-exclusive:

- Climate and global change impacts on landscapes and ecosystems including mitigation and adaptation strategies
- Human Dimensions of Global Change
- Biodiversity and ecosystem processes linked to ecosystems, landscapes and regions
- Biogeography
- Ecosystem and landscape services including mapping, assessment and modelling
- Land System Science
- Regional ecology (including bioregional theory & application)
- Human-Environment Interactions and Social-Ecological Systems & Frameworks (SESF) - including theories, practice and modelling

Volumes in the series can be authored or edited works, cohesively connected around these and other related topics and tied to global or regional initiatives. Ultimately, the Series aims to facilitate the application of landscape research and land system science to practice in a changing world, and to advance the contributions of landscape theory and research and land system science to the broader scholarly community.

More information about this series at http://www.springer.com/series/6211

Antonella Contin
Editor

Metropolitan Landscapes

Towards a Shared Construction of the Resilient City of the Future

Springer

Editor
Antonella Contin
Department of Architecture and Urban Studies
Politecnico di Milano
Milan, Italy

ISSN 1572-7742 ISSN 1875-1210 (electronic)
Landscape Series
ISBN 978-3-030-74423-6 ISBN 978-3-030-74424-3 (eBook)
https://doi.org/10.1007/978-3-030-74424-3

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

State of the Art

During the IALE 2019 Conference (Milan, July 2019) the MSLab of the Politecnico di Milano and ETSAS (Sevilla) organised the Symposium: Metropolitan Landscapes. We propose a discussion on the resilient articulation of the interface space among the city's infrastructure, agriculture, and nature to promote the Metropolitan dwelling quality, ensuring human well-being.

The Symposium aimed to discuss the approach introduced by Urban Metabolism, which considers the combination of Metropolitan Landscapes set in a single ecosystem. Accordingly, new design strategies of transformation, replacement or maintenance, and linkage patterns can compose a decalage from urban to rural contexts.

An ecological interest in environmental sustainability, compatibility, and resilience is not tied exclusively to the balance between production and energy consumption. Instead, the integration over time and at several scales of the urban and rural landscapes and their inhabitants nourish the Metropolitan Bioregion.

The Metropolitan Discipline (Contin et al., 2017) and its Practice introduce a methodology and tools to produce the metropolitan ecosystem through new-built-form-types: new land uses and typo-morphologies patterns. That multidisciplinary endeavour applying science-based approaches assess the strategical and structural plans at the metropolitan scale.

The Symposium focused on discussions about possible toolkits for strategic actions based on understanding the territory in geographical, urban, architectural, economic, environmental, and public policy perspectives. The participants provided analysis and interpretations of their cities existing conditions to co-produce integrated design tools and new possibilities for the municipal decision-makers concerning the metropolitan system.

The reason for the IALE Symposium proposal dealt with the awareness that according to the United Nations World Urbanization Prospects 2018, by 2050, almost 70% of the world's population will live in urban areas. The rapid growth of cities is challenging citizens and governments to ensure the sustainable and

equitable development of its metropolis in terms of urbanisation conditions, demographic transformation, climate, environment changes and social cohesion. The destruction of forests, pastures and wetlands related to changes or mismanagement of land use and the urban area's occupation are diminishing the capacity of ecosystems to maintain carbon, water, and biodiversity balances. The loss of nature combined with the low quality of urbanisation and the effects of climate change will have an increasingly negative impact on cities' health, resilience, and life.

This radical territory transformation must be managed with a strategic vision. The widespread growth of urban areas indicates the importance of building increasingly resilient and sustainable cities with up-to-date infrastructure and focused on the human scale, capable of minimising the production of climate-changing gases and smog. Solutions are needed to meet the new demand of the citizens of a renewed landscape metropolitan region focus. That is mandatory to reinforce the Green-Grey Infrastructure continuity as the strategic structure or architecture of the metropolitan city dimension. Understanding the role as interface of the urban and rural linkage and its consequences for sustainable development will be essential for implementing the Agenda 2030.

In this scenario, the 2018 edition of the UN World Water Development Report (WWDR2018) announces that:

> More than 2 billion people lack access to safe drinking water, and more than double that number lack access to safe sanitation. With a rapidly growing global population, water demand is expected to increase by nearly one-third by 2050. In the face of accelerated consumption, increasing environmental degradation and the multi-faceted impacts of climate change, we need new ways to manage competing demands on our precious freshwater resources.

Nonetheless, water management is one of the biggest tasks within a city, and getting it right is necessary for cities and their inhabitants to survive and thrive. The water management of the city also transforms rural and natural areas, threatening the freshwater reserves. National and regional climate policy and planning must take an integrated approach to climate change and water management. Increased water stress and meeting future demands will require increasingly tough decisions about allocating water resources between competing water uses, including climate change mitigation and adaptation.

Metropolitan Glossary: Search for a New Language to Mean Metropolitan Landscape

The need for a future glossary construction understanding Metropolitan Landscape's meaning is the Metropolitan Landscape Book's research hypothesis. Towards a shared construction of the resilient city of the future.

A heterogeneous Glossary strengthens the basis of understanding the complexity of Metropolitan Landscape. In the Metropolitan Discipline Assessment (Contin

et al., 2017), the interconnection between heterogeneous concepts, within a Glossary is necessary. A new language narrative is needed to compare several definitions and terms according to different disciplines active in the metropolitan field. A set of words that can accurately describe the new subject is crucial to be precise and compare with the traditional disciplines. Moreover, by its nature, Metropolitan Landscape is a multi-faceted entity and hybrid dimensional realm consisting of different disciplines related to each other: natural processes, day-to-day life, a world of symbols of hidden leaning, policies and economies. It is an open edges space (Sieverts, 2007); therefore, it is no longer the result of poetic reaction events (Le Corbusier, 1923). However, it is a complex spatial system merging different academic fields and practices' issues. Every sector has its terminologies defined within each milieu. There is a limit in using the terms without agreeing on the meanings of the vocabulary used in the Metropolitan Landscape's discussion.

However, the Book aims to extract and compare knowledge and concepts within Metropolitan Glossary, which is not a simple list of words with static definitions. The discussion goes beyond the individual terms and focuses on the relationship among heterogeneous words, composing the new fundamental ontology towards Metropolitan Landscape definition. Metropolitan Glossary's research is an open-ended collection of vocabularies brought and discussed by experts of various fields because of considering the meaning of similar words in different behaviours using other languages.

The Metropolitan Glossary aims to search for a dynamic Metropolitan Landscape meaning to reach an agreement on the words used to describe complex issues touching sensible fields, across the time. It is a challenging yet mandatory research activity. Besides, it defines the Metropolitan Discipline with clear concepts and words that could be common among the professionals and academicians. It also helps people understand where a word or a concept comes from and how it was defined and formed within the metropolitan contexts.

Two directions can be followed compose the Glossary's cloud of words. It is possible to consider Diachronic meaning and Synchronic meaning of the single words.

Diachronic meanings descend from trans-disciplinary content and represent the change of a linguistic element through knowledge over time. Every discipline, so, deals with the same word and concepts' but with a different meaning. The Metropolitan Glossary presents them all but selects only one of them concerning the Metropolitan Discipline. On the other hand, the Synchronic meanings define a precise meaning in Metropolitan Discipline, merging different disciplinary contents. In the Glossary, though, it is even possible to keep all definition to witness the origin of the term and allow other experts to add, emendate or change the word.

Moreover, the cloud of keywords and related concepts allows drawing the Metropolitan Cartography Maps, providing a visual mental mapping of mandatory concepts in the Metropolitan Discipline (http://www.tellme.polimi.it/tellme_apps/tellme/login) (Contin & Galiulo, 2020).

The Metropolitan Proposal

One of the Book's main objectives is to open a dialogue amongst cross-cutting discipline experts to discuss approaches, tools, and case studies focused on urbanity and ecology's coexistence. The research focuses on theoretical and practical contributions at the metropolitan scale. It discusses toolkits based on the territory's reading with geographical, urban, architectural, economic, environmental, and public policy perspectives. It introduces the aim of Practice of Metropolitan Discipline (Contin et al., 2017), which is new.

The Practice of a Metropolitan Discipline viewpoint provides an ecosystem where the various perspectives dealing with the metropolitan complexity are collected and connected using a framework, a methodology (Metro-dology), and tools (Metropolitan Cartography Maps). "The competence to build could be defined as the human ability to shape a specific environment, its set of scales, the articulation of its spaces, and its differences being the setting for human existence and experience." (Choay, 1972).

The Practice of Metropolitan Discipline supports the construction of the metropolitan spatial structure, including management and technical expertise. It intends to drive the urbanity as one of the leading metropolitan projects' goals. The physical and virtual network between the new city shape, the interfaces among built capital and natural capital, and the new forms of conviviality are the fundamental starting points reaching the result.

In the past few decades, the rapid metropolization (Ascher, 2007) changed the scene of urban life on a global scale radically. Many critical issues have arisen within the physical and spatial transformations of the metropolitan regions. What we call the Metropolitan Complexity challenges are social and economic inequality, the fragility of environmental systems caused by the global climate change, the emergence of the political idea of the metropolitan dwellers as global citizens, the preservation of cultural heritage, the metropolitan governance and policy issues are only a few of the challenges. However, these are only the urgent complexities the Metropolitan Discipline must face.

These issues cannot be addressed with a single, static, and traditional disciplinary approach, but instead, require a comprehensive and cross-cutting disciplines' visions to understand them. According to some scholars (Monte-Mor, 2014), we need to develop a different way of conceptualising the new metropolitan territorialities. Metropolitan experts have to shape the city dimension starting from an environmental perspective (the environmental question in its urban and metropolitan dimensions), to evaluate the relationship between city and countryside, and subsequently, the links between the metropolis and the region, as well as the settlement patterns in contemporary metropolises.

Our Book provides metropolitan critical studies as generators of theoretical contents and approaches, good practices, experiences, tools, and data to plan the metropolitan city-region. Metropolitan solutions are focused on pragmatic integrated strategies as tasks that the current city must adopt.

The Authors

We definitively moved from the "why" and "what" to the "how". Towards the Book's chapters, we identify processes and priorities projects from the Metropolitan Discipline's new perspective focusing on a metropolitan method for Practice, which is exceptionally relevant to share across universities worldwide. The authors of the Book are connected by cultural values that, for a long time, have been embodied by shared research and design-oriented projects. This group of authors promotes the multidisciplinary approach. It is deeply rooted in years of collaborative work of the entire team, more so than each individual. Nevertheless, each author has his/her physiognomy and professionalism and can interact with other valuable professionals who have complementary skills and knowledge. The multidisciplinary approach supported here enables awareness towards the range of skills needed to innovate each of the field involved, which also stimulates the curiosity and open-mindedness necessary to actively seek integration within a team composed by different professional identities.

The Book Aims: Education and Practice

The main problem that we will have to face in the coming decades concerns new training and educational processes. Ignoring this simple truth will only cause or accelerate our planet's decline, and the communities inhabiting it. We, therefore, need to address this issue as soon as possible and with bright ideas. This Book's structure allows for flexible and integrated reading paths according to the diverse interests and approaches' specificity. Its open index can be adapted over time according to the reader's training needs about their different metropolitan contexts. It allows using this volume as a didactic tool dedicated to higher education. However, it also fosters specialisation for civil servants and professionals engaged in several sectors that must today be included in the Metropolitan Discipline understood as a vision of the whole system, still without losing their competences' specificity.

The insertion of selected contributions from IALE19 Metropolitan Landscape Symposium allows us, as authors, to implement and integrate the Practice of Metropolitan Discipline (Contin et al., 2017). However, introducing new perspectives and experimentations allows young researchers to capitalise upon years of investigative and professional works within a consolidated but evolving legacy. The relational and multidisciplinary values that this Book expresses through its contributions embody the Metropolitan Approach to Complexity (Contin et al., 2017) as integration and cooperation among the diversities that this group of authors "believes" in, fostering and strengthening the identity that characterises the metropolitan city itself.

The Book has been conceived in three sections: *The new cultural Perspectives* (Part I), *The Good Practice* (Part II), and *The Metropolitan Landscape Tools* (Part III) formulated for describing the practical use of needed tools in specific case studies.

The first part is a theoretical introduction of the Metropolitan City and Landscapes' existing and future conditions. It is based on research assumptions relating to questions such as:

- How the structure of the Metropolitan Landscape can be upgraded? (Chap. 1)
- Can the Media-scapes be considered as a new image of the city? (Chap. 2)
- What does Metropolitan Landscape mean for the people who live there? (Chap. 3)
- Is it still possible to talk about image or form in Metropolitan Landscape? What are the new forms of the Metropolitan Landscape? (Chap. 4)
- How to organise the new Metropolitan Landscape? With which rules of form? (Chap. 5)
- How Metropolitan Landscape can be considered as a drive for new common space project? (Chap. 6)
- As planner and designer, how can we manage the multidisciplinary form of Metropolitan Landscape considering the Mutating and Hybrid structure of it? (Chaps. 7 and 8)
- What kind of actions and operational tool do we need to build open common space in a new Post-landscape city? (Chaps. 9 and 10)
- How the innovative tools of the Metropolitan Landscape can Detect, Envisioning, Monitoring and Interconnect multidisciplinary information active on ground project? (Chaps. 11, 12, 13 and 14)

The section, thus, collects experts' theoretical contributions who provide keys to reading and interpreting research questions that emerged at the Metropolitan Landscapes IALE Symposium. The comparison of research lines highlights the Metropolitan Landscape definition as a complex system in which cities and the natural environment are components of a broader landscape. Metropolitan City and Metropolitan Region are a unique socio-environmental apparatus defined by multiple simultaneously active Metropolitan Landscape Units. Today, however, it is possible to introduce the concept of Post-landscape City (Chap. 6) which claims the need for urgent actions. Post-landscape City needs new Urban Design Strategies in the Anthropocene era (Chap. 2), following the environmental modelling structure to allow the Green-Grey Infrastructure continuity in the new Bioregion according to the principle of the Environmental Justice and Spatial Justice (Soja, 2009) (Chap. 3). Moreover, the Green-Grey Infrastructure is conceived as the new Metropolitan Landscape structural Matrix. Focusing on the continuity of Green-Grey Infrastructure it is possible to demonstrate a new kind of public and common space for a new settlement pattern that is productive and experimental and yet ecologically resilient in the era of climate change. Therefore, the first section explores the guiding role of green space in integrating space, inspiring the site, and the future urban space in the process of high-speed urbanisation and climate change in the Meta-city (Shane, 2005).

Data-scapes (Chap. 7) of Meta-city opens up a new system for weaving, multiple, parallel, dynamic worlds into a dynamic patch system at multiple scales. These dynamic worlds also introduce the Metropolitan Landscape Culture issue. That is perceived through spatial-temporal relationships of urban components, spaces for

the preservation and transformation of natural expansion in the metropolitan Bioregion for the implementation of Landscape's pedagogical assignment to reach a new production of common knowledge through Botanical City's projects (Chap. 4). Therefore, Ecology is capable of establishing new urban relational scales. In this conceptual parenthesis, nature is considered mainly according to three general categories: performativity, understood as technology; as symbiosis, understood as a reciprocal modification with culture; as resilience, i.e., as places of transformative potentiality. The goal is not to reach the recovery of an impossible past, but rather to guarantee the expansion and transformation of its pedagogical mission and critical principals to the larger urban scale. Besides, the relationship of reciprocity between the city and the countryside introduces the need for Sustainable Cultural Heritage. It consists of material and immaterial components and the historical and contemporary values that are attributed to them. The mutual benefit can exist by integrating rural heritage protection with urban agriculture initiatives at the metropolitan scale (Chap. 5).

Part II- The Good Practice introduces research contributions in which the theoretical apparatus of the new cultural perspective, finds application through operational landscape strategies and practices at the metropolitan scale. Starting from the analysis of traditional Urban Morphology, it is possible to structure new Landscapes Architecture projects through it, described as a driver of changes for articulating the new morphological approach in Metropolitan Landscape (Chap. 8). Therefore, Geography and Urban Morphology within the Metropolitan Architecture Project can be considered a whole project, which controls the process of continuous substitution of the environment, determined by production activity. Geography must be continuously reinvented in a sustainable way (Gregotti, 1966) within Metropolitan Landscape and Architecture Projects. Nevertheless, our cultural experience as metropolitan territory agents is relevant to rediscover geography again. The Metropolitan Architecture Project contributes to the definition of the metropolis' great image.

Therefore, the space-time scale of metropolitan projects and monitoring tools allow us to understand the spatial dynamics and transformation of landscapes through the memorable image of Metropolitan Cartography's Maps as symbolic triggers of Metropolitan Landscape (Chap. 9).

Overall, it is important to emphasise the role of Metropolitan Cartography that is a Mapping evidence-based project.

A new planning and design approach for developing countries must use modern technological methods to drive conscious localisation choices (Chap. 10), even in highly fragmented urban contexts. Self-constructed housing is the standard. Cumulative problems in the management of informal settlements and slums, due to the world population and urbanism growing determine the intensification of inequality in-stances in different social classes.

Part III - The Metropolitan Landscape Tool, is structured to present innovative tools for the representation of the Metropolitan Landscape, through the management and coding of informative levels active in the metropolitan ground project (Secchi, 1986).

It includes the description of Metropolitan Cartography Mapping tools experimented in specific metropolitan contexts in order to: Detect data (Chap. 11), Envisioning and Monitoring new spatial relations of Metropolitan Landscapes (Chap. 12), Interoperate and Interconnect (Chap. 13) socio-environmental and geopolitical information in specific case studies, according to the Shrinkage Scales of Metropolitan Landscape (Chap. 14).

The spatial analysis method is used to establish the correlation between digital information and spatial site planning, and to further define the metropolitan area landscapes.

Currently, city managers need innovative approaches and practical devices to identify urban contexts' correct planning, moderating some of the most critical risks for human health, even in the built environment. Appropriate and accurate maps are necessary, and structured databases are crucial to understanding the specific needs of complex functions, according to particular elements in architectural/urban projects, referring to the local scale.

In conclusion, the Book proposes to demonstrate how heterogeneous visions, research contributions and design approaches constitute the hybrid nature of the Metropolitan Landscape. That is a complex system of interface spaces. The drama of dynamic interactions flows of goods, people, urban morphologies, and capitals in hybrid territories that are not yet connected to the metropolitan area network. The Metropolitan Landscape is a set of different landscapes. It has to be treated as a Pedagogic Bioregion where the Metropolitan Landscape is the synthetic result of heterogeneous and interconnected dross-spaces' intersection shaped by socio-environmental and cultural forces as much as geographic, ecological and topological ones, across the time.

Department of Architecture and Urban Studies
Politecnico di Milano, Milan, Italy
Antonella Contin

Department of Architecture and Urban Studies
Politecnico di Milano, Milan, Italy
Phd Student at Universidad de Sevilla
Doctorate Program in Architecture, Seville, Spain
Valentina Galiulo

References

Ascher, F. (2009). Multimobility, multispeed cities. *Place Journal, The Future Metropolitan Landscape, 21*(1), 36–41. Retrieved from: https://placesjournal.org/assets/legacy/pdfs/multimobility-multispeed-cities.pdf

Contin, A., & Galiulo, V. (2020). TELLme Metropolitan Cartography: dispositivo metodológico para elegir espacio de calidad de los nuevos morfotipos metropolitanos. In IV Congreso

ISUF-H. *Metrópolis en recomposición: prospectivas proyectuales en el Siglo XXI: Forma urbis y territorios metropolitanos, Barcelona, 28–30 Septiembre 2020*

Contin, A., Ortiz, P.b., Kim, S. (2017). Metropol-ing: Fundamentals for a metropolitan curriculum. Shaping the new metropolitan discipline for the quality of dwelling in the Bigness-Era. In Goodwin, D., Kotzen, B., Wall E., Waterman, T., *Creation/Reaction*. (pp. 335–348) ISBN 978–0–9,935,909-6-2. https://eclas2017london.com

Choay F. (1972). *L'allégorie du patrimoine*. Paris: Seuil

Gregotti, V. (1966). *Il Territorio dell'Architettura*. Milano: Feltrinelli

Monte-Mor R., L. (2014). Extended urbanization and settlement patterns in Brazil: an environmental approach, *Implosions/explosions, 36*(3) https://doi.org/10.1177/0263775818775426

Le Corbusier. (1973). *Verso un'Architettura*. Milano: Longanesi

Lynch, K. (1960). *The image of the city*. Cambridge, MA: MIT Press

Ortiz, Castano, P. B. (2014). *The art of Shaping the Metropolis*. New York: McGraw Hill

Roberts, J. L. (2000). Landscapes of Indifference: Robert Smithson and John Lloyd Stephens. *Yucatán in the Art Bulletin, 82*(3): 544–567 https://www.tandfonline.com/doi/abs/10.1080/00043079.2000.10786949

Secchi, B. (1986). Progetto di Suolo. *Casabella*, 520–521, 19–23

Sieverts, T. (2007). Metropolitan landscapes: Attitudes, research and practice. *Place Journal, The Future Metropolitan Landscape, 21*(1): 28–35. Retrieved from: https://placesjournal.org/assets/legacy/pdfs/metropolitan-landscapes-attitudes-research-and-practice.pdf

Contents

Part I
The New Cultural Perspective

Chapter 1
The Metropolitan Structure for a Set of Metropolitan Landscapes

A. Contin

1.1 Theoretical Introduction

1.1.1 The Metropolitan Region Structure

A metropolis exists in the scale continuum from the neighbourhood to the nation. It is a specific scale, enabling strong relationships amongst diverse agencies working as an entangled system in both the strategic and physical level. Hence, a metropolis has the potential for 'leaping the scale' between the global and the local. The metropolitan spatial patterns are dealing with and determine metropolitan complexity. The acknowledgement of this mutual impact is crucial in defining the spatial quality that, in the end, is experienced at the human scale. In order to take care of today's fragile territory and promote a space of quality, we need to understand the complex relationship between the physical context and the metropolitan patterns of settlement. Nevertheless, we have to think of the relations between nature and the built space in the entire scale spectrum as the accessible and inhabitable Landscape of the metropolitan public realm.

In order to define the metropolitan approach, it is essential to recognise the paradigm shift from the urban to the metropolitan scale, thus seeing the contemporary metropolis as a "net-city".

According to D. G. Shane (2005), the net-city is "a multi-centred network system" emerged "to handle the apparently chaotic flows of diverse participants in an increasingly global network. Growth appears to take place at random over the network, with no clear hierarchy or top-down patterning. Relationships can shift and change among actors, resulting in rapid change and instability."

A. Contin (✉)
Department of Architecture and Urban Studies, Politecnico di Milano, Milan, Italy
e-mail: antonella.contin@polimi.it

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_1

The net-city is essentially a system of cities of different sizes functioning as a whole throughout a network of physical and virtual infrastructures. In this polycentric system, however, we are not only dealing with the nodes and edges of the network. According to authors such as Terry McGee (2009), Edward Soja (2000), Neil Brenner (2014), and many more, we are dealing with a hybrid territory where the urban and the rural define a seamless heterogeneous landscape. This space in-between the network is called "body-space" (Shane, 2005), where the continuity and the connection with the previous system are lost due to metropolitan infrastructure systems. The shift from the paradigm of a polycentric model to the network of the net-city (Shane, 2005) is significant for the contemporary metropolitan city. This causes the need to deal not only with the nodes of the network and the infrastructures that make them accessible, but also with space in-between the networks, which must be re-conceptualised with new meaning, structure, and new image in the metropolitan era.

1.1.2 The Re-Conceptualization of the 'Space In-Between': The Green-Grey Infrastructure as the Metropolitan Architecture

The recognition of "body-space" allowed us to discover new patterns of settlements that are beyond the dichotomy of urban and rural patterns. It opened the whole new possibility of shifting between different scales and time that require new spatial practices, social behaviours, and organisational structures. This change also fostered engagements of new spatial agencies such as private, collective, and public organisations, universities, families in the interactions amongst global and local forces challenging fixed administrative boundaries at different scales and requiring innovative forms of institutional organisation, and planning.

The green-grey infrastructure is the metropolitan form, the architectonics (the structure) of the new metropolitan 1:1 scale map. We practice the concrete metropolitan city map inside a vector (car, train) at the speed-scale; this happens without any prosthesis, at the local scale. Let's say, therefore, that there is an "urban fact" of the metropolitan scale, as well as a portion that is not the built-city, but cultivated or natural field within the metropolitan city: we call it "agricultural or natural fact". The metropolitan city with the green-grey metropolitan infrastructure and its networks of medium and small cities are the urban vertebrae of an eco-region.

We analyse the contemporary territories that we define as fragile based on an integrated learning approach that refers to metropolitan complexity. Our goal is to identify the metropolitan dynamics that have generated the fragility of territories, recognise their shortcomings, and finally propose a project based on a metabolic vision (maintenance, improvement, or transformation) of the life cycle of the city, which determines the metropolitan biography (Contin, 2016) over time. The specificity of the current city is a multipolar way of local growth/transformation

involving increasingly large areas based on the effectiveness (performance) of infrastructure networks.

1.2 Metropolitan Landscapes

1.2.1 The New Metropolitan Monumental Approach to a Robust Public Civic Image

A new Metropolitan Landscape, – its structure and imageability-, is therefore needed, and this issue also involves a sensitive reshaping of an already existing environment (Lynch, 1960): natural and built. Nowadays, the exclusive technology approach to Landscape reduces the local value of the characters of a place, because, – according to that vision – they are increasingly connected to supra-local economies. The progressive globalisation of the system of values considers nature and cultures a heritage to make money out of it (Gregotti, 1966). Although the metropolitan dimension, – considering the metropolitan continuity of eco-armatures and their articulation with the grey infrastructures through a Metropolitan Architecture project-, can be the engine for the construction of a new relational non-static identity, that revaluates the local characters of a place connecting them also to the net of the cities of the world.

Besides, according to Lynch, the manipulation of the world can be sensuous and because of that, can strengthen a robust public image at strategic points. However, we would like to also remember Secchi, who spoke about the modification of the existing territory and cities through a not ordinary, reductive, technic and inarticulate project of the ground (Secchi, 1986). Moreover, Frampton (1983) promoted the interaction between the "wet: landscape place-form and the "dry" rationally assembled product-form-. He also proposed to introduce a visual plan whose final objective is not the physical shaping and reshaping itself but the quality of the image in mind inside the analysis and proposal of Urban Design. According to us, the quality of the image reveals the quality of the dwelling that is the principal aim of the Metropolitan Architecture project. According to Lynch, the human modification must be carried out with an awareness of the interconnectedness and yet the individuality of both: natural resources and personal purposes (Lynch, 1960).

To conclude, according to Lynch, "a large city environment can have a sensuous form" relevant for the mental map production of metropolitan city and its articulated identity. To design the metropolitan form, we have to conceive it as a "complicate pattern, continuous and whole, yet intricate and mobile. It must be plastic, open-ended and receptive to the formation of new imagery. It must invite its viewers to explore the world".

Unfortunately, "the density and the extent and elaborate technology of the modern metropolis all tend to obscure the underlying topography and the pre-existing natural setting". Nowadays, it is more and more evident that as the city expands the

significant “natural” factors become the larger, more fundamental ones (Lynch, 1960). The topography is “an important element in reinforcing the strength of urban elements” and “the modern high-speed path is an excellent viewpoint from which to grasp topographic structure at extensive scale”. Lynch started to suggest an intense green and grey infrastructures interaction in 1960.

Due to this, according to McGee, we need to consider two main layers: the metropolitan off-site grid, – that we organise through the Metro-Matrix geometrical model (Ortiz, 2014)-, and the in-site archipelago, – that we take into consideration either to maintain some tremendous common forms or to build “a richness of possible structures and clues” within the environmental materials.

1.2.2 Metropolitan Architecture and Landscape Projects

Metropolitan Architecture and Landscape Projects work as equipment of technique for structuring and intervening at a big scale: they are a specialisation of the different methodologies related to the form issue at different scales.

Due to the “Bigness” issue (Koolhaas, 1995), – spatial extension and temporal acceleration-, specific equipment or techniques for structuring and intervening at big scale, related to a formal definition, is needed.

Landscape at Bigness scale is a possible material for Architecture too, that receives a new and vast meaning. In the past, Baroque Architecture used the Landscape as a construction material for the Baroque city: nature was a dialectic element concerning the production of buildings; not a mere background.

According to Gregotti (1966), the environmental question not only concerns the most prominent set of problems but slightly different issues.

If this is so, the territory of the architecture discipline becomes more extended, dealing with environmental sets at all scales. An audit of the architectural discipline is mandatory, which will allow the consideration of architecture as a work on the transformation at the territorial scale too.

Architecture discipline must deal with the specialisation of the different methodology related to the form issue at different scales. The metropolitan discipline, consequently, founds a technology for the form of the metropolitan anthropic-geographical Landscape (Gregotti, 1966). Gregotti considers Architecture as the technical description and related project of the “surrounding”, in other words, a synthetic way to define a place constituted by built and natural environment together (Focillon, 2002).

Metropolitan Architecture and Landscape projects work as a meaningful articulation of green and grey infrastructure (# wet and dry lands; # project of the ground; # constructive ground) to shape a robust metropolitan civic image: a collective memory deposit and a metropolitan multiplicity of spatial identity which is not only local but global.

Nevertheless, Landscape is not only a production process but also a significant element for a bigger scale city project per se. It produces the quality of the figure of a specific landscape, in other words, its identity (Lynch, 1960). The Metropolitan Architecture project applied to the landscape issue is not only a technical language for a small group of technicians, but also an impoverished language. It is similar to a linguistic corpus, – within its syntax, grammar and vocabulary-, which coincides with the total physical visible environment. This is why Landscape functions as a sign marked into the ground by men (and therefore their values and ideas) which will be forever the shape of the collective memory of a specific social group (Fig. 1.1, 1.2, 1.3, 1.4).

Fig. 1.1 Guadalajara-Acatlan de Juarez, Landscape Tonality, Galiulo & Di Fini

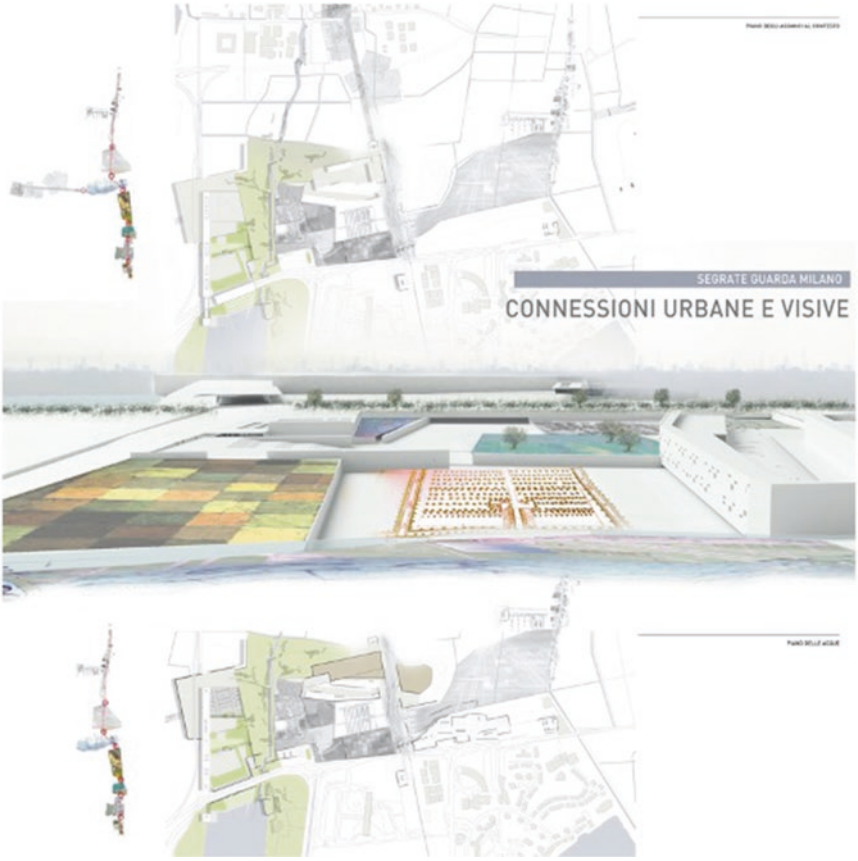


Fig. 1.2 Milan-Segrate, Ricci Curbastro & Righetto

1.2.3 Ground and Constructive Ground Projects

It could be useful to compare Secchi's "Project of the ground" (Secchi, 1986) to Linda Pollak's Constructed ground (Pollak, 2006). According to Pollak, "Constructive ground" is a "hybrid framework that crosses between architecture, landscape architecture, and urban design to engage the complexity of contemporary urban landscape".

This can only happen in a not conventional disciplinary framework. Pollak dislikes the nowadays way to represent the ground as a void around buildings that considers the landscape, such as an unproblematic background. For Pollak and Kennet Frampton (Frampton, 1999) the priority "should now be accorded to the landscape rather than freestanding built form". Because of this, the Metropolitan Architecture project has to involve the ground as "material for design, using

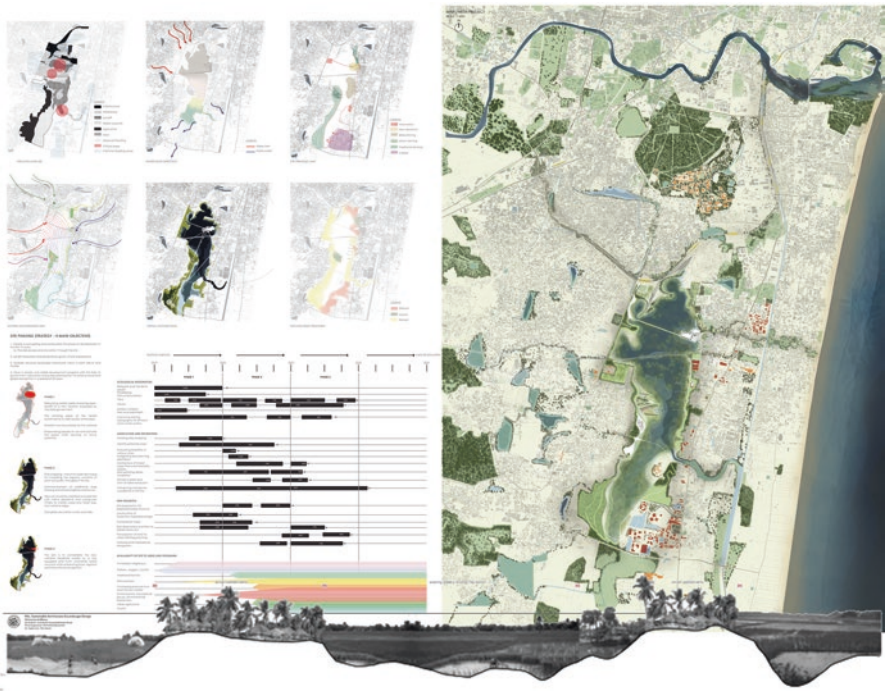


Fig. 1.3 Kolkata-Desakota Landscape, Kumar and Chennai-Masterplan, Sravya & Raval

landscape as both a structuring element and a medium for rethinking urban conditions, to produce everyday spaces that do not exclude nature".

We can also mention Paola Viganò's Discovery of the empty space (Viganò, 2010) such as a project related to space in between and its sequences, which allow new ways of land uses. Viganò argues that the term Landscape urbanism originally means that the urban space is made of landscape because it is built with landscape's materials.

First of all, we have to deal with "the non-built space" where urbanity, both diffuse and fragmented, does exist, in which the landscape has an important part. This context, indeed, requires rethinking the materials and techniques of the project.

A new Metropolitan Landscape project, – its structure and imageability-, is therefore needed, and this issue involves a sensitive reshaping of an already existing environment too (Lynch, 1960). Nowadays, the exclusive technology approach to landscape reduces the local value of the characters of a place. However, the metropolitan dimension, – considering the metropolitan continuity of eco-armatures and their articulation with the grey infrastructures-, can be the engine for the construction of a new relational non-static identity, that revaluates the local characters of a place while connecting them to the net of the cities of the world. Frampton, too, distinguished between the grid and the pathway: the rationality of the universal grid versus the autochthonous pathway or the rationality of normative technique versus

Fig. 1.4 Istanbul-Golden Horn-Haliç Masterplan, Kadioglu

the rationality of idiosyncratic form. Frampton promoted interaction between the "wet" landscape place-form and the "dry" rationally assembled product-form.

According to Linda Pollak, "identity is grounded in space in ways that are geographically and historically specific". That is true at the metropolitan scale dimension too. However, the contemporary relational identity is dependent on articulation, in a sociological sense. Pollak also argues that the articulation of the different collective and private spaces, or among infrastructural net's elements, including the different infrastructural elements and built form types (Secchi, 1986), is the structural support for a multiplicity of spatial identity. These are the main "Bigness"

results (Pollak, 2006). The term resonance as opposed to dichotomy- used by Pollak-, enlightens the need for a unity of different disciplines rather than a sectorial a priori assumption.

1.3 The Practice of Metropolitan Discipline

1.3.1 The Practice of Metropolitan Discipline as a Support of the Metropolitan Landscape Project

The Practice of Metropolitan Discipline supports the construction of a structure for the setting of metropolitan landscapes. It provides organizational and technical expertise for a new overall project of urbanity. That knowledge is based on the physical and virtual (Meta-city, Shane, 2005) network between the new city shape, the interfaces among built capital and natural capital, and the new forms of conviviality within metropolitan urban-rural linkage patterns of settlement.

Our metropolitan metabolism approach, consequently, nourishes the territory through an ecological interest in environmental sustainability, compatibility and resilience not exclusively tied to the balance between energy produced and consumed, but also to the integration over time and to the different scales of the rural and urban landscapes.

Metropolitan Landscapes arise where the resilient articulations of the interface between city, agriculture and nature promote the quality of dwelling sufficiently enough to ensure the human well-being within the metropolis. We aim to discuss the approach introduced by the concept of urban metabolism that considers the arrangement of landscapes in a single ecosystem, and according to the dècalage from natural to rural, to the urban context, which is understood through new design strategies of transformation, replacement or maintenance.

The Practice of Metropolitan Discipline – that we are promoting- aims at a multidisciplinary endeavor which applies science-based approaches to assess the compliance of the municipal land use plan with the conservation and restoration model of the entire ecosystem through new-built-form-types.

Our research focus is on case studies at the metropolitan scale and discussions about possible toolkits of strategic actions based on the understanding of the territory in a geographical, urban, architectural, economic, environmental, and public policy perspectives. It considered the analysis and interpretation of the existing conditions, and the creation of integrated design tools, inter-reliant in the metropolitan system, as new planning opportunities also offered to the municipal decision-makers.

According to the United Nations World Urbanization Prospects 2018, by 2050 almost 70% of the world's population will live in urban areas. This radical transformation will be managed with a strategic vision. The widespread growth of urban areas indicates the importance of building increasingly resilient and sustainable

cities with up to date infrastructure and focused on the human scale, capable, then, of minimizing the production of climate-changing gases and smog. Solutions are needed to meet the new demand of the citizens of a renewed metropolitan landscape. Understanding the role as interface of the urban and rural linkage and its consequences for sustainable development will be essential for the successful implementation of the Agenda 2030[1] .

1.3.2 A Cultural Reorientation: Nothing of This World Is Indifferent to Us

Much has been said about the need to rethink the contemporary city in terms of environmental sustainability. I want to start with two texts that I consider revolutionary concerning the fundamentals of Western cultural thought that have made anthropocentrism their strong point. The first is the encyclical letter Laudato si' of the Holy Father Francis on the care of the shared home. The second is the Synod for the Amazon.

Francis places the terms of the discourse on the relationship between man and nature within a primarily ethical and political discourse. We are earth, and our body is earth and, Francis states, "nothing of this world is indifferent to us" and because of this "it is not possible to live healthily in a sick world". We must start again from the sense of responsibility and interconnection that gives strength to an idea of justice that recognises the same rights to all living beings and proposes the value of the circular economy (Padoan, 2020). The human being is the guardian of creation. It is a complex fact that cannot be traced back to its poor functioning: the technocratic paradigm must be overcome through an awareness of our identity that is strengthened in our relationship with other living beings. His thought also presents a "theology of difference", understood in the broadest sense. In our society, He argued, the aim is to include in an "agora of differences" all differences and their rights. The principle of the common good (such as water, for example) is an important issue that must be transformed into everyday practice.

[1] In this scenario, the 2018 edition of the UN World Water Development Report (UN, 2018) announces that "More than 2 billion people lack access to safe drinking water and more than double that number lack access to safe sanitation. With a rapidly growing global population, water demand is expected to increase by nearly one-third by 2050. In the face of accelerated consumption, increasing environmental degradation and the multi-faceted impacts of climate change, we need new ways to manage competing demands on our precious freshwater resources". Nonetheless, water management is one of the biggest tasks within a city, and getting it right is necessary for cities and their inhabitants to both survive and thrive. The water management of the city also affects rural and natural areas, threatening the freshwater reserves. National and regional climate policy and planning must take an integrated approach to climate change and water management. Increased water stress and meeting future demands will require increasingly tough decisions about how to allocate water resources between competing water uses, including for climate change mitigation and adaptation.

For this reason, the economy must be invested in this kind of reasoning, and environmental justice must be linked to social justice. Urged by the drama of poverty and inequality produced by climate change and today's Covid19 pandemic, we must change the benchmarks of our relationship with the Earth to affect social and economic processes. The theme of the common good, which is the classic principle of social doctrine, must become political energy for change (Tomassone, 2015).

The Synod for the Amazon is not a local episode but also concerns a radical theological reorientation concerning an "outside" that is radical: a possible new line of direction that does not follow the thought that sees man at the centre. Compared to the old continent this "outside" means new themes, new ways of dealing with the relationship with the natural environment, and the reference to a radical decentralisation of a world that is not centred around the human being. Not anthropocentric concerning nature, not marked by the primacy of the human being within the environment. The biome is a hyper-connected reality that requires an overall interpretation of its elements not only in terms of ecological issues but also relatively to those who inhabit it. An integral ecology involves the valorisation, defense and development of all this reality. A global and intercultural, ecological, and social reflection is mandatory. It is a cultural reorientation because each part is relative to the whole. The centre is, therefore, everywhere, and the cities start in the suburbs. That is the radicality of a discourse that needs an integral conversion. What, then, does it mean to think within a situation as unprecedented as that of today? It means considering the present through the lens of a radical change in the man-nature relationship that also introduces the aspect of uncertainty and "don't know".

Gaia is the product of a process of complex interactions between identities.

In his text: Facing Gaia. Eight Lectures on the New Climatic Regime, Bruno Latour (2017) argues that we need to rethink the idea of progress by discovering a different relationship over time. The thought then will tend to re-learn how to be part of the natural world: "Only if we place ourselves inside this world will we be able to recognise as one particular arrangement the choice of existents and then ways of connecting what we call Nature/Culture and what has needed a long time to format our collective understanding (at least in the Western tradition). Ecology clearly is not the irruption of nature into the public space but rather the end of 'nature' as a concept that would allow us to sum up our relations to the world and pacify them".

What makes us ill – justifiably- is the sense that that Old Regime is coming to an end. The concept of "nature" now appears as a truncated, simplified, exaggeratedly moralistic, excessively polemical, and prematurely political version of the otherness of the world from which we must protect ourselves if we are not to become collectively mad – alienated, let us say. To sum it up rather too quickly: for Westerners and those who have imitated them, 'nature' has made the world uninhabitable".

Having cancelled the infinite dimension of the universe by the effects of climate change, according to Latour, we return to a finite world. The distinction between nature and culture dissipated, he proposes the concept of "worldling" understood as a multiplicity of existents connected to the multiple way of life. His champion is Lovelock, who speaks of a land impersonated by the mythical figure of Gaia who

was born together with Eros and Chaos and who, understood as a "whole composite", no longer presents the internal coherence of which holistic theory speaks. Holism is only possible if one believes in the theory of a great watchmaker who governs the world with the aim of universal harmony. Nevertheless, this is not so. Gaia's eco-system is a systematic connection and not holism. It is not necessary then to explain the history of all things as much as it is somewhat necessary to develop a series of tests to bring to light what Latour calls the unexpected characters, in order to create "collective bodies". The research must then focus on which are the organised agents to attribute a significant role in the conservation of the Earth. The Earth is a superorganism that has no parts and no whole. Each part acts in it without an entity to govern it. Each organism is an agent that does not develop in an environment. However, it informs it according to its particular intention and in a manner appropriate to its development and interest. Gaia's role is to capture these intentions by determining complex interactions between them without erasing the meaning of each element at the moment of their insertion, so that each one is understandable and does not lose its identity. What counts is the number of agents who take part in the action by adapting to the environment, modifying it and thus transforming its origin. Gaia is, therefore, a single indivisible process formed by the evolution of organisms and their environment. Latour calls this creative action "waves of action". Calculating an optimisation of the process becomes impossible (Ostrom, 2006); instead, the opportunities that complex interactions offer must be seized.

What is the economics of nature in carrying out this process? The hypothesis is that the edges between the inside and outside of the phenomena must be eliminated by following waves of action, thus modifying the scale of the phenomenon. The vision of Latour illuminates our reasoning on the metropolitan approach to complexity.

Many of the contemporary territories are places of juxtaposition of many independent singularities (parataxis). The leap in scale and the rapidity of change have been the drivers of transformation: the space of the metropolitan city is the offspring of time. A changing territory in which important reasons for crisis emerge that are highlighted by unconnected parts of the territory and that are deeply linked to the distinctive features of dispersion, within which, in particular, specific infrastructural configurations have been defined over time: the diffuse networks of water and roads, for example (Viganò, 2008). The research, starting from the experimental and concrete project of some places affected by the transformation, questions the possibility of producing a metropolitan physical space in which the syntactical structuring is characterised by different levels of physical-spatial integration between infrastructures (green/blue and grey). Primarily, we are dealing with peri-urban areas, linked to large megalopolises or the rural areas today affected by rapid urbanisation, with visible effects on the organisation of citizenships.

1.3.3 The Landscape Physical Dimension: Ecology of Form

We name the generative processes of the system of relations: Set of Metropolitan Landscapes, and we identify them as hybrid landscapes.

In today's city, cosmopolitan globalization brings about a syntactical transformation. The new cities or their new neighbourhood as individuals do not result from reinterpretations linked to their position interpreted on a different scale, and the places cancel each other out. In 1844 Carlo Cattaneo called the Italian landscape "anonymous regional garden", indicating that the Italian territory, which Lynch called "total built landscape", was social work. The identity of a place is a process in which space, time, work and memory are the crucial elements for the definition of identity matrices of geographical, agrarian, and morpho-typical nature. Today, in the discontinuous local territories of archipelagos, the new infrastructural installations articulate and disarticulate that garden, interrupting the relationships that exist in the territories and above all, cancelling the identity matrix of the agrarian nature, which is compromised. However, it is not erased. It determines a territory whose identity is not static but understood as a dynamic process (Raffestin, 2003).

Magnaghi (2003) profoundly criticizes contemporary planning, which reduces the territory into abstract space, into isotropic support, inanimate of economic activities, and which generates new poverty due to environmental degradation. That is what is produced when the territory is not understood as individuality or set of patrimonial deposits through which to build sustainable development strategies. Magnaghi proposes to plan the territory as a system that is self-sustainable when it can determine a relational system between human and natural environment.

There are two hypotheses that we can put forward. One hypothesis naturally proposes a hypothesis of molecular re-appropriation of the territory, advanced by Magnaghi, starting from local values and enhancing them by creating new relationships between territory and settlement, mobility networks and landscapes. This approach aims to create a vibrant and high-quality agro-tertiary economy, which starts from the culture of care and the awareness of a shared design around which to build new relationships for the production of lasting and self-sustainable wealth. The second hypothesis, instead, aims to work on the interchange nodes between valley and city at the new scale of the metropolitan region, and reads the territories as a network of archipelagos. We intend to make them both converge into a project for the metropolitan region and its small and medium cities, which we have called: a gradient landscape of formality or set of metropolitan landscapes.

The new model of the city in the metropolitan region that we propose incorporates agriculture by including new functions and a new idea of public space. From a metabolic point of view, growth needs a discontinuity in its structuring, which regulates the logic of decommissioning structures that are no longer sustainable. However, against the dissipation of the heritage of the past, the concept of sustainability must be perfected. The question of the research is: how is the transformation of the territory sustainable? What kind of knowledge allows us to know the problem

that is inherent in the transit of the scale and the process of metropolitanisation and "de-lamination"?

The study of the ecology of metropolitan forms such as the organization of their life processes and structures, is relevant to this.

Let us analyze then:

1. The effects of metropolitanisation;
2. The exchange agents that help the transition between an agricultural and urban culture;
3. The value of community relations;
4. The tools of the metropolitan architecture project ("Hotspots Network").

1.3.4 Hotspots Network Strategy

Ours is essentially a design dimension that goes in search of the metropolitan infrastructure in the territory and pushes for continuous change by informing it to answer the question: how to translate metropolitan processes into space since we can anticipate change but not predict it? We are elaborating a thought on urban-rural linkage patterns that we have called "Hotspots Network". By interpreting the concept of biological hotspots, we mean the "Hotspots Network" as an exchange pattern between these two landscapes: it is a re-balancing agent introduced to mediate a series of dynamic instabilities. It is a new form of rural settlement with urban characteristics. A hybrid space that combines the two qualities:

It anticipates the urban by redefining the rural.
It develops a circular rural economy.
It determines a new density typical of the rural, metropolitan character to generate a new rural community and a new type of metropolitan architecture that embodies the urban-rural linkage pattern.

Following Latour again, we can talk about a new type of metropolitan village "as an ontological ideal: modern places where the spatial organization reflects a dynamic livelihood in transition". Our metropolitan architecture project aims at re-conceptualizing the scales of the territory (Figs. 1.5 and 1.6).

We wish to respect the local identity dimension of habitability, in a context in which the city has already, at times, grown into a formation that incorporates, within it, fragments of agriculture, which must be re-conceptualized through a synergistic relationship with the urban structure. The field conditions, then, must determine a porous plot (re-code), searching for sensitive territories and reactivating codes of self-generation as new care of the landscape. We consider agriculture, to all intents and purposes, a requirement of the metropolitan city. That is a way to rethink industrialization, which starts with geographical investments in raw materials, as happened in Lombardy in the past two centuries and which we consider an example to

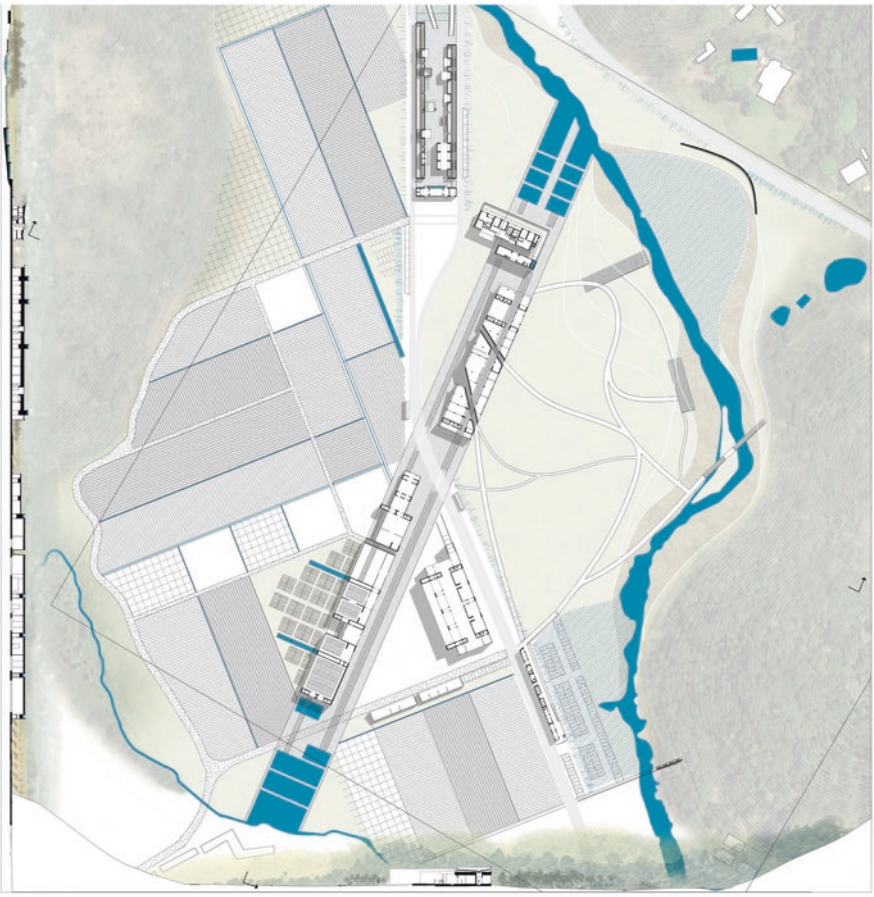


Fig. 1.5 Rio de Janeiro-Tinguà, Hotspot Networks Masterplan, Tomasella & Buzzella

be rethought. Water was considered a regional infrastructure and water took over agricultural and industrial production linked to agriculture, as a resource before local development. Based on water as an energy-industrial resource, industry built the landscape and constituted a way of sustainability: consumption and care.

Bernardo Secchi (1986) argued that we must take into consideration the different parts of a city and its territory, in other words, their differences and specificities. However, it is not only a need for documental classification. This analysis aims to recognize the generative processes or the system of relationships which have produced these differences. Because of this, the perceptual characters of the parts, which reveal their morphological features, are relevant to describe generative processes. In the end, according to Secchi, we need to mark the leaps in scale to enlighten the different spatial levels articulation; this is precisely the Metropolitan Architecture's project aim.

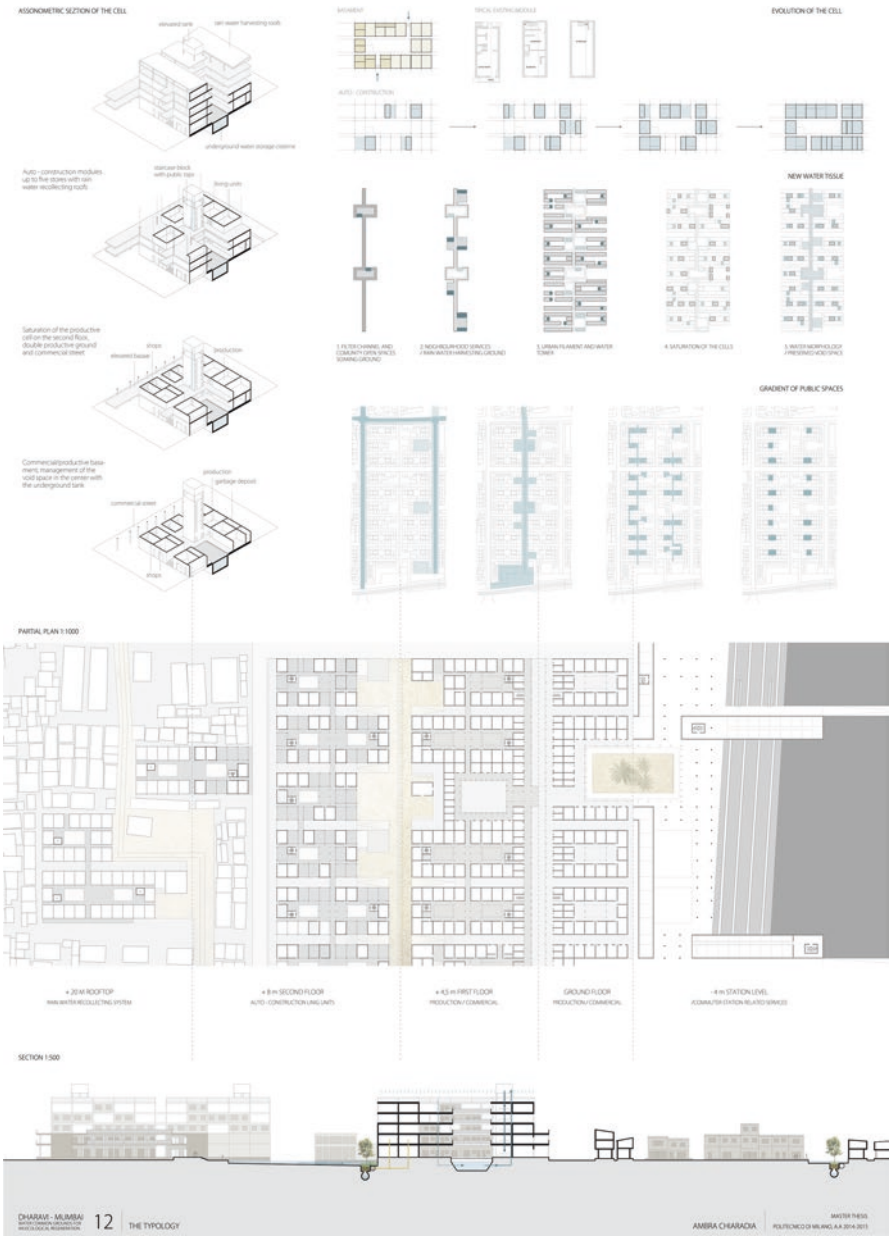


Fig. 1.6 Mumbai-Darawi, Water System Plan, Chiaradia

We would like, therefore:

- to define in the territory the metropolitan digits (operative reading unit, Gregotti, 1966): measure and position are the criteria to demarcate them (Ortiz, 2014). These must be related to geography, in other words, to the territory formal values. This means: related to the anthropic – geographical formal typologies; conceived such as the reading and representation of the indicator of formal transformation due to the planning actions; and finally, all these terms will constitute the basis to define the specific criteria for the metropolitan digit definition. Each Unit named Figural Unit of Landscape has anthropic – geographical structure and represents a Typical Figure of Landscape, not only a Metropolitan Land-Use Digit (Rogers, 1997). This is relevant because it shows how the environment issue represents a shift from architecture only to landscape too, as a way to remember the places relevant for our lives (i.e. the system of orientation in Lynch, 1960);
- to describe the relationship among the homogeneous metropolitan digits;
- to explain how to interpret each of their roles inside the whole and between different wholes;
- to recognize the different level of the field of action (section strategy) (Gregotti, 1966);
- to conceive new built form types and new land uses to enlighten the morphological rules able to allow clear legibility of the metropolitan scape (i.e. city's floor space or distribution of adapted space, – activity pattern-, Lynch & Rodwin, 1958).

1.4 From Territory to Environment

1.4.1 The Territory Type

The Territory (Sereni, 1961) is a dynamic concept that can be read at different scales at different times, but above all capable of integrating different scales, times and functions. Among the Italian studies, according to Raffestin (2003), Territory is understood above all in its physical component. It is subtended by a dynamic process that increases its complexity. The discussion on the concept of "Territorial Type" (Caniggia & Maffei, 1979) is relevant. It is defined as: "the concept of Territory that every man relevant to his time assumes, that is, a way to travel it, to choose the places where to settle, to place the locations where to meet. It is a concept that includes a dimensional entity. It is a gradual conformity: a typological process of Territory. […] A dimension of a cultural area presupposes adherence to a delimited territory. There is a relationship between a leading area and marginal areas, which act in imitation of the model suggested by the leading area but do not enjoy the privileges since they practice on incongruous dimensions. The territorial typological process is the progressive change of territorial types as a system of laws of procedural transformation of a previous type into a subsequent one, the reading of the processes is carried out through the reading of a system of signs that are

recognized as inherent to the same concept of Territory as complementary. In each phase, there are load-bearing structures that in the next phase are used as secondary or marginal because they are residual at specialist structure levels.

The maintenance of these reserves of the Territorial Type is concretized in the valorization of a past cultural world given a return cycle to propose it again. (p. 243): cyclical periodization of Territorial Types. The cycle is defined through the phases of planting, consolidation, recovery, and restructuring. […] Our time appears to be the final product of the fourth cycle: it is characterized by a high artificiality and consequent fragility of structures that have become too complex and too oppositional concerning the capacity to withstand the natural structure: high specialization and short duration. There will inevitably be a new crisis of settlement that will determine a new localized structuring, efficient on a small scale (p. 249)".

The reasoning then shifted to the local scale and typology: "Building is one element if compared to a system of larger-scale sizes, such as those necessary to reach the whole territorial organism. The Building inside is composed of smaller-scale structures and systems. It will be necessary to study the laws of connection of each scale, laws intrinsic to the same laws of their becoming in the dialectic of progressive formation-mutation. For each scale, it will be necessary to go back to the elementary matrices (gradualness of formation)". For Caniggia the continuous becoming is subject to the law of the successive doubles, but it also foresees in moments of crisis a moment in opposition to the inherited models. The growth occurs by a progressive complication, which is also the constant achievement of a greater degree of complexity and relative complementarity and indispensability of the components. E.N. Rogers in his Experience of Architecture (1997) had already introduced the concept of a "Typical Figure of the Territory". According to Rogers, it was not history that founded the new cities, but rather the environment. Caniggia also introduced the concept of "Environmental Organism": "Organismo Ambientale" (p. 254). This is a concept of environment and environmental type which includes the types of each scale, readable vertically, for each scale, in its proceeding from elementary matrices to complex derivations and horizontally in the unitary historical configuration of the human environment. It is operating in synchronic correlations, for each horizontal section we want to operate in the various scalar meanings of the typological process, diachronic by definition. The scale environment is differentiated for each place in the city and territory".

Therefore: Typical Figure of the Territory that introduces with the term "figure" the need to consider the geographical structure that makes the Territory and its primary unit a uniqueness; Territorial Type that changes over time according to the interpretation that different cultures give it as a resource. Nevertheless, it is the environment that holds together the vertical reading of the meaning of each place with the horizontal and historical one. From Territory to environment (each community tells the story of the Territory and its biodiversity) this is the first pair of terms that undermines the concept of "operating history" present in Muratori's (1967) works, and opens the field to the metropolitan approach to complexity.

1.4.2 Metropolitan Measurements and Dimensions

All these concepts qualify an essential architectural concept which is that of measurement. That is the relationship between large and small, where the small coincides with the body of a man and the large coincides with the whole inhabited field (total landscape made visible, as Lynch and then Gregotti said) which is the Digit or Minimum Unit of the Metropolitan Landscape.

Two definitions of minimum unity of the metropolitan landscape have emerged, that of Cultural Landscape Unit and that of the Implementation Unit. In both definitions, what is common is the principle of homogeneity. The form of the minimum unit of the metropolitan landscape is constituted in the perceptual world in such a way that the elements unified in a formal complex present a certain qualitative homogeneity, immediately identified by the expert eye. That is a property of the whole. The need to give structure to the perceptual world is a way in which there is a natural tendency of the elements to achieve a certain homogeneity of scale.

This tendency, however, also acts on the elements unified in formal complexes of new dimensions: thus, even the elements themselves tend to become homogeneous. The tendency to homogeneity supports the regulating principle that perceiving a form tends to homogenize the elements in order to make them available for the implementation of a metropolitan project. The project of metropolitan architecture, after all, is usually linked to infrastructural plans in which the technical component tends to be replicable everywhere. To overcome the de-differentiation of the places invested by metropolitan infrastructure projects, the definition of Cultural Landscape Unit becomes central.

The elements that make up the Units of Implementation are called "factors" ("Unidad de Desarrojo Equilibrado" or "Bud", Ortiz, 2014) with an explicit reference to mathematical equations. The effects of the relationships between them can be measured and calculated:

It needs to define Metropolitan Governance, Metropolitan economics, Metropolitan sociology, Metropolitan Environment (urban and natural), Metropolitan transport, Metropolitan Land use, and others. Moreover, it also needs to prove in each of these fields the difference between the urban approach and the regional approach. Simply speaking of urban or regional and applying these to the metropolis does not mean defining a discipline. It needs to establish the policies necessary in each of these fields. It needs to establish the calculus mechanisms to be able to calibrate the components, policies, and budgets necessary to manage these fields.

It needs to apply cost-benefit analyses, externality calculus, efficiency, and efficacy standards. It needs to establish the mathematical curves that relate to determining factors. Every "factor" must be quantified. That is what helps to find the right solution with the right amount of effort to be applied to each factor.

The Cultural Landscape Unit is analyzed according to (Alcantara et al., 2018):

- Natural Factors
- Historical evolution

– Cultural landscapes and their dynamics
– Sense of belonging
– Landscape views.

The way the description of the Implementation Unit is configured as linked to prepare a response to an immediate need. In the words of Choay (1986), we would call it: "model" and "utopia". The way of the description of the Cultural Landscape Unit is instead to be understood as an apparatus of tools for a future instance. In Choay's terms, we would call it: "rule" and "treatise".

The first way of approaching the metropolis, – following the French author – could be assimilated to what in the Middle Ages (Siena, 1200) was constituted by the municipal edicts. These were not the founders of generative principles of the entire field of knowledge about the city, and they were behind the royal urban edicts that founded the norms of such edicts. The first systematic royal edict was Haussmann's Paris Plan, which recast the royal edicts in the form of a police treaty with the corrective functions of a system. An empirical approach and what had never been a real system, rather than a scientific foundation, became the pillar for the planning and construction of the city.

For this reason, the proposed normative behaviours have no claim to legitimate scientificity. We could broaden the field of critical historical analysis also to what was later called the science of urban planning from which the concept of the Unit of Implementation derives.

We are still within what Choay called the "Utopia model". After all, even the instrument of the Metro-Matrix that we use to determine the metropolitan structural plan belongs to that category as a product of a utopian vision, which believes it is possible to achieve integration and social equity through a spatial model. The Utopia model referred to Tommaso Moro describes space as existing space that is opposed to real society. It is, therefore, a model outside of historical time and not modifiable. The poignant criticism of this model lies in the fact that it excludes planning errors.

Before Moro we can identify other authors who with their writings were prodromes of his vision. We can begin with Philaretes, who however denies the inflexibility of the model and points out its perfectibility. Leonardo configured a dimension of utopian models. He inaugurated a tendency towards "futurology" of the city in which the consequence of the progress achieved because of the discoveries is exhibited.

Rabelais, in his Gargantua and Pantagruel, described the space of the world in reverse as the guarantor of a condition of freedom.

Of the description of the Units of Cultural Landscape, we can say that it is a text that comments on the territory and its genealogy, made of memory, facts and people: its geography and its specific ethnography.

The medieval Panegyric of the city of Florence, written by Friar Lazaro of Padua, and Bonvesin de la Riva's De Magnalibus Mediolani can be considered the predecessors of this operation produced by the Autonomous Metropolitan University of Mexico City, since in both of them, space is given a primacy determining its possible "objectivity", that is, its positive description. The structure of space is put in a

position of dominance because it allows the authors to communicate the message about the value of the territory and of its cities to be shared and handed down.

1.4.3 New Technologies and Metropolitan Landscapes: Sets and Scenes

We introduced with Secchi (1986) the concept of "ground project". The soil (solea) is the horizontal line of the ground in the descriptive representation of a drawing. Given an elevation 0 (zero), we establish the two elevations +1 (plus one) and −1 (Below 1), creating a more complex image generated by a plane scan. We then determine the question of the scene: evocative scene of memory/experience for a psycho-geographic awareness of places (Lefebvre Situationists). For metropolitan landscapes, technology becomes a poetic reaction tool to determine a new environment when it is placed in a situation to generate an aesthetic object (Simondon, 1969). However, the ground and soil for metropolitan landscapes are also a fundamental archive of places to stimulate an imaginative action in the spectator (Chrislov Bakargiev & Vecellio, 2009). The metropolitan project creates a relationship with memory through the creation of a virtual image, conveyed by new technologies, which coexists with the current perception of the object. The structure of memory is not a nostalgic or picturesque feeling linked to the landscape, nor a philological reconstruction or a mechanical memory. It is rather that complex mixture of memory, experience and space that through the quotation uses traces of removal to find a past that is always present, thus anticipating the future (Vidler, 2006). It is as much a project of the past as a project of the future. The landscape as a scene must have within it: a futuristic component and the sense of a collective memory generated by the sharing of archetypal images. Its aim must be to make explicit the meaning of a place for the city (Jedlowski, 2002) by reactivating it from an experiential point of view. His compositional form then is that of editing (Contin, 2004). That is why we talk about Sets of Metropolitan Landscapes.

1.5 The Social Landscape Dimension: The Right to the Landscape

1.5.1 The Green-Grey Infrastructure as the Metropolitan Agora

Like Harvey (2014), Lefebvre (2014) saw the normal workings of everyday metropolitan life as generating unequal power relationships, which in turn manifest themselves in inequitable and unjust distributions of social resources across the space of the metropolis. This demands greater access to social power and valued resources

by those most disadvantaged by inequitable and unjust geographies define the struggle to reclaim the manifold rights to the city. The aim, at least from a liberal egalitarian point of view, is to gain greater control over the forces shaping urban space, in other words, to reclaim Democracy from those who have been using it to maintain their positions of advantage. Within the metropolitan studies context framework, the inclusion of the rights to Landscape and the Lifestyle is fundamental.

The right to the Landscape is related to the identity rooted in the Landscape. Every city has a Typical Figure of the Landscape (figura tipica del territorio) that is the result of a long mediation between the environment and the settlement. When natural resource refers mainly to the utilizable source of the environment, the right to the landscape concept underlines the importance of the shape and image of the Landscape as an intangible resource. It cannot be simply disregarded by economic rationale and global intervention.

How is Democracy linked to the idea of nature, Metropolitan Landscape and new land uses? Unfortunately, the idea of Democracy has been emptied of meaning, and it has been tinselled since the counterbalances of economic power were eroded. The first problem, however, is the speed of change in the metropolitan regions. We are facing the knowledge that the metropolis space-time must come to terms with the dislocation of unity. Design experience no longer proceeds from the understanding of the landscape digit because the rules in all fields are constantly changing, and the space of the observable is rapidly evolving. How, therefore, can Galileo or Maturana and Varela's experiment by setting its limits be implemented if everything changes so quickly?

The political role of the metropolis should be reconsidered. Its public responsibility in managing employment and investment, first of all. Is this possible if we continue to talk about the competitiveness of metropolitan regions? It is hard to believe so. Two themes are engaging today.

The brain runs on 20 watts of energy, and we are replicating a cerebral cortex with the matrix on the territory. What is of interest today is the urban part of the metropolis, its atopic digital proximity which, we have now discovered, can also be emotional. However, its physical proximity, the slow speed that today seems to be scary, must be mentioned.

We must also put in the foreground what we do not see in the urban metropolis: poverty and women's work. That could be one of the more passionate aims of the metropolitan studies as the metropolises are the contexts in which these invisible ones are most visible.

There is a lack of debate on how we should arm our thinking to face an unprecedented situation: to rethink our human condition. In short, how we have access to the reality of our cities it is only related to the issues of health, public hygiene, its size and viability. According to David Harvey (2020), a new type of collective action is needed so that all of us can be free individually. Arendt reminded us how the city needs places from which Democracy can arise: places where the joyful emotion of being together in a space and enjoying active participation in the town can begin (Cavarero, 2019). Participatory Democracy, therefore, understood as a dynamic resource, as an affection that can always be activated, as a positive and

creative emotional experience. However, today due to the Covid pandemic, it is particularly frightening to "be together" because of the distance that must be above all physical. So, what happens to this Democracy? How can we rediscover the freedom to act together in common (the Latin concept of communis: something that the citizens share until when they use it together) or public space as a horizontal space of participation?

What must the metropolitan society do so that women and men can be bearers of a citizen's rights? Every social evolution passes through an anthropological transition that is made of relationships: the city and architecture and their physical and mental space are the tools for "intersomaticity" (Choay, 1972): entering into relation with other bodies, whether animated and not.

Democracy escapes the mesh of classifications. It does not end in a model of government defined by a set of principles, rules, and procedures, nor in a system of values. It belongs to the phenomenology of political experience (polis) which according to Arendt is focused on the material sharing of a common space (agorà) in which free individuals interacted as equals. It is a place in between, which affirms itself as the place of the relationship between a plurality of equal and distinct actors. This physical space of participation has as its purpose to relate and make those present appear to each other, while leaving them separate so that they do not merge into an indistinct mass (the multitude of Marxist individuals). This discovery takes the concrete form not only in space but also in a type of life "bios politikos": a full realization of plurality.

How can the metropolis qualify Democracy through the re-founding of the concept of habitability, removing it from the grey zone of universal trivialization that identified it only as governance, policies, law or representative regime?

The metropolis is characterized by a horizontal conception of widespread, participatory, and relational power between equals that are such because they horizontally share the space that is the Earth (Environmental Justice). This is a political characterization of the metropolis that does not refer to Plato's political doctrine on government, which replaced the experience of the polis with the notion of politics understood as the technique of governing citizens and administering their interests. The metropolis can be the alternative model; it is another political idea that has a generative and affirmative, germinal aspect.

Politics must not only deal with social and economic activities but must propose a new way of living. This is written in the Metropolitan DNA structure which is described by the Metro Matrix and Genoma (www.pedrobortiz.com) as the continuity of the green-grey infrastructure, that we also name eco-armature, the common space where the metropolitan citizenship can live and act. It promotes an ecosystemic approach to integrate the management of land resources and water into the Metropolitan Landscape project, promoting its conservation and sustainable use. The whole metropolitan complex system functions as an extensive ecological infrastructure -composed of blue, green, and grey infrastructures- that can reconnect the different parts of the territory, crossing natural, rural, and urban areas.

The habitability of this space-time (where time is that of man but also that of nature) is linked to the category of plurality with its ontological meaning as

constitutive of the specific human condition. There is a mental and corporeal spatial dimension of political interaction. This agorà today is the green-grey infrastructure. It is a space that allows bodies to appear by acting, a materially shared space in which to show themselves with acts and words. Equity here is achieved by accessing the visibility of the public sphere where the human beings define and understand themselves as equals: qualities of the world generated through "nomos" more than "lex" and which allow everyone to be citizens, living beings endowed with rights and duties.

1.5.2 Post Landscape. The Environmental and the New Public Space Question

The Brenner analysis (Brenner, 2014) linked to the environmental issue, will lead the discourse of urbanisation to understand the profound changes in production and economic processes associated to the contemporary society (Luis Monte-Mor, 2014).

According to Henri Lefebvre (2014) the countryside, right now, is the town's environment, its horizon, and its limit. However, urban problematics cannot be engage at every problem: there are problems that are exclusive to agriculture and industry, even though urban reality modifies them. Therefore, our responsibility is to identify, analyse and design what happens to the forms, functions, urban structures and landscapes within their different contexts that are transformed by the breakup of the ancient city and the new process of fast urbanisation.

In this sense, Lefebvre introduces the considerable idea that urban society, virtually covers the planet by recreating nature, which has been wiped out by the industrial exploitation of natural resources and the destruction of the so-called natural particularities.

If it is so, today, there are essential issues of post-urbanisation which will characterise our landscapes (built and natural) in the same way as post-industrialisation did in the past. For example, what will happen to the previous low urban context spread in our territory?

Regarding the natural landscape, we try to describe new common spaces where people could relate to the land not as individuals but as persons inside a community, through new inclusive land uses and social facilities for different citizens. That means that we have to insert the post-landscape dimension (Harvey, 2005; Wall & Waterman, 2017), reclaiming land for new hybrid territories, understood and evaluated at the large scale, but discovered at the small one which is in fact the only scale real.

Observing the built landscape, however, as Wall (2019) claims, inside the city new landscapes of high control, through security, gating and fencing-off, was countered within the creative resistance of protests and demonstrations – both approaches attempting to redefine social relationships through appropriation and occupation of public spaces. In practice, these new metropolitan landscapes, reconfigured

landscapes formed through mass demonstrations which gathered in public spaces, undermine scenography promises of managed, pacified and comfortable urban spaces which had accompanied contemporary developments across the city. For this reason, contemporary cities with highest informality rates are the most prominent laboratories to experiment alternative forms of socio-ecological organisation through alternative re-combinations of public/common space patterns informing the city (Frigerio, 2016). The public space issue and the concept of the public realm, which alternates a space that today is only a public-use space will be a relevant point to discuss along with the chapter.

1.5.3 The Economic Landscape Dimension

Reading of the territory from the perspective of όικονομια, the economy dimension alongside a more cultural and anthropological approach, allows us to analyse a city and the territory it controls, based on its capacity for development. Consequently, we can investigate the place within its particular moment of development. After this reading, concluded with a hypothesis of experimental design, the need to make the regulatory apparatus and the three metabolic operations of maintenance – restoration interventions, conservation; replacement – the normal state of design and approval of the works; transformation – verification of compatibility, and integration project concerning impact studies and the European Landscape Convention consistent becomes clear.

As we advanced from the modern to the contemporary era, the driver of the economy shifted from land and labour to entrepreneurship and innovation (www.pedrobortiz.co). The new combination of technology to address the existing problems and meet the new demand of the evolving market is fundamental in nowadays economic growth. A conception of the economical alternative to the dominant one, – in which profit is still kept as a value (values of exchange and use)-, but also as a value of relationship (Luigino Bruni et al., 2019), that includes a plurality of values in itself, is mandatory. In the current state of over-production and over-consumption, it is essential to investigate alternative models, such as the circular economy, within the metropolitan discipline.

The circular economy is a model of production, circulation, consumption of goods and management of the relative waste, guided by the principle of temporal and spatial conservation of the socio-economic value of the assets (value of use and exchange value). Moreover, the model is realised through the design of economically closed systems, in which the use of renewable energy is privileged. To be applied, the model requires both a technological evolution, related to new skills in design and use of material waste (biological and non-organic) and an evolution of territorial policies, related to the ability to privilege the socio-economic processes of circular type.

Both can measure the results obtained from the application of the model: economic indicators (increase in product value-added) and environmental indicators

(reduction of the production of pollutants, solid, liquid, and in the form of greenhouse gases). In a growing number of areas of application, indicators related to the social sphere are also considered, in particular the increase in jobs produced by the circular economy.

1.6 Metropolitan Architecture and Landscapes Project as Generators of the Theoretical Part

1.6.1 The Metropolis Architectural Project. Spatial Phenomenon and Environmental Question

The Metropolitan Architecture project is based on research on types of buildings, units of land use, and types of Landscape studied regarding a metropolitan urban fact that defines meaning and significance. A precise definition of dimension and size (bigness) is linked to its recognisable image and a possible determination of a mental map even at the scale of the spread city rise.

The projects carried out within the Measure and Scale Laboratory of the Contemporary City, start from the study of geography, as a layer of the Earth. It determines the characteristics structuring the process of territorialisation of different cultures in history (urban biography). Changes in territorial hierarchies, the structure of the poles and networks, which are the basis of contemporary landscape schemes (territory plus landscape) are the first focus of the research. The Landscape, then, becomes an image of transmission of a vision, and value. The Landscape or, as Magnaghi says (Magnaghi, 2003), its celebration, makes the invisible visible. The basis for a long-term process of territorialisation are determinated by identifying the aspects of territory invariance (material and cultural sediments), which can determine new balances between man and environment.

Nevertheless, it also changes as a place of new metropolitan relationships, especially on the scale of urban agriculture. These are projects, in fact, that outline a utopian scenario, a conceptual reference, a vision. That identifies the value of the limit of measure of technique, applied to the construction of the metropolitan city. Our projects start from the dimension of the infrastructural node. According to Ortiz (2014), it varies alongside the hierarchy of the different centralities (national, regional, urban), to arrive at the project of the neighbourhood, which can renew the typological dimension of living by incorporating urban agriculture and the pattern of urban-rural linkage (Fig. 1.7).

Our study's objective is the government of the leap in scale of the contemporary city, through the definition of a multiscale structural paradigm for the metropolitan city, which promotes an architectural and urban design and Landscape. The design of the shape of the Metropolis must derive from a spatial concept that synthesises the strategic activities of the different areas in a global form. Once the strategic form is recognised, therefore, the tactical positioning of specific projects can be carried

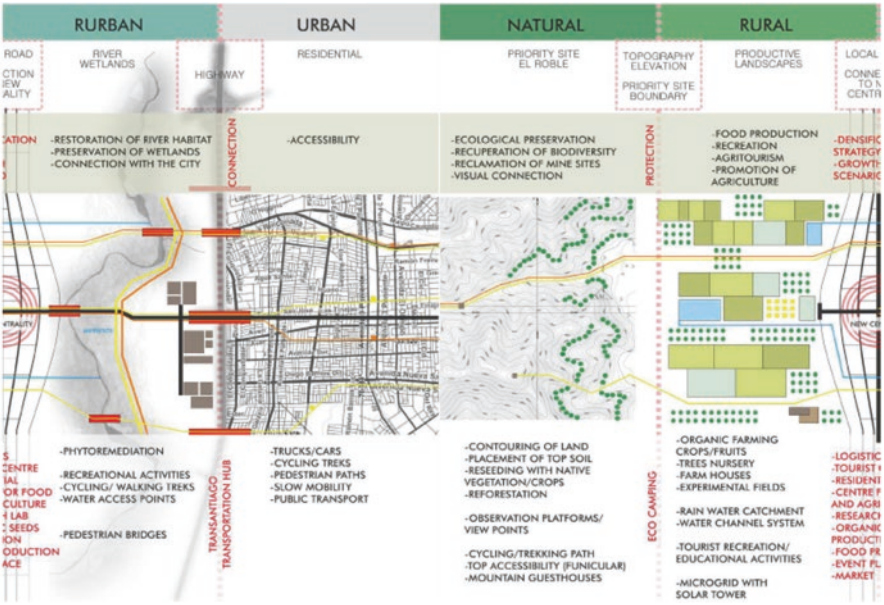


Fig. 1.7 Linkage Urban-Rural Diagram, Perkova

out. This implies that each urban project must reflect the strategic concept as applied tactically to that area. Only the Metropolitan Architecture projects can shape the strategic concept. The metropolitan form is immeasurable with the anthropometric scale. Therefore, the feeling of adequacy is given only through the image of a project at the urban scale.

The architectural project together with the infrastructures and landscapes that allow and present it at the metropolitan scale is no longer considered only as a sign imprinted on the territory. It interacts with the soil and determines a rhythmic sequence (expansion and compression of space/time) in the Landscape, which identifies different sets of landscapes as tones of living.

The forms of movement (new linear infrastructural system: commuter trains and motorways integrated with BRT, subways, minibuses and local capillary transport systems), are significant elements of the structure of the metropolitan scale, starting from the assumption that a new concept of territoriality at the geographical scale is based on the organisational principle of the Earth as a place of meeting and mobility (Lynch, 1980). The concept of infrastructure, be it grey, green, or green-grey, conceives infrastructure always linked to services, i.e. interpreted as what supports, allows, and presents services, i.e. the functions of the city. Even at the metropolitan scale, it is still understood as one of the founding elements of urban reality. The Green-Grey Infrastructure is connected to a new concept of monumentality**,** today attributable to the Landscape as a scarce asset to be safeguarded, and to the anonymous urban or agricultural fabric (Rossi, 1978). Cattaneo defined the agricultural territory of the Lombardia Region in Italy in 1844 as an “Anonymous Regional

Garden": a garden as a sign of culture and anonymity of the work of the generations that cultivated it. It is a sign of a Landscape as social work with aesthetic and not only productive intent. The result is the definition of the Metropolitan Landscape through the visual rhythm (Le Corbusier, 1973), generated by the compression and decompression of the space, determined by the infrastructures. The green-grey infrastructure space is linear, in the dimension of global relations of distance, but at the local scale, it becomes areal and topological: space of relationships, rhythmic space, non-Euclidean undulating. In the new Metropolitan Landscape, then, movement, as if it were a new settlement principle, generates space also through its environmental qualification: the soil expresses itself. The Landscape section (The Valley Section, Geddes, 2015) and its strategy of levels, becomes the dominant element of the project. The mobility network becomes, for this purpose, an essential and characteristic element, which does not follow the model of the historical city. As Gustavo Giovannoni argued (Giovannoni, 1995), it is possible to preserve and develop the ancient cities only if we can connect them to a new network. That is an important factor, because precisely the old structures, well-rooted in the territory, behave, on a regional scale, as structuring elements also of the new metropolitan reality. They allow it to be connected with the geography of the territory and with the Landscape that is its figure and image, considered as a fundamental resource on the local scale (Geddes, 2015). One can thus attempt to construct a vertebral system for the new dimension of the Metropolis, which we call green-grey infrastructure.

Metropolitan models need, in fact, a form of coordination of rail and road accessibility infrastructures. However, usually, the versatility and capillarity typical of the railway network within the urban fabric, and vice versa, in the metropolitan territory, are not reflected. The potential for preferential growth, then, should be defined by possible extensions of the railway network. At the same time, the road network will have to be diversified to avoid the collapse of an excess of concentration towards a single route and a single centre. Diversified sites in advance of railway expansion will thus avoid over-dependence on a linear structure. The green system that accompanies the grey (Zarza, 1992) is no longer only conceived as a protective green, but as an inter-scalar system or eco-armour (Gouverneur, 2016) capable of making social sustainability compatible with ecological sustainability.

Green infrastructure and mobility infrastructure acquire a geographical, urban and architectural "skin". The nodal points of interchange between the stairs are shaped and shape the compatible form of the green-grey infrastructure, which articulates the territory of the Metropolis. The architecture project of the Metropolis: new built form types, land uses, urban-rural linkage patterns, becomes the skin of the infrastructural framework, the geographical skin connected to the structure of natural and artificial soils, as it becomes the place of relationships with the rest of the cosmos or metropolitan archipelago.

The concept of environment, finally, must be integrated into the metropolitan fabric as capital to be preserved and implemented. A definition of environmental values must be determined before planning itself and accepted as a pre-established policy. The flexibility of the model produced by the Reticular Metro Matrix methodology (Ortiz, 2014) allows compatibility between environment and urban

development. The environment prevails when the two continuous grey and green infrastructures overlap (the only two continuous ones, while housing, services and industry are not continuous and therefore determine the sprawl). Natural environments must have a continuity to allow networking and biodiversity, which must filter through the metropolitan fabric to reach the heart of the urban system.

The needed tool is the construction of a topographic map, which is the device capable of supporting a mental map at the metropolitan scale. That passing from a geographical scale to local geography consists of a continuous and discontinuous system and a thick soil surface. Concerning the urban structural paradigm, finally, we want to define the possibility of a syntactic and communicative value of metropolitan architecture (cognitive value). It can succeed through the determination of a new multidisciplinary dimension, which tends to the definition of a statute of the architectural subject, as the ground project (Secchi, 1986). It is recognised as an instrument of construction and symbolic interpretation of the environment at the new scale: natural landmark and built as a new relais for the interconnections between the scales (Lynch, 1980).

1.7 The Tool

1.7.1 The Goal of Sustainability

First of all, we refer to an urbanised geographical field. It is often organised in an unorderly manner, jeopardising the city's ecological footprint sustainability. The dispersed or widespread urbanisation, in fact, is characterised by the inability to protect the continuity of the natural armour on which the health of the land and its inhabitants depends. The Basque Declaration of 2016 is taken as the reference text for the Goal of Sustainability. The design of further works that insist on our territories, and especially those of metropolitan dimension, requires a more complex and updated conceptualisation (Fig. 1.8).

This is true in particular, for the need to recognise not only the preservation of geographical eco-region but also the style of an ideal and utopian intention

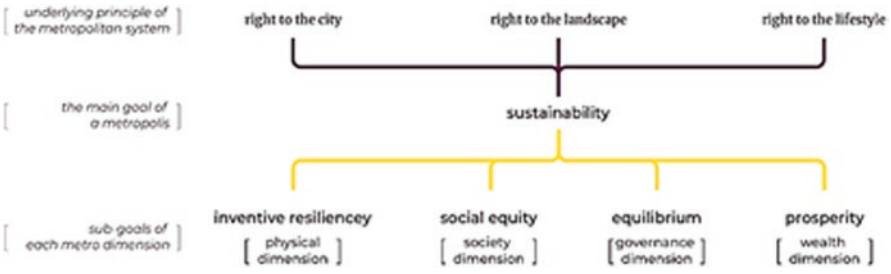


Fig. 1.8 The Underlying Principles and Goals of the Metropolitan Discipline

(principles and values) that animate knowledge, techniques and behaviours. The awareness of new actions of living in the map construction is fundamental to establish a practice of metropolitan living at different scales of spaces and times. This approach determines the temporal cadences of life (the new "metropolitan rites"). It introduces the notion of Right to the city and Right to the Landscape but also the Right to the Lifestyle, which is well-rooted at the local scale (Fig. 1.8).

1.7.2 The Principle of Continuity/Discontinuity: Atopic Proximity and Meta City

The Metropolitan concept is related to a measure and a scale which are not associated to human dimensions or commensurate with the urban fabric and the density parameters/index of urban concentration, represented in the concept of proximity. Metropolitan as a category is related to a context of mass mobility of people and goods, which implies a different relationship between individuals and groups. The technological utopia, embodied by the spreading of metropolitan infrastructure networks and the overlapping natural universe, has erased previous geographical traces, which were continuous, disarticulating agricultural and urban historical topological patches. Nevertheless, as a result, we may notice a sense of loss of productive and symbolic connotations of the cultivated land.

The old urban typo-morphological structure, whose functioning was mostly centripetal, suffers from congestion and lack of efficiency. Therefore, the concept of "paesaggio" must be integrated into the Urban Landscape discipline. Metropolitan works, consequently, are an alternative, intense urban form. Their environment, where discontinuity of the city fabric and atopic proximities due to the new technologies are produced, provides a convenient bridge to the abstract and invisible world of the informational and networked city (meta-city) as the content for the new technologies and new maps.

Our research field of action is the city that is the first engine for social integration, economic growth, worldwide cultural production and metropolitan architecture projects such as its structure demands a new discipline. Nevertheless, incommensurability emerges as one of the main topics, also concerning a new sensitivity toward the natural and local ground, and with the attention of new styles of behaviours induced by virtual communications in real-time. The mental conception of the new Metropolitan Architecture and Landscape projects must deal with a necessity for a discontinuity. It arises from the incommensurability of the new city dimension. The research investigates ways and strategies to adapt and reform the typological and morphological paradigms of architecture and urban design and new linkage urban-rural patterns for the transformation of sustainable contemporary urban territories.

Shane (2005) calls the era we are living in the Telecittà era, which takes the form of a net-city and a meta-city. The meta-city concerns the size or the virtual

telecommunications layers that determine proximity that is no longer linked to a continuity of the urban fabric and instead determines atopic proximity. The Telecittà is a net-city, and it is characterised by landscapes that are defined as the new hybrid landscapes (McGee, 2014). A sustainable approach to heritage leads us to integrate the structures of the past – often out of scale now – into the new Hybrid Landscape. The Landscape Urbanism discipline must describe that environmental issue.

The environmental issue, furthermore, carries two big cultural clashes: there is the so-called Latin Landscape, that Kevin Lynch (1980) called a total visible environment, and there is the wilderness of the Anglo-Saxon Landscape. It is essentially necessary to outline a profound conflict between the concept of Cityscape (Corner, 2006), further subdivided into techno-scapes, transportation-scapes, suburb-scapes and even sub-city-scapes. The peripheral strips and debris that Gruen calls the "scourge of the metropolis" is the living space inside the plots of networks. Consequently, these are defined as water channelled and regulated territory, against a landscape or wilderness, which is a space between the plots of networks and where water is managed, but it is a naturally flowing water.

We refer the principle of continuity to the green-grey infrastructure, the continuous metropolitan dimension elements, defined by the Metro Matrix. These systems require protecting the still free areas, according to the concept of desakota (McGee, 2014) and define the transport infrastructure. Thus, some regional blocks and areas of growth are identified, due to the infrastructure nodes that will increase the strategic role and the impact of housing, services, and productive activities (the discontinuous elements of the metropolitan area). The increase will result in continuous and constant feedback on the two main elements.

1.7.3 Metropolitan Cartography (Fig. 1.9)

While in the Latin culture the keywords for the urban discipline are scale and limit, in the Anglo-Saxon urban the keywords are scale and growth (without necessarily defining a measure). Often, the Anglo-Saxon world (Rowe & Koetter, 1984; Banerjee & Southworth, 1990) has interpreted the Latin world from the patterns' characterology and not from its value as a paradigm. In defining the contemporary urban models, the twentieth century had three crucial moments:

Paris: the attainment of the limits foreseen in 1850. The theme of density.

Chicago: the overcoming in one hundred years of the limits previewed and the consequent invention of an original type of settlement that comes from the urgency of exchange between the points no more tied by contiguity of fabric.

After 1950: the discovery of the regional dimension. Hilberseimer (1993, 2012) said "on the side of the city" it is no longer visible; later Lynch (1960, 1980) considered the regional dimension as a total visible environment, and Forman (1986) perceived it as the landscape ecology.

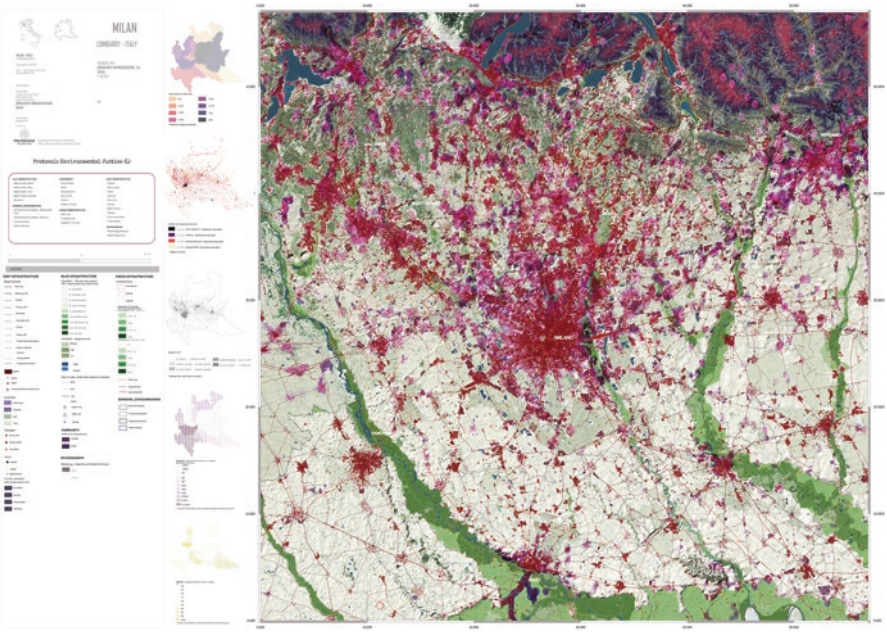


Fig. 1.9 Metropolitan Cartography – Environmental Justice Protocol Map of Milan. V. Galiulo (Contin et al., 2021)

Today, we return to Lynch (1996) because we are interested in his question: how can we come up with a new model of the city that, by embracing the environmental issue, becomes part of a spatial phenomenon? We are interested in analysing the explanation of the city as a spatial phenomenon, which integrates the natural element, now necessary to obtain a model of sustainable development.

An investigation on ways of thinking about spaces that change as a study of the urban paradigm over time, able to define a series of mental and real maps where the highest scales imply the lowest scales, is necessary. We are developing the Metropolitan Cartography as a useful tool to define metropolitan urban paradigms that are more complex, concerning the cultural theme of urban Biography.

Within a definition of the new metropolitan paradigm, having understood that the critical threshold of growth has been reached, it is a matter of delivering the design of the metropolitan works. These must evolve the existing city patterns towards the scale of the net-city according to a paradigm that requires:

– strengthening citizens' personal-social actions (Right to the Lifestyle);
– being sustainable (Right to the Landscape/Environmental Justice);
– accepting a democratic principle (Right to the City/Social & Spatial Justice).

The skills we need to produce achieving this are:

– competence regarding the historical-geographical situation of the area: a survey on the strong geographical support point for the living (Febvre, 1980);

– competence concerning the moments-events that establish the broad present, i.e. the Biography of a city. The Biography of a city means how each culture has interpreted the role of the geographical situation (orography) as a constituent element of the city (Focillon, 2002);
– competence in choosing metabolic interventions of maintenance, substitution, and transformation, necessary for the growth/development of the settlement, whose current state has been produced by activating what has been preserved or invented in the territories of the past.

Architecture is no longer a real map for settlement orientation, with different shades, aimed at marking the differences between the set of landscapes that people had learned to recognise and live and, at the same time, had built. In the past, it was just the architecture of the city, which allowed man to elaborate an anthropological image through geometric construct semantics. The place known as living space was conceptualised through geometry and recognised, therefore, through its constructed forms. Nevertheless, we are now in a moment of passage, where catastrophic places of discontinuity and change are generated, in which the meaning of architecture and landscape is re-founded through the definition of a new inter-scalar formative trace that the Metropolitan Cartography must represent with new codes and signs.

1.8 Conclusion

1.8.1 Bioresistances. Spatial Intelligence Mappings

The word Environment and its relative concepts can help us to rethink the territory not in its legal meaning, but geographically and substantially through the search for its "intelligence". Territorial Intelligence is a concept developed within the Sixth Framework Programme of the European Community between 2002 and 2006. In post-industrial societies, Territorial Intelligence is the science that aims at the sustainable development of the territories, and that has as subject the territorial community. In particular, the concept:

– links the multidisciplinary knowledge of the territories with their dynamics;
– strengthens the capacity of territorial communities to participate in their development in an equitable and sustainable way;
– improves the exchange of territorial information and disseminates its methods and tools of analysis using new technologies;
– promotes governance, decision-making processes and practices that improve participation and partnership and action-research that contribute to the equitable and sustainable development of the territorial community.

The concept underlines the contribution of intangible resources to overall development, allowing differences not to become an obstacle to the affirmation of these needs, but to underline the value of the territory's heritage. Territorial Intelligence reconciles post-material values with those of the culture of industrial society,

supporting the development of territorial resources, and recognises the inherent qualities and uniqueness of the latter and makes their use attractive to heterogeneous "glocal" societies.

Some people oversee Territorial Intelligence that implements a political activity. They named it "bioresistance" from the consideration that resisting is first of all is right and then it is beautiful. Bioresistance starts from the recognition of the value of a common good that occurs when there is a community that recognises it. It is carried out through non-intensive agriculture that protects the landscape and communities. Safeguarding agriculture, a guardian of the territory, it fights for legality through the protection of sustainability and thus builds Democracy.

The term "bioresistance" is intended to describe a plurality of situations related, on the one hand, to environmental protection and, on the other, to the protection of rights and legality through concrete actions. "Bioresistence" is a project of the Italian Confederation of Farmers (CIA) which aims to highlight the great heritage represented by a particular type of agriculture: that agriculture which is aware of the concept of limit, time, the complexity of the environment works for the common good. Agriculture is an action of safeguarding rights and legality. Legality does not mean the abstract principle of the positive observance of laws but the constitution of a space where the rights of all are realised and applied, where people are citizens; an action to safeguard the environment, an act of protection of the territory, the landscape, biodiversity.

The term "bioresistance" is, therefore, intended to describe a plurality of actions that revolve around a "healthy" relationship with the territory. It shows that agriculture is not only an economic/financial action but also a practice of resistance to forms of illegality. It is also a resistance to standardisation (which is flattening and not egalitarian) of both culture and food, resistance to the violence with which natural resources are treated and managed, resistance to the disappearance of biodiversity.

A path capable of recalling and underlining the link between these agricultural practices and responsible citizenship; agricultural experiences that build and implement Democracy in Italy: companies that, perhaps without realising it, every day uphold the principles and values of the Republican Constitution by defending the common good of the land.

1.8.2 Openings. For an Accumulation of Intelligence

The challenge, referring to a possible Metropolitan Architecture and Landscape project, consists in defining the approach capable of activating new productive processes for collaborative metropolitan development. It takes advantage of heritage and culture to regenerate and accumulate local values to also connect them to the socio-economic sphere at other scales through participation and innovation. This type of accumulation of Intelligence is what interests us and is opposed to the contemporary situation which, on the contrary, sees the territory as being colonised and not accumulated. Investments and infrastructures that accumulate within the

territory are counted as densifications and not as accumulations. The specificity of today's city is a multipolar form of local growth/transformation that involves increasingly large areas based on the efficiency (performance) of infrastructure networks. The paradigm of the contemporary metropolitan city is no longer a polycentric model, but a network: the network city. This change is significant because it implies the need to address not only the network nodes and the infrastructures that make them accessible but also the space between the networks, which must be reconceptualised. That space is often a contested territory between new inhabitants, almost rural migrants, and the local host population. In other cases, it is the city itself that in its growth occupies the rural field expelling the local communities.

Over time, the relationship between the city and the metropolis has changed significantly. In order to solve the problem of the inclusion of different identities in the same (contested) territory, instead of the city-countryside opposition, we are interested in studying the form of a metropolitan region. In it, simultaneously, the mother city within a multitude of medium and small cities (places) is involved in a relationship, which is transformed locally.

We need intelligible and wise tools to diagnose the metropolitan context with the intention of projects.

Finally, the proposal for a metropolitan project is:

1. Not the territory but the environment.
2. Types of dynamics and integrated environment.
3. Space as a constructed space; the physical dimension as a starting point (without sociology only).
4. Architecture as built space is the tool to create the space, which is the capacity for acclimatisation and the cultural habit.
5. If it is the environment, the struggle is for its sustainability which is "bioresistance" and healthy agriculture for a Metropolitan urban pattern of green-grey infrastructure as a new metropolitan agorà.

References

Alcantara, S., Zamora, A., Alvarado, M., González, S. R., Herrera del Real, V. R., Itzel, D. M., Contreras, V., & Juárez Guerrero, J. A. (2018). *Trabajo Terminal para optar por el Diploma de Especialización en Diseño, Planificación y Conservación de Paisajes y Jardines*. Ciudad de Mexico: UAM.

Banerjee, T., & Southworth, M. (1990). *City sense and city design, writings and projects of Kevin Lynch*. Cambridge, Massachusetts (US): The MIT Press.

Brenner, N. (2014). *Implosions/explosions: Towards a study of planetary urbanization*. Berlin: Jovis.

Bruni, L., Becchetti, L., & Zamagni, S. (2019). *Civil economy and sustainable development*. Roma: Ecra.

Cattaneo, C. (1844). *Notizie naturali e civili su la Lombardia*. Milan: G. Bernardoni.

Caniggia, G., & Maffei, G. L. (1979). *Lettura dell'edilizia di base*. Venezia: Marsilio Ed.

Cavarero, A. (2019). *Democrazia sorgiva*. Milan: Cortina.

Chrislov Bakargiev, C., & Vecellio, M. (2009). *Hito Steyerl. The city of broken windows*. Milan: Skira.
Choay, F. (1972). *L'allégorie du patrimoine*. Paris: Seuil.
Choay, F. (1986). *La regola e il modello*. Roma: Officina Edizioni
Contin, A. (2004). *Atlante*. Milan: Maggioli Editore.
Contin, A. (2016). *The narrative structure of the agro-urban metropolitan territory. The metropolis as Hypertext for the history of the XXI century: A network of middle cities as an operational topography*. Berlin: Springer.
Contin, A., Ortiz, P. B., & Galiulo, V. (2021). THE "UNEQUALS" INCLUSION. Hotspot's Network Strategy for a Metropolitan Agriculture Revolution Eluding Informality. In M. Meninato (Eds.), *Informality and the City*. Berlin Springer: (ongoing).
Corbusier, L. (1973). *Verso una architettura*. Milano: Longanesi. (Original work published 1923).
Corner, J. (2006). Terra fluxus. In C. Waldheim (Ed.), *The landscape urbanism reader* (pp. 21–34). Architectural Press. https://cdland4.files.wordpress.com/2013/06/corner_terra-fluxus1.pdf
Febvre, L. (1980). *La terra e l'evoluzione umana. Introduzione geografica alla storia*. Torino: Einaudi (Original work published 1922).
Focillon, H. (2002). *Vita delle forme seguito da Elogio della mano*. Torino: Piccola Biblioteca Einaudi (Original work published 1934).
Forman, R. (1986). *Landscape ecology*. London: Wiley.
Frampton, K. (1999). Megaform as urban landscape. In B. Carter (Ed.), *1999 Raoul Wallenberg lecture*. NY: The University of Michigan A. Alfred Taubman College of Architecture + Urban Planning and Kenneth Frampton.
Frampton, K. (1983). Towards a Critical Regionalism: Six points for an architecture of resistance. In *The anti-aesthetic essays on postmodern culture* (Vol. 1, pp. 16–31). Seattle: Bay Press. https://monoskop.org/images/archive/0/07/20150505143904!Foster_Hal_ed_The_Anti-Aesthetic_Essays_on_Postmodern_Culture.pdf
Frigerio, A. (2016). Facing rapid urbanization: A century of East African Urbanism. *Proceedings of HISTORY URBANISM RESILIENCE: Scales and Systems, 17*(6), 67–78. https://doi.org/10.7480/iphs.2016.6.1323
Geddes, P. (2015). *Cities in evolution*. London: Williams & Norgate. (Original work published, 1925).
Giovannoni, G. (1995). *Vecchie città ed edilizia nuova*. Milano: Città studi (Original work published 1931).
Gouverneur, D. (2016). *Diseño de nuevos asentamientos informales*. Bogotà: Universidad de LaSalle.
Gregotti, V. (1966). *Il Territorio dell'Architettura*. Milan: Feltrinelli.
Harvey, D. (2005). *A brief history of neoliberalism*. Oxford: University Press.
Harvey, D. (2014). Cities or urbanization? In N. Brenner (Ed.), *Implosions/explosions: Towards a study of planetary urbanization* (pp. 52–68). Berlin: Jovis Verlag.
Harvey, D. (2020, March 19). *Anti-Capitalist Politics in the Time of COVID-19*. http://davidharvey.org/2020/03/anti-capitalist-politics-in-the-time-of-covid-19/
Hilberseimer, L. (1993). *Das neue Frankfurt 1926–1931* (G. Grassi, Ed). Torino: Dedalo Edizioni (Original work published 1929).
Hilberseimer, L. (2012). *Metropolis architecture*. GSAPP Columbia University Graduate School of Architecture, Planning and Preservation. (Original work published 1920).
Jedlowski, P. (2002). *Memoria, esperienza e modernità: memorie e società nel XX secolo*. Milan: Franco Angeli.
Koolhaas, R. (1995). *Bigness, or the problem of large. S, M, L, XL*. NY: The Monacelli Press.
Latour, B. (2017). *Facing Gaia. Eight lectures on the new climatic regime*. Cambridge: Press Cambridge UK.
Lefebvre, H. (1991). *The production of space*. Oxford: Basil Blackwell.
Lefebvre, H. (2014). From the city to urban society. In N. Brenner (Ed.), *Implosions/explosions: Towards a study of planetary urbanization* (pp. 36–51). Berlin: Jovis.

Lynch, K. (1960). *The image of the city*. Cambridge Massachusetts: MIT Press.
Lynch, K. (1980). *Managing the sense of a region*. Cambridge Massachusetts: MIT Press.
Lynch, K. (1996). A theory of good city form. In R. Melai (Ed.), *Progettare la città. La qualità della forma urbana*. Milan: Etaslibri.
Lynch, K., & Rodwin, L. (1958). A theory of urban form. *Journal of the American Institute of Planners, 24*(4), 201–2014. https://doi.org/10.1080/01944365808978281
Magnaghi, A. (2003). La rappresentazione identitaria del patrimonio territoriale. In G. Dematteis & F. Ferlaino (Eds.), *Il mondo e i luoghi: geografie delle identità e del cambiamento* (pp. 13–20). Istituto di ricerche economico-sociali del Piemonte.
McGee, T. (2009). *The spatiality of urbanization: The policy challenges of mega-urban and Desakota Regions of Southeast Asia*. Proceeding of UNU-IAS 161. ISSN 1564-8427.
McGee, T. (2014). The emergence of desakota regions in Asia: Expanding a hypothesis. In N. Brenner (Ed.), *Implosions/explosions: Towards a study of planetary urbanization* (pp. 121–141). Berlin: Jovis.
Monte-Mor, R. L. (2014). Extended urbanization and settlemen patterns in Brazil: An environmental approach. In N. Brenner (Ed.), *Implosions/explosions: Towards a study of planetary urbanization* (pp. 109–120). Berlin: Jovis.
Muratori, S. (1967). *Civiltà e territorio*. Roma: Centro Studi di Storia Urbanistica.
Ortiz Castano, P. B. (2014). *The art of shaping the metropolis*. NY: Mc Graw Hill.
Ostrom, E. (2006). *Governare i beni collettivi* (G. Vetritto, & F. Velo, Eds.). Venezia: Marsilio. Venezia: Marsilio (Original work published 1990).
Padoan, D. (2020). *Niente di questo mondo ci risulta indifferente*. Rimini: Edizioni Interno4.
Pollak, L. (2006). Constructed ground: Questions of scale. In C. Waldheim (Ed.), *The landscape urbanism reader*. NY: Princeton Architectural Press.
Raffestin, C. (2003). Immagini e identità territoriali in territoriale. In G. Dematteis & F. Ferlaino (Eds.), *Il mondo e i luoghi: geografie delle identità e del cambiamento* (pp. 3–12). Istituto di ricerche economico-sociali del Piemonte.
Rogers, E. N. (1997). *Esperienza dell'Architettura*. (L. Molinari Ed). Milan: Skira (Original work published 1958).
Rossi, A. (1978). *L'architettura della città*. Milan: Clup.
Rowe, C., & Koetter, F. (1984). *Collage city*. Cambridge Massachusetts: MIT Press.
Secchi, B. (1986). Progetto di suolo. *CASABELLA, 520/52*, 19–23.
Sereni, E. (1961). *Storia del paesaggio agrario italiano*. Bari: Laterza.
Shane, G. D. (2005). *Recombinant urbanism. Conceptual modeling in architecture, urban design, and city theory*. London: Wiley-Academy.
Simondon, G. (1969). *Du mode d'existence des objets techniques*. Paris: Aubier – Editions Montaigne.
Soja, E. W. (2000). *Postmetropolis: Critical studies of cities and regions*. Los Angeles: Blackwell Publishing.
Tomassone, L. (2015). *Crisi ambientale ed etica. Un nuovo clima di giustizia*. Torino: Claudiana ed.
United Nations. (2018, March 19). *World Water Development Report 2018*. https://www.unwater.org/publications/world-water-development-report-2018/
Vidler, A. (2006). *Il Perturbante dell' Architettura*. Milan: Einaudi. (Original work published 1992).
Viganò, P. (2008). Water and asphalt. The projection of isotropy in the metropolitan region of Venice. *AD Architectural Design, 78*(1), 34–39. https://doi.org/10.1002/ad.606
Viganò, P. (2010). *Il territorio dell'urbanistica*. Roma: Officina edizioni.
Wall, E., & Waterman, T. (2017). *Landscape and agency*. London: Routledge.
Wall, E. (2019, 11–16). *Landscape citizenships*. (Conference presentation) Greenwich, University of Greenwich, UK.
Zarza, D. (1992). Límites: Arroyo Culebro. Imágenes e ideas para una ciudad verde en el sur metropolitano de Madrid Región. *Arquitectura, 293*, 1–23. https://www.coam.org/es/fundacion/biblioteca/revista-arquitectura-100-anios/etapa-1987-1990/revista-arquitectura-n293-1992

Chapter 2
Anatomy of a Mutating Landscape

Giovanni Santamaria

It has become extremely important to revisit our overall design field in consideration of the impressive and sometimes overwhelming progress that the technology available to document, analyze and represent the complexity of our built and natural environments has reached, and also of the role that it has been proactively playing in affecting our way of thinking, designing and building. A renewed "theory of formativity" (Pareison, 1991) characterizes a knowledge that is generated by a constantly transforming process of "making,"[1] in which methodologies, theories and learnings arise within the actions of designing and building across dimensional scales.

2.1 "Transforming Data-Scapes"

The several levels of accessibility often simultaneous, to various sets of information have changed drastically through the use of heterogeneous and adaptable media systems, deeply tailored on the needs of each individual, and yet strongly interconnected in limitless and layered networks (Negroponte, 1996).

[1] Interestingly the Greek etymology of the word 'poetic' comes from the verb 'ποιεω,' which means 'to make,' to operate through conscious actions which also have immaterial effects. This also refers to the way M. Heidegger used the same word 'ποιεω' as connected to the word 'poetic,' being that the only way for humans to inhabit a space, transforming it into a place through the introduction of poetic implications.

G. Santamaria (✉)
School of Architecture and Design, New York Institute of Technology, New York, NY, USA
e-mail: gsantama@nyit.edu

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_2

We are called then to manage a more sophisticated complexity of interactions across fields of knowledge, scales and pace of their evolution, and the emerging of a holistic understanding of the global systems of actions and reactions that characterize our current environments understood through their mutual connections. The overexposure that involves both individuals and collectivities, introduces an unprecedented level of ethical issues about the authorities in charge of collecting and managing the data-scapes available, their legacies and purpose of their utilization, especially when some of these can alter worldwide social behaviors, political decisions and financial settings. Moreover, considering that decisions and strategies adopted at political and economic levels end up affecting people/societies and places/territories far from the source, the issue of selection and dissemination of the information becomes absolutely relevant. This factors characterize our daily life and the spaces within which subjects—physically and/or virtually—move or better flow, formally and informally. Before us is a diverse and often rhizomatous horizon of information, which must be sifted to find what is truly essential. It is critical then to develop tools and strategies to filter and critically select the data which are most effective for the understanding of phenomena both physical (climate change, ecological footprint, etc.) and ephemeral (social behaviors, informal use of space, etc.) characterizing our current landscapes, and the possible directions for their evolution.

We developed advanced and interconnected tools to record, decode, describe and represent these evolving info-scapes that we are part of, leading to a renewed semiology that is often difficult to translate into syntax, being in a sort of self-celebratory aesthetic limbo, in which the originality of the representation of the data can be disorienting and misunderstood with the usefulness of its applicability. The ways we communicate the data seem to become more relevant than their translation into effective strategies or design applications, and of the reality of spatial structures and experiences that these generate. Their conversion in proactive strategies to operate into a context, should be anyhow one of the main purposes of such availability of information, overcoming a sort of paralysis of the action as consequence of an overwhelming quantitative collection of the information itself. In this way, the transformation processes can become more sustainable at multiple levels. Therefore it is necessary to be aware of the possible reactions of a context to the changes introduced by a new action—in short and long term and at a local and large scale—in terms of both space and life quality, and towards the definition of more resilient hybrid narratives. These are the ways through which the same data with their several levels of abstraction, can become real and effectual, connecting individual and collective biographies to the ones belonging to places and territories, exploring and redefining grounds for “landscape urbanism” (Waldheim, 2012).

Accessibility to information about demographics, physical characteristics of spaces and habits of inhabitants has become today certainly more available, detailed, and also predictable through sophisticated devices, which are capable of realistically envisioning several scenarios. A crucial point is then how to critically filter among these data the ones that can be truly useful and proactively influential for the articulation of more strategically located, balanced, sensitive, and site specific design proposals which can work as operating catalysts. It’s important to select and

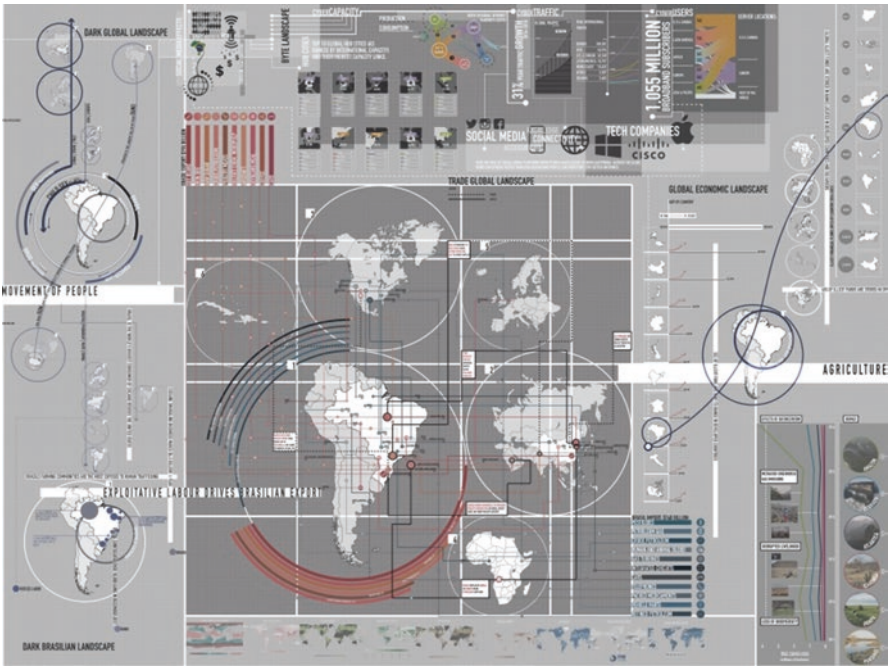


Fig. 2.1 Mapping and diagramming global movements, legal production, trades and illegal traffics. NYIT- School of Architecture and Design. Thesis 2019 – Rio de Janeiro, Brazil. Students: S. Delgado, T. Ferreira, Y. Prior, C. Wade

cross relate the available information to deductively direct outputs towards a better and more integrated understanding of the present contextual conditions, framed accordingly to the historical awareness of their evolving paths, and oriented towards coherent and imaginative visions for the future (Fig. 2.1).

2.2 Global Geographies and Local Cultural Landscapes

We are asked today to develop tools and knowledge to proactively participate to the construction of our environments, upon and because of the understanding of complexity and correlations among the various dynamics—political, economic, social, ecological, technological, anthropological—which are the primary causes that have been shaping and reshaping our global geographies, as well as each locality that is part of it. These dynamics take then the forms of choices made by decision makers and investors, public institutions, administrations and private agencies, becoming possibilities to improve our cities and the quality of our lives. Operating towards understanding and prioritizing the issues that generate the problem in the first place, by more than just dealing with the effects deriving from these, and being aware of

the systemic connections among phenomena of transformation, will eventually nourish a different generation of thinkers and makers, more sensitive and creatively engaged in their personal and global cultural landscapes. They will be also qualified to envision and participate in creating the new institutions, structures, entities and sets of rules needed. Being aware of the consequences of their actions, and of reactions and dynamics that certain choices will initiate, at the same time they will perhaps have a better understanding of the real reasons at the base of those choices and the intricate network of correlated causalities, so they will operate to modify malfunctioning processes and doing so, potentially break unproductive and unfair cycles.

A generation capable of constantly integrating and proactively moving between thinking, researching, and creating, will critically react to the changes and be able to direct them, envisioning and producing new knowledge and renewed professional contexts and tools, which can holistically take care of our environments. In this perspective the construction of a building, a portion of city or of an entire metropolitan area, becomes an opportunity to experiment and verify theoretical, methodological, morphological, typological and technological possibilities. This leads to more sustainable and integrated infrastructure, services, living, producing, working and leisure spaces considered as integrated systems of both natural and manmade materials and tectonics, guaranteeing a more balanced and equal future for our societies. Academic environments can therefore become the places where these collaborative experiences can start nesting, where the gap between thinking and doing is bridged through investments in our human capital, the students and their entrepreneurship, the creativity of their ideas and their innovative approaches to problems, or their original vision in recognizing and strengthening potentials, free from preconceptions. In this perspective, information metabolized into knowledge become fundamental media to reach awareness and expertise. This same expertise should result in an inspiration to push further, envisioning and experimenting with what is new, conquering challenges and learning form defeats, all while engaging in productive alliances and shared intuitions across disciplinary boundaries and beyond consolidated and predetermined structures.

This scenario delineates then a renewed synergy between fields of action, which describes at the same time a new humanistic approach that positively integrates scientific and pragmatic knowledge, classic[2] theories and the most advanced applications of science and digital technologies. Here we find the need for a truly collaborative and interdisciplinary coordination among backgrounds and areas of expertise that are involved in the expression of our mutating landscapes. Along with this, new procedures and administrative structures will be needed as professionals seek to design processes that ask to be understood at the scale of complex territorial systems but simultaneously come from and characterize the one-to-one dimension of the locality. These have to be recognized within the ecological, economic, social and cultural complexity of our diffused and diverse urbanizations in a more resilient

[2] The notion of "classic" it's here understood as sort of authority which doesn't over-impose itself to a context, but it's spontaneously recognized because of being meaningful despite the time distance, and since ontologically related to the historical nature of the being that confirms its value across the times. This approach is further developed and documented into the book by Hans Georg Gadamer, Verita' e Metodo, Italian transl. by Giovanni Vattimo, (Studi Bompiani Ed. 1983)

way, referring to larger and layered space and time dimensions to better understand their evolutions and mutual influences.

The need for design choices and strategies that operate across both local and large contexts—often coinciding with vulnerable post-industrial environments, or iper-dense informal urbanizations—is dramatically manifesting its relevance almost every day on lands and communities. Therefore there is an equally serious need for more consistent and coordinated actions across territories, as well as institutional and geographical boundaries. We must stay aware of the systemic connections among phenomena globally, for decisions that must go beyond specific political and ideological positions and their time frame, to guarantee a shared, accessible and equally distributed well-being. There should be then a consolidated understanding that even though ideological differences and contrasting positions are vital in a democracy to keep the dialogue alive and push constantly to do and be better, a common ground of values and priorities has to be established to protect the survival of our planet, which means also our future. This understanding points to the need of working together towards rights and equity[3] for all (Fig. 2.2).

2.3 Renewed Mapping Processes

Learning how to decode and represent the complex and multilayered systems of cause and effect through a new integrative and dynamic "agency of mapping" (Corner, 1999) will become even more relevant for the future generations, and equally important for the definition of a new professional expertise capable to operate within our landscapes often characterized by a variety of conflicts and vulnerabilities that must be addressed by more holistic design proposals. This renewed way of mapping focuses not only on statically describing the physical conditions of a territory and the locations of the structural elements that identify it, but also represents/diagrams the interactions between visible and hidden phenomena referring to natural and cultural behaviors and social beliefs historically layered to a place, the symbolical and perceptual values that have been defining the anthropological evolution of it, framed in a geopolitical perspective. This, along with a new understanding of the relevant role played by the ecological dynamics within our territories, and the intricacy of their effects across time and place—mostly as consequences of series of human choices and behaviors—have made it necessary to experiment with mapping as a more dynamic, performable, technically evolved and most of all design oriented tool. This must also be understood as a methodology to decode complexity, capable not only of describing elevated levels of processing, but also offering the ability to critically synthetize and interrelate data and phenomena to enable a deeper understanding and potentially a better way of anticipating and preventing problems, also in a spatially localized perspective (Fig. 2.3).

[3] The term equity and not equality is used on purpose. Unlike equality, which refers to treating everyone in the same way and giving everyone access to the same opportunities, equity refers to the proportional representation of race, class, gender, etc. in those same opportunities. Therefore to achieve equity, policies and procedures may result in an unequal distribution of resources.

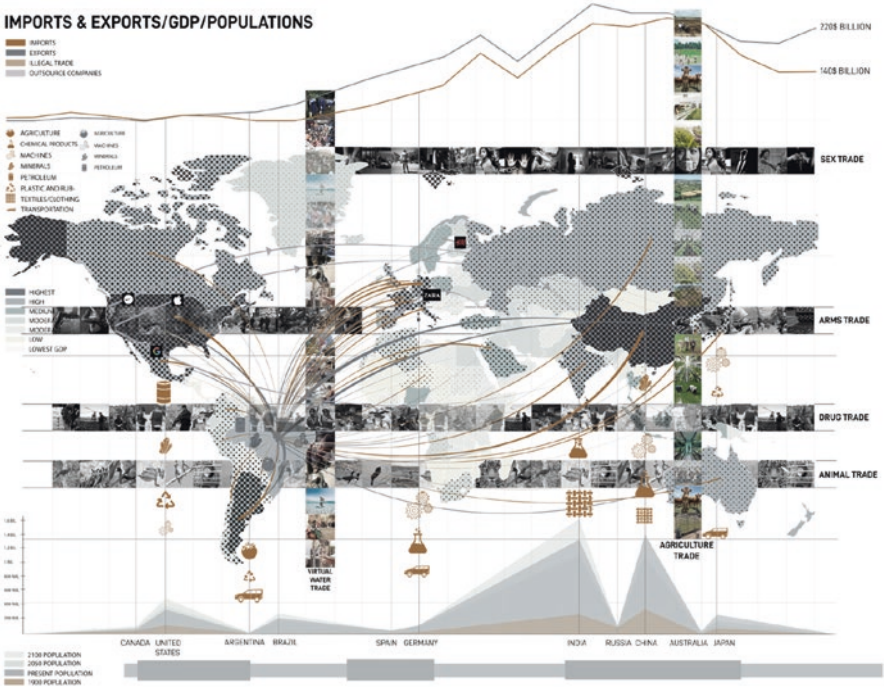


Fig. 2.2 Mapping and diagramming global flows, demographics and wealth, and their effects on processes of environmental growth and decay. NYIT- School of Architecture and Design. Thesis 2020 – Rio de Janeiro, Brazil. Students: H. Ahn, P. Mendoza, S. Moral, H. Patel

2.3.1 Mapping as Meta-design

The mapping process becomes particularly relevant as an integrated part of every design proposal, especially the ones operating in vulnerable contexts characterized by transforming processes formal and informal, of shrinking or fast growth of built and natural landscapes. These occurrences can be deeply understood and sustainably managed only if considered as parts of larger and more complex territorial and extra-territorial systems. The design approach deriving from this processes of mapping becomes then itself not only an indispensable tool to understand the complexity of dynamics that are often hidden and ambiguously layered, but it's also a possibility to rethink the existing systems of production and distribution of resources and information in a more sustainable way.

Here the thresholds between research and work in the field merge and mutually enrich each other, creating a stronger awareness about the responsibilities of designers/planners at the multidimensional scales of their interventions and in various connected sectors. This responsibility has to be accepted and proactively embraced also within the renewed learning environments of our schools, which will then produce professionals who have a clearer vision and a deeper understanding about how to lead and coordinate changes that require multidisciplinary teams, considering the implications of their choices as an integrated part of the design process.

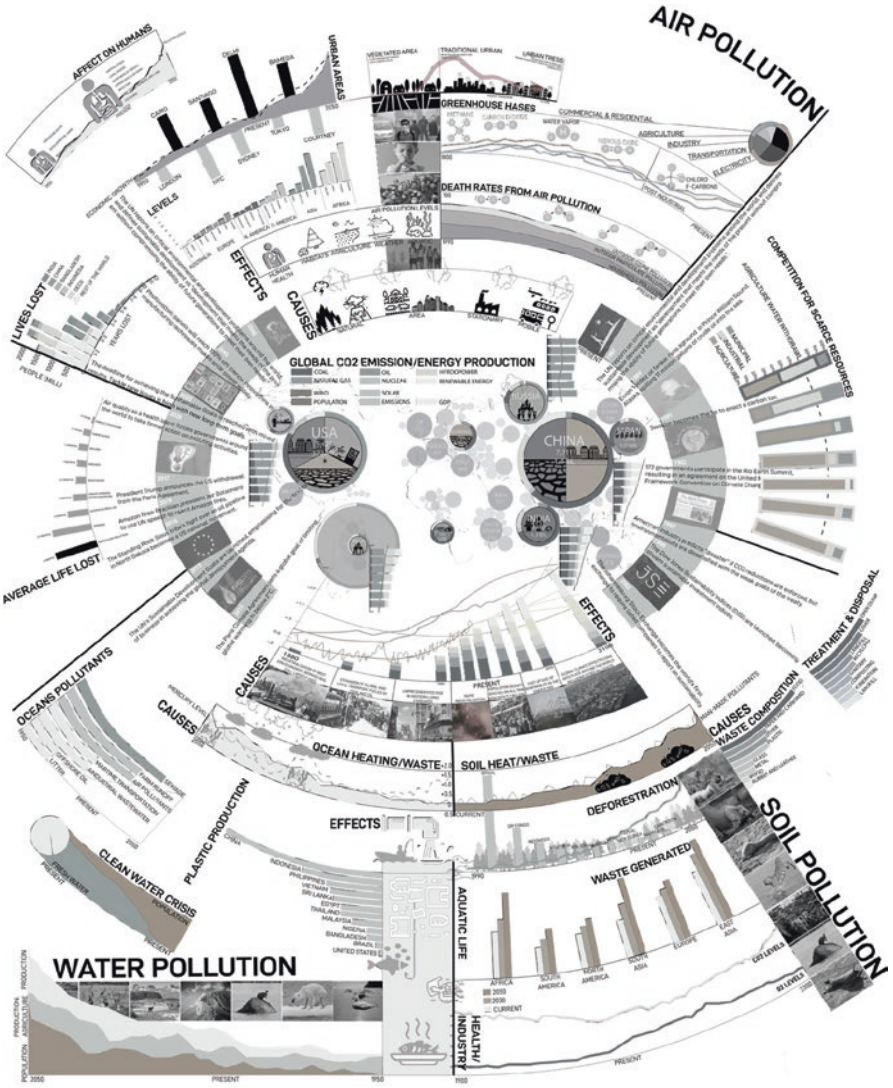


Fig. 2.3 Mapping and diagramming cause/effect processes regarding global phenomena of pollution, and their consequences on natural and human capital. NYIT- School of Architecture and Design. Thesis 2020 – Rio de Janeiro, Brazil. Student: Himesh Patel

The mapping/remapping as meta-design project is then not only a way to analyze and record processes of transformation across several dimensional scales and fields of issues, understanding the reciprocities of their cause-effect conditions, but also crucial part of the actions of re-envisioning while discovering, necessary to originate and nourish better design choices. These become then understanding of the operating issues beyond their formal expression, and rooted into territorial and cultural conditions. It's a way to "re-write" the narrative of a site that assumes then the connotation of a place, in which proactive choices find their expression through an

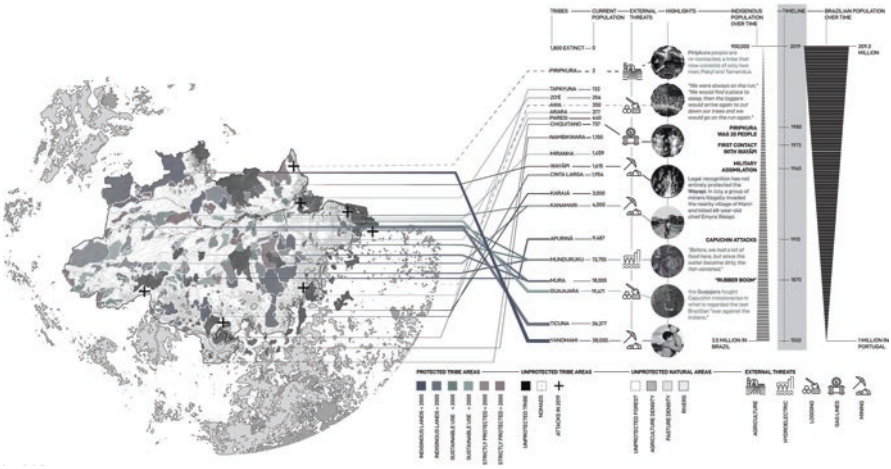


Fig. 2.4 Mapping and diagramming anthropological processes of transformation and their inner connections with productive and natural landscapes, and living habits. NYIT- School of Architecture and Design. Thesis 2020 – Rio de Janeiro, Brazil. Students: H. Ahn, P. Mendoza, S. Moral, H. Patel

open, performable and integrative "strategic plan" as evolution of the modernist idea of a predetermined, formulaic and abstract "master plan." This new plan explores and coordinates as sort of neuronal system, the several possible processes of metabolic change that, involving a metropolitan region more than an urban sector, are expression of phenomena simultaneously deriving and affecting global territories and specific localities. These phenomena are often effect of undeclared, hidden and illegal dynamics that, driven by strategies of profit, power and control, yet often misunderstood by some leaders as ideologies and beliefs, have deep consequences on our natural, built and social environments, originating conflicts that are difficult to eradicate, and at the base of inequality and injustice (Fig. 2.4).

2.4 Action in Place: Strategic Plan and Sensitive Locations

Taking form from the need of decoding and proactively react to the previously described dynamics, the strategic plan integrates systems that engage the complexity of ecological, infrastructural, cultural, technological, political, and economic layers, understood in their plural and mutual cross determinations, and approached in their continuous evolving, not as separated entities in which the urban structure has a self-referential, ultimate and determined role of "master." The understanding of human behaviors, not always immediate, of collective and individual beliefs, of cultural belonging, merge then with the complexity of the geographic and ecological components of a place (Mostafavi & Doherty, 2010), a landscape continuously in-making, which is the result of the components described above, but at the same time also able to affect the way these components themselves have been changing, and will evolve.

Therefore the strategic plan describes, re-envisions and proactively challenges, structures, policies and at the same time space making tools and roles, the systemic interactions of physical and ephemeral phenomena, focusing on a qualitative more than quantitative approach. Introducing ecological processes of reclaiming, restructuring, reusing, recycling, etc. it rethinks environmental structures as spaces for an elevated quality of life. Furthermore this doesn't have any longer the "man," and even less a specific social/cultural/anthropological/gender oriented "typology of man" at the center, as the only inspiration and goal of the design action.

Within the complexity of the systems introduced, integrated and "spatialized" through the strategic plan, a selection of "sensitive spots" (Lefebvre, 2004) involving places with the highest level of resonance and density of issues/potentials, is identified and explored as landing agents through which disseminate the most effective actions from. These also engage a variety of specific micro-regions gravitating around the selected localities, still connected to the larger scale of issues that they belong to.

Problems of flooding and erosion, pollution and waste production, energy and soil consumption, unequal access to services and resources must be identified, mapped and resolved through the territorial localization of these sensitive spots[4] within the strategic plan, and the tools of an environmentally oriented urbanism. The latter has been on the rise as a shared urgency and as a counterpart to the lashing production of an oligarchy of star-architects around the world. In this context the creative component of a design proposal not only involves the original expressions of the form making, but also the architecture[5] of the overall strategy, of the methodology involved, and of the originality of the rethinking process of structures and systems (Fig. 2.5).

2.5 New Adaptable Paradigms

An environmentally oriented approach has to envision new sustainable and adaptable paradigms for networked metropolitan areas involving multidimensional scales, and also consider the uniqueness of each location. This approach begins with an overall understanding of the outcomes of decisions made at various levels and in contexts often different from the ones in which we are called to operate. Outcomes must be conceived of and included into the design process, in which the action can aid in finding the minimal formal and structural solutions that can then have the broader effects in activating a more resilient change and a better diffused

[4] These locations are selected accordingly to their relevance within the natural/ecological and cultural/symbolic contexts, and they can vary in relation to the dimensional scale, even though these operate across them, from the local to the territorial one. They can also create and/or modify urban and metropolitan dynamics of accessibility, circulation, production and exchange, in coordination or in contrast to historical values and individual or collective agendas.

[5] Besides the primary definition of this word and its etymology which refer to the "art and practice of designing and constructing buildings," the use of the word refers here to its secondary meaning of "the complex and carefully designed structure of something" in terms of its conceptual frame and logical organization and correlation of its parts.

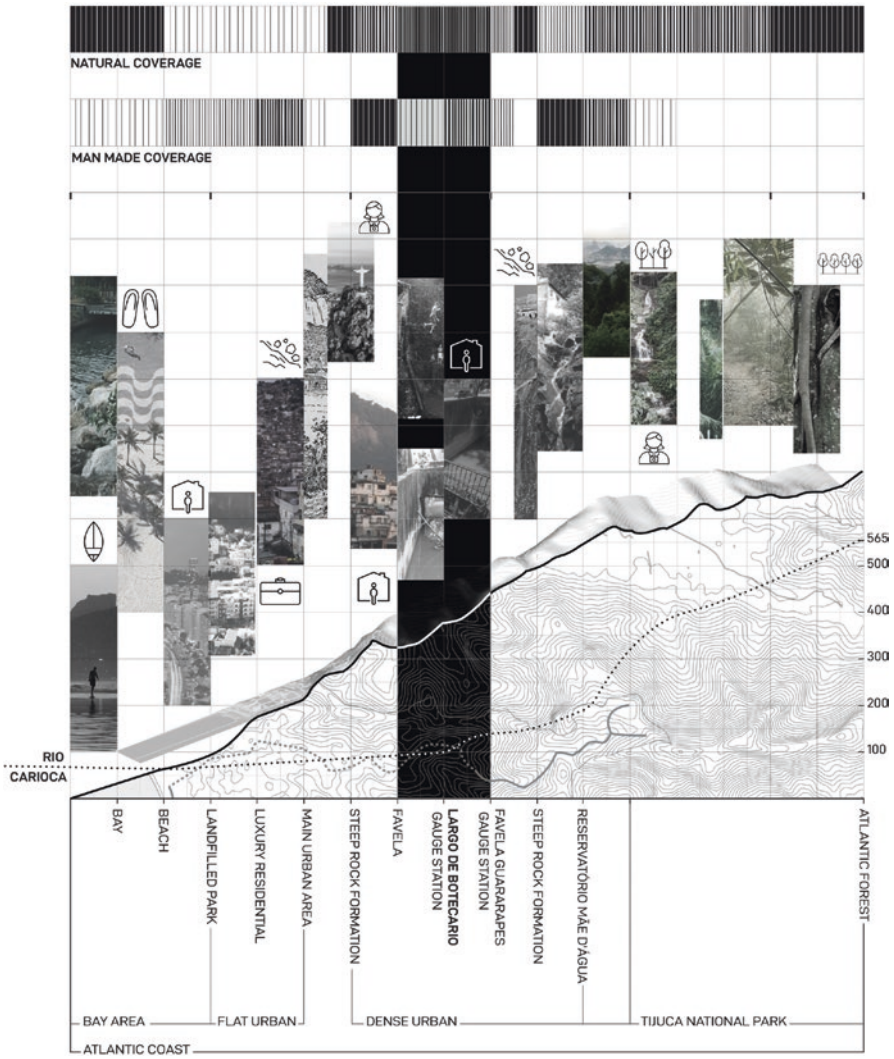


Fig. 2.5 Analysis of the territorial transept underlining correspondences between topography, urban morphologies, building typologies and cultural landscapes. NYIT- School of Architecture and Design. Thesis 2020 – Rio de Janeiro, Brazil. Student: S. Moral

environmental quality. The specific sensitive locations mentioned above, are then rethought and reclaimed through highly contextual and at the same time deeply visionary and experimental design interventions, becoming local mediators that perform as catalyzers and part of a more complex regional metabolism. At the small scale these work as epicenters of attraction, points of accumulation of territorial forces, and operating like permeable and multiscale clusters of exchanges, open to opportunities to rethink programs, structure, and methods of construction reducing the variety of existing conflicts, towards more resilient landscapes (Fig. 2.6).

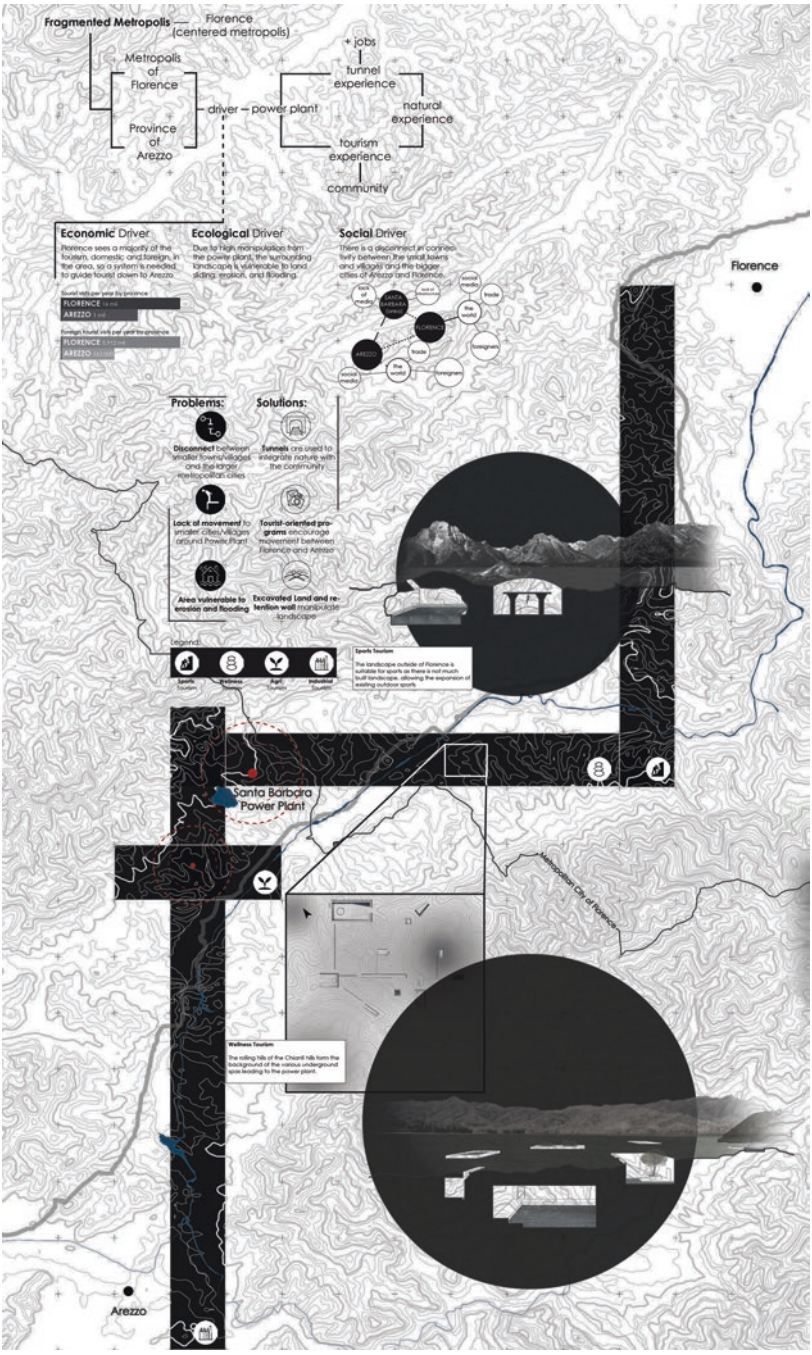


Fig. 2.6 Strategic plan for the adaptive reuse of the abandoned power plant of the Italian energy company ENEL, and reclaiming strategies for the surrounding natural landscape. NYIT- School of Architecture and Design. Thesis 2019 – Santa Barbara- Florence, Italy. Student: Zandile Ncumbe

A renewed methodological approach arises from the arguments above and from the need for a more effective knowledge: open, integrative, adaptable, dynamic and truly experimental, in which re-thinking structures, organizational systems and their multiple interactions can overcome the rigidity of a model-oriented one belonging to modernism. It will integrate and build upon the knowledge and legacy of consolidated tectonic, typology and compositions, liberating them from the dogma of an aprioristic definition, through the deep understanding of their genealogical transforming processes, and towards their evolution in crossing scale "morph-typological" and "trans-typological" deductive schemes of possibilities and integrated design proposals that can be transformable and proactively adaptable accordingly to the specific contexts and their interactions through time. This new methodology reacts to and includes the understanding of the DNA of a context in a territorially extended physical perspective, but also geo-politically, geo-philosophically and geo-anthropologically (Gregotti, 2014) focused. At the same time a bottom-up exploration of the local characteristics, allows us to create a more sensitive tectonic, responding to the transforming needs of the users.

We all are called to positively embrace the challenges and explore new possibilities to do and be better, to be "agents of change" (Corner, 2014) responding to the needs of evolving contexts, and often anticipating and redirecting transformations towards a more equal and sustainable future for all, giving form to the anatomy of our mutating landscape.

References

Corner, J. (1999). The agency of mapping. In *Mapping*. Chicago University Press.
Corner, J. (2014). *The landscape imagination* (Collected Essays by James Corner 1990–2010). New York, NY: Princeton Architectural Press.
Gregotti, V. (2014). *Il Territorio dell"Architettura* (Feltrinelli Ed.). Milano, Italy.
Lefebvre, H. (2004). *The urban revolution*. University of Minnesota Press.
Mostafavi, M., & Doherty, G. (2010). *Ecological urbanism*. Lars Muller Publisher.
Negroponte, N. (1996). *Being digital* (Vintage Ed.). New York, NY.
Pareison, L. (1991). *Estetica. Teoria della Formatività*. Bompiani.
Waldheim, C. (2012). *The landscape urbanism reader*. Chronicle Books.

Chapter 3
Cities After Landscape: Post – Landscapes, Other Practices, and All Things

Ed Wall

3.1 Introduction

In 1888 Patrick Geddes published *The Rise and Aims of Modern Botany* which included ideas that would become the basis for what he termed the 'Valley Section' – drawings that explore relations across a regional landscape, following a river from the hills to the sea, connected to practices and tools of work. The valley section is one of several conceptual frameworks that Geddes constructed that consider the transformation of places through practices of work in order to understand the formation of civilisations. As Geddes states: "We can discover that the kind of place and the kind of·work done in it deeply determine the ways and the institutions of its people" (1923). However, the valley section has also proven a particularly useful framework for thinking about other land relations. It opens up questions of how we perceive, interact with, and produce the worlds around us, whether through everyday actions of travel, work, and dwelling or more specific client, material, and territorial decisions that are formed through architectural projects. In this essay I explore the notion of the valley section as the basis for questioning the relational dimensions of producing urban landscapes. What are the relations between landscapes transformed through processes of urban change, from new city forms to places depleted of raw materials? How do relations of work lead to hierarchies of practice that afford greater value to certain roles and less to other actions? Who are the human and non-human agents that have the capacity to inform processes of urban change? In the context of rethinking Geddes' valley section as it relates to

E. Wall (✉)
University of Greenwich, London, UK

Politecnico di Milano, Politecnico di Milano (DAStU), Milan, Italy
e-mail: e.wall@gre.ac.uk

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_3

contemporary urbanization and future landscapes, I am also interested in how these entanglements of what Geddes termed 'place', 'work' and 'folk' are represented.

I employ the valley section as a means to analyse contemporary processes of urbanization and future relations of landscapes. This follows the exploration of urban relations undertaken by horticulturalist and landscape architect Jaqueline Tyrwhitt, who brought Geddes' work to the British MARS group and CIAM, and influenced Team X, who in 1954 published their interpretation of the valley section in the Doorn Manifesto (See Welter, 2003). I argue that the valley section offers ways of conceiving of landscape that challenge prevailing Western European conceptions, that see landscape in scenographic terms, constructed from singular positions of power, and tightly controlled through spatial and visual frames. Referring to the potential of other relations with the land, I developed the term 'post-landscape' (2011, 2017) as a way of imagining approaches that may establish more just social relations, that recognise the collective capacity of landscape, and that are accessibly produced by wider populations. This focus on 'other landscapes' builds on Barbara Bender's critique of landscape in *Landscape: Politics and Perspectives* (1993):

> True, the word [landscape] was originally coined in the emergent capitalist world of western Europe by aesthetes, antiquarians and landed gentry – all men. It is also true that this coinage is a fine example of how those with power can use language and image to conceptualise and naturalise a particular, and in this case, deeply unequal, way of relating to the land and other people. But is it inescapably true that even at the historical moment when the word 'landscape' was coined and used to its more powerful effect, there were, at the same time and the same place, other ways of understanding and relating to the land – other landscapes (Bender, 1993:2).

Post-landscape is employed as a term to open up conversations about the potential of other landscapes, rather than claiming the end of landscape. It is in this context that I have been interested to unpack Geddes' notion of the valley section, reimagining other physical forms, other practices and other tools of work. Through processes of analysing, removing, replacing, extending, and rearranging elements of the valley section I open up questions pertinent to specific forms of landscape and reveal its relevance to future forms of urbanization.

In this essay I extend Geddes' concept of the valley section to explore the different relations of contemporary and future landscapes (from urban centres to remote mountains and seas) and new practices of work as well as advanced technologies and tools that engage with these places. I recognise that Geddes repeatedly returned to reconsider, edit, adapt, and redraw the valley section over several decades, with later versions exploring relations along a high street (1925), and I continue these speculations to investigate and open up questions of contemporary urbanization and landscape. I focus on Geddes' drawings since 1909 – the date of the first published valley section that incorporates different settlements at contrasting urban scales, recognising the significance of urbanisation across the regional landscape. Reflecting Bender's claims of multiple landscapes existing simultaneously I emphasise that cities are landscapes, that they include landscapes and that they are components of wider landscapes. Landscape defined in such relational terms – that include physical forms of land as well as the relations that come to produce them – is a useful

framework for denying the separation of cities from their hinterlands as well as recognising the site-specific forms and conditions that are created through processes of urbanisation. I propose that cities are produced from specific relations with the land, as Bender claims of landscapes, and that rather than architectural artefacts, they are constantly changing material, ecological, and social relations inseparable from their contexts (1993:3). I consider the fields, woods, and hillsides of Geddes' sectional drawings alongside villages, towns and cities: they are all landscapes going through change, transformed by human actions and informed by more than human processes.

The exploration of Geddes' valley section is a process of contextualising the concept in contemporary forms, practices, and tools of landscape. Bender writes:

> The way in which people – anywhere, everywhere – understand and engage with their worlds will depend upon the specific time and place and historical conditions (Bender, 1993:2).

Although Geddes claimed that the valley section could represent any place in the world, it can be closely read as places along the east coast of Scotland representing the profile of the land as it falls from the Scottish hills to the towns and cities along the North Sea. This is the point of departure for my speculative research into the valley section that began similarly in an area of the North East Highlands of Scotland, several hundred miles further north than the settlements of Dundee and Edinburgh that Geddes was familiar through his work. Initially investigating relations between whisky production – including the distinctive tastes of malt whisky, the water and barley from surrounding landscapes, and the traditions of work unique to distilleries (Wall, 2015, 2020) – I expand my research of the valley section to diverse forms and conceptions of landscapes, as well as corresponding forms of work and tools of its production. I explore, through the *Valley Project*, landscape in holistic and relational terms (see Figs. 3.1, 3.2, 3.3 and 3.4). The *Valley Project* (see Figs. 3.1, 3.3 and 3.4) is an ongoing exploration of the valley section, through surveys, drawings and models, that adapt Geddes valley section to specific landscapes as a means to understand the issues at stake as these landscapes are transformed. I include the dynamic associations between living beings, material objects, physical environments, and processes of change and how they are entangled through many different practices and narratives. The aim of this essay is to highlight how the valley section can be developed further as a useful device for exploring and questioning the relational dynamics of cities and landscapes – as they have existed and how they may be in the future.

This essay is roughly structured around the sections of Geddes' interest in 'place', 'work' and 'folk' – what I have termed post-landscapes, other practices, and all things.

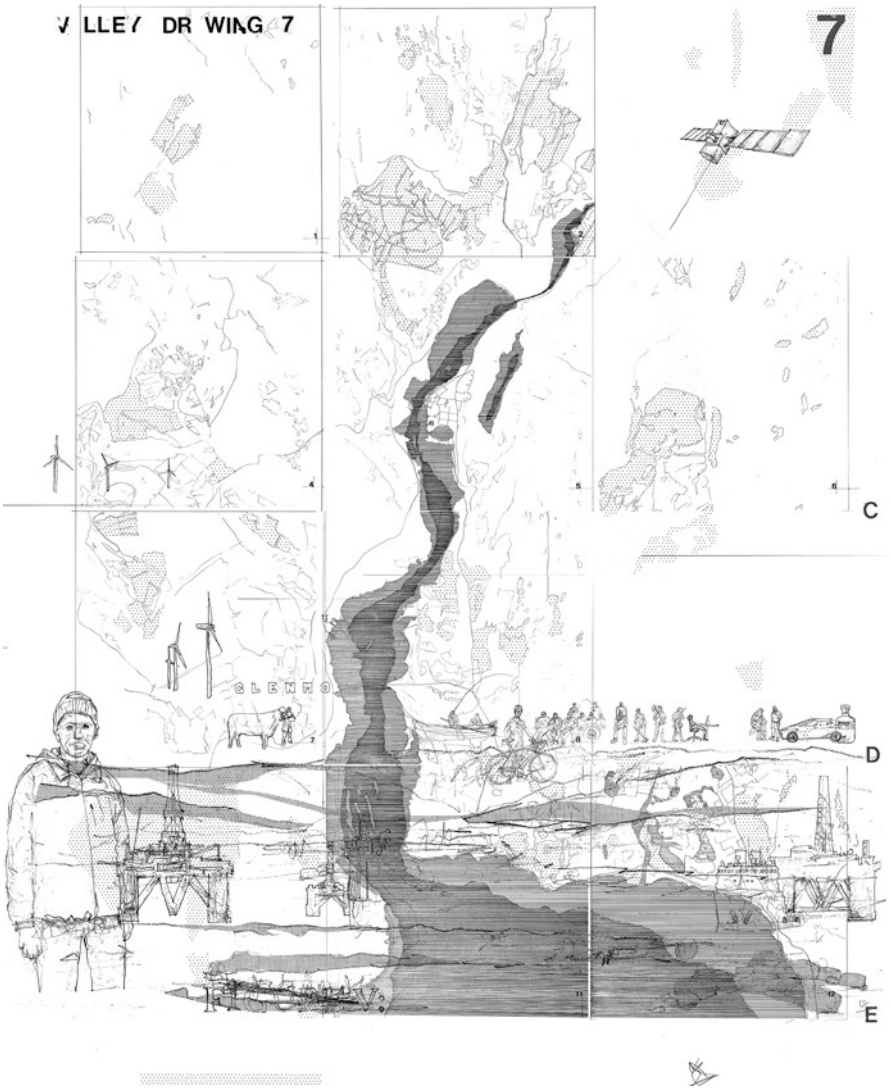


Fig. 3.1 Drawing 7 of the *Valley Project* explores the landscapes in tension across operations, scales, and imaginaries of a North East Highlands valley. (Credit: *Valley Project*, Drawing 7, 2019, by Ed Wall | Project Studio)

3.2 Post-landscapes

Reading the valley section horizontally opens up questions of urbanization. While Geddes' valley section drawings are often read from top (physical landscape) to bottom (work practices) – emphasising Geddes focus on relations between 'place', 'work', and 'folk' – the valley section diagrams are also important to be studied for

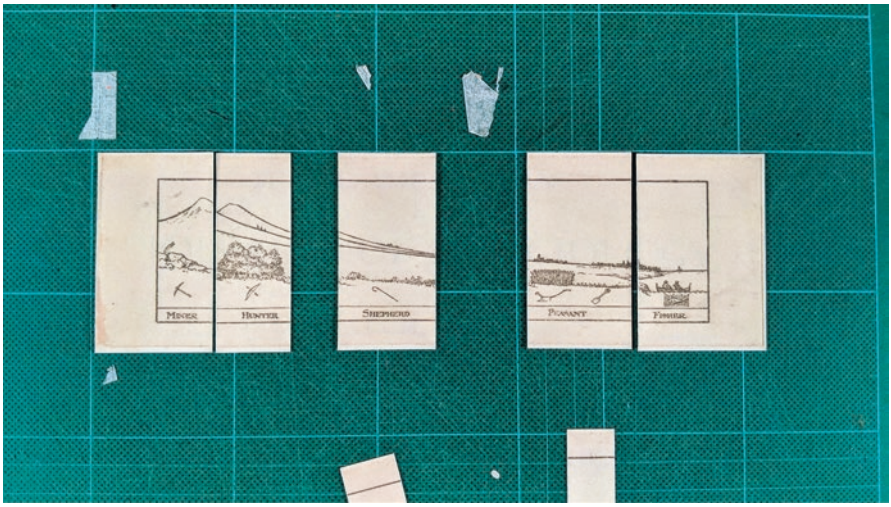


Fig. 3.2 Dissection of Geddes', 1909 valley section, in preparation for reordering, adding, removing, adapting, and extending the model as it is used to investigate specific landscapes. (Photo by Ed Wall | Project Studio)

their horizontal relations between the quarry in the mountains to the city by the coast or the woodland on the hills to the arable fields on the plains. The architectural historian Volker M. Welter (2014) describes Geddes' interest in relations between cities and regions: the physicality of cities developing in the context of networks of settlements as well as reliant on and in service to the surrounding landscapes of food production, mineral extraction, and forestry. Early sectional drawings of Geddes (1888) did not include urban settlements, although they did trace the river from the hills to the sea and indicated the occupations of miner, woodsman, hunter, shepherd, peasant and fisher to these land types. In 1905, in what was termed the *Valley Plan of Civilization*, Geddes included a large city by the coast, and by 1909 what had become known as the valley section included the presence of cities, towns, villages, and hamlets (see Welter, 2002). From this 1909 drawing we can recognise that the urban forms that Geddes illustrated were part of a region of settlements. Geddes decentres the singular form of the city to show its relation to other land types and settlements – later claiming that the city was the product of the region: "It take the whole region to make the city" (Geddes, 1904). Reading horizontally across a contemporary valley section can reveal associations between different forms of land, the impact of rising sea levels, intensifications of agriculture, and rapidly urbanizing territories. This perspective exposes the reciprocity of landscapes (see Hutton, 2013), as materials are quarried from the uplands to pave the streets of urban centres, as food is grown in the plains to feed populations across the region, and as surplus realised outside the city is invested in the construction of landmark structures within. Correspondingly, knowledge and technologies produced in businesses

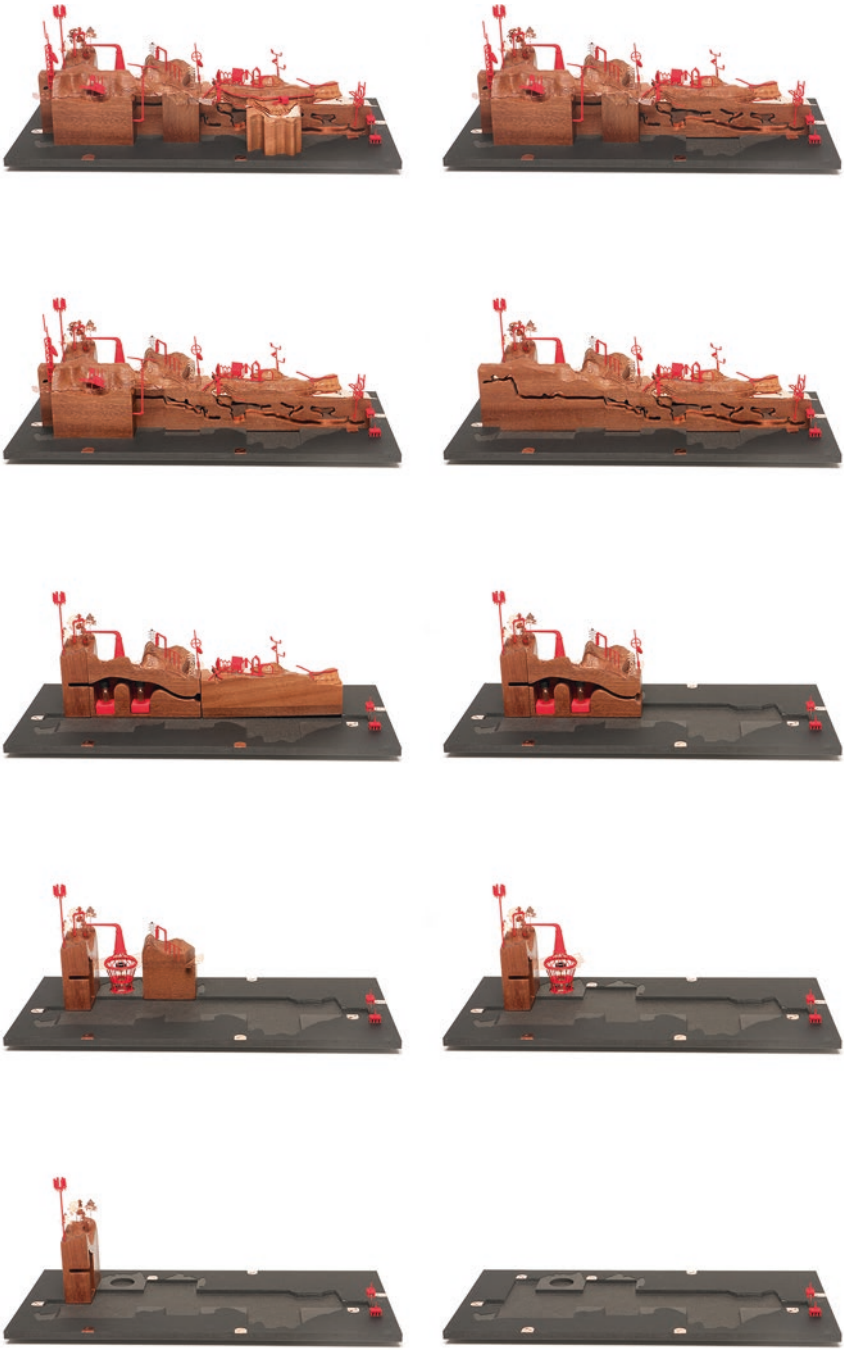


Fig. 3.3 Construction of sectional model exploring the making and remaking of the valley. (Credit: *Valley Project* Model 1, 2019, by Ed Wall & Emma Colthurst | Project Studio)

Fig. 3.4 Early *Valley Project* explorations investigated material and labour relations of making whisky in the Scottish Highlands. (Credit: *Valley Project* Model 1, 2019, by Ed Wall & Emma Colthurst | Project Studio)

and institutions located in cites are employed in the development of new agricultural systems, larger machines of extractions, and advanced processing facilities.

Reading associations across the valley section also raises questions of the regional dimension that Geddes focuses on: What is outside of the region and what are the relations that intersect its boundaries– commercial partnerships, trade relations, migrant journeys, colonial expansions, and national conflicts? What are the less contiguous relations of land that connect the valley region to islands, cities, or continents far away? What is the relevance of the scale of the region when planning cities, building projects, and designing landscapes? In describing Geddes' approach, Welter highlights that the measures of the valley section, in particular the region, were the basis for understanding planetary relations: "The region-city was the basic building block of the entire world and the universe beyond" (Welter, 2003: 106). Through revisiting the valley section we can explore the networks, associations and interrelations that constitute such landscapes – not just landscapes under the lens of

contemporary globalisation, but the historic landscapes of cities and nation states centuries before Geddes conceived of the valley section.

> A study of a land mass in this way makes many things vivid to us; such as the range of its climate; its corresponding vegetation and its accompanying animal life. In this study we can recognise not only snows on the mountains, but also their neolithic nature and their structure as well. (Geddes, 1923)

People travel for trade, explore new places, and migrate across continents – and other animal species, beings and more than human processes also define these planetary landscapes. Weather patterns, bird migrations, geological movements and interactions across the universe are fundamental processes of landscapes that are not bound by regional frameworks. To design cities is to consider their multiple landscapes – the sites from where materials where extracted, the energy required and pollution caused in their construction, and the changes caused by new architectural forms that reach beyond projects sites or regional envelopes. As measures of ecological footprint can indicate the impacts of designed places, we need to recognise the wide complexes of social, material, and ecological relations that inform and are transformed as new landscapes are produced.

Over the last century we can recognise the emergence of new landscape forms as well as the advancement of long-established spatial types. Technological inventions have facilitated taller buildings, sprawling urbanization, faster transportation networks, and more intensive agricultural productions. They have also created new landscapes of windfarms, space stations, and call centres. The destructive side of human technologies produce polluted lands, fortified borders, and war damaged cities at scales never imagined when Geddes conceived of the valley section. Expansive agriculture and mineral extraction that has provided for massive urban growth has necessitated both the appropriation of lands from Indigenous peoples as well as the comprehensive exploitation of their resources. Critiquing the valley section in contemporary contexts requires that these other physical landscapes, practices, and tools of work are represented and questioned. From the clearances of the Scottish Highlands to the colonisation of expanses of North America and from the Brazilian Amazon to Australia's mining operations, the work of many landscapes is bound up with practices of appropriation and exploitation. For architectural design to contribute to attempts to address climate change, urban inequity, or racial injustice, new ways of thinking through projects, alternative ways of producing architectures, and critiques of the contradictions within architecture are required. Through making landscapes visible in valley section drawings exposes relations with the land that may otherwise be obscured, they establish critical frameworks for rethinking operations, and they provide a basis for imagining other futures.

Although Geddes' valley sections followed the trajectory of a river, his early diagrams equally divide the valley region into different land types. This emphasis on types of land ignores landscape processes, informed or not by human practices. Whether oil pipelines or river deltas, air pollution or storm seasons the ways that landscapes move, transform, grow, and decay are fundamental to the production of the landscape types and forms through work. To enquire of the relational processes

of these landscapes provides opportunities to investigate their frequently obscured productions that are facilitated through entanglements of human actions – such as state policies, commercial transactions, environmental improvements, territorial occupations, and warfare – with non-human processes. Such analysis opens up questions of how the distinct landscape types impact each other as they are worked for mineral resources, timber products, and agricultural goods. How rising sea levels intersect with formerly industrial waterfronts that are planned for redevelopment raise questions that extend beyond relations of work and place. How architectural and infrastructural proposals that manage stormwater benefit or displace existing communities, how polluted lands are remediated after corporations sell up, or how global investments in cities exacerbate climate concerns are landscapes that could be made more explicit in contemporary conceptions of the valley section. The uneven productions of such places, contextualised in specific geographies, are more representative of the contrasting distribution of resources and designations of land-uses as well as the imbalances of power that work these landscapes. Redrawing the valley section to more clearly represent these relations would provide a basis from which such relations with the land could be questioned.

3.3 Other Practices

Types of physical landscapes have changed and expanded as have contemporary practices of work, opening up challenges to the occupations set out in early valley section drawings. What Geddes termed 'natural occupations' reflect his interest in Enlightenment theory that describe social evolution through four stages, from hunting to pastoral, to agriculture, and finally to commerce (see Welter, 2003). However, in reading his lecture at the New School of Social Research in New York City in 1923 (see Tyrwhitt 1949), and in his 1925 illustration of the valley section, we can understand Geddes' own struggles with the limited nature of these definitions. In the latter 1925 valley section the work of mining, hunting, forestry, farming and fishing is multiplied into many more occupations – as well as places of work – than Geddes had considered in earlier drawings. While there is a need of further critique to Geddes' notion of 'natural occupations', I focus here on the changes to work practices in contemporary worlds and revealing practices that Geddes excluded. The evolution from driving carriages, to Black Cabs, to Ubers are associations between contemporary and historic forms of work that can be clearly made. However, many work practices that provide and make goods for a global population involve additional labour less evident in landscapes. How can we make visible practices of processing, packaging, transporting, and selling goods within the valley section? Furthermore, in the context of considering the design of cities and landscapes, where are the architects, landscape architects, and urban designers? What is their role? What tools do they employ? If we are to consider the design of spaces across the city region we can understand that practices of architectural design impact all land types: therefore, can the valley section provide a useful lens from which

designers can reflect on their roles in rewilding forests, mineral extraction, urban agriculture, or suburban sprawl?

Considering the design of cities for the twenty-first century we should enquire further what practices of work are missing from the valley section. Where is domestic labour within the triad of place, folk and work? Where is the work of national defence and military conflict? Where are cultural, leisure and tourist industries? Where are the less productive practices of vacations, the work of play, the activities of retirement, and the pauses in work due to industrial action or incarceration? Such questions open up possibilities for considering future forms of the valley section but also require a critical reflection on the oversimplification of Geddes diagram. In Geddes' expansive writing, the complexity of the region, less evident in the valley section, can be read. While the valley sections of Geddes obscure less desirable settlements, practices, and people that are essential to the production of the regional landscape – as the scenographic landscape paintings and design practices that were developed in fifteenth and sixteenth century Europe also do – this is not representative of Geddes' approach. Describing Geddes' curation of the Edinburgh Room at the great Town Planning Exhibition of 1910, Sir Patrick Abercrombie writes: "It was a torture chamber to all those simple souls, who had been ravished by the glorious perspectives or heartened by the healthy villages shown in other and ampler galleries […] There was something more in town planning than met the eye!" (1949:xii). Is it therefore possible through a critique and update of the valley section to represent the complexities of the region as envisioned by Geddes? The situated approach of the Valley Project (See Figs. 3.1, 3.3, 3.4) highlights the potential of testing the simplicity of the model within more intricate realities of places. By using practices specific to particular places as the lens through which to focus, the abstraction of Geddes model can be tested for the contemporary worlds that we construct. Geddes explains: "From an understanding of our regions and our cities, we cannot but come to vitalising and evolving them in place, work and people; and with in every case their own people creating the best from their own place." (1949:xxviii)

A focus on traditions of paid labour also deny the productive capacities of housework and volunteering or the continued presence of modern slavery. While Geddes' writing recognises the different practices that men, women, and children have historically undertaken across the region the roles of the valley section highlight paid labour, traditionally undertaken by men. In so doing, the valley section ignores less visible structures of power, whether within domestic homes or in places of work, where social structures, political systems, land ownerships, and employment contracts reinforce hierarchies that benefit some people more than others. Furthermore, the forms and construction of the valley region cannot deny the contributions of non-human agents – the beings, objects and systems across forests, wetlands, and oceans that make worlds inhabitable. The prioritisation of paid work in Geddes concept and in contemporary thinking ignores resources produced by other people and other beings – contributions essential to functioning of farming, fishing, forestry and mining in Geddes drawings. Critiquing the term 'natural capital' the political theorist Alyssa Battistoni aims to address such concerns through claiming a 'hybrid labor' that 'understands the "work of nature" as a collective, distributed

undertaking of humans and nonhumans acting to reproduce, regenerate, and renew a common world' (2017:6). As if a warning not to accept the region merely through abstractions of land types as resource to be exploited or protected (or excluded from such representations as the valley section), Battistoni writes:

> The concept of hybrid labor articulates a view of nature that neither reduces it to a set of objects to be instrumentally used by humans nor arbitrarily declares elements of it to be inviolable. (2017:25)

Advancements in technologies, new tools and devices, have contributed to many of the transformations in work practices that we can observe. Digital technologies that have come to dominate contemporary work may be some of the most significant advances in 'tools' of work over the last few decades. Whether the focus of work is architecture or medicine, computers and digital hardware – along with the software, applications, robots, and infrastructural networks – mediate the way that we design buildings or prescribe medicines. Reflecting on Geddes natural occupations, digital technologies enable farmers to more accurately predict weather patterns and to remotely track their grazing cattle. Larger machines that are reliant on satellite communications and remote sensors have also facilitated expanded operations of mining companies and fishing fleets. The combination of new forms of work with advancing and shrinking technologies makes working remotely increasingly easy. Through global networks of wireless Internet access the places from which work is undertaken have for many people changed. Corporate offices, design studios, universities, and many industries have embraced different ways of allowing employees to work remotely. Such changes transform relations of the valley section, breaking many associations between types of landscape and practices of work. These breaks are compounded by advances in automation, remote working that may not have been possible in traditional agricultural practices is now made possible – huge megafarms reduce the presence of farmers by embracing robots (and assisted robots) in practices of feeding, milking, cleaning, and slaughtering. In these contexts, should we ask whether the associations that Geddes' makes across the valley section – relations between land types and work practices – are still relevant?

3.4 All Things

The absence of certain practices of work reveal the omission of many people from the valley section. While Geddes only included figures in some of his renditions of the valley section, the 'folk' he did include were all men and the annotated practices were those that tend to exclude women. Domestic workers – whether women, minorities, or migrants – cleaners, carers, and maintenance workers are also excluded. The valley section becomes a problematic framework when it reinforces the assumption that such practices of work are not essential, productive, or of value to the existence of the region of which it describes. Where are the migrant workers essential to informal practices? Where are the unemployed people whose work is

replaced by new technologies? Where are the frequently criminalised sex-workers? Furthermore, while recognising that there are many occupations missing from the valley section diagrams there is also a need to acknowledge populations rendered invisible through exclusion and displacement from land. Many of the Scottish landscapes that Geddes represented in the valley section had been forcibly cleared of people to make way for sheep farming with communities left to resettle by the coast. Across the world, the violence directed towards environmental activists, Indigenous communities, and working-class populations to make way for mining, agriculture, or urban redevelopment cannot be completely obscured by the abstraction of the valley section diagrams. While recognising people excluded from the valley section we must also locate the landowners, business leaders, and politicians who make many of the decisions that inform the forms, conditions, and lives. The occupations included by Geddes and those described above exist in relation to plans made by individuals and corporations who own land, factories, and neighbourhoods. Whether they reside within the region or not it is important to recognise the power that private and political interests have over the landscapes of the valley section. As architectural designers working between powerful clients, stakeholders, and publics – some with less capacity to make change – the ability to inform decisions that can make cities more accessible and environments more just is important. How cities are designed, what is produced, and how they are represented in architectural renders should be consistent concerns for architects, landscape architects and urban designers.

To question the inclusivity of the valley section should also be to challenge its anthropocentric nature and to recognise the contribution of non-humans to the ecosystem of the region. Whether it is the wetlands that sequester carbon from the atmosphere or the apex species that maintain biodiversity in ecosystems, there are many beings, objects and processes that contribute to the construction of the valley section. It is not merely humans that 'work' the valley section. Battistoni writes:

> I believe that consciously and reflexively regarding nonhuman activity in terms of labor can help us critically analyze emerging forms of economic and political organization, understand more-than-human relations, and envision possible futures as we continuously remake our habitable world. (2017:25)

From small pollinating insects to larger mammals the significant productive capacity of animals in all landscapes need to be recognised if landscape relations are to be effectively considered. As we question the agents of the valley section we can also recognise the collective agency of constructed objects and landscapes themselves. From buildings and bridges to coastlines, the role of living and inanimate objects in being part of relational landscapes needs to be recognised. In so doing, the significance of entities of land-ownership, corporate structures, and government policy that have led to fundamental changes in land relations can be more effectively understood. Should there be additional dimensions or overlays to the valley section that make evident these otherwise invisible influences? (Fig. 3.5).

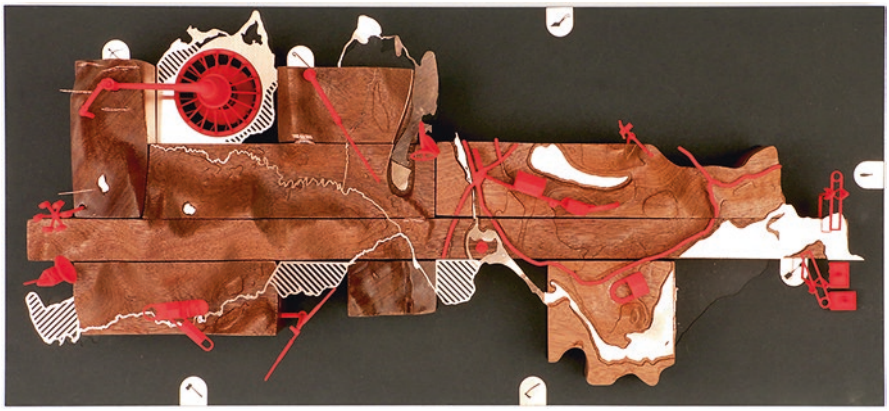


Fig. 3.5 The valley section provides a framework to investigate how lives and landscapes are considered as places are planned, designed, and transformed. (Credit: *Valley Project* Model 1, 2019, by Ed Wall & Emma Colthurst | Project Studio)

3.5 Processes

As I unpack the valley section in this essay I highlight other ways of reading the drawings, ways of reordering them, and many land types, practices of work, and people who could be more represented. In some ways, I bring Geddes' broad and complex considerations of place, work, and folk to bear on the valley section – but for contemporary landscapes and future forms of urbanization. As Alison and Peter Smithson attempted to do for units of housing (see Welter, 2003), I aim to further the notion of the valley section as a means for understanding contemporary and future relations of landscapes. There are three conclusions I draw from this essay.

Firstly, I conclude that the valley section is an open framework for testing site-specific landscape relations – between people, what they do, and the worlds around them. The simplicity of Geddes' drawings should not obscure the potential usefulness of such a relational framework, even one that can at times feel crude, hierarchical, and outdated. Bringing a model of the valley section to bear on contemporary places or future plans provides a means to critically reflect on what and who is included or left out and the relations of power that produce them. Secondly, the valley section is a landscape model rather than a city-type, with the lateral relations across the valley section being important perspectives for understanding urbanization in ways that do not prioritise and objectify urban forms of cities. Welter describes Geddes' argument for the historical formation of the city by the coast: "This large metropolis is the one settlement which is not matched with one particular natural occupation. Ultimately, the large city was created by the united efforts of all the other natural occupations and smaller settlements." (2003:91). I argue, however, that all elements of the valley section inform each other dialogically. While Geddes, in other research, constructs hierarchies that elevate the significance of larger cities and the importance of the city core, I propose reading the settlements in

the 1909 valley section drawing as more representative of contemporary landscapes, urbanization, and urban networks. The agency of human and more than human entities across the landscape inform the production of different settlements – and these places inform the cultures and practices lived. The final conclusion is that there will always be spatial forms, practices of work, and people that are less evident in landscapes and it is necessary to draw them into discourse in order to recognise what is at stake as places are redesigned. The valley section is a useful device for investigating post-landscapes – other landscapes that can challenge prevailing visually oriented relations with the land. Finding new ways to employ the relational conception of the valley section in redesigning landscapes and cities is essential if we are to understand the role of design and the impact of design proposals on all landscapes.

References

Battistoni, A. (2017). Bringing in the work of nature: From natural capital to hybrid labor. *Political Theory, 45*(1), 5–31.

Bender, B. (1993). *Landscape: Politics and perspectives*. Berg.

Geddes, P. (1888). *The rise and aims of modern botany*. University College Dundee.

Geddes, P. (1904). Civics: As applied sociology, part I. *Sociological Papers, 1904*, 105.

Geddes, Patrick. (1905). Valley plan of civilization.

Geddes, Patrick. (1909). Valley section drawing.

Geddes, P. (1923). Lecture at New School of Social Research in New York City. In J. Tyrwhitt (Ed.), *Introduction [to cities in evolution]*. Williams and Norgate. (1949).

Geddes, Patrick. (1925). Valley section drawing.

Geddes, P. (1949). *Cities in evolution*. Williams and Norgate.

Hutton, J. (2013). Reciprocal landscapes: Material portraits in New York City and elsewhere. *Journal of Landscape Architecture, 8*(1), 40–47.

Tyrwhitt, J. (1949). Introduction. In P. Geddes (Ed.), *Cities in evolution* (pp. vii–ix). London: Williams & Norgate.

Wall, E. (2011). Post landscapes. In *Landscape and critical agency symposium*. UCL The Bartlett.

Wall, E. (2017). Post-landscape. In E. Wall & T. Waterman (Eds.), *Landscape and agency*. Routledge.

Wall, E. (2015). The valley section lecture. In *Metropolitan Food Patterns International Workshop*. Politecnico di Milano. 9 July 2015. Milan.

Wall, E. (2020). Les paysagistes: Expanding, producing, contested fields of landscape. In E. Wall (Ed.), *2020. Architectural design: The landscapists*. Wiley.

Welter, V. M. (2002). *Biopolis: Patrick Geddes and the city of life*. MIT.

Welter, M. V. (2003). Five annotations. In *CIAM team 10-the English context* (pp. 87–110). Technische Universiteit.

Welter, V. M. (2014). The valley region: From figure of thought to figure on the ground. In *New geographies, 06*. Harvard University Press.

Chapter 4
Urban Design in the Anthropocene

D. G. Shane

4.1 Introduction

50 years ago Jim Hansen, the distinguished Earth Scientist, began warning of the dangers of the Anthropocene, as he recorded that the heat produced by human energy consumption had started to reshape the climate of the planet. He warned of spectacular sea level rise, much hotter poles, massive ice melts, the expansion of desert climates and giant storms capable of hurtling huge boulders through the air. His maps showed all the major river deltas, with enormous populations and great historic cultural importance, going 5 m under water. Alexandria on the Nile delta, Amsterdam on the Rhine, Kalkota on the Ganges, Shanghai on Yangtze, not to mention Venice on the Po would all disappear (Hansen, 2016). His solutions were controversial, cap and trade schemes for carbon use, including nuclear as a clean energy source with solar, wind and hydro power, all necessary for the clear goal of carbon emission reduction (Kolbert, 2009).

Hansen was equally clear who was to blame for this ecological catastrophe. He spotlighted government inaction and the big energy companies that supplied the fuel that produced the heat that was forcing the climate. In global terms solar, wind and hydro power make up less than 5% of most country's energy budget (Grübler & Wilson, 2013). Oil and gas predominate in most rich, modern economies, much supplied by petro-states like Saudi Arabia and Russia. Coal was still king in the poorer countries including India and China. The American Union of Concerned Scientists has detailed the oil majors' profits from this global forcing and the ecological costs of their business model laying the basis for a court case (AUCS, 2019; Ekwurzel et al. 2017).

D. G. Shane (✉)
Urban Design Program, Columbia GSAPP, New York, NY, USA
e-mail: dgs6@columbia.edu

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_4

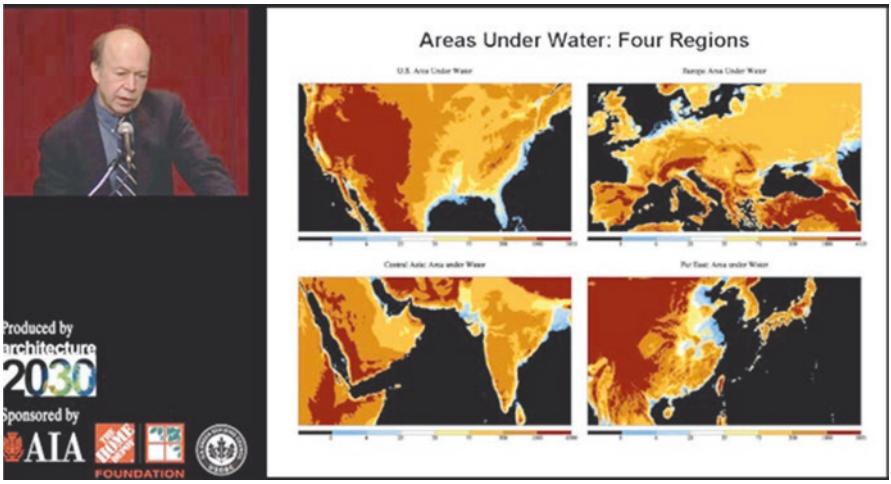


Fig. 4.1 Screen shot: James Hansen modelling 5 m water rise impact 2010. Copyright: Public domain, screen shot from Architecture 2030 website

As weather modelling has got better (Fry, 2019) the possibility has grown of applying similar complex mathematical techniques to other indeterminate and uncertain human habitats. This has appealed to students of the city who regard urbanization as a science in the tradition of the French Polytechnic School, with its rational models like Ildelphonso Cerda, the planner of Barcelona (Puig, 1996; Batty, 2017). Contemporary ecologists have refined these arguments into the concepts of energy balance sheets, seeking an equilibrium of minimal impacts, modelling urban metabolic systems (Odum, 1971; Giradet & Seymour, 1987) and calculating energy footprints for urban designers working between city planning and architectural scales (Wackernagel & Rees, 1996) (Fig. 4.1).

4.2 Three Environmental Modeling Traditions; A Survey

This paper presumes a familiarity with the basic urban elements the enclave, armature and heterotopia (Shane, 2005, 2011) and three basic urban models as summarized by Kevin Lynch in Good Urban Form (1981) and many other designers, historians and theorists like Spiro Kostof (1986) or Choay (1997).

4.2.1 Model 1. The City of Faith: Enclave Patch Forms and Systems

The enclave encloses an especially privileged space at the center of a hierarchy of positions around the primary, symbolic, central power, described mathematically by Central Place Theory (Fischer, 2011). The “stasis” of the Forbidden City seen as a

power center inside Beijing exemplified for Lynch (1981) the "City of Faith" with its attendant hierarchical network of control; gates, walls, streets, lanes, courtyards and axes. Religious and military actors dominated such Feudal systems that enslaved the majority of the population as serfs or peasants, like cattle, tied to the manor or plantation houses working the estate land. In this model the metropolis or "mother city" spawned a hierarchical network of smaller cities, towns, villages and hamlets, a common Feudal agricultural-urban model born of the agricultural revolution.

This system can be found in Africa on the Nile, in the Middle East river valleys, in the great Asian river valleys, in Latin America and European river valley cultures prompting the Valley Section, transect analysis of Patrick Geddes in Cities in Evolution (1915). The geographer Terry McGee (1971, 2009); McGee et al., (2007) rediscovered this system in Asia in the 1970's, naming it the Desakota, "village-city" in Indonesian. This rural-urban relationship shifted after the spread of the bubonic plague of the Black Death shattered the dominant global trade between India and China, allowing European nations to gain a global foothold (Abu-Lughod, 1991; Pomata, 2005; Wright, 2020). With the rise of the European city states their artisans and merchants gained their freedom, developing the industrial logic of the Lynch's second model, the City Machine. Ebenezer Howard's (1898) plan for the Garden City with new towns beyond a green belt exemplified the resultant rur-urban metropolitan hybrid with its rings and radial growth. This model was later applied at an enormous scale in Moscow (1935), in Abercrombie's London Plan (1944) and in Beijing in the 1950's creating enormous metropolitan, regional city territories based on coal and steel energy ecologies (Hobsbaum, 1970; Mumford, 1938) (Fig. 4.2).

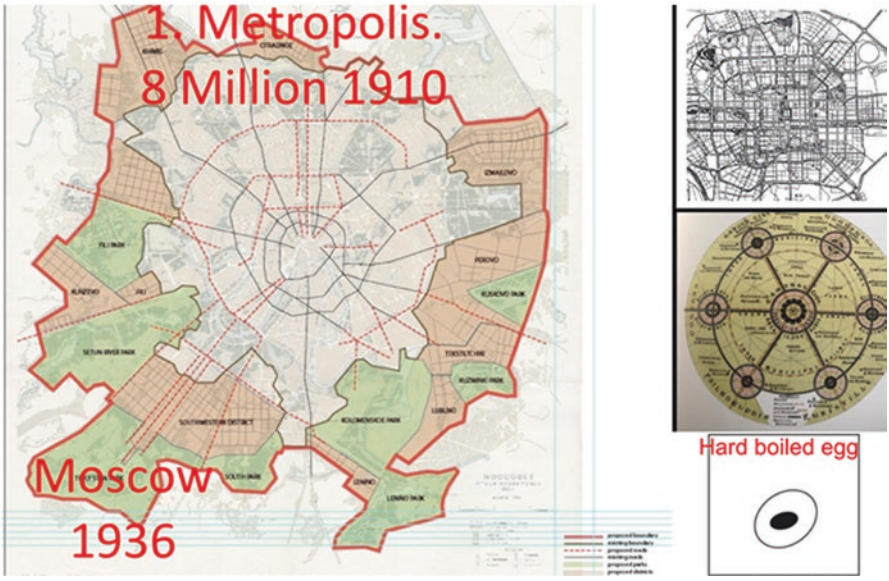


Fig. 4.2 The Metropolis showing the ring- radial, fractal pattern of Beijing, Howard's Garden City and the 1936 Moscow plan, copyright D.G. Shane other items public domain, educational use

4.2.2 Model 2. The City Machine, Armatures and Systems

The second urban element the armature has a binary, linear structure between two poles of attraction in contrast to the mono-centric closure of the enclave system. Armatures manage flows both material and immaterial (like information) forming a linear sorting device; sending airplane passengers to their flight, gate, row and seat, tracking planes on land and in the air. Urban armature systems, like tree structures, are hierarchical and multi-scalar, forming city alleys, streets, boulevards, highways, railways etc., often accelerating the speed of flows. In Lynch's City Machine armatures, besides being stretched to extend the city territory as in railway corridors of development, could also be compressed and stacked vertically; in ancient market bazaars or modern shopping malls serviced by escalators. Vertical armatures, like elevators could also compress the center city center in high density skyscraper clusters or Central Business District (CBD) enclaves. This version of the metropolitan model was visually represented for modern architects by the New York City skyline of 1910 (population eight million), later placed the center of the Regional Plan Association plan of 1929 for an expanded city territory.

Geddes (1915) developed this systemic armature logic arguing that cities and their cultures occupied evolutionary and ecological patches in the landscape topography of his "Valley Section" transect, forming specialized economic and political urban niches as humanity evolved over time (Holling & Orians, 1971; Corboz, 1983). Each city phase and form involved a city model, leading in Geddes' view to a cultured city and higher knowledge in a unifying "Civic Crown"(Welter, 2003). Jean Gottman in Megalopolis (1961) developed this Machine City logic further seeing the whole East Coast, Bos-Wash corridor as a 400 mile long urban armature and ecological transect hosting 32 million people (now 52 million) based on oil and automobiles. Gottmann mapped water and food supplies, the advance of suburbanization and informational flows on telephone, telegraph, television. European architects and theorists were fascinated by this new, widely distributed city territory (Banham, 1971; Venturi et al., 1972; Corboz, 1992). Gottmann & Harper 's later work (1990) extended this analysis to Europe and East Asia, where the Tokyo-Osaka corridor (32 million) with its high-speed trains and Transport Oriented nodes of development (T.O.D) provided an alternative to the American original (Newman & Kenworthy, 1989) (Fig. 4.3).

4.2.3 Model 3. The Fragmented Metropolis, Heterotopias and Systems

The new scale of the ecology of the American Megalopolis, besides depending on big oil, also depended on the mass migration of agricultural worker-peasants to cities to provide labor. American industrial cities drew their labor first from Europe, but during the Second World War brought five million descendants of

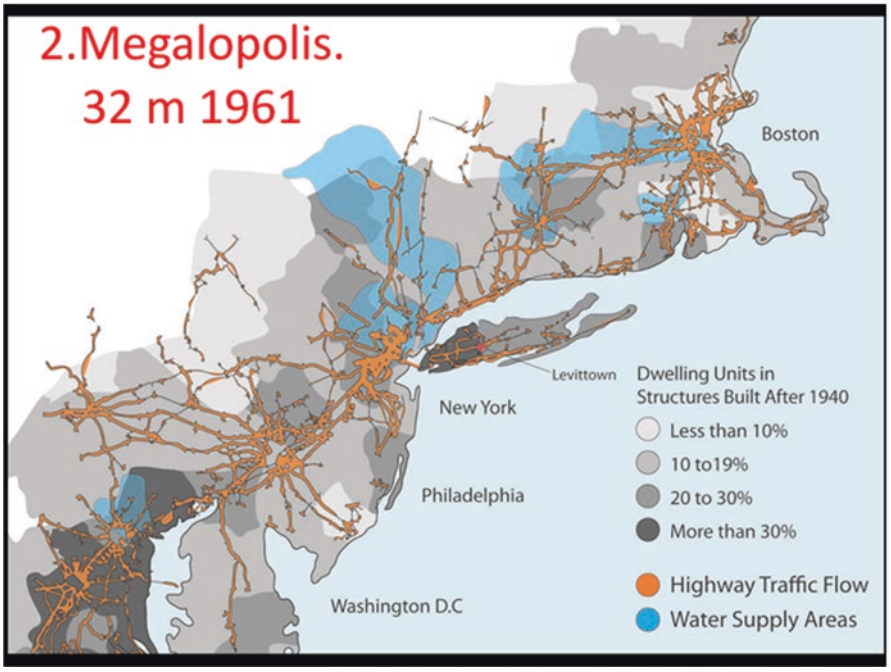


Fig. 4.3 Caption: The American East Coast Megalopolis redrawn based on Gottmann's 1961 maps. Copyright: D G Shane and Y Wegman

African-American ex-slaves north in the Second Great Migration (Lemann, 1991). After the war 45 million, mostly white Americans (the population of France at the time) moved to the suburbs in 15 years, leaving the new arrivals trapped in the "Rust Belt" of Detroit, Baltimore, Chicago, Pittsburg, even industrial New York (which almost went bankrupt in 1976). It was in this period of American urban riots and European student unrest that Michel Foucault (1967) hypothesized the contradictory and ambiguous urban element of the heterotopia, borrowing a medical term.

Here two cells normally inimical to each other cooperated to mutual advantage, creating an "other" space (Sohn, 2008). Within this complex feedback system a dynamic second order of cybernetic modeling and modernism reflected on the stability of the first, as Banham proposed in his *Theory of Design in the First Machine Age* (1960). In the inner city Jane Jacobs (1961) described the heterogenous life of the West Village neighborhood, as a small urban patch fighting Robert Moses' highway plans. In Boston Lynch (1960) created a visual code to map neighborhoods and paths (enclaves and armatures), as well as heterotopic "nodes" connecting them. In this period McHarg (1970) tried to guide suburban development into fragmentary patches, Holling & Orians, (1971) described a fragmented "Urban ecology" and Forman (1979) began to analyze how such patches formed "landscape mosaics" (Forman & Godron, 1986; Forman, 1995). This incremental and layered ecological approach emerged in Urban Design as Contextualism (Schumacher, 1971; Shane,

Fig. 4.4 Contextualism and Collage City, the emergence of urban fragmentation and patch dynamics in Urban Design in 1970's. Copyright: Multiple. London drawings DGShane, Roma Iterrotta SK Peterson

1972, 1976), Collage City (Rowe & Koetter, 1975, 1978), the Analogical City (Rossi, 1976), the Archipelago City (Ungers & Koolhaas, 1977), Roma Interrotta (Rowe et alia 1978) and Delirious New York (Koolhaas, 1978). In the absence of a New York City Masterplan since 1968 urban designers used Special Zoning Districts (the predecessors of Special Economic Zones (SEZ)) to encourage local development enclaves with zoning and tax incentives, as at Battery Park City (1978) (Barnett, 1982; Shane, 2005).

Lynch (1981) hoped for third, more fuzzy approach layering ecological systems, feedbacks and patches in the Ecocity, closer to McHarg (1970), Alexander (1977) and Holling & Gunderson (2002). Soja came close to describing this ecology of systemic fragmentation in Post-modern Geography (1989) and Post-Metropolis (2000), as well as in The Third Space (1996). Harvey (1990) ascribed this pattern to the larger Post-modern condition of global investment in real estate that reconstructed the industrial waterfront of Baltimore as a shopping mall. The Baltimore Ecological Study (1998–2020) described the patch mosaics of the ruined city as a scientific project along with its suburban landscapes but never quite captured the devastated urban life forms of the fragmented metropolis and its shifting, weather-like dynamics (Fig. 4.4).

4.3 Evaluation the 3 Models; Emerging Mega/Meta City Models and Systems

While Jacobs (1961) studied the micro urbanism of the street ballet in an urban village, the Metabolist Group of architects around Kenzo Tange imagined the megalopolis as an energetic metabolism. This vision produced huge, novel, mixed use megastructures around the time of the 1964 Tokyo Olympics, as their teacher projected a mega grid new town extension across Tokyo Bay (Shane, 2011). In the 1990's and early 2000's the UN adapted Janice Perlman's (1976) term "Megacity" to describe cities of over ten million, progressively raising this figure upwards (UN, 2007, 2014), while Satterthwaite (2000). argued that only 8% of global population would live in megacities, most would live in much smaller cities (3–4million) networks. Perlman applied the term to Rio, a city that was 60% favelas. The Dutch group MVRDV (2000) compressed the enormous amount of UN megacity data into a giant data cube, a "Metacity" of information. Foucault (1967) had foreseen this spatial and digital turn, as heterotopias, the third urban element, became fast changing informational displays. These spaces, "sites" whose relationships were constantly shifting as a result of information exchanges anticipated the internet (Soja, 1989; Shane, 2005; Pasquinelli, 2014). These "heterotopias of illusion" marked the Metacity arrival; expos, exhibition halls, museums, stock markets, cinemas, theaters, sports stadia, leisure and pleasure facilities along with associated infrastructures (Shane, 2005, 2008; Shane & McGrath, (2012); Simpson, 2019; Xue, 2019).

The Metacity model is extracted from big data, through statistics and sensors, as information that appeared first on giant computers, then on networked computers (Castells, 1989), then on desktop machines (Graham & Marvin, 2001), then on laptops and now on mobile, handheld devices (Shane 2005). These devices became the Metacity's way finding tools for train time tables, booking facilities for travel, hotel, entertainment, food, banking, digital payments, social media, digital communities, creating a new city territory (Benkler, 2006; Serres, 2013, 2014; Eldon, 2013; Shane, 2014). The Metacity implied an augmented reality (Carta, 2019), it became a meta-object, a quasi-object easily monitored by the state (Greenwald, 2015) and commercial interests (Pasquinelli, 2009, 2018). This information proved useful to medical authorities in SARS (2003) and COVID (2019) who derived micro-urban, biopower algorithms from big data that were essential to local attempts to control disease, tracking the population's health and mobility (Foucault, 1975a, b; Eldon, 2016; Hessler, 2020a, b).

The advantage of the Metacity is that it can include the previous models of cities hypothesized by Lynch and the Megacity model as information extracted from the history and theory of urban development. All become data models of urban metabolisms including Hansen's planetary models of urban climate impacts. The shift to Second order computing in the Fragmented Metropolis, in which the image of the city (Lynch) was detached from the city metabolism, meant that with increased computing power ever more data sets and uncertainty could be incorporated. This added layer upon layer of complexity, developing algorithms to search for fractal

patterns and refine the feedback and response patterns of logistical and other services that could be automated in the dream of the "Smart City" dependent of mechanical sensors (Greenfield, 2013). In such informational systems the actual urban code, whether ancient, modern or post-modern, became a secondary consideration, but with large consequences for urban form and life (Pickett et al., 2013).

In this situation Landscape Urbanists (Waldheim, 2006) brought Landscape Ecology, with its footprints, together with Landscape Design in a discussion of urban form that could encompass both the distributed urban form of the rur-urban desakota and the concentrated form of the historical city, even the CBD. The multiscalar approach of Jim Corner of Field Operations could range from planetary sourcing of raw materials and food, through fragmented, strategic urban interventions, to performative urbanism, locally customized small scale interventions contextualized to place. This approach included the meta, informational systems and an awareness of the press and media presence of a project in the mediascape, image of the city. This necessitated the construction of heterotopias of illusion, narratives and dreams, to change the city (Corner, 1999). These projects often involved the reinhabitation of older structures, palimpsests with a memory, brought to a new leisure purpose, as in Freshkills Park on Staten Island (2008–), the Highline Manhattan (2009) and Domino Park in Brooklyn (2019). Field Operations Quinhai New Town project (Corner & Field Operations, 2012) demonstrated these principles at the macro-scale and speed of East Asian rapid urbanization when 350 million people moved into Chinese cities in 15 years (the population of the USA) (Shane, 2015). This case represented the shift in Chinese government thinking to accommodate and remediate the ecology as the modern project proceeded rather than later (Wu, 2010). There are other offices in China, Europe, America, Latin America designing for the Anthropocene, such as Kongjian Yu (2016) from with his "Sponge City" techniques for the absorption of water in threatened cities or West 8 from the Netherlands, below sea level, with projects world-wide (Geuze et al., 2007) (Fig. 4.5).

4.4 Conclusion: Urban Design in the Anthropocene?

The review of the urban models leading in to the Anthropocene and their ecological footprints shows that humans have always used their skills and intelligence to shape their environment for many centuries, but never at the scale of the recent urbanization. People have always made their environments locally, symbolized by domesticated gardens at the micro-scale like Japanese or Chinese Gardens, Persian gardens, modern pocket parks in Manhattan. These micro-landscapes now reside inside big data that tells a different story of energy use and planetary exploration at a new vast scale.

The anthropocentric design of the City of Faith with its ancient hierarchical empires, freed perhaps 10% of the population to live well while relying on local ecologies and massive slave labor. Labor shortages after the Black Death brought in the scientific pursuit of efficiency in the City Machine that transformed the Metropolis into the heart of global system of colonies, controlled by long lines of communication and transportation, shortened over time. A hundred years ago there

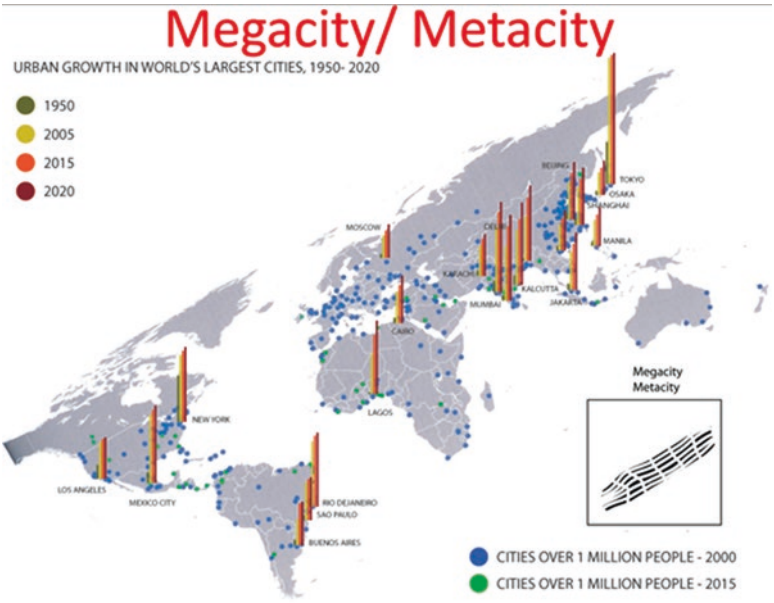


Fig. 4.5 Map of Megacities and networks of smaller cities, redrawn from UN diagram (2007). Copyright: D G Shane and Y Wegman

were a few metropolitan centers of eight million with 10% middle class of clerks and a large majority of working-class citizens, often recent urban immigrants and disenfranchised. Even then the industrial expansion created its own micro-climates of smog and pollution in local or regional patches. Since 1945 this situation has altered and the balance shifted to the point where Earth Scientists like Hansen talk of the global impacts from the Megalopolis and its fossil fuel model, now vastly amplified by the Megacity success of East Asian industrialization. This success creates a new model for a vast new global middle class beyond the American Dream, to be followed by Brazil, India and African states.

Cities and coastal states are already feeling the force of the Earth Science arguments and the only real debate is the timing and scale of the disaster. Given this situation to talk of the Anthropocene in terms of human progress gets very complicated. Clearly it is desirable to raise human populations out of poverty but also the old industrial model needs to be altered and its ecological impacts remediated (Hopkins 2014). 100-year climate events are happening far more frequently and it would seem to make sense now to incorporate planning for disaster relief, "Black Swan" events (Taleb, 2010), dyke failures, flooding and emergency relief on a scale unforeseen before, as seen in the Covid 19 response in some countries (Bratton, 2020). Climate scientists know what is needed and urban designers can build in the required resiliency and redundancies to survive climate impacts, whether by heat or storms, especially using the informational networks of the Metacity. Heterotopias with their capacity to switch codes, from medieval charity housing, to prison, military garrison or factory, to shopping mall, hotel or hostel, have a great role to play, as when expo centers were

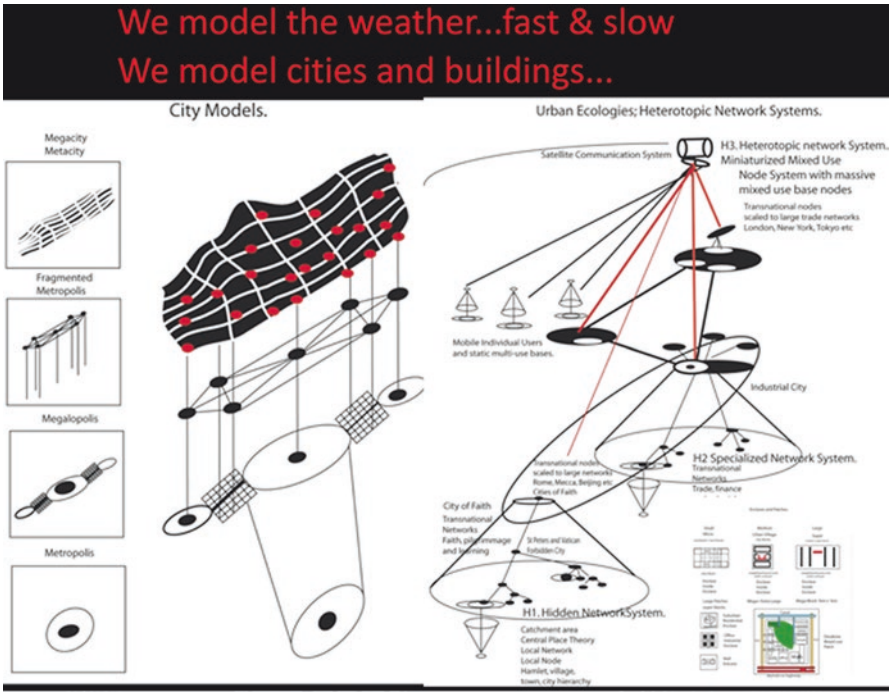


Fig. 4.6 Diagrams of layered, multi-scalar heterotopic systems and their rur-urban distribution. Copyright: D G Shane

converted to Covid hospitals around the world. Redundant spaces like CBD office towers in the future might be used to address some of the glaring inequalities of the megacity/metacity through mixed use conversions, imagined by Jacobs (2007).

While Landscape Urbanists, Urban Designers and Landscape Ecologists await the Green Revolution of solar power and intelligent, ecological housing and electric mobility devices, there is much work to be done. Asian gardens in China and Japan present miniature pictures of a perfect, harmonious world, with its mountains, forests, streams and valleys leading through lakes to the sea, watched over by scholars in their hidden studies and with pavilions for visitors, including moon gazing seats by the lake, providing a simple teaching environment for a clear Anthropocene model. The Shanghai Expo (Wu, 2010), visited by 73 million, echoed this educational theme and seemed to promise a transformation of a continent on an epic scale, a promise yet to be fulfilled. The European Union has its own epic plans, yet to be fulfilled. Landscape Ecologists and Urbanists have their role to play, yet even if the disaster strikes, it is worth remembering that the beauty of Venice, a city of streets made of water, has been an inspiration for countless simulacra: from Disney's Epcot (1981) to the Venetian in Las Vegas (1999) and now Macao (Simpson, 2019). Designing for the ecology of the Anthropocene will involve unforeseen leaps of the imagination and extraordinary juxtapositions of catastrophes, man-made environments and memories only seen so far in such strange, Metacity heterotopias of illusion (Fig. 4.6).

References

Abu-Lughod, J. (1991). *Before European hegemony: The world system A.D. 1250–1350*. Oxford University Press.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language; Towns, buildings construction*. Oxford University Press.

American Union of Concerned Scientists (AUCS). (2019). See https://blog.ucsusa.org/ken-kimmell/climate-change-lawsuits-agaCnst-fossil-fuel-companies-are-heating-up. Accessed 8 Aug 2020.

Banham, R. (1960). *Theory and design in the first machine age*. Architectural Press.

Banham, R. (1971). Los Angeles; The architecture of the 4 ecologies. Cambridge: MIT Press. And video "Reyner Banham Loves Los Angeles" at https://youtu.be/ymgOe4g7qeQ.

Barnett, J. (1982). *An introduction to urban design*. Harper Collins.

Batty, M. (2017). *The new science of cities*. MIT Press.

Benkler, Y. (2006). *The wealth of networks – How social production transforms markets and freedom*. Available online at http://www.jus.uio.no/sisu/the_wealth_of_networks.yochai_benkler/portrait.a4.pd. Accessed 18 June 2015.

Bratton, B. (2020). *18 Lessons from quarantine urbanism.* Online at https://strelkamag.com/en/article/18-lessons-from-quarantine-urbanism. Accessed 27 July 2020.

Baltimore Ecosystem Study (BES). (1998–2020). *Long term ecological research*. Online at https://baltimoreecosystemstudy.org. Accessed 8 Aug 2020.

Carta, M. (2019). *The augmented city; A paradigm shift*. List Lab.

Castells, M. (1989). *The informational city: Information technology, economic restructuring, and the urban regional process*. Blackwell.

Choay, F. (1997). *The rule and the model: On the theory of architecture and urbanism*. MIT Press.

Corboz, A. (1983). Land as Palimpsest. *Diogenes, 31*(121), 12–34.

Corboz, A. (1992). *Looking for the city in America; Down these mean streets a man must go*. Getty Foundation and Boston, David R Goldring.

Corner, J. (1999). *Recovering landscape: Essays in contemporary landscape architecture*. Princeton Architectural Press.

Corner, J., & Field Operations. (2012). *Quinhai waterfront city* at http://www.fieldoperations.net/project-details/ project/qianhai-water-city.html. Accessed June 18 2015.

Ekwurzel, B., Boneham, J., Dalton, M. W., Heede, R. J., Mera, R., Allen, M. R., & Frumhoff, P. C. (2017). The rise in global atmospheric CO2, surface temperature, and sea level from emissions traced to major carbon producers in *Climatic Change*. Cologne: Springer. Available at https://link.springer.com/article/10.1007/s10584-017-1978-0. Accessed 8 Aug 2020.

Eldon, S. (2013). *The birth of territory*. University of Chicago Press.

Eldon, S. (2016). *Foucault's last decade*. Polity Press.

Fischer, K. (2011). Central places: The theories of von Thunene, Christaller and Losch. In H. Eiselt & V. Marainov (Eds.), *Foundations of location analysis*. Online at https://www.researchgate.net/publication/321610821_Foundations_of_Location_Analysis. Accessed 8 Aug 2020

Forman, R. T. T., & Godron, M. (1986). *Landscape ecology*. Wiley. ISBN 0471870374

Forman, R. T. T. (1995). *Land mosaics: The ecology of landscapes and regions*. Cambridge University Press. ISBN 9780521479806

Forman, R. T. T. (Ed.). (1979). *Pine barrens: Ecosystem and landscape*. Academic. ISBN 9780122634505. According to WorldCat, the book is held in 562 libraries[6]

Fry, H. (2019). Looks Like Rain: How weather forecasting got so good in *The New Yorker*. New York: Conde-Nast. Available at https://www.newyorker.com/magazine/2019/07/01/why-weather-forecasting-keeps-getting-better. Accessed 20 June 2020.

Foucault, M. (1967). *Of other space; heterotopias.* Accessed 7 Apr 2017 at https://foucault.info/doc/documents/heterotopia/foucault-heterotopia-en-html.

Foucault, M. (1975a). *Discipline and punish: The birth of the prison*. Vintage Books.

Foucault, M. (1975b, 2003). *Society must be defended: Lectures at the Collège de France, 1975–1976* (D. Macey, Trans.). New York: Picador.
Geddes, P. (1915). *Cities in evolution*. Williams & Norgate.
Giradet, H., & Seymour, J. (1987). *Blueprint for a Green Planet: Your practical guide to restoring the world's environment*. Dorling Kindersley Ltd..
Gottmann, J. (1961). *Megalopolis: The urbanized North Eastern seaboard of the United States*. Twentieth Century Fund.
Gottmann, J., & Harper, R. A. (1990). *Since Megalopolis; The urban writings of Jean Gottmann*. John Hopkins University Press.
Graham, S., & Marvin, S. (2001). *Splintering urbanism networked infrastructures, technological mobilities and the urban condition*. Routledge.
Greenfield, A. (2013). *Against the smart city*. Verso.
Greenwald, G. (2015). *No place to hide: Edward Snowden, the NSA, and the U.S. surveillance State*. Metropolitan Books.
Grübler, A., & Wilson, C. (Eds.). (2013). *Energy technology innovation: Learning from historical successes and failures*. Cambridge University Press.
Geuze, A., Ibelingx, H., and West 8. (2007). Zürich Birkhauser: Mossics.
Hansen, J. (2016). *Regional climate change & national responsibilities* at https://www.youtube.com/watch?v=-mQ1fym0HfQ. See also Hansen (2020) https://csas.earth.columbia.edu. Accessed 8 Aug 2020.
Harvey, D. (1990). *The condition of postmodernity: An enquiry into the origins of cultural change*. Blackwell.
Hessler, P. (2020a). Letter from Chengdu; Life on Lockdown; Forty-five days avoiding the coronavirus in *New Yorker*, New York, Conde Nast.
Hessler, P. (2020b). How China Controlled the Coronavirus in *New Yorker*, New York, Conde Nast.
Hobsbaum, E. (1970). *Industry and Empire: From 1750 to the Present Day*. Penguin.
Holling, C. S., & Orians, G. (1971, Jun). Toward an urban ecology. *Bulletin of the Ecological Society of America*, *52*(2), 2–6. Stable URL: http://www.jstor.com/stable/20165859
Holling, C. S., & Gunderson, L. H. (2002). *Panarchy: Understanding transformations in human and natural systems*. Island Press.
Hopkins, R. (2014). *The transition handbook: From oil dependency to local resilience*. Chelsea Green.
Howard, E. (1898/2009). *Garden cities of tomorrow: A peaceful path to real reform*. London: Routledge.
Jacobs, J. (1961). *The death and life of great American cities*. Vintage.
Jacobs, J. (2007). *Dark age ahead*. Vintage.
Kolbert, E. (2009). The Climate Expert Who Delivered News No One Wanted to Hear in *The New Yorker*, New York, Conde-Nast. Available at https://www.newyorker.com/magazine/2009/06/29/the-catastrophist. Accessed 20 June 2020.
Koolhaas, R. (1978). Delirious New York. Oxford University Press, Oxford UK.
Kostof, S. (1986). *The city shaped: Urban patterns and meanings through history*. Bullfinch.
Lemann, N. (1991). *The promised land: The great black migration and how it changed America*. Vintage Press.
Lynch, K. (1960). *The image of the city*. MIT Press.
Lynch, K. (1981). *Good city form*. MIT Press.
McGee, T. (1971). *The urbanization process in the third world*. Bell and Sons.
McGee, T. G., Lin, G. C. S., Marton, A. M., Wang, M. Y. L., & Wu, J. (2007). *China's urban space: Development under market socialism*. Routledge.
McGee. (2009). *The spatiality of urbanization: The policy challenges of mega-urban and Desakota regions of Southeast Asia* (UNU-IAS working paper (161)). United Nations University Institute of Advanced Studies.
McHarg, I. (1970). *Design with nature*. American Museum of Natural History.
Mumford, L. (1938). *The culture of cities*. Harcourt.

Newman, P., & Kenworthy, J. (1989). Gasoline consumption and cities: A comparison of US cities with a global survey. *APA Journal, 55*, 23–39.
Odum, H. T. (1971). *Environment, power, and society*. Wiley-Interscience.
Pasquinelli, M. (2009). Google's PageRank algorithm: A diagram of cognitive capitalism and the rentier of the common intellect. In K. Becker & F. Stalder (Eds.), *Deep search*. Transaction Publishers.
Pasquinelli, M. (2014, Spring). The labour of abstraction: Seven transitional theses on Marxism and accelerationism. *Fillip, 19*, 107.
Pasquinelli, M. (2018). Metadata society, keyword entry. In R. Braidotti & M. Hlavajova (Eds.), *Posthuman glossary*. Bloomsbury.
Perlman, J. (1976). *The myth of marginality; Urban politics and poverty in Rio de Janeiro*. University of California Press. See also https://megacitiesproject.org/publications/research/. Accessed 8 Aug 2020
Pickett, S. T. A., Candasso, M. L., & McGrath, B. (Eds.). (2013). *Resilience in ecology and urban design: Linking theory and practice for sustainable cities*. Springer.
Pomata, G. (2005). *Historia: Empiricism and erudition in early modern Europe*. MIT Press. (co-edited with Nancy G. Siraisi).
Puig, A. S. (ed),. (1996). Cerda I: The five bases for the general theory of urbanization. .
Rossi, A. (1976). Consalascio, E., Reichlin. B., Reinhart, F. (1976) The Analogous City available at Rodighiero R *The Analogous City Map* https://www.researchgate.net/publication/280530086_The_Analogous_City_The_Map. Accessed 8 Aug 2020.
Rowe, C., & Koetter, F. (1975). Collage City in *Architectural Review*. London: Architectural Press, 178.
Rowe, C., & Koetter, F. (1978). *Collage City*. MIT Press.
Serres, M. (2013). *Nouvelles Technologies*. Accessed 25 July 2017 at https://www.youtube.com/watch?v=S-qIzalLof0
Serres, M. (2014). *Thumbelina: The culture and technology of millennials*. Rowman and Littlefield.
Satterthwaite, D. (2000). Will most people live in cities? *BMJ: British Medical Journal, 321*(7269), 1143–1145. Retrieved August 19, 2020, from www.jstor.org/stable/25226104
Schumacher, T. (1971). Contextualism: Urban ideals+ deformations in *Casabella*. Milan: Electa.
Shane, D. G. (1972). "Contextualism 1; Covent Garden", in Architectural Design, 4: 229.
Shane, D. G. (1976). "Contextualism", Architectural Design, 46 (11, Nov): 676–79.
Shane, D. G. (2005). *Recombinant urbanism; Conceptual modeling in architecture, urban design and city theory*. Wiley.
Shane, D. G. (2008). Heterotopias of illusion from Beaubourg to Bilbao and beyond. In M. Dehaene & L. De Cauter (Eds.), *Heterotopia and the city: Public space in the postcivil society* (pp. 259–272). Routledge.
Shane, D. G. (2011). *Urban design since 1945; A global perspective*. Wiley.
Shane, D. G. (2014). Metacity; Origins and implications. In A. Contin & R. Salerno (Eds.), *Innovative technologies in urban mapping*. Springer.
Shane, D. G. (2015). Chinese rapid urbanization and the metacity. In W. Ding, A. Graafland, & A. Lu (Eds.), *Cities in transition/power/environment/society* (pp. 411–437). Nai010 Publishers.
Shane, D. G., & McGrath, B. (2012). Metropolis, megalopolis and the megacity. In C. G. Crysler, S. Cairns, & H. Heynen (Eds.), *The Sage handbook of architectural theory*. Sage.
Simpson, T. (Ed.). (2019). *Tourist utopias; Offshore islands, enclave spaces, and mobile imaginaries*. Amsterdam University Press.
Sohn, H. (2008). Heterotopia: The Anamnesis of a medical term. In M. Dehaene & L. De Cauter (Eds.), *Heterotopia and the City: Public space in the postcivil society* (pp. 41–50). Routledge.
Soja, E. (1989). *Postmodern geographies: The reassertion of space in critical social theory*. Verso.
Soja, E. (1996). *Third Space; Journeys to Los Angeles and other real and imagined places*. Blackwell.
Soja, E. (2000). *Post metropolis; Critical studies of cities and regions*. Blackwell.

Taleb, N. (2010). *The black swan: The impact of the highly improbable: With a new section: On robustness and fragility*. Random House.

UN. (2007, 2014) *Megacities*. https://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html. Accessed 24 July 2020.

Ungers, M., & Koolhaas, R. (1977). *The city archipelago.* Republished in Hertwerk, F., & Marot, S. (Eds.). (2013). *The city in the city: Berlin green archipelago.* London: Lars Mueller.

Venturi, R., Scott-Brown, D., & Isenour, J. (1972). *Learning from Las Vegas*. MIT Press.

Wackernagel, M., & Rees, W. (1996). *Our ecological footprint: Reducing human impact on the earth*. New Society Publishers. ISBN 0-86571-312-X

Waldheim, C. (2006). *The landscape urbanism reader*. Princeton Architectural Press.

Welter, V. M. (2003). *Biopolis: Patrick Geddes and the city of life*. MIT Press.

Wright, L. (2020). A scholar of the plague thinks that pandemics wreak havoc- and open minds in *New Yorker,* New York, Conde Naste, at https://www.newyorker.com/magazine/2020/07/20/how-pandemics-wreak-havoc-and-open-minds. Accessed 7 July 2020.

Wu, S. Z. (2010). *How I built a new China; A talk with expo 2010 planner*. Siegfried Zhiqiang Wu. http://www.*archdaily*.com/561083/how-i-built-a-new-china-a-talk-with-expo-2010-planner-siegfried-zhiqiang-wu. Also Zhang, Y., Yan, J., & Wei, W. (2014). "How I built a new China: A talk with expo 2010 planner Siegfried Zhiqiang Wu" 24 Oct 2014 in *ArchDaily*. Accessed 18 July 2020. http://www.archdaily.com/561083/how-i-built-a-new-china-a-talk-with-expo-2010-planner-siegfried-zhiqiang-wu/.

Xue, C. Q. (Ed.). (2019). *Grand theater urbanism; Chinese cities in the 21st century*. Springer.

Yu, K. (2016). *Sponge city: Theory and practice*. Architecture & Building Press.

Chapter 5
Metropolitan Landscape Culture: Journeys Toward the Tropical Botanical City

M. A. Villalobos H.

My Botanical Garden is not so much the imperial palms,
It's a darker, edge of the jungle,
the one with thrushes, marmosets, squirrels,
Of the pigeon and of -Watch out! Eventual jararaca…
The Acaras spotted blue and black, standing in the current.

(Antonio et al., 2005, p. 35–36)

5.1 Introduction

The tropical botanical landscape where Jobim composes is ancestral, alive, and didactic; there, events and emotions are knowledge. The darker edges are temptations that go beyond material boundaries. The thrushes, marmosets, and squirrels continuously sculpt the ethereal atmosphere. There you do not feel paralyzed by nostalgia; you take enthusiastic empowering action towards the future; you write poetry, and you sign. At Jobim's garden, you don't fail; you live.

This journey emerges from a living botanical landscape like the one described by Jobim. Specifically, this story begins at the Botanical Garden of Maracaibo (JBM), Venezuela, conceived by the Brazilian landscape architect Roberto Burle Marx and the Venezuelan botanist Leandro Aristeguieta, together with José Tabacow, Haroushi Ono, and Ernesto Foldats (Fig. 5.1).

In an area of 108 ha, previously occupied by Shell International, the JBM was opened in 1983 to preserve the tropical dry forest and as the First School of Horticulture in Latin America (Fig. 5.2).

This article discusses some lessons learned during the restoration and reopening of the garden, after 20 years of closure and abandonment. This exploration reflects my Ph.D. research at the National School of Landscape Architecture of Versailles,

M. A. Villalobos H. (✉)
College of Architecture, Illinois Institute of Technology, Chicago, IL, USA
e-mail: mvillaloboshernandez@iit.edu

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_5

Fig. 5.1 Roberto Burle Marx teaching and building at Maracaibo's Botanic Garden, Fundación Jardin Botánico de Maracaibo, 1983 Approx

Fig. 5.2 20 years of abandonment and closure at Maracaibo's Botanic Garden, Maria A. Villalobos H., 2009

Fig. 5.3 Restored and reopen Maracaibo's Botanic Garden, image by Botanical City Inc, 2020. Aerial Photography, Andry Jones, 2019

and my work as a practitioner with my partner Carla Urbina and the Fundación Jardin Botánico de Maracaibo (2009–2017) (Fig. 5.3).

The article contains three sections. The first section reflects on the ancestral cultural landscape values embedded in the JBM capable of establishing relationships across scales and time and through urban components. The second section discusses the performative essence of the JBM, where scientific and artistic knowledge production co-occurs. The third part focuses on preservation as a creative process of permanent transformation that, over time, moves towards the expansion and adaptation of the immaterial pedagogical mission of the case study to the larger tropical scale. Finally, the article circles back to discuss the preservation of the JBM as transformation beyond the garden's walls.

5.2 The Tropical Botanical City Is Ancestral

> *The essential ecology of the botanical garden is urban; like the city, the programmatic capacity of the garden to intermingle and interrelate, and therefore to produce the new, including the exotic, is precisely its virtue.* (James, 2005, pp. 123–143)

A hypothetical Tropical Botanical City rooted in the lessons learned at the JBM is ancestral and global. It expresses the long evolution of urban landscape paradigms related to the botanic garden as a microcosmic synthesis of the larger context. This landscape typology, retrospectively, spans at least five centuries, from the Botanical Garden of Padova (1545) to the expansive and futuristic botanical exhibition known as the Eden Project (2000).

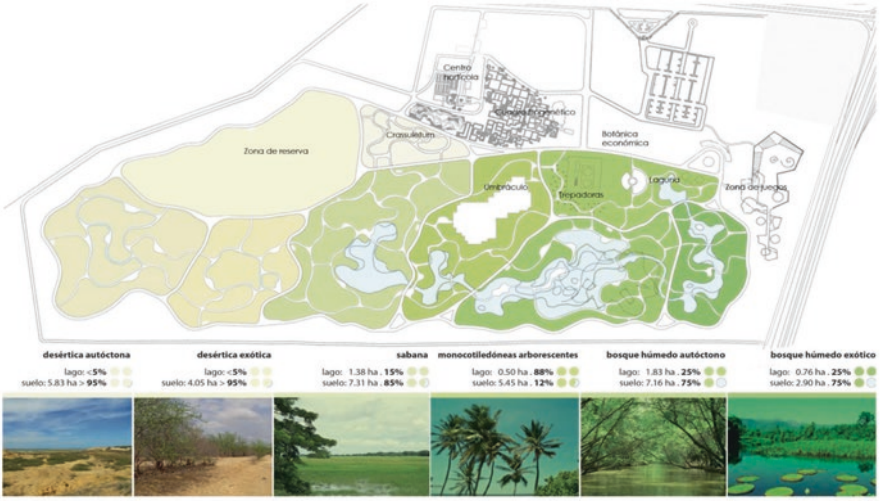


Fig. 5.4 Maracaibo's Botanic Garden morphological and biological system, Maria A. Villalobos, 2014

In Botanical Urbanism, J. Corner explains how the orthogonal urban grids remind us of the organization of the rose gardens in the botanic gardens, in general; the radial baroque botanic gardens emulate Haussmann's urban interventions, and the hierarchical tree-like compositions of the modern botanical gardens can be related to the rational urban patterns of the city modeled through zoning by modernism. The JBM belongs to this long tradition of botanic gardens where the morphological and biological structures speak about the city and its time (Fig. 5.4).

Additionally, at the JBM, the biological program relates to the phytogeographical composition of the region. Such relationships between the garden, the city and the region are expressed through three key operations.

First, the general urban grid structure of the garden reproduces the regional distribution of habitats, ranging from the driest to the wettest and displaying differentiated collections of native and exotic species capable of adapting to similar conditions. The plan becomes a microcosmic representation of the region's diverse phytogeography.

It is important to mention that while most of the botanical provinces, in the garden, have the same area, there is one of larger dimensions and special morphological and biological importance dedicated to the protection of the native tropical dry forest. This habitat is currently the most threatening in the world, as well as the most important in the face of climate change (Bullock et al., 2009).

Second, the lake and canal system form a biological armature that runs through the different botanical provinces, with structural intentions of continuity similar to those of boulevards and green belts in cities. The water system follows the natural topography and serve as a biologic connector, similar to the way water bodies (creeks, rivers, ponds, and lakes) function in a region that hosts the largest lake in

Fig. 5.5 5 de julio Av Landscape Mater Plan and University Forest, images by Botanical City Inc, 2020

Latin America: the Maracaibo Lake. The water system provides a sense of physical and botanical continuity in the garden (Fig. 5.5).

Third, the network of botanical centralities includes three types of facilities: (a) centralities for botanical education, which host exhibitions of endangered regional species (like the Orchidarium, Crassuletum, Phylogenetic Garden, etc.); (b) civic centralities for social encounters, recreation, and artistic production (like the Castillito and the Cafetín) and; (c) the vegetal monuments, which are trees of special relevance due to their size, location, and origin. All botanical centralities perform as moments in which different flows, uses, and users come together to further intensify activities and density of occupation, similarly to the way in which squares and parks work within the city (Fig. 5.5).

From this reading, garden, city and region are one living system. Initial success stories of the restoration within the garden's wall served as a catalyst for transformations in the city. In 2014, Urbina and I were hired to rethink the five kilometers of urban landscape known as "Avenida 5 de julio". The proposed plan follows the same three principals observed at the garden scale: (a) The garden's phytogeographical structure translates into an urban-learning adventure to take citizens from the most arid life zones at the highest elevation of the city through the different native forests and towards the lake; (b) The continuous water armature becomes a living support system and an experiential device to connect the native forests and urban centers (Fig. 5.6); and (c) The network of botanical centralities turned into moments where the water armatures occupy more space and function as outdoor classrooms for urban pedagogy.

Fig. 5.6 From the Botanic Garden towards the Botanical City. A Hypothetical expansion of the JBM's pedagogical mission to the 5 de julio Av, image by collage by Botanical City Inc, 2020

The "Avenida 5 de julio" Landscape Plan served as the first experimental example of how the expansion of the JBM could work. The current work continues to expand the framework to the broader region (Fig. 5.6). The JBM taught us that the restoration quest includes advocacy for the botanical and cultural diversity of the city and the region.

5.3 The Tropical Botanical City Is Alive

> *Certainly, performative research is derived from relativist ontology and celebrates multiple constructed realities. Its plurivocal potential operates through interpretative epistemologies where the knower and the known interact, shape and interpret the other.* (Brad, 2006, pp. 7)

Reflecting on the experience at the JBM and how it may serve the metropolitan scale takes the conversation to the constant biological transformation and expansion in the ground. This was the second lesson. If the botanical garden is not only a morphological and biological microcosm but also a methodological one, then the Tropical Botanical City could methodologically perform as a living operative utopia. An operative utopia is a method where practice is research and where actions and knowledge come simultaneously from rational analysis and emotional engagements. This suggestion is not a subversive attempt against conventions but rather a desirable correspondence between the method and the case of study. That is to say, a botanical garden school designed to be built by its students, professors, and staff over time.

The first example of the JMB's performative essence comes from how it studies, collects, and displays the native plants. At the JBM, classes on native vegetation and botanical taxonomy were also the botanical expeditions ex-situ to collect plants and build the garden's collection in-situ, which interpreted vegetal associations and phenomena observed during the trips. Consequently, at the larger scale, there is an opportunity for a botanical urban landscape that could go beyond the debate between the naturalistic and the humanistic, highlighting the importance of the "process" as a meeting point among diverse sources of knowledge coming from in-situ and ex-situ learning.

The second example speaks about the role of flexible representation tools in performative methods. The JBM did not depend on specific detailed drawings or contracts. It is impossible to find a "final set of original drawings". For example, the shape of the water botanical armatures was determined on-site. At JBM, J. Tabacow drove the truck that was excavating the lakes, adjusting the plan at every step of the way. From this example, one can infer the importance of transitioning from descriptive and prescriptive visualization instruments typical of a project, such as plans, perspectives, sections, etc. The tools in the Tropical Botanical City, are also alive. They do not aim to depict a complete and, therefore, impossible realities. They aim to encourage specific explorations in the landscape not to achieve prescribed or fixed results but rather to continually search for new balances.

The third type of expression of the performative essence comes from the coalition between learning and building. At the JBM, the class on Landscape Design Principles, taught by Burle Marx in-situ, was at the same time the construction of the Orchidarium. Students and professors learned by doing. Such an example present the pedagogical role of the landscaping project as a mechanism that could allow the collective, participatory, and democratic never-ending construction of the metropolitan landscape.

At the JBM, life shapes the method (Fig. 5.7).

The process includes the traditional steps of bibliographic review of the "original project", documentation of the evolution over time, and representation of proposed changes. However, the process is enriched by interactions along the way. Therefore, it is a method that values time; time that is made of constant restarts and lessons that allow progress in clarity and substance through the simultaneous exercise of inventorying the past, living in the present, and projecting the future.

5.4 The Tropical Botanical City Is Didactic

> *Between preservation and process, the process must have the last word. In the end, the truth of the urban is in the movement.* (Kostof et al., 1992. pp. 305)

Two important characteristics of the JBM and the hypothetical Tropical Botanical City have been discussed. The first one was the ancestral urban roots of the morphological, programmatic, and biological components as mechanisms to achieve

Fig. 5.7 Ephemeral Botanical Garden installation for the COP 21 at Maracaibo's Botanic Garden, image by Andry Jones & Ligia Ararat, 2015

connectivity across scales of time and space. The second one was the performative nature of the model. Finally, in this section, the questions deal with the didactic mission of life in the JBM. It proposes that perhaps the most important legacy is the immaterial one.

Is it possible to consider the legacy of Burle Marx's garden not as a static object but as a creative process over time? What kind of an "original condition" is possible to recover when dealing with a scientific landscape designed to transform? Could one seek not to restore an object but rather to steward the essence of a changing creative experience supported by the project's strategic principles? Instead of considering the JBM as an artifact fixed in time and space, the quest shifts towards questioning the pedagogical relationships between the garden's components that sustain new transformative botanical and aesthetic equilibriums over time.

From this perspective, preservation efforts would not recover an impossible past, but rather behave as an expansion of a pedagogical landscape system. The expansion would occur through the ancestral morphological and biological strategies and the performative methodological principals. This was another vital lesson. It was essential to speak about the garden, over and over, not as a work of art that was frozen in time and space but as a living process in constant transformation, of which everyone is a part and for which everyone is responsible. Collective memory and responsibility are built by constant active engagement. In other words, in the process of becoming, feelings of belonging proved to be transformative.

In Burle Marx's work, such commitment to constant education was consciously part of the landscape project. For Burle Marx, "didactic patience" allowed any pedagogical operation to transcend obstacles (Motta & Gautherot, 1984). That "didactic patience" is a design principle that translate in the construction of landscape not only to be seen but to educate, to learn to love the culture and nature that is essential

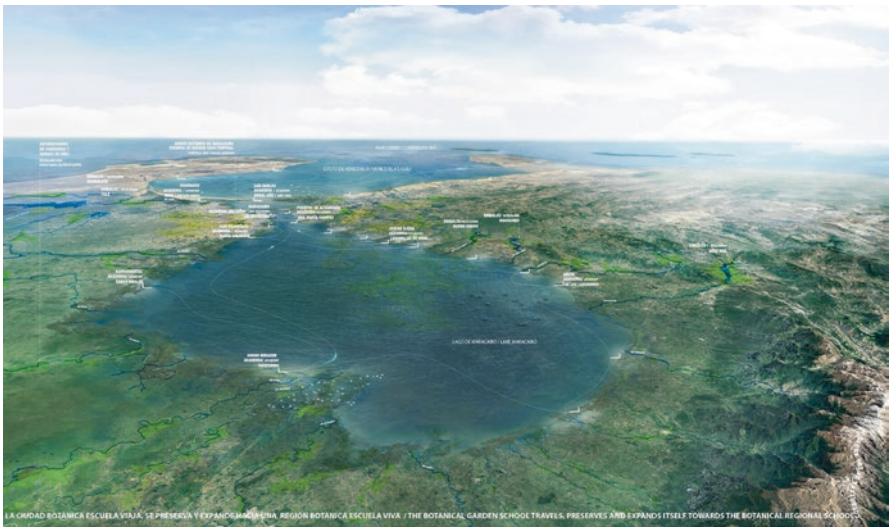


Fig. 5.8 From the Botanical City towards Lake Maracaibo Metropolitan Areas, image by Botanical City Inc, 2020

to protect. In the conference Garden and Ecology (1967) (Roberto, 1987), Burle Marx spoke about the necessity to insert into the urban landscape large botanical reserves, or true natural gardens in Brazil and other the tropical countries:

"[…] in Brazil, and possibly in other tropical countries, to outline a policy of preservation of what still exists, by creating, with private, public, and international resources, a series of reserves with the main objective of maintaining in the present and conserving for the future samples of nature in its primitive state, or even with little alteration" (Motta & Gautherot, 1984, pp. 43).

The JBM is one of those living garden schools that he was able to insert in one tropical country to educate, protect and enjoy the tropical culture and nature (Fig. 5.8).

There, he planted the ancestral, living, and didactic seeds of an operative utopia that, from the garden scale, speaks about the city, the metropolitan region, and the tropics. This research and practice journey aims to encourage new research and actions on the preservation of the most vulnerable treasure: the immaterial didactic mission of Roberto's legacy across the tropical landscapes, which are home to half of the world's human population and more than two-thirds of the world's biodiversity.

5.5 Going Forward

Concerning the contribution of this work, the first is a topical one related to the relevance of identifying principles of operation, beyond aesthetic behaviors and physical limits. Secondly, the work offers an example of a performative method

where the practice is research, and where what we do is as relevant as how we do it. Finally, there is a possible theoretical contribution regarding the preservation of the JBM as a transformation beyond the garden's walls and towards the metropolitan region through a Tropical Botanical City Operative Utopia. In this sense, the case study can serve in similar situations by delivering a message of resilience and adaptation, one that emerges from a garden-school that builds itself, where "practice is research" and where endurance is the celebration of the continually transforming landscape. At last, this work powered by the confidence learned from the master creators of the JBM, that in the face of abandonment, disagreement, hopelessness, apparent impossibility, emptiness, and ruin, always "who seeks, who has love, who has passion, can reach positive results for that continued effort." (Roberto, 1989).

References

Antonio, C., Jobim, & Araujo, Z. (2005). *Meu Querido Jardim Botânico* (pp. 35–36). Jobim Music.

Brad, H. (2006). A manifesto for performative research. *Media International Australia incorporating Culture and Policy, 118*(1), 98–106. Issue published: February 1, p. 7.

Bullock, S. H., Mooney, H. A., & Medina, E. (2009). *Seasonally dry tropical forests* (pp. 1–34). Cambridge University Press.

Motta, F. L., & Gautherot, M. (1984). *Roberto Burle Marx e a nova visão da paisagem*. Brazil, Nobel.

James, C. (2005). Botanical urbanism: A new project for the botanical garden at the University of Puerto Rico. *Studies in The History of Gardens & Designed Landscapes, 25*, 123–143. https://doi.org/10.1080/14601176.2005.10435340

Kostof, S., Castillo, G., & Tobias, R. (1992). *The City Assembled: The elements of urban form through history* (p. 305). Thames and Hudson.

Roberto, B. M. (1987). *Arte & Paisagem*. Conferências Escolhidas, Nobel, São Paulo, p. 43..

Roberto, B. M. (1989). *Interview part 1/2, Globo Ciência*. https://youtu.be/6ldr00bTefg. Accessed 13 June 2015.

Chapter 6
Morphology as a Tool for the Articulation of the New Metropolitan Landscapes

Sara Protasoni

6.1 Introduction

In the different areas of the planet, settlement phenomena (the most recent ones and those stratified over time) appear today to be affected by such profound mutations as to impose a rethinking of the very notions of city, countryside, nature and landscape for addressing the positioning of architecture and design in relation to the transformations taking place at the scale of the city, territory and landscape. The hypothesis proposed in this essay is that in this field the concept of "New Metropolitan Landscape" assigns a new centrality to interpretative categories and operational tools developed by landscape architecture over the last two centuries.

The identification of the scope of action and the responsibilities to be addressed by landscape architecture are an issue that is currently being defined especially in relation to some indisputable urgencies, such as the security of the territories, the sustainability of the transformations that affect them, the protection of biodiversity, the protection of soil and water, and the mitigation of climate change. A landscape expert figure is emerging, torn between two opposing dimensions. On the one hand, he is called to measure himself against the complexity of phenomena between nature, technique and culture, becoming the interpreter of an integrated approach, which in some areas is declined with the adjective holistic. Unfortunately, it must be said that very often this approach tends to pose the questions not so much in transversal terms with respect to traditional disciplinary approaches but through continuous shifts towards generic and culturalist postulates, removing or postponing the need to deploy specific technical skills to address objective critical issues. On the other hand, with respect to some problems of extreme urgency and complexity,

S. Protasoni (✉)
Department ABC – Architecture Built Environment and Construction Engineering, Politecnico di Milano, Milan, Italy
e-mail: sara.protasoni@polimi.it

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_6

technical and hyper-specialist approaches prevail that address identified critical issues by applying non-negotiable tools and intervention objectives.

Symmetrically, often in the transformation processes the competences appear fragmented among a very high number of actors called upon within political systems, public administrations and technical-economic systems. This is a potentially rich condition on the political and social level, which, however, risks strongly undermining the authoritativeness and the impact of the different technical-scientific knowledge, necessary to face the issues at the highest level of competence, sometimes inducing irrationality drifts in the processes. Also at this level, therefore, there is a marked condition of fragility as uncertainty and unpredictability in the interaction.

Landscape architecture, indeed, defines an approach to design capable of observing phenomena at different scales (from the geographical of the territory to the human of architecture); to bring to synthesis multiple knowledges, in the fields of natural sciences, ecology, construction and human sciences; but above all, to deal with the processes of transformation in an adaptive way, tackling in an integrated way decision-making, implementation and management aspects. It works, therefore, along a multidimensional and dilated time line to include different cycles and natural and anthropic processes.

This approach refers to an inclusive field of research and discussion, involving nature and human sciences, architecture, engineering, planning, geography, geology, botany, agronomy, anthropology, aesthetics, ethnography, art history, ecology, landscape ecology … Reformulating conceptual categories and operational tools derived from studies on urban morphology and building typology, it crosses research programmes open to very different languages, interpretations and description techniques, which address the issue of transformation with a renewed focus on the difficult dialectic between nature and artifice that characterises the contemporary world. It is well known how the contribution of anthropogeography and the solicitations of the French historiographic school of the 1920s represented by the magazine "Annales" was taken up in the 1960s with results of great interest by Italian architects, such as Aldo Rossi, Carlo Aymonino and Vittorio Gregotti (Marzot, 2002). This line of researches contributed to the definition of the approach to the project defined by Gregotti as "critical modification of the context" (Gregotti, 1966, 1984, 2004) which is related to the development of a territorial approach to urban and landscape design in Italy in the period between 1980s and 2000s.

The word landscape, in this approach, alludes to an infinite dimension, a larger totality that orients the project to different scales and that refers to that dense network of connections that link the elements of physical space (natural and artificial, living and mineral: soil, water, air and vegetation) with the universe of meanings and values. The reference to the landscape therefore makes it possible to address the issue of the rootedness of settlements in places not only from an environmental ecological point of view, but also as a definition of the modes of cultural relations between the local and global dimensions, and, at the same time, a search for the appropriateness of new realizations, fundamental to define their value and meaning for the inhabitants. On this theme, the landscape disciplines have introduced the

concept of "mediance". According to Augustin Berque (Berque, 1995), landscape is something common, mediated by words and images, interpreted by cultural archetypes; it should not be regarded as a thing, but as a relationship. Seen from this angle, the question of identity is also understood not as a subjectively recognized sense of belonging, but as the set of principles that have guided society's coevolutive relationship with its environment throughout history. What is the subject (between individual and community) and the practices that realize this semantization, what relationship is established between technical knowledge and local knowledge, what skills are called in the field, are all still open questions, with respect to which responsibilities and role of the project in the face of the new challenges of globalization must be redefined.

6.2 The Morphological Approach Within Landscape Disciplines

From the point of view of the landscape project, the morphological approach intervenes within the conformation processes of the "New Metropolitan Landscapes" starting from three preliminary methodological assumptions:

- to read the phenomena at different scales of interactions (from the geographical one of territory to the focused one of architecture);
- to make a synthesis of multiple knowledges (among natural and earth sciences, social and economic disciplines);
- to test decision-making analytical methodologies integrating the singular inputs of the various actors involved in the processes.

On a large scale, morphological research focuses on the recognition of present and past structuring territorial figures, often superimposed on previous settlement armatures, which sometimes persist, sometimes are totally erased, sometimes are barely recognizable as few fragments survive. The element that must be investigated is the way in which the geometries of the settlement layouts take position with respect to the original site configuration: soil forms, ecological contextes and anthopogenic landscapes, with specific attention for the cultural dimension of places (identity and memory) which requires studies in the field of cultural heritage, history and archeology.

At the scale of settlement and architecture, this approach combines the study of the form and character of places with the study of memories and expectations, then of individual and collective representations and images that affect them; the dialectic of the relationship between the principle of settlement and the way of building (i.e. way of building and living); the system of necessary exceptions to the context; the relationship between architecture and the soil.

The palimpsest metaphor, introduced in the field of architecture more than 30 years ago by a well-known essay by André Corboz (Corboz, 1983), represents

today one of the most effective categories to fully understand and deepen the potential of the morphological approach as a tool for the articulation of the new Metropolitan Landscapes.

One of the reasons is undoubtedly that the word palimpsest refers to an inclusive field of research and discussion, involving natural sciences and humanities, architecture, planning, geography, geology, botany, agronomy, anthropology, aesthetics, ethnography, art history, ecology, landscape ecology … On the one hand, the use of the palimpsest metaphor is effective in relation to the crisis condition in the mechanisms of representation of the natural world, a representation that has always proved to be influenced by the different cultural projections on the thing itself, the main cause of the polysemy of the very term landscape. On the other hand, it is effective in giving an account of the stratification of natural systems in the context of ecological processes, both along the time line of transformations and in the depth of possible sections that cross competing systems. This approach is the basis of researches aimed at investigating the temporal depth of the ecological palimpsest in which the interaction between non-anthropic and anthropic factors is today recognized as one of the main causes at the origin of some characteristic biotopes, from forests to peat bogs, for example.

But the concept of palimpsest has found a new field of investigation especially in the dialectic between ecology, which can be traced back to the field of natural sciences, on the one hand, and cultural ecology, which can be traced back to the field of ethno-anthropological sciences, on the other; a field, the latter, which investigates the relationships between the socio-cultural aspects of human groups and the environment in which they live. In this field, it has emerged that the cultural dimension is an essential aspect for the study of landscape ecology as a factor that decisively orients the transformations of the physical environment towards sustainable developments (Zapf, 2016).

On the human sciences front, the palimpsest, understood as a metaphorical device, today finds new areas of legitimation in the historiographic field, where the primacy of the chronological order is questioned by research that places the spatial and local dimension of human history (spacing history) at the centre of the investigation. A position, this one, that finds a happy synthesis in Friedrich Ratzel's famous phrase "Wir lesen im Raum die Zeit" (Ratzel, 1904) recently resumed in a volume by Karl Schlögel (Schlögel, 2003) and that can be traced back to the cultural line known as anthropogeography, which unfolded along a path all within the German geographical school of the nineteenth century, starting from the monumental work of Alexander Von Humboldt (Humboldt, 1845). It is well known that the contribution of anthropogeography was taken up with results of great interest by Vittorio Gregotti at the end of the 1960s, starting also from the solicitations of the French historiographic school of the 1920s represented by the magazine "Annales" (Gregotti, 1966) and contributed to the definition of the approach to the project defined by Gregotti himself as "critical modification of the context" (Gregotti, 1966, 1984, 2004).

For the disciplines of landscape, the palimpsest has been the banner of a series of researches in the field of the enhancement of the so-called cultural landscapes that

certainly (even if the convention does not use the term) have found a synthesis in the European Landscape Convention (Florence, 2000) and an application in relation to the UNESCO policies that, starting from the 1990s of the twentieth century, introduced a new category of heritage, that of the cultural landscape (Cosgrove, 1988, 1998).

6.3 Palimpsest Metaphor Within the Morphological Approach

Following this trajectory, which crosses different disciplinary fields, the metaphor of the palimpsest has acquired new values for reflection on the landscape, deepening some important insights that André Corboz's 1983 essay already contained, even if in that essay the word used is territory and not landscape.

First of all, the conviction that the landscape is to be read as "an incessantly shaped space", therefore in continuous transformation, as a result of natural phenomena involving an environment and the community of living people living in it, but also of intentional projects and concrete works aimed at making the human world inhabitable also and above all in relation to spontaneous processes. The accurate description of the processes calls into question the different disciplines that have competence over them, brought back to the synthesis of a "landscape" view that focuses on the morphological effects, forms and spaces of physical transformation.

Two postulates are implicit in this vision. The first states that the recognition of this dynamic between natural and anthropic allows us to shed light on the complex question of the construction of meaning and therefore of the recognition of the identities of places with respect to their physical form, overcoming the mechanicism of the classical vision whereby the landscape unfolds in the sequential relationship between the thing itself and its representation.

The second postulate states that in the continuous process of transformation of a territory, the relationship between phenomena of natural origin and anthropic action is subject to continuous reciprocal adjustments in which it is possible to recognize a design activity (collective and individual) that tends to direct the process towards set objectives, even if sometimes in conflict with each other. To use Corboz's words, "the territory is a project". But it is undeniable that the project of which Corboz speaks does not tend towards a closed and defined form; rather, it is the set of actions that trigger processes of transformation according to dynamics and geographies that are often unpredictable. Which leads us to the contemporary idea of a multi-scalar, multidisciplinary project-process aimed at a multiplicity of different actors that engages the most interesting experiences of contemporary landscape design, from James Corner-Field Operations, to Catherine Mosbach, Bas Smets, Georges Decombes and others (Fig. 6.1).

Fig. 6.1 Atelier Descombes Rampini, Renaturation of the River Aire, Geneva

These designers show an approach of great interest not only in what they come to define a real program of re-signification of structures and spaces that would otherwise be devoted to obsolescence, but also a plan of re-naturalisation that directs spontaneous processes towards the formation of an articulated system of landscape units with a strong evocative charge within an overall park design. Sometimes even transforming into ruins the residual fragments that the processes of decommissioning leave on the ground, while at the same time creating collective spaces with multiple possible uses, as in the case of the Bas Smets' Estonian National Museum Park (2008–14, architecture: DGT Architects) or in the case of Catherine Mosbach's Louvre Lens Museum Park (2003–16, Kazuyo Sejima + Ryue Nishizawa/SANAA) (Fig. 6.2).

These are interventions through which landscape architecture has introduced practices which can be ascribed to the paradigm of care (understood as the assumption of responsibility for the habitability of a place also terms of maintenance, reclamation, cultivation, management, control, etc.) rather than the installation of new naturalistic systems, according to a tradition of landscape architecture that has accompanied the construction of urban planning, starting from Alphand in Paris and Olmsted in U.S. cities. The now famous case of the New York Highline (James Corner – Field Operations with Diller Scofidio and Renfro and Piet Oudolf) undoubtedly represents a paradigm for this approach (Fig. 6.3).

Care as action is based, on the one hand, on the observation of the elements present in a place; on the other hand, on the choice of strategic interventions, which do

Fig. 6.2 Catherine Mosbach/MOSBACH PAYSAGISTES, Architecture: Kazuyo Sejima + Ryue Nishizawa/SANAA, Louvre Lens Museum Park

not deviate from the strict application of that principle of economy typical of traditional landscape techniques. To leave things as they are or as they might evolve as much as possible presupposes a project based on the study of reality and critical judgement with respect to the conditions and times of the transformations underway. A project capable of triggering processes that do not tend towards unattainable completeness but mark decisions (to be understood as the assumption of responsibility within an approach that is essentially of a negotiating and adaptive nature) and actions (which include the problem of construction, management and maintenance techniques) that refer to the relaxed times of the transformations of a place, between nature and culture.

Fig. 6.3 Bas Smets, Estonian National Museum Park. (Architecture: DGT Architects)

References

Berque, A. (1995). *Les raisons du paysage. De la Chine Antique aux environnements de synthése*. Hazan.

Corboz, A. (1983). Le territoire comme palimpseste. *Diogène, 121*, 12–34.

Cosgrove, D. E. (1988). *The iconography of landscape: Essays on the symbolic representation, design and use of past environments*. Cambridge University Press.

Cosgrove, D. E. (1998). *Social formation and symbolic landscape* (2nd edition with additional introductory chapter). Wisconsin: University of Wisconsin Press.

Gregotti, V. (1966). *La forma del territorio*. Feltrinelli

Gregotti, V. (1984). Modificazione. *Casabella, 498*(9), 4–5.

Gregotti, V. (2004). *L'architettura del realismo critico*. Laterza.

Marzot, N. (2002). The study of urban form in Italy. *Urban Morphology, 6*(2), 59–73. http://www.urbanmorphology.org/pdf/marzot2002.pdf

Ratzel, F. (1904). Geschichte, Völkerkunde und historische Perspektive. *Historische Zeitschrift, 93*(1), 1–46. https://www.jstor.org/stable/i27601131

Schlögel, K. (2016). *In Space we read time. On the history of civilization and geopolitics*. Bard Graduate Center – Cultural Histories of the Material World, Chicago (Monaco, 2003).

Von Humboldt, A. (1845). *Kosmos. Entwurf einer physischen Weltbeschreibung*. Cotta.

Zapf, H. (Ed.). (2016). *Handbook of ecocriticism and cultural ecology*. Walter de Gruyter GmbH & Co KG.

Chapter 7
The Agricultural Heritage: A Climate Change Answer for the Metropolis

P. Branduini

7.1 Introduction

At a first glance the relationship between agricultural heritage and climate change could sound excessive. However, this association is embedded in urban agricultural landscape since centuries. Unequivocal scientific evidence shows that unprecedented concentrations of greenhouse gases (GHGs), driven by human activities such as burning of fossil fuels and deforestation, are contributing to climate changes including warming of the oceans and atmosphere, sea level rise and diminished snow and ice. The impacts of these changes are already damaging infrastructure, eco-systems, and social systems – including cultural heritage – that provide essential benefits and quality of life to communities. Excessive and insensitive development reflects the abandonment of sustainable patterns of land use, consumption and production, developed over centuries if not millennia of slow adaptation between communities and their environment (ICOMOS, 2019).

We will first explain the historical connection between countryside and the city that shaped agricultural landscapes; then, we will move to clarify the citizen's relationship to the present agricultural tangible and intangible heritage; finally, we will demonstrate how agricultural heritage can provide suggestions for the contemporary city climate problems. The city of Milan will supply suitable examples.

P. Branduini (✉)
Department of Architecture, Build Environment and Construction Engineering (DABC), Politecnico di Milano, Milan, Italy
e-mail: paola.branduini@polimi.it

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_7

7.2 The Evolution of Relationship Between City and Countryside

Urban agricultural landscapes, intra or peri urban, were formed by the need of food production (especially vegetables) and building materials for the city over time (Scazzosi, 2020). Until early XX century, the food supply to the Maggiore Hospital's patients were assured by Morimondo land's farmsteads; likewise building materials such as bricks, poles and beams were provided by Fallavecchia's furnace and Morimondo's woods, transported along the Bereguardo, then Grande Canal, then Navigli's Circle until the small lake behind the Duomo, close to the hospital (Branduini et al., 2019, 2020) (Fig. 7.1).

The need to produce large quantities of fresh grass affected the spread of water meadows technique (locally called *marcita*, which allowed 6/7 cuts of fresh grass per year instead of the usual 4/5) to feed city's horses. This technique strongly characterized the landscape of Milanese South-west, where the city's wastewater (Brown & Redondi, 2017), richer in nutrients, produced more forage.

7.2.1 Effects on Landscape

The field's division into progressively smaller squares, that we perceive today, is the specialization of the marcita technique occurred since XIX century (Fig. 7.2). Similarly, at the same age, rice cultivation increased to meet the city's food

Fig. 7.1 Dependence of the city from the countryside: transportation of construction materials as well as food to the city along Naviglio Grande (Approx. 1930)

Fig. 7.2 The water meadows, locally called *marcita*: an ancient but extremely advanced technique that shaped the agricultural landscape of Milan, is now threat to disappearing

requirements and even today it is one of the most "directly sold" crop in the area closest to the dense city. The "rooms" of rice, that become water glasses in spring and we enjoy today, are the result of a cultivation technique specialized for the city two centuries ago.

7.2.2 Landscape as Palimpsest of Heritage

Therefore today we enjoy a landscape that is the palimpsest of tangible permanencies interlaced by intangible meanings: irrigation canals, water regulation artifacts, terraces, embankments, alignment trees, forests, as well as roads and agricultural buildings are some of the tangible traces; agricultural techniques, local recipes, toponyms, religious rites, popular and contemporary songs written and sung in dialect in the urban courtyards are signs of intangible living heritage (CEMAT, 2003). Tangible heritage provides the substance and the evidence of intangible heritage: courtyard space delimited by agricultural buildings is the appropriate frame for celebrating rites and performances, because it conveys inclusion, separation from traffic, acoustic and visual insulation from the city noises. Therefore, landscape is not a sum but a system of tangible and intangible heritage (Scazzosi & Branduini, 2014; Scazzosi, 2018) and the key for understanding this potential is an appreciation of the breadth of cultural heritage concept. "Over time, the meaning of cultural heritage in professional practice has expanded from single monuments and sites identified as objects of art to cultural landscapes, historic cities, and serial properties. Contemporary practice further extends the concept of heritage beyond 'tangible

heritage', to the intangible dimensions of heritage as well. This means the entirety of knowledge derived from the development and experience of human practices, representations, expressions, knowledge and skills and associated objects and spaces that communities recognise as part of their cultural heritage" (ICOMOS, 2019). So we should move the attention toward the actors, who reproduce intangible heritage and those who benefit from it.

7.3 The Actors of Heritage

Intangible heritage is dynamic, because it is "constantly recreated by communities and groups in response to their environment, their interaction with nature and their history" (art. 1 UNESCO, 2003). According to their attitude it is possible to distinguish the bearers of agricultural traditions, so called role models, and those who try to reproduce them, so called replicators.

7.3.1 Role Models and Replicators

The role models are generations of farmers who consciously or unknowingly repeat the practices because they have been handed down to them by daily use. They follow good agricultural practices, which keep the soil in good condition, aerate it, reuse the excrements to fertilize, closing the biogenomic cycles (Sorlini, 2020). These farmers perpetuate practices and arouse citizen's interest: they are wishful to learn and replicate horticultural suggestions in their allotments or community vegetable gardens (Fig. 7.3).

Some farmers are able to perpetuate rural rites and groups of citizens ask farmers to reproduce it and strengthen their sense of community. The Saint Antony's bonfire, celebrated the 18th of January to bless animals, has spread to all the "surviving" Milan urban farmhouses, and usually gathers around it hundreds of people, in the

Fig. 7.3 The work of waterman and his gesture explained during a course for new watermen

Fig. 7.4 Saint Antony bonfire for animals blessing at Biblioteca farmstead: the celebration is still in use even if no more farmer and cattle are present in the farmstead.

cold of winter. Sometimes the farmer is no longer present but the tradition is replied by the community, as in Biblioteca farmhouse. The choral celebration fostered a so tough cohesion face to citizen individualism, that the celebration occurs with or without farmers, animals or fire, namely without the object and the mean of celebration (Branduini, 2020), overwhelming authenticity (Fig. 7.4).

7.3.2 Community Face to Tangible and Intangible Heritage

When there is a loss of tangible heritage and presence of intangible heritage, like in case of traumatic events (flooding, earthquakes) and the tangible heritage is partly or totally damage, intangible heritage can help cohesion and reinforce identity: after the collapse of all churches in the 2016 earthquake in the center of Italy, the community found again cohesion in continuing rural celebration (Branduini & Carnelli, 2021a) (Fig. 7.5b) When there is presence of tangible heritage and loss of intangible heritage, like a farm converted to residence, or a water meadow adapted to cornfield, or a vineyard terraced changed to a pasture, a gradient of evidence in historic matter (buildings and land morphology) can be read, but the new functions totally or partially cancel the readability of the reasons the artifact was made for (Fig. 7.5a). In the urban context, the horticultural practice and knowledge exchange can give new life to former agricultural and now abandoned areas (brown fields) that was former agricultural areas (Branduini, 2016). When there is presence of both tangible and intangible heritage, the relationship between buildings and cultivated land is reinforced (Branduini et al., 2020). The evidence of tangible heritage strengthen the vitality of intangible heritage and keep both alive (Branduini &Carnelli, 2021b). So, integrated approaches are welcome (ICOMOS, 2004).

Fig. 7.5 Tangible and intangible relationship: (**a**) Vione farmstead tangible heritage is well restored as a residential village, no more remains of intangible heritage; (**b**) the Faoni bonfire in Norcia was repeated every year even after the earthquake seriously damaged every churches

7.3.3 Engagement and Participation

People's involvement in intangible heritage safeguard is very active and dynamic and it takes place through engagement and participation. They have the same goal, but a different approach. Citizen participation is an informal bottom-up process, and is the common way people start collaborating in an urban agriculture initiative. It can embrace engagement, the active and intentional dialogue between public decision makers and citizens: it is a formal top-down approach, usually initiated by the institution to involve citizens in the preservation and defense of cultural heritage (Branduini, 2020). During the celebration of agricultural rituals, the urban community's sense of belonging around the farmhouse brings together long-term residents with new ones, from European, African and Eastern cultures: it is the Faro convention's "heritage community" (ICOMOS, 2003) that gathers all who recognizes to belong to a place or a group of people sharing a well-being based on the traditional habits. Mutually, the community's involvement can save the farmers from the threat of moving in front of urban expansion projects and change municipality's plan: this happened to Campazzo farmhouse with petition and declaration as an "heart's place" (establish by FAI Foundation for Italian environment, one of the most important Italian NGO for landscape protection). (Fig. 7.6).

Fig. 7.6 Campazzo farmstead, S. Martin celebration with the farmer's family (linked to the movement of rural people at the end of agrarian contract) in a still active farmstead: celebration of agricultural tradition established a strong link with the local neighborhood that help the farmer fighting against the eviction

7.4 Heritage at Risk

There are specific cultivation techniques, like water meadows, as mentioned before, that are now considered obsolete and abandoned because they require a lot of manual labor compared to mechanical work, and that have been influenced and modified by the city proximity: flooded paddy fields were turned into dry field, in order to limit the number of mosquitoes close to the city districts; corn fields were transformed into wheat fields due to the water pollution; dairy cattle farms decreased or disappeared in the immediate surroundings of the city related to the water meadows abandon and water pollution. Although they risk extinction, these techniques respect the soil and increase animal and plant biodiversity, so they contribute to improve the environment quality. Landscape protection bodies, such as the Parks (around Milan, Parco Sud, Parco del Ticino), are in charge of the protection of agricultural heritage through constant dialogue with the farmers who still practice traditional agricultural techniques. The law protects the tangible heritage, the physical landscape, but the intangible component should be transmitted by refresh courses to spread the knowledge outside the family context in order to create an intergenerational bridge and increase awareness among farmers as heritage bearers (as was done in the course for drowner in Life Biosource project http://ticinobiosource.it/corso-sulle-marcite/corso-marcite-formazione-campari). In Italy these landscape are recognized in the

Register of Agricultural Practices and Rural Landscapes by the Ministry of Agriculture; worldwide they are (potentially) recognized by FAO through the GIAHS Globally Important Agricultural Heritage.

7.5 Agricultural Heritage for Climate Change

Agricultural traditional techniques (before mechanization), based on circular energy flux through crop and livestock, could help to improve circular economy and provide solutions to climate change (Branduini & Scazzosi, 2020). They should combine ancient knowledge with present technologies, manual labour to mechanization, renewable with fossil resources: for that reason they are innovative rather than obsolete. They are in a constant dynamic balance, several time altered but continuously re-establishing their stability: they are resilient, if a pressure occur to perturb them, they move their equilibrium system forward new states (Bocchi, 2020).

Agricultural heritage should be safeguard because is traditional, contemporary and living at the same time, inclusive, representative and community based (art. 3 UNESCO, 2003). Agricultural heritage could help cohesion, reinforce identity, gather the community and strength the resilience of the contemporary cities. "Cultural heritage is a resource for the future. Communities over time have developed strategies to respond to local conditions and landscape change including architectural and agricultural adaptations and settlement patterns. These endogenous ways of knowing support contemporary mitigation options, from low-carbon, locally adapted approaches to decarbonizing buildings and cultural landscapes to pointing the way to low-carbon models for developing peri-urban areas" (ICOMOS, 2019). The research group on Heritage and Climate Change (ICOMOS, 2019) encourages large communication, interdisciplinary research, all level education and intersectoral policy development: these actions should promote a fundamental shift in policy and professional practices to acknowledge the power of cultural heritage. Moreover, the study of agricultural heritage can provide solutions for contrasting climate change for adapting practices to respond to climate change effects on heritage: in order to limit global warming to 1.5 °C, it would require rapid and far-reaching transitions in the way we use land, energy, industry, buildings, transport, and cities.

References

Branduini, P. (2016). Il patrimonio rurale nutre la città. *Economia e Società: oltre il ponte, 34*.

Branduini, P. (2020). Engagement, participation and governance of urban agricultural heritage. In L. Scazzosi & P. Branduini (Eds.), *AgriCultura. Urban agriculture and the heritage potential of agrarian landscape*. Springer.

Branduini, P. & Carnelli, F. (2021a). The intangible multiple values of landscape as a post-earthquake driver of resilience. In L. Patrizio Gunning & P. Rizzi (Eds), *Invisible reconstruction cross disciplinary responses to natural, biological and man-made disaster*. UCL Press.

Branduini, P. & Carnelli, F. (2021b). The preservation of rural landscapes for building resilience in the context of small towns: Insights from Northern Italy. In F. Arefian, J. Ryser, A. Hopkins & J. MacKee (Eds), *Historic cities in the face of disasters*. Springer.

Branduini, P., Perrin, C., Nougarèdes, B., & Colli, E. (2019). Cultural heritage preservation and resilience in urban agriculture through the lens of social justice: A case study. In M. A. Thornton (Ed.), *Urban food democracy and governance in North and South* (pp. 101–122). Springer.

Branduini, P., & Scazzosi, L. (2020). Paesaggi tradizionali, paesaggi innovativi. In P. Branduini & L. Scaz-zosi (Eds.), *Cambiamo Agricoltura. Una PAC per il futuro dei paesaggi agrari*. www.fondo-ambiente.it

Branduini, P., Laviscio, R., & Scazzosi, L. (2020). AgriCulture in Milan. The mutual benefit between urban agriculture and cultural heritage. In L. Scazzosi & P. Branduini (Eds.), *AgriCultura. Urban agriculture and the heritage potential of agrarian landscape* (Urban agriculture series). Springer.

Bocchi, S. (2020). Paesaggi in cura. Principi, pratiche risorse. In P. Branduini & L. Scazzosi (Eds.), *Cambiamo Agricoltura. Una PAC per il futuro dei paesaggi agrari*. www.fondo-ambiente.it

Brown, M., & Redondi, P. (2017). *Dalle marcite ai bionutrienti. Passato e futuro dell'utilizzo agricolo delle acque usate di Milano*. Guerini e associati.

CEMAT. (2003). European rural heritage observation guide.

ICOMOS. (2003). *Convention for the value of cultural heritage*. Portugal.

ICOMOS. (2004). *Yamato declaration on integrated approaches for safeguarding tangible and intangible cultural heritage*. Nara.

ICOMOS. (2019). *The future of our pasts: Engaging cultural heritage in climate action*. Climate Change and Heritage Working Group.

Reach-culture, RE-designing Access to Cultural Heritage for a wider participation in preservation, (re-)use and management of European culture. https://www.reach-culture.eu/

Scazzosi, L., & Branduini, P. (2014). *Paesaggio e fabbricati rurali. Suggerimenti per la progettazione e la valutazione paesaggistica*. Maggioli editore.

Scazzosi, L. (2018). Landscape as systems of tangible and intangible relationships. Small theoretical and methodological introduction to read and evaluate Rural Landscape as Heritage. In E. Rosina & L. Scazzosi (Eds.), *The conservation and enhancement of built and landscape heritage* (pp. 19–40). PoliScript.

Scazzosi, L. (2020). Urban agriculture as heritage: Methodological issues and perspectives. In L. Scazzosi & P. Branduini (Eds.), *AgriCultura. Urban agriculture and the heritage potential of agrarian landscape* (Urban agriculture series).

Sorlini, C. (2020). L'evoluzione dell'agricoltura e gli effetti sul paesaggio. In P. Branduini & L. Scazzosi (Eds.), *Cambiamo Agricoltura*. Una PAC per il futuro dei paesaggi agrari. www.fondo-ambiente.it

UNESCO. (2003). *Convention for the Safeguarding of the intangible cultural Heritage*. .

Part II
The Good Practice

Chapter 8
The Memorable Image of Metropolitan Cartography as a Symbolic Trigger for Metropolitan Landscape

Antonella Contin and Valentina Galiulo

8.1 The Image of the Metropolitan Cartography as Symbolic Trigger of Multi-Scale Cycles of Change in the Metropolitan Landscape

The need to draw maps comes from the journey: it is a reminder of the succession of stages, the layout of a route. That is what Italo Calvino wrote in his Il viandante nella mappa in 1984. Though the representation of the world arises from a practical instance, the need to represent an aesthetic matter also exists. Cartography and landscape painting meet in the representation of the territories of the world in the great painted scrolls of antiquity. According to Calvino (1984), the simplest form of a geographical map is not the one represented by the surface of the ground, but rather a linear image, which can only be given in a long scroll. For example, in the long scrolls of Roman maps, or the precious Japanese scroll that in the eighteenth century represented the route between Tokyo and Kyoto.

Nevertheless, Calvino's most exciting discovery is that at the origin of cartography is the need to understand the dimensions of space and time in an image. "The map, in short, even if static, presupposes a narrative idea, it is conceived in the function of an itinerary, it is an Odyssey". That is what Metropolitan Cartography, which is the instrument born from the Metropolitan Approach to Complexity, also affirms. The narrative of territory must be communicated by a logical structure and a

A. Contin
Department of Architecture and Urban Studies, Politecnico di Milano, Milan, Italy
e-mail: antonella.contin@polimi.it

V. Galiulo (✉)
Department of Architecture and Urban Studies, Politecnico di Milano, Milan, Italy

Phd Student at Universidad de Sevilla, Doctorate Program in Architecture, Seville, Spain
e-mail: valentina.galiulo@polimi.it; valgal@alum.us

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_8

powerful image in a map. The map must be able to capture the attention of even the most distracted metropolitan travellers (Benjamin, 2007) so that they too feel as immersed in the map as in the territory, even if at the metropolitan scale. To reach that goal, we refer to the Muses, history, and memory (Contin, 2014). This means understanding the profound reasons for contemporary space. It is the possible answer to constitute new values for the inhabitants of the Metropolitan Landscape in transformation; it means recalling the world of semiology and the new figures of meaning that allow the definition of an innovative image that is not linked to temporary use and consumption but is the vehicle of a revolutionary symbolic identity.

The contemporary metropolitan city is an agent of rapid cycles of change that involve important mechanisms of transformation due to the progress of technology, infrastructure, information, and culture. These are conditions that deeply alter the contemporary Metropolis' topography. Currently, these alterations of the geographical dimension of the territory significantly affect the usability and accessibility of the metropolitan territorial space by the inhabitant, temporary users and commuters. The analytical framework of our investigation refers to crucial questions such as:

– What knowledge is needed in the theoretical and practical research context to read and interpret the contemporary Metropolis and its Metropolitan Landscape? What representations are essential to understand the inter-scalar change of the city in the processes of accelerating change? With what tools is it possible to interpret the current and future transformation factors of the Metropolitan Landscape?

These considerations support the multiple objectives of the research, including that of testing the practical-theoretical methodology of Metropolitan Cartography - to experiment with a new tool to support the analysis and interpretation of conflicting urban and rural territories.

This research aims to define Metropolitan Cartography as a flexible and necessary tool to identify the factors of change in the Metropolitan Landscape through the generation of multi-scale maps capable of communicating the logical sequence of choices in the Map-Making phase, to open new topics of multidisciplinary comparison in the decision-making processes in the field of urban planning and architectural design. Besides, the research intends to expose a new strategic, operational approach through a design methodology that interfaces with the complexity of metropolitan transformation phenomena related to the shrinking city, from global to local and vice versa; a complexity that has affected our territory facing the change of typologies and morphologies not only of the public spaces of the city but especially of its landscapes.

Architectural and urban planning projects can, therefore, build a suggestive scenario of connection with the geography and temporal stratification of the city's ground. It is fundamental to refer to the archetypes of the past by connecting to the local and territorial intelligence that can facilitate the knowledge of dynamic processes of cultural transition, which in turn allow for the implementation of a metropolitan identity in change. According to this objective, the evocative power of the identity image of the local is considered significant and with a global echo, using the

map as a constructive agency that can be acted through the cartographic practice in the fields of architecture, landscape and urban planning (Corner, 2011).

Metropolitan Cartography produces a map-image which is the result of a technological and creative process that encapsulates the trigger of a metropolitan context symbolic value, i.e. a powerful and memorable image. Cartography allows the connection, through the mental perception of the map, of a place to a specific event. For this reason, the map takes on a priority position of mediation in the context of multidisciplinary communication, becoming a form of transition between the temporal and physical dimensions. The new scale of the contemporary metropolis form requires a trans-morphic and sign-symbolic transformation. Dino Formaggio in his essay Forma, paradigma, trans-morfosi spoke of: "a process of radical morphic transmutation, as a principle of the foundation of every class of events in culture" (Formaggio, 1987, pp.6). He meant that the form, in order to survive, must be based on an image, causing a break in the limit between object and function; the image becomes the result of a process, produced by the inter-relational connection of structural elements of hybrid spaces animated by the movement of the observer that constituted the typical configuration of the modern urban image (Fig. 8.1).

Currently, cartographic production is a matter of substitution of the real through signs (Boudrillard, 1983). The territory, therefore, it is not the model for the map: it is the map that precedes the territory; it consequently generates the territory.

This theoretical assumption is also relevant for analyzing what is happening today in the contemporary social dimension. Today the inhabitants of the territory risk losing physical contact with it, relating exclusively to the simulacrum of the

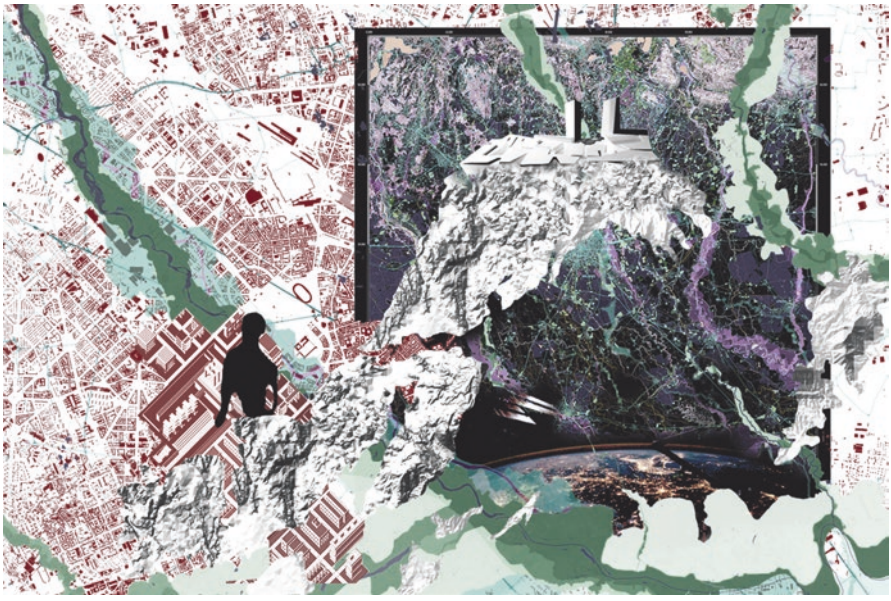


Fig. 8.1 MSLab – Metropolitan Cartography Manifesto. Own Elaboration, 2020

image of capitalist society represented by data and algorithms that define the meaning of a map. Instead, the map must be understood as an instrument of representation and interpretation of the landscape that hides not only a technical and functional matrix but also a creative one which allows to identify the human and cultural dimension of the metropolitan landscape.

8.2 Metropolitan Landscape as a "Drama Palimpsest" of Dynamic Interaction Flows

The Metropolitan Landscape is a multi-dimensional condenser that must be redefined according to its metropolitan unit, understanding its relationship between quantitative and qualitative interaction flows. There is a broad debate about the definition of the boundary and the control of the shape of the Metropolitan Landscape, especially in the urban-rural transition space. Thomas Sieverts (Sieverts, 2003) in Cities without Cities, explicitly described the processes of fragmentation of the discontinuous urban-rural patterns and the expansion of settlements, due to the dynamics of the globalised evolution of the contemporary city, that exists in a state of space in between local and global, space and time, between city and countryside. Sieverts defined the "in-between" or "intermediate" city, as a negation or absence of the characteristic and distinguishing traits of the traditional dense European city: Zwischenstadt.

Zwischenstadt is the place where specific strategic action sites of nations are concentrated: cities and communities. It is strongly influenced by the local and international market logic, in which the speed of information and connections are linked to space. Here, the old contrast between city and country dissolves into a city-continuous movement for a new interpretation oriented to the cultural project of the landscape.

Different configurations of change for new spatial relationships and new interlaced cultures need a new image of the landscape, concerning the city and its marginal spaces.

In the Landscape Urbanism Manifesto (Waldheim, 2016), Waldehim presented the new discipline as a supportive ideology to urban practice. The author argues that the landscape is the goal through which it is possible to read and build the contemporary city; for these reasons, the city of today must be imagined, conceived and designed as if it were a landscape (Shane, 2004). The idea advocated by the author rejects the city-country dualism. It suggests an innovative way of understanding complex systems and the relationships between nature and culture, declaring that the landscape should be the driving force for the sustainable development of the city. As Corner wrote, Landscape Urbanism goes beyond parks, public spaces, and gardens, suggesting great interdisciplinarity between planning sciences and ecology, geography, anthropology, cartography, aesthetics, and philosophy, suggesting a multi-scale approach.

Landscape Urbanism focuses on the study of the interrelations between human activities and natural landscape, considering potential interstitial infrastructural spaces. These are spaces for a model of performative urbanism (Corner, 2006), or on the other hand, they are the field of action of urban processes. We can consider them places of observation of the dynamics active in the ground space of the city in which the relationships and interactions of the chains of consumption and land use are manifested. That vision emphasises the need to build new collisive sites (Lyster, 2016), or new public spaces intended to be points of ecological balance between built and not built. Still, metropolitan ground space is also the place where social events take place that makes it common, for new performative practices (Shane, 2005).

The critical thinking of Alan Berger that contributes to the definition of the concept of "Drosscapes" (Berger, 2006), that is landscapes that are the result of natural and anthropogenic processes of relationship, is particularly relevant. Dross is waste, but it also represents the natural component of any city that develops dynamically. The city-dross relationship can be considered as an indicator of the health of urban development. Focusing primarily on the empty spaces of the city, the author argues that the waste landscape consists of interstices, spaces between the urban fabric of the city, neglected lands, marginal rural areas waiting for development, seemingly endless surfaces, not interrupted and their perimeters. These are areas of accumulation produced by the traces of socioeconomic use and the consumption process of deindustrialisation, post-Fordism and technological innovation. They are territorial stripes, buffer zones with indefinite edges that make the transition of the status of the Metropolitan Landscape from urban to rural implicit.

Preparing the new urban and architectural scenes of the Metropolitan Landscape involves planning the composition of a hybrid space in which fragmented urban areas, agricultural spaces and infrastructure generate new places seemingly devoid of identity. The marginal landscapes of the Metropolis are interstitial environments in suspension in which the interphase spaces represent a liminal state, a program of heterogeneous flows that produce a physical state of transition and perennial dynamism. These unstable places between nature and artifice, formal and informal, structure and organicity, are also intended to be spaces of the Metropolitan Landscape characterised by the multi-scale relationship of hybrid territories, those which are not yet connected to the regional territorial network (Fig. 8.2).

Metropolitan Landscape can be understood as the space in which the drama of the dynamic interactions of flows of goods, people, habitus and capital that determine the management policies of Linkage Urban-Rural, leave marked traces of vulnerability on the ground. For this reason, multi-dimensional images generated by urban density, infrastructure nodes, productive agricultural land or waste, can be included in the Metropolitan Landscape. Therefore, the need arises to promote strategic design programs capable of re-forming indefinite and heterogeneous spaces, composed of different grains and textures, offering the opportunity to conceive a new global image that can declare itself as a new cultural mediation code for the Metropolis.

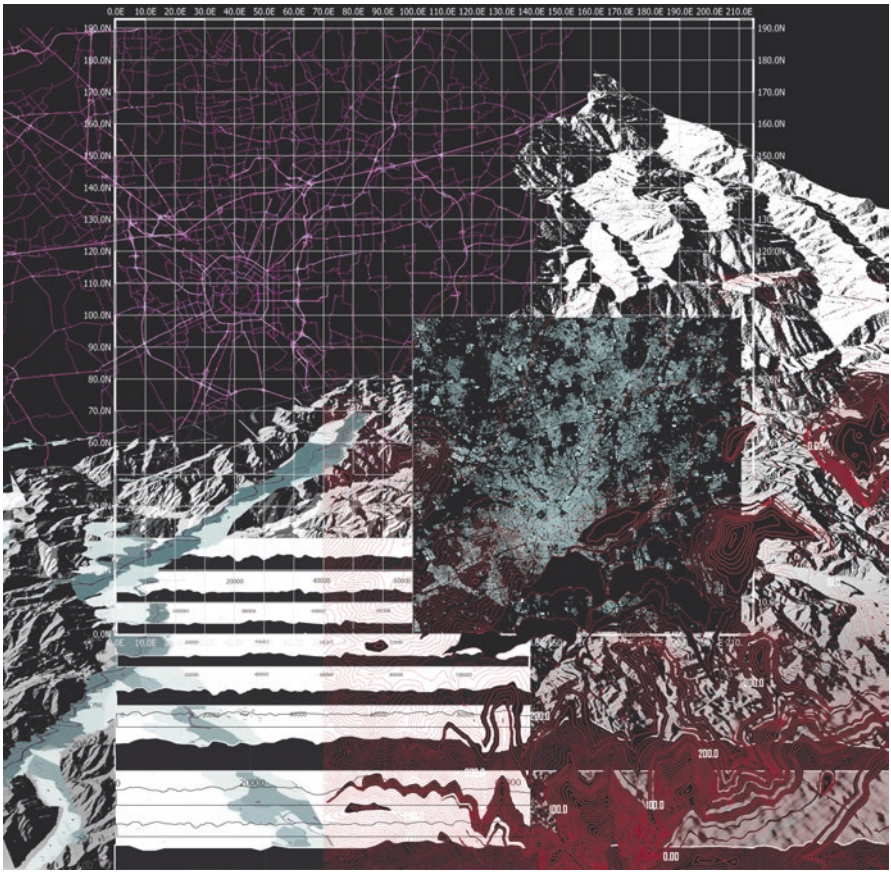


Fig. 8.2 MSLab – Metropolitan cartography based – drawing. Own Elaboration, 2020

8.3 Metropolitan Cartography: Technological Implementation Strategy Tool to Be Engaged in a New Dynamic Narrative

In recent decades, mapping dynamic urban processes through open digital interactive platforms have become particularly important to facilitate the dynamics of self-management to face the lack of city services (Contin et al., 2014). For this reason, cartography is considered one of the most fertile research arenas in the field of architecture and landscape. The representation of the map would need a return to traditional cartographic techniques to reinvent the land manipulation of the contemporary city. Metropolitan Cartography aims to converge the precision and instrumentality of the technical plans with the geographical and territorial interpretations of the map.

Recently, mapping practices have been considered not only as functional to the transmission and sharing of information and graphic data, but also as methodological actions for the construction of a cartographic project that can facilitate the critical reading of the territory.

The visualization of the data in the culture of the design is proposed as an innovator tool introducing new projective representations of cartographic practices due to the evidence and the modification of the material and immaterial components that constitute the condition of metropolitan complexity; this representation is transferable and repeatable through the intersection of the digital component, the computer data, mediated by the experience and spatial intelligence of the architect and the planner.

Cartography is not only functional to the quantitative measurement of the indices of socio-environmental variation of the Metropolitan Landscape, but it is used to research what is implicit in physical space and has not yet been investigated. Metropolitan Cartography, therefore, intends to experiment with methodological processes and new correspondences of form/meaning, which can convey the subjectivity of the urban agent. For this reason, cartography needs a powerful cartographic image to engage the viewer in a dialogue through a visual map that will reveal new narratives.

Within the representation of hybrid landscapes that need to be reclaimed, renamed, ordered and re-formed by new rules of form, the contribution of experts in the figuration of the multi-dimensional landscape that try to break away from the conventional cartographic representation canons is particularly notable.

Asserting the need for reclaimed landscapes (Berger, 2002) involves aligning cartographic information with new mapping categories that reveal, compared to the structure of the existing local Green-Grey Infrastructure, new cumulative alteration factors of Landscapes that belong to the geographical and social dimension of the Metropolitan Landscape.

This experimental objective has been applied during the 3 years of study by the research unit MSlab of the Polytechnic of Milan for the project European Co-funded TELLme (Training for Education, Learning and Leadership to a new Metropolitan Discipline). Metropolitan Cartography firstly analyses the metropolitan bibliography and narrative-based references for the definition of new concepts of the Metropolitan Discipline. Then, applied in heterogeneous metropolitan contexts (Argentina, Spain, Italy and Mexico), it has allowed the development of a methodological tool and a new architecture of Information Design System prototype. In short, it can express the semantic relation glossary/category, concept/level of information, setting it into the system of practical-theoretical correlation of the Mental Map (Contin et al., 2017) and the cartographic project in GIS (Geographic Information System). After this experimental process, it was possible to define a new Sémiology Graphique of Metropolitan Cartography (MC) (Fig. 8.3).

The metropolitan city and its landscape constitute a complex narrative. It needs a story to be communicated and a language that can be understood by heterogeneous users. The task of the MC research is to work on the difficulty in entering geo-referenced quantitative data, provided by different disciplines, in a new model

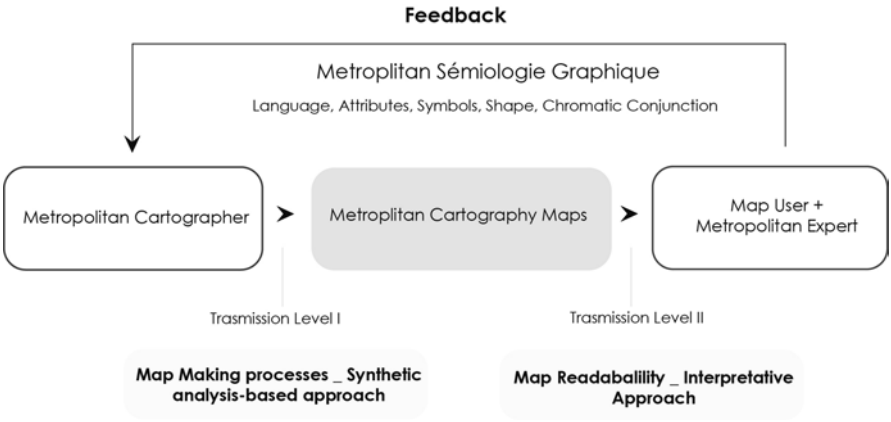


Fig. 8.3 Descriptive diagram of language, attributes, symbols, shapes and color level transmission through the new Metropolitan Sémiologie Graphique. Own Elaboration, 2020

of poly-vocal reading, and urban and territorial translocational readings (Eagleton, 1986) according to new signs of metropolitan semiology.

The coding of a new semiology, which differs from the one used by the European cartographic standard or geographical disciplines and environmental science, facilitates the understanding of the dynamics active on the territory, restoring a memorable image of the Field of Action project. This step could allow to open up a common field of debate in the international mapping context.

Our maps construction project is the result of a methodological approach which aims at structuring the logical processes of information selection to share comparable and similar project strategies with other sciences.

The European cartographic standard proposes static models of cognition for the understanding and reading of the territory.

We incorporate the Maps European technical production rules into our cultural rules of production for a memorable territorial image. Nevertheless, restoring a memorable and sensual image (Lynch, 1960) of the metropolitan field of action launches an open field of debate in the context of global mapping.

Cartography thus becomes the theoretical and practical body of knowledge that designers and mappers should develop in an alternative way of persuasive representation (Mangoni, 2008), hyper-local and global, by a logical succession of choices determined by steps.

The Metropolitan Cartography decision levels are Selection, Abstraction, Simplification- Classification in hierarchies (Harley, 1989). Thus, we give relevance to visuality in shaping mental structures, repeatability, and we reinforce the sense of belonging in a place in the world. These steps contribute to giving the image of the Composite Landscape (Waldheim et al., 2014) the memorable formal quality able to emotionally engage the designer and the end-user. Cartography is a tool of knowledge within the evidence of the real. It changes its rules according to the society in which it is produced. Consequently, the Metropolitan Cartography maps are the

result of a factual image reproducing the anthropological, temporal, and spatial dimension of architecture and the city.

References

Benjamin, W. (2007). *Infanzia Berlinese*. Torino: Einaudi. (Original work published 1973).

Berger, A. (2002). Representation and reclaiming. Cartographies, mappings and images of altered American Western Landscapes. *LANDSCAPES Journals, 4*, 82–93. Arlington: PRAXIS.

Berger, A. (2006). *Drosscape*. Princeton Architectural Press.

Bertin, J. (1967). *Semiologie Graphique*. Paris: EHEES.

Boudrillard, J. (1983). *Simulacres et Simulations*. Paris: Galilée.

Calvino, I. (1984). *Collezione di sabbia*. Milan: Garzanti.

Contin, A. (2014). La città delle Muse. Urbanità/Convivialità della Net-City. La struttura dello spazio per i diversi e nuovi comportamenti contemporanei. In *Colloqui di Architettura 1, Sui fondamenti della Composizione* (pp. 33–50). Milan: Maggioli.

Contin, A., Kim, S., Musetta, A., & Manfredini, F. (2017). *Metropolitan Cartography as a tool for the metropolitan approach to complexity: The Ugandan Key Study*. International Conference. Un futuro affidabile per la città Apertura al cambiamento e rischio accettabile nel governo del territorio. XIV EDIZIONE PROGETTO PAESE. 21 novembre 2017. Milano: Triennale di Milano.

Contin, A., Paolini, P., & Salerno, R. (2014). *Innovative technologies in urban mapping: Built space and mental space*. Berlin: Springer.

Corner, J. (2006). Terra fluxus. In Waldheim C., *The landscape urbanism reader*, Architectural Press, p.11

Corner, J. (2011). The agency of mapping. In M. Dodge, R. Kitchin, & C. Perkins (Eds.), *The map reader: Theories of mapping practice and cartographic representation*. London: Wiley.

Eagleton, T. (1986). *Against the grain*. London: Verso.

Formaggio, D. (1987). Forma, paradigma, trans-morfosi in *Belfagor* Vol. 42, No. 1, pp. 1–14. Verona: Casa Editrice Leo S. Olschki.

Harley, J. B. (1989). Decostructing the Map. *Cartographica, 26*(2), 1–20. Toronto: University of Toronto Press.

Lynch, K. (1960). *The image of the city*. Cambridge, Massachusetts: MIT Press.

Lyster, C. (2016). *Learning from logistics: How networks change our cities*. Berlin: Walter de Gruyter GmbH.

Mangoni, G. (2008). Mapping e strategie performative. La cartografia come strumento persuasivo. In *Visibile. Diagrammes, cartes, schémas graphiques* (Vol. 4, pp. 109–120). Limoges: Presses Universitaires de Limoges.

Shane, G. (2004). The emergence of landscape urbanism. Reflections on stalking Detroit. *Harvard Design Magazine, 19*, 1–8. http://archtech.arch.ntua.gr/forum/harvard-design-magazine/19_onlandscape.pdf

Shane, G. (2005). Recombinant urbanism: Conceptual modeling. In *Architecture, urban design and city theory*. London: Wiley.

Sieverts, T. (2003). *Cities without cities. An interpretation of the Zwischenstadt*. London: Routledge.

Waldheim, C. (2016). *Landscape as urbanism*. Princeton: Princeton University Press.

Waldheim, C., & Hansen, A. (2014). *Composite Landscape: Photomontage and Landscape Architecture*. Berlin: Hatje Cantz Verlag Gmbh & Co Kg.

Chapter 9
From "Landscape DNA" to Green Infrastructures Planning

Maddalena Gioia Gibelli, Viola Maria Dosi, and Caterina Selva

9.1 "Landscape DNA" as a Basis for Sustainability

According to the theory of Landscape Ecology, landscapes are co-evolutionary systems that are complex and adaptive (Kauffman, 1991; Rescia et al., 2012). They are characterized by spatial heterogeneity, that can change greatly during the time (Pickett and Cadenasso, 1995).

Nevertheless, such heterogeneity originates from some main structures and processes that act as invariants: the deep-rooted interdependencies between the original structures of the landscapes (particularly latitude, climate and hydro-geomorphological characters), and, even more notably, local resources.

Landscape has also been described as a "resource interface" in order to explain the use that communities make of landscape over time, and the co-evolution between landscapes and humans (Farina, 2008).

The changed landscape alters human needs as well as the type and use of resources that are requested by humans. New human needs drive new landscape transformations.

This process links the environmental issues related to resource consumption to the concept of "common good" that regards both use and community. In this sense, landscape is strongly linked not only to environmental resilience but also to social resilience and sustainability.

Landscape evolution can be told as the history of the domestication of nature by humans (Zeller & Göttert, 2019), in which the relationships between *available*

M. G. Gibelli (✉) · V. M. Dosi
Politecnico di Milano, Milan, Italy
e-mail: gioiagibelli@gmail.com

C. Selva
MA candidate at Goldsmiths University of London, London, UK

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_9

information and energy on the one hand, and used information and *energy on the other,* are critical in shaping landscape in different ways throughout the centuries.[1].

Information plays a substantial role within landscape dynamics. Information can be defined as the total memory of the natural and cultural history of a place, and as the capacity to organize a system (Farina, 2006).[2]

Throughout this history, landscapes accumulate over time the signs and the memory of their evolution (Turri, 2003), in terms of main structures (typically hydro-geomorphological and pedological) and population behaviors (the results of the co-evolution between nature and culture), that remain as "marks" through the centuries.

These marks act as a continuous condition that is driving the evolution and the organization of landscape, their regeneration and/or conservation, despite the enormous transformations prompted by humans.

The evolution of landscapes is oriented by the great heritage of information that they accumulate over time and from the different needs that populations try to satisfy by exploiting resources and energy.[3]. We could think of this heritage as the genetic pool that drives the development of an organism and that acts as the "landscape DNA".[4]

Losing "landscape DNA" means to lose a part of the total amount of the accumulated information or some items that permit information exchange within the landscape, organizing it.[5]

---

[1] In 1990 Zev Naveh coined the term "total human ecosystem", meaning that every ecosystem on the planet is now conditioned by human activities. Today, we call it "Anthropocene", describing the current period as the period during which human activity has been the dominant influence on climate and the environment.

[2] Types of information fluxes through time:

- the immaterial part of the landscape that drive its evolution, as cycles, events, species presence and interactions memory;
- the biophysical exchanges between geomorphological items and primaeval vegetation that drove the evolution of soils, the evolved vegetation and, at last, ecosystems including the human's,
- the actual immaterial and material exchanges between landscape items. In this case, the exchange acts as the main link of landscape systems in the form of the vital relationships between biotic and abiotic elements, between the land mosaic and the organism, and finally between different organism. Information theory help to understand the concept of suitability: not all landscape items can exchange information with each other; not all the landscape can easily adapt to a relationships system.

[3] As an example, the vast (huge) transformations that began with the Industrial revolutions are well explained by this concept, strictly linking information and energy in an entropic process.

[4] The "landscape DNA" concept is highly promising to explain ancient processes and structures that play important roles in the actual patterns.)

[5] This is the case of (that) infrastructures, (able) capable to interrupt the main biotic fluxes within a landscape, but also of the loss of traditional relationships between city and country, that is reflected in the actual resource consumption-based policies (actual policies based on resource consumption), as well as in the difficulty to improve material and immaterial synergies within town and territory. Is part of this loss, the missing of knowledge of the natural cycles underlying some critical process for the landscape.

The loss of “landscape DNA” is directly linked with the loss of landscape resilience, cities unsustainability, “landscape consumption”.

These dynamic landscape trends cannot be foregone or controlled, but they can be influenced or driven to preferable directions by plans, projects and activities.

Understanding the “landscape DNA” is therefore a prerequisite of landscape sustainability.

9.2 Metropolitan Landscapes

Metropolitan landscapes are critical as they present the fastest shifts in evolutionary dynamics when compared to other landscapes.

They also show deeper transformations in the previous spatial patterns that are based on natural resources, such as soil, surface water, groundwater, biodiversity and the knowledge and culture that originates from them.

Nevertheless, metropolitan landscapes generally retain some structural elements like hydrological and geomorphological characters, the Environmental DNA (Ruppert et al., 2019), and some main characters of the populations that form the “landscape DNA”.

Today, such structural elements play a strategic function in ecosystem and landscape development, in terms of their role in the co-evolutionary history of a given territory. To take into account the structural elements of the landscape sits at the base of a real sustainable planning, aming towards an equilibrium of the urban metabolism where urban areas are able to produce resources.

Recognizing these elements is a necessary step in developing plans and projects that make full use of the natural dynamics, rather than opposing them, while also “making nature work” according to human needs and tendencies. In this way plans and projects can promote sustainability and resilience.

Landscape Ecology metrics are tools that can be used to better the understanding of the above-mentioned landscape patterns and elements, as well as the influence of these patterns on different functions and processes over time.

These tools have key functional roles, such as describing the past, highlighting vulnerability and resilience factors and helping to develop future scenarios.

The case study of the Torino Metropolitan Area will be used in this paper to explain the principle foundations of space-time scaling and landscape transformation, as well as the different methods of studying and planning the metropolitan landscapes altogether.

9.3 The Case Study

The widespread growing attention for Green and Blue Infrastructures (GBI, EU, 2013) and for their capability to provide benefits to the human ecosystems and to address adaptation goals, is forcing urban planners to innovate landscape governance.

The inclusion of GBI in planning instruments, at different levels of governance and in different planning tools, is critical for implementing the European Strategy on Green Infrastructures. GBI inclusion in planning instruments reveals the strong interaction between the social and the ecological systems.

This paper presents a multiscale and multidisciplinary method aimed at developing a sustainable landscape plan for the Turin metropolitan area (i.e. the Green Crown of Turin).

The project has been developed within the interregional project LOS_DAMA!, driven by Piedmont region, aimed at integrating the landscape dimension, Ecosystem Services (ES), GBI and Nature Based Solutions (NBS) into planning policies.

The methodology used relies on the analysis of the genetic characters of the metropolitan landscape to highlight its diversities and vulnerabilities, applying the ES paradigm within a participatory process.

9.3.1 Principles and Methods

We rooted our analysis in the understanding of landscape vulnerability (Adger, 2006) as the opposite of the robustness and resilience ensemble (Gallopin, 2006; Janssen et al., 2006).

We consider *Resilience (R)* as the ability of groups or communities, or ecosystems, to cope with external stresses and disturbances as a result of social, political and environmental change. In landscape, resilience is the ability of response to a certain disturbance with a new configuration and equilibrium.

Robustness is the ability of a landscape to maintain its dynamic equilibrium and features facing novelties. Therefore, resilience and robustness together represent different strategies for a landscape to evolve.

We consider *Vulnerability (V)* as the probability that a landscape unit disappears, survives or changes its own characters, functions and equilibrium when exposed to different disturbances and stresses.

Vulnerability, Resilience and Robustness depend on the state of health of the set of ecosystems that characterize a specific landscape, including humans as part of the ecosystems.

Vulnerability, resilience and robustness usually coexist in a system and are intended as a characterizing property of a landscape itself.

Reducing Vulnerability and improving Resilience is the final goal of our work. This goal is reached through the development of a participated plan integrating ES (Costanza et al., 1997; Costanza, 2008; Haines-Young & Potschin, 2018) and GBI.

In this process, ES play a dual role:

– ES as a tool to describe the Landscape Units (LU) and their diversity, helping understanding the LU DNA, their vulnerability and their own role within the overall landscape mosaic;
– ES as tool to orient the plan, highlighting those related ES able to reduce vulnerability itself. In this approach each LU has its proper priority ES (Table 9.1).

The method has been tested and refined through a participatory process aimed at the development of a governance tool for an area comprising 49 municipals, through the following steps (see Figs. 9.1, 9.2, 9.3, 9.4 and Table 9.2).

Table 9.1 The main issues developed within the project

Principles	Uses
Landscape approach	Integrating analysis and plan to reach sustainability
Multi-scale approach on three study area. This approach is useful to characterize the three study areas with different levels of details and information	The upper scale, regarding the overall landscape “Green Crown of Turin (CV)”
	The medium, regarding the planning scale: 14 Landscape Units (LU)
	The lower regarding the project scale: a local area included in three LU.
Vulnerability and resilience properties at the three scales	They help to highlight the peculiar diversities of LU, their proper roles within the pilot area, understand the priority ES within each LU; orient the plan and the monitoring of the landscape mosaic dynamics
Application at the different scales, of spatial indicators borrowed by landscape ecology (see paragraph dedicated)	They act as a proxy of some soil ES and are used to highlight the main vulnerabilities and the priority soil ES of each LU
Development of the “water map” (see paragraph dedicated)	Understanding the water cycle linked to land transformation and definition of the the main vulnerabilities and priority water ES of each LU
ES (and the proper GBI), significant for the overall landscape, and the ones that are significant within the different LU	They are analysed to set policies suitable either for the large scale and the LU
Participation as a structural element to exchange information and in the definition of the multiple values	Build a share scenario of GBI planning, to be implemented with suitable NBS, based on the landscape and communities needs

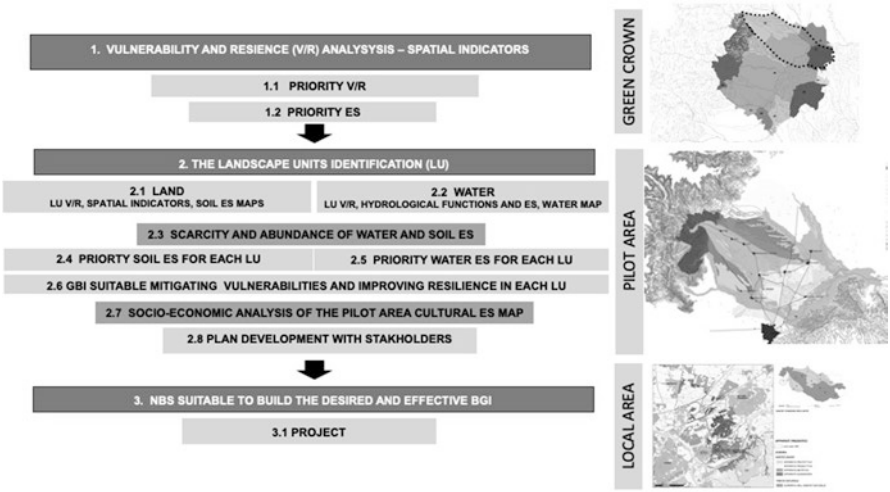


Fig. 9.1 Multi-scale approach to planning and designing effective Blue and Green Infrastructures

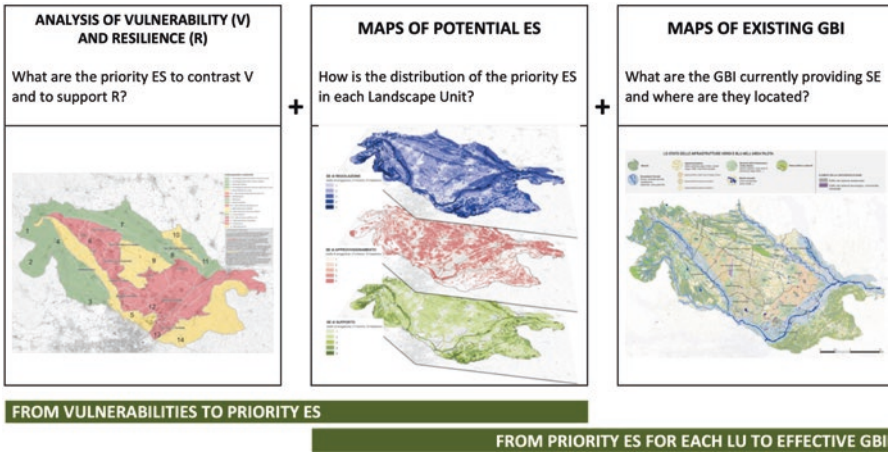


Fig. 9.2 The three phases of the pilot area development plan

9.4 The Tools

Specific metrics and spatial indicators have been used to estimate landscape loss, Vulnerability increase, and cultural and ecological ES that the agricultural landscapes can provide.

Spatial indicators describe the structures and the function of the landscape mosaic and are used as a proxy for vulnerability factors and dynamics.

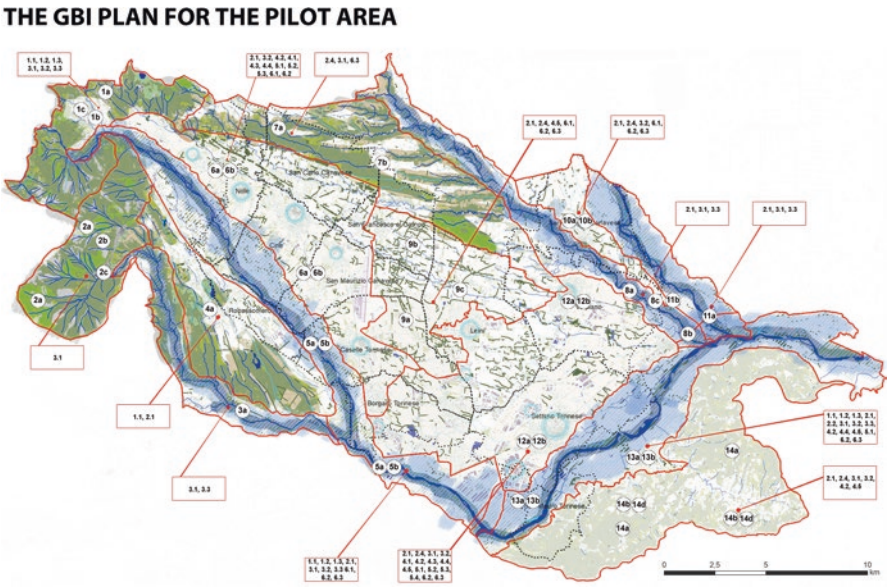


Fig. 9.3 The final map of the GBI plan for the pilot area

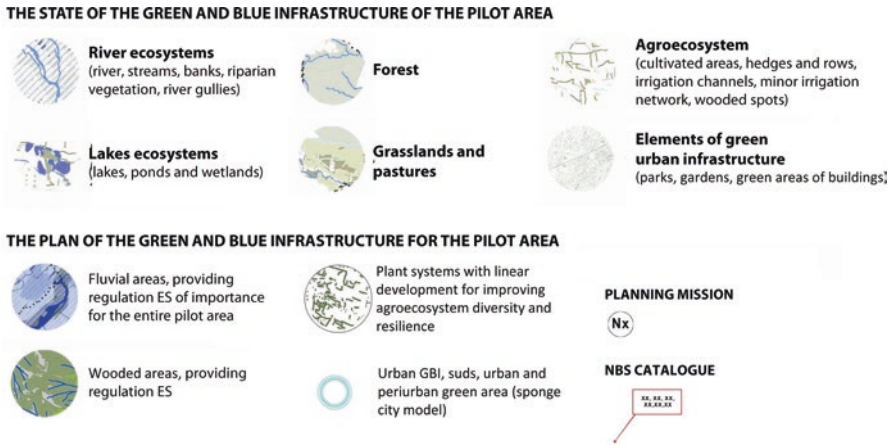


Fig. 9.4 Legend of to the map Fig. 9.3: the legend is organized in such a way as to differentiate the elements of the existing conditions, which form the basis of the plan, and the elements of the project are developed through the planning missions and the catalogue of the NBS

Table 9.2 Short description of methodological approach phases for the plan instrument, integrated by the evaluation of the Ecosystem Services and the identification of actions to increase resilience

Phase	Short description
1	The preliminary evaluation of the landscape vulnerability of the Green crown and its Land Units (LU). Such evaluation has been developed with suitable spatial indicators.
1.1	Highlighting the priority factors of Vulnerability (V) and Resilience (R). Resilience specifically, is linked with landscape "DNA".
1.2	Identifying the Ecosystem Services (ES) to reduce the main vulnerabilities of the Green crown. The selected ES are part of the priority ES, as their improvement at the lower scales, helps to reach sustainable goals for the overall landscape.
2	The identification of the LU depending from the overall main structures (Hydrogeological items, main patterns and physical relationships) and the medium scale analyses.
2.1	The development of the landscape mosaic, the soil ES maps and the implementation of the spatial indicators within the LU, in order to study the soil ES, to characterize the LU and their V/R linked to land cover and its patterns and dynamics, and, at the end, to sustain the GBI plan (see the paragraph "Measuring the total impact of soil consumption").
2.2	The development of the "water map". It considers the hydrological functions of the different elements of the land cover different elements, in order to study the water's ES, characterize the LU and their V/R linked to water distribution and dynamics, and, at the end, better integrate the water cycles with the plan of land (see the paragraph "Mapping Water").
2.3	The assessment of the scarcity and abundance of the ES able to reduce vulnerability.
2.4, 2.5	The identification of the soil and water ES able to reduce the main vulnerabilities, for each land unit: this phase allowed to define the set of the prior ES for each land unit, throw the assessment of the scarcity and abundance of the ES able to reduce vulnerability.
2.6	From the ES that are priority and scarse, are outlined the effective GBI, able to mitigate vulnerability and improve resilience within the LU
2.7	A socio-economic analysis of the pilot area, including the mapping of cultural ES, their providers and beneficiaries, and the identification of governance tools fitting with the ES enhancement the economic evaluation of the GBI in the pilot area. This step has been developed using the contingent valuation methodology, the sole able to capture non-use and indirect values in a Total Economic Value framework
2.8	The participated plan development on the pilot area. The participation process has been developed with a diversified group of stakeholders and it was a tool to share either the analysis and the planning phasis.
3	The shared choice of the Nature Based Solutions (NBS) able to implement the ES needed form each land unit.
3.1	Development of the project al the local scale.

Moreover, they are useful to explain vulnerabilities to stakeholders and to monitor future evolution of the landscape mosaic. Such indicators are based on data derived from the Land Cover Map.

The next paragraphs describe two indicators, one for detecting the loss of landscape functions due to soil sealing, the other related to the need to join the soil policies with the water ones: The Water Map.

9.4.1 *Measuring the Total Impact of Soil Consumption*

Soil sealing is a well-known topic. Nevertheless, current soil sealing metrics and management still lack a spatial strategical overview. They need to better take into consideration the ES provided by fertile soils and the urbanization dynamics effects on soil loss and degradation.

Such impacts are strictly linked to the patterns of urbanization.

We can assess direct impacts caused by sealed areas, and indirect impacts caused by disturbances derived from urbanization or by the loss of previous functions because of landscape fragmentation and patches size reduction.

These phenomena are especially visible in urban fringes, where the structural changes go hand in hand with the issues caused by the accelerated speed of human processes. Such phenomena undermine the provided ES, and the persistence of local “landscape DNA” and local knowledge, as well as the adaptation strategies of the ecological system.

Taking into account different case studies, we developed a spatial indicator able to describe the total impact of widespread urbanization on the landscape (Fig. 9.5, 9.6 and 9.7).

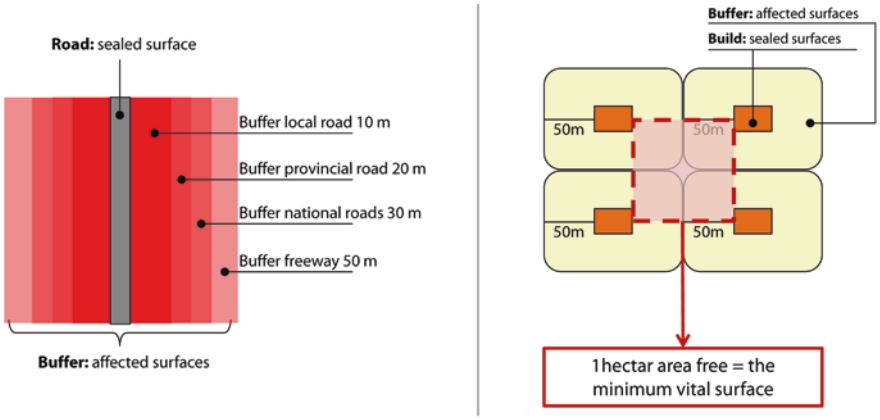


Fig. 9.5 The buffer around the road (left) and the buildings (right) is the affected surface by direct and indirect impacts. In these areas, soil ES can’t develop their potential performances because of the limited size of the patches

The width of the roads0 buffers comes from Forman (2003), the one for the building comes from Dinetti (2005), and Gibelli (2003): 1 h free area seems to be the minimum vital surface suitable for birds habitat and to maintain agricultural activities in urban fringes

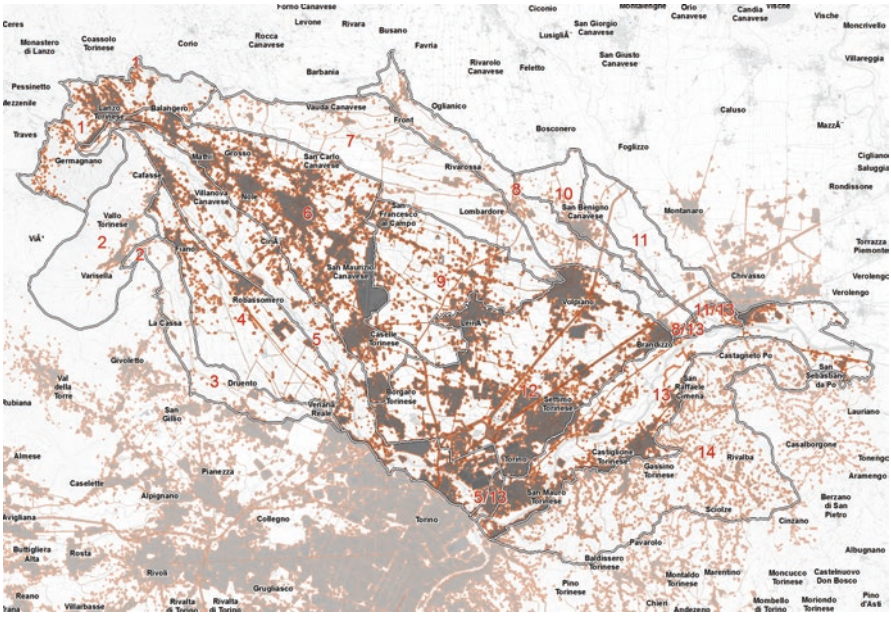


Fig. 9.6 Mapping the indicator at the scale of 14 LU

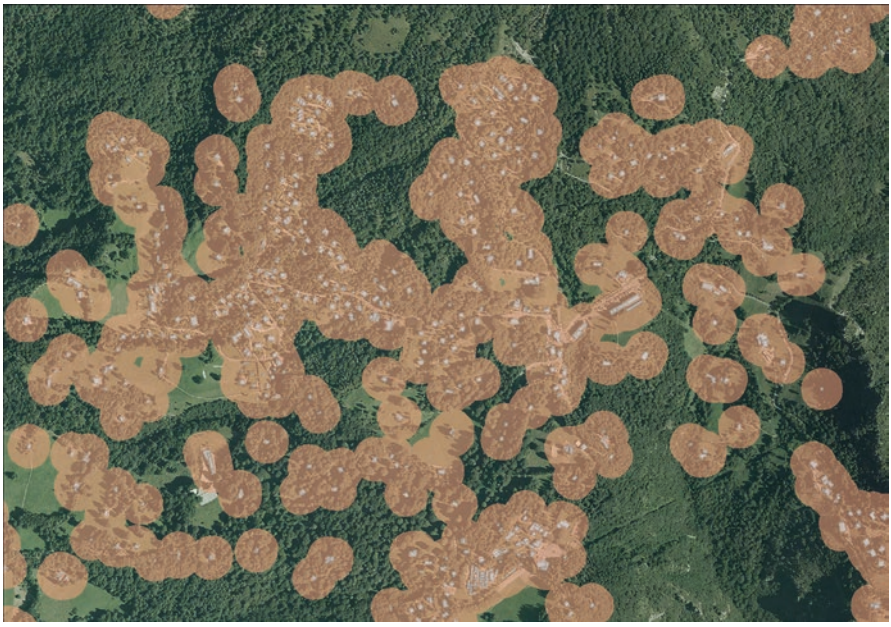


Fig. 9.7 Mapping the indicator: zoom level for the map

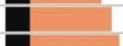
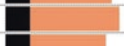
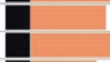
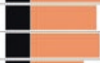
LU	Settlement Form Index [SFI]		Total Impact Index [TII] (%)		Settlement Sprawl Index [SSI]	
	dimensionless value	Icon that represent the ratio: - Black label represents total sealed surface of LU - Orange label represents total affected surface of LU	value (%)	Icon that represent the ratio %: - Black part represents total affected surface of LU - Green part represents total free surface of LU	dimensionless value	Vulnerability level class
8.	1,15		26%		30,27	
2.	2,89		11%		31,64	
11.	3,31		16%		51,98	
7.	3,61		20%		72,64	
4.	3,05		24%		73,54	
3.	3,40		22%		74,64	
10.	2,65		29%		75,81	
1.	2,81		27%		77,05	
13.	2,15		40%		85,82	
Green Crown	2,18		40%		86,06	
5.	2,16		42%		91,17	
12.	1,83		54%		98,23	
9.	3,58		32%		112,87	
6.	1,87		61%		113,51	
14.	4,33		36%		153,91	

Fig. 9.8 The results of the spatial indexes for the overall landscape “Green Crown of Turin (CV)” and for each 14 LU: the icons represents the ratio between the area sealed by buildings and infrastructures (black) and the affected area (orange). The LU presenting the largest orange buffers present the main vulnerabilities

The indicator is easy to use, implementable, comparable and communicable. It consists in three spatial indexes (See Fig. 9.8) based on the ratio between the sealed areas and the ones interfered from buildings and infrastructures.

The dimensions of the interfered areas (buffer) has been defined on the basis of the minimum ecological functionality of the land mosaic tesserae. The indexes are based both on experimental analysis and scientific literature related to lowland agroecosystems in temperate climate.

These three indexes allow to:

– take into account not only the soil consumption, but also the effects on the ES, considering both the sealed area and the surrounding area affected by the indirect impacts as fragmentation, pollution, aesthetical damage and so on;
– have a set of 3 indicators, working as a “proxy” for the missing ES, to be easily used in territorial planning;

- define areas in which the sprawl growth can increase landscape vulnerability.

– be used to build an aggregate indicator for the classification of peri-urban landscapes (Fig. 9.9).

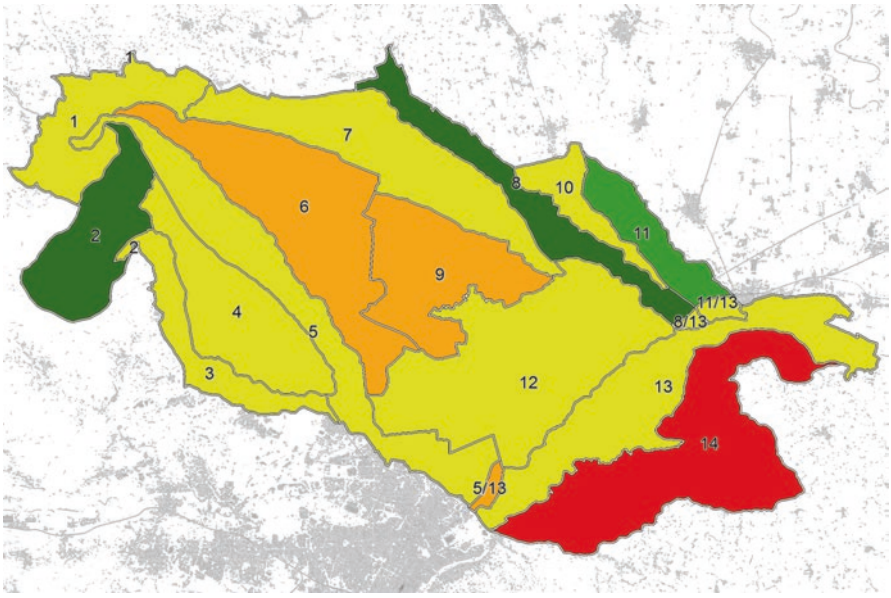


Fig. 9.9 The 5 vulnerability classes within the 14 units: 5 classes of vulnerability where found: the low level vulnerability (value < 35); medium low (35 < value < 60); medium (60 < value < 100); medium high vulnerability (100 < value <120); high vulnerability (value > 120)

9.4.2 Mapping Water

Fresh water availability is one of the main challenges of the current century: water is both a critical resource and a responsibility now and in the near future.

Climate Change affects the hydrological balance and the current standard water management policies increase the vulnerability of the water system.

Each land transformation affects the hydrological cycle, including effects on ground water: indeed, every time that a plan is approved water is threatened.

Typical planning tools fail to consider water as a structural element of the territory at the scale of the river basin. Therefore, urban growth can damage the water resources, adding vulnerability to the landscape and to the whole territory.

The "Water Map" has been developed with the aim to build a tool to help planners to understand the importance and the role of water, similarly to the land cover map for the soil.

The Water Map highlights the links between the main hydrological/ecological functions and the land cover elements. It allows to understand the specific role of each landscape tesserae in relation to water and to highlight the ES that derived from the water cycles. It is completed by a map of the existing pressures on water.

The Water Map shows the relationships between water and soil and it is a useful tool to characterize hydrographic basins, to assess scarcity and abundance of

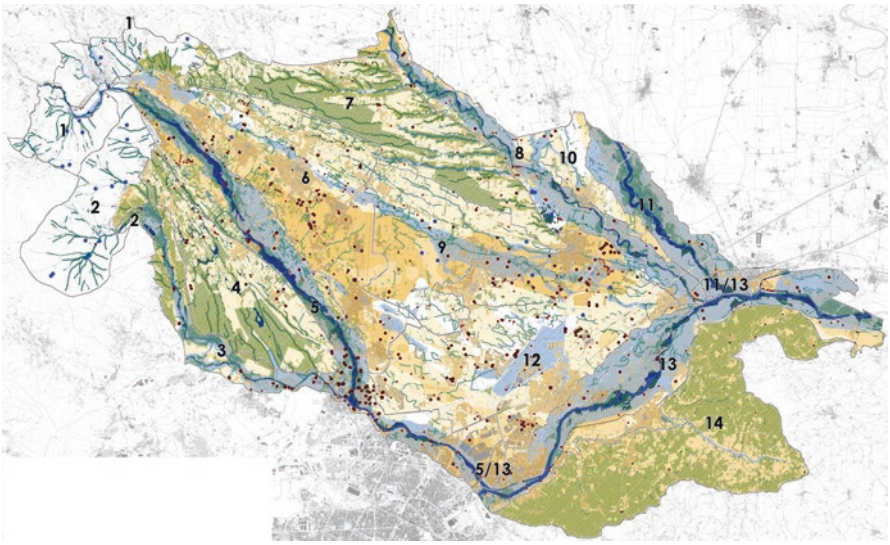


Fig. 9.10 Water Map: spatial distribution of the landscape elements that perform hydrological functions. The Map highlights the land landscape elements able to provide Ecosystem Services linked to the water cycles and the hydro-ecological functions

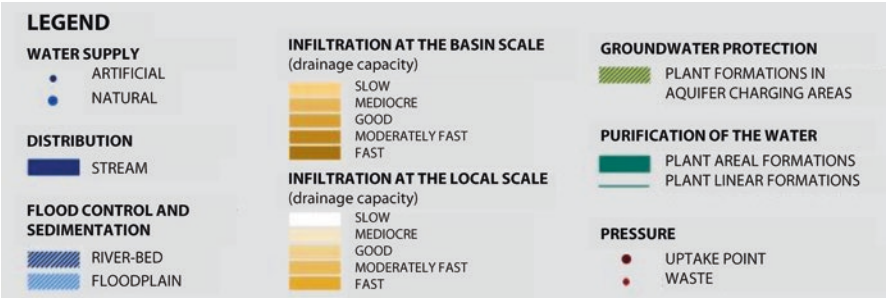


Fig. 9.11 Legend of Water Map: “hydrological functions”

hydrological functions, to understand the relationships between settlements, human activity and water, to orient GBI plans and plans in general, choose suitable NBS.

Furthermore, putting water as a central topic of planning, helps to increase the stakeholder’s consciousness of water (Fig. 9.10 and 9.11).

9.5 The Results

The output of the project is a strategic plan oriented at solving or mitigating the current issues, through encouraging and implementing effective sustainability practices, based on GBI and efficient projects. A flexible plan "to do well", based on the local development of GBI and of a new Governance model.

The project implementation gave the opportunity to test some technical tools as the Water Map and the spatial indicators that where also used within the participatory process. The participatory process was able to improve the understanding of the local landscape and of its resources for the community.

Moreover, it facilitated the joint work between municipalities, public and private actors. Such forms of cooperation could take up a leading role within the phase of strategy implementation, as well as promoting the cooperation between different institutions and different governance levels.

The actors shared a common interest in the recommended implementation actios, also because the plan was capable of enhancing local diversities, understood as synergic parts with their specific role.

Some of these actions are suitable to promote local circular economies that could develop from from multifunctional GBI.

The result is an articulated proposal built through a participatory process and using different tools, precisely to support a self-regenerating process capable of including larger communities by improving their knowledge.

9.5.1 The Tools for the Implementation of the Plan

The plan provides the strategies and the guidelines for the local development of actions. Therefore, it is rich in tools to communicate the local landscape characters and vulnerabilities. The plan also provides the strategy to help to design an effective GBI.

- *The knowledge: Descriptive sheets of LU*

Each LU is accompanied by a sheet synthetizing the characters of the LU itself through a synthetic description and the results of the analyses on which the planning and project scenarios are based.

Each sheet includes information related to:

– the main Landscape structures, that have an effect on its evolution;
– the Vulnerability and Resilience drivers;
– the results of the indicators used to describe V/R (maps and data) and the highlighted criticalities;
– the hydrological functions used to describe V/R (maps and data) and the highlighted criticalities;
– the priority ES;

– the effective GBI to improve priority ES and the planning missions suitable to develop the local GBI linked to the overall scenario.

These tools provide a set of instruments for technicians and stakeholders to orient actions at different scales and to monitor them.

- *The Planning missions*

Planning missions are the result of the process in its entirety. They are represented on a map and explained in the LU descriptive sheets.

The planning missions map is completed by sketches useful to communicate the priorities of the missions in each LU and by written sentences related to the same priorities.

- *Economical estimate of the expected scenarios*

This part was developed during the participatory process workshops by using the “Willingness To Pay” (WPT) method (Derkzen et al., 2017).

The activity took into consideration two different scenarios.

Scenario 1 assumed the provided GBI could mitigate the temperature increase and the flood effects.

Scenario 2 assumed that the provided GBI could achieve the goals set in Scenario 1 and furthermore could save agricultural land and their products as well as the open-air recreational activities.

The results are synthetases in Table 9.3.

The results show a significant engagement of people, specifically regarding the vulnerability of their landscape facing Climate Change, and a remarkable willingness to pay to improve ES and GBI to reduce vulnerability.

Moreover, it shows that people generally do not care significantly about agriculture loss and open-air spaces. It must be noted that this work has been developed before the COVID-19 pandemic and now the perception regarding these elements has probably changed.

However, the majority of the people attending the participatory process were urban citizens without a complete perception of the importance of the rural and natural landscapes. Such landscapes are important for maintaining the resources and ES that sustain the life of the city life and that have a main role in regulating vulnerability and quality.

- *Governance instruments for GBI development and management*

The tools are developed in two documents.

The first is a specific written document including the actions directed to the different sectors of the regional Administration, and a list of different economical

Table 9.3 The WTP in the different scenarios

	WPT (€ per family per year)	Annual value (MLN /year)	10 years value (MLN)
Scenario 1	43	3,6	36
Scenario 2	36	3,1	31

resources, suitable for the GBI improvement. ES and GBI are a transversal concepts and objects, and quality and benefits depend on different causes that reside in different operative sectors and policies.

Therefore, it is critical to address the administrative sectors that could have actual effects on the ES and the GBI, such as Agriculture and Forestry, Infrastructures and Public Works, Social Services, Basin and Town Planning, Climate Adaptation, Energy, and to indicate what kind of policies could consider the implementation of GBI.

The second document is the NBS abacus. A work tool that explain with words and graphic how to choose the best NBS to design an effective GBI with the priority ES and the vulnerability.

References

Adger, W. N. (2006). Vulnerability. *Global Environmental Change, 16*, 268–281. Elsevier, Amsterdam.

Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, J. R., Sutton, P., & van den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Nature, 387*, 253–260.

Costanza, R. (2008). Ecosystem services: Multiple classification systems are needed. *Biological Conservation, 141*, 350–352.

Derkzen, M. L., van Teeffelen, A. J. A., Verburg, P. H. (2017). Green infrastructure for urban climate adaptation: How do residents' views on climate impacts and green infrastructure shape adaptation preferences?. *Landscape and Urban Planning, 157*, 106–130. Elsevier, Amsterdam

Dinetti, M. (2005). Infrastrutture e biodiversità: iniziative italiane e progetto europeo COST Action 341. *Regioni & Ambiente, 6*(2), 62–64.

European Union. (2013). *The EU strategy on green infrastructure*. https://ec.europa.eu/environment/nature/ecosystems/strategy/index_en.htm

Forman, R. T. T., et al. (2003). *Road ecology, science and solution*. Island Press, Washington, Covelo.

Gallopin, G. C. (2006). Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change, 16*, 293–303. Amsterdam: Elsevier.

Gibelli, M. G. (2003). a cura di*, Il paesaggio delle frange urbane*. Milano.

Haines-Young, R., & Potschin M.B. (2018). *Common International Classification of Ecosystem Services (CICES) V5.1 and guidance on the application of the revised structure*. Retrieved from www.cices.eu

Janssen, M. A., Schoon, M. I., Ke, W., & Borner, K. (2006). Scholarly networks on resilience, vulnerability and adaptation within the human dimensions of global environmental change. *Global Environmental Change, 16*.

Pickett, S. T. A., & Cadenasso, M. L. (1995, July 21). Landscape ecology: Spatial heterogeneity in ecological systems. *Science, 269*(5222), 331–334. https://doi.org/10.1126/science.269.5222.331

Rescia, A. J., Pérez-Corona, M. E., Arribas-Ureña, P., & John, W. (2012). Cultural landscapes as complex adaptive systems: the cases of northern Spain and northern Argentina. In T. Plieninger & C. Bieling (Eds.), *Resilience and the cultural landscape understanding and managing change in human-shaped environments* (pp. 126–145). Cambridge University Press. Online ISBN: 9781139107778. https://doi.org/10.1017/CBO9781139107778.011

Ruppert, K. M., Kline, R. J., & Rahman, M. S. (2019). Past, present, and future perspectives of environmental DNA (eDNA) metabarcoding: A systematic review in methods, monitoring, and applications of global eDNA. *Global Ecology and Conservation.* [s.l.]: Elsevier. 17 e00547. p. 1–29.

Turri, E. (2003). *Il paesaggio degli uomini*. Zanichelli.

Zeller U., & Göttert T. (2019). The relations between evolution and domestication reconsidered – Implications for systematics, ecology, and nature conservation. *Global Ecology and Conservation, 20*(2019), e00756 Contents lists available at http://www.elsevier.com/locate/gecco

Chapter 10
Metropolitan Cartography, Remote Sensing and Geographic Information Systems

Alessandra Maria Pandolfi and Giovanna Sona

10.1 Georeferenced Products for Green-Grey-Blue Infrastructures Detection

All metropolitan areas identified in the world have some common features and elements (see Zhao et al., 2019; Costa et al., 2019), that can be used to determine, from many points of view (e.g. socioeconomic indices, demographic definition, urban planning rules), what a metropolitan system is and is made of (see, f.i., Toure et al., 2018). Several studies on metropolitan areas show that monocenter structures have been evolving into complex and interconnected spatial organizations (Contin et al., 2014b), described by the same basic features that can shape metropolitan aggregates (see Lan et al., 2019; Li, 2020), through the composition of green, grey, and blue infrastructures (GGBIs). Effectively recognizing this basic structures and analyzing their localization choices and evolution is a relevant activity for the metropolitan development of the future (Leyk et al., 2019), to mitigate the effects of risks and catastrophes (from anthropic and/or natural sources; see WHO, 2017) and to promote a sustainable use and organization of existing and future resources in urban systems (see UN, 2017).

Useful datasets (free/paid, public/private domain), that can be retrieved for this purpose, can be divided into several main classes, starting from aerial and satellite images (ASIs), produced by official sources or private users (using drones, aerial or satellites surveys) for one or many different possible goals, that determine different interpretation strategies and outputs (e.g. Padrò et al., 2019). The most interesting

A. M. Pandolfi (✉)
Department of Architecture and Urban Studies, Politecnico di Milano, Milan, Italy
e-mail: alessandramaria.pandolfi@polimi.it

G. Sona
Department of Civil and Environmental Engineering, Politecnico di Milano, Milan, Italy
e-mail: giovanna.sona@polimi.it

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_10

data sources are represented by vector and raster maps, produced using land or aerial surveys, having different covering and detailing levels, depending on the location. To draw and thematize maps for a specific purpose (e.g. Campi et al., 2017), zenithal images, when available, can be processed through aerial photographic and satellite image interpretation techniques.

The main element determining the potential use of ASIs is the spatial resolution (SR), that is the size of a pixel on the ground, which defines the dimension of the smallest detail that can be obtained and recorded on a map. SR is essentially a function of the sensor distance from the ground. In addition to this, there are three other resolutions that are significant for the ASIs possible use: spectral (the capability of capturing images in different wavelengths bands, from the most common RGB images to 'invisible' ones, such as infrared, to detect different surfaces), temporal (i.e. the revisiting time of the same area) and radiometric (which reveals distinct shades of the same 'color' to better detect objects). This means that images can be used in many ways for metropolitan studies about GGBIs and the most interesting ones are identified as follows.

Satellite images. They're related to Earth surface description in thematic mapping at large scale, e.g. to identify land use and/or coverage (LU/LC) classes, or to study natural or anthropic trends evolution through change detection (multitemporal analysis using archive data about urban growth, desertification, deforestation, floods, fires, ecological studies, water quality assessment, and so on). In agriculture: crop extension mapping, monitoring in different phenological phases, yield prediction, physical parameters of soils, water bodies, vegetation (f.i. biomass or Leaf Area Index maps).

Aerial images. These images are used worldwide to produce and update technical cartography, in a wide scale range (from 1:500 to 1:100,000), and topographical databases (DBT). Plus, photogrammetric techniques of stereoscopic images are used to create 3D surface and terrain models and aerial orthomosaics. With digital multispectral cameras, it is now possible to obtain high resolution thematic maps.

Drone images. Digital images (DIs) acquired by a drone (Unmanned Aerial Vehicle – UAV) can have centimetric resolutions and are used for detailed surveys on archaeological excavations, structural surveys, precision agriculture, critical events, emergency management, dangerous/remote areas, 3D building modelling, and many others.

On a large scale, ASIs provide reliable and updated geospatial information on large areas, with high geometric, spectral and temporal resolutions (GSTRs), allowing the description of the three main LC/LU categories: vegetation, built-up areas, water bodies – that is to say, GGBIs. Moreover, long time series in archives can help studying their changes in time (Osgouei & Kaya, 2017). For large regions lacking in cartographic data, ASIs can provide valuable georeferenced and up-to-date information.

Despite the wide range of available data, knowing which kind of images should be used and how to get them involves some experience, due to the intrinsic complexity of data. Though there are large archives of images, even finding and downloading them can be complicated: of course, resulting analyses and elaborations,

and extracting the desired information in usable forms, needs higher skills development.

Another kind of data that is fundamental to understand local occurrences is the digital translation of the orography description: digital terrain models (DTM), that cover the entire Earth surface, are available nowadays, but with very different geometric resolutions (GRs), depending on the original satellite or aerial surveys (and, again, different geometric details can be 'seen' in the DTMs, depending on images resolution), from 1×1 km to 30×30 m, up to local ones, from aerial photos or Lidar, with cells of few meters, which are not available everywhere (terrain models made by drones can have resolutions that are significantly lesser than 1 m, but on very limited areas).

To view, overlay, and map in a common reference (and coordinate) system different kinds of geographic information, existing databases and maps, DTMs and 'raw' images, Geographic Information Systems (GIS) platforms and Remote Sensing specialized software packages can be used. Plus, using historical archives of ASIs (from 1950s onwards), the evolution of different areas can be researched (change detection).

Through GIS imagery tools, users can turn images, DTMs or CAD data into georeferenced databases, in manual, semi- or fully automatic ways. Once the dataset is ready, users can analyze the raster information content using processing functions (preset, or customized), to perform several tasks, such as data management, visualization, and analysis. In the analysis tasks, it is often convenient to convert images to set specific indices and simplify the identification of certain occurrences in imagery, such as vegetation, geology, water, or landscape units. At higher levels, the classification process allows to segment, select samples and post-process raster and vector layers, to extract selected features from images and datasets.

10.2 Existing Georeferenced Products and Related Uses

Satellite optical sensors provide DIs that consist of many 'single colour' images: this means not only the three colour bands - Red Green Blue (RGB), but also many different 'channels', covering information about the reflected light intensity in several portions of the electromagnetic spectrum (EMS) (Fig. 10.1).

By recording many different wavelengths, in fact, different kinds of surfaces can be distinguished more accurately in the images. Objects, that are similar in visible colours, may reveal significant differences in the invisible (for human eyes) EMS part, e.g. in the infrared section. In technical terms, surfaces made of different materials have 'spectral signatures' that can be similar in visible bands, but very different in other wavelengths (Fig. 10.2).

These multiband raster images (tiff, or jpeg, or other formats) can be observed on a screen by using only the three RGB video channels, that is why we can only display three bands at a time, in a 'false colour' way, that can give evidence to different objects types lying on the Earth surface (Fig. 10.3).

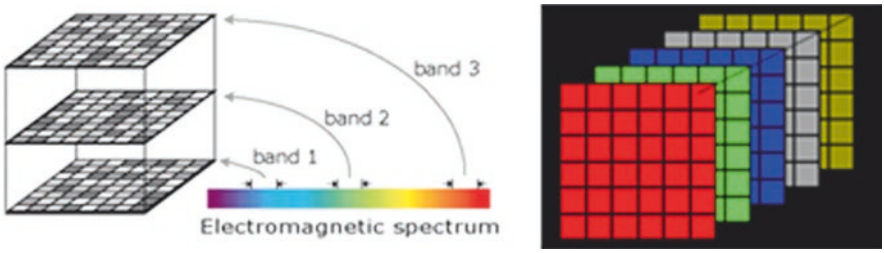


Fig. 10.1 Multispectral digital images formed by many rasters (bands)

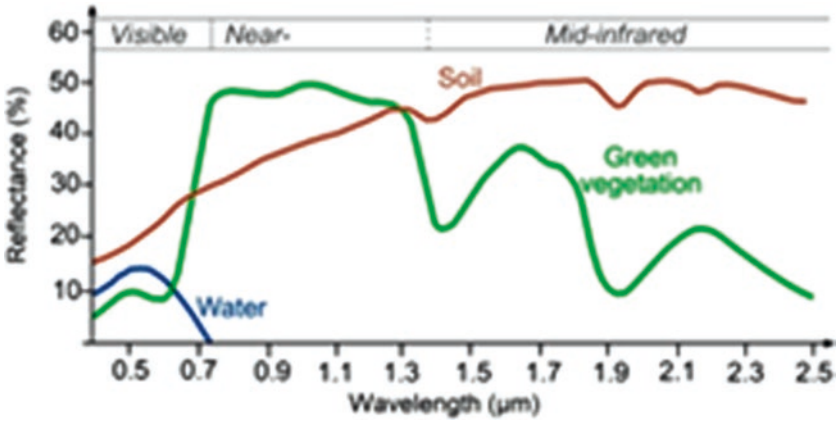


Fig. 10.2 Typical spectral signatures of Vegetation, Soil and Water

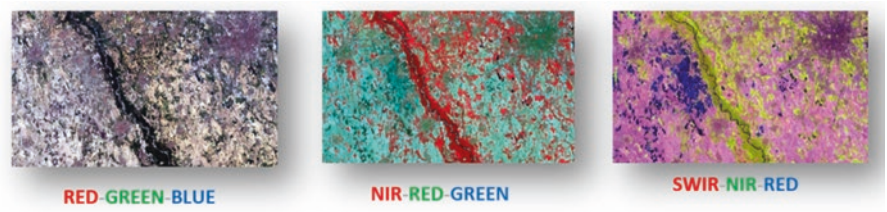


Fig. 10.3 False color visualization of multispectral images

Each band is described by digital numbers in a very ‘dense’ scale (very high dynamic range) of different values, from zero to the maximum intensity, a wider range compared to common RGB images, that have 256 hues for each band. In this way, the information content of each band increases, and the performance of automatic analysis, too, though involving heavy files and time-consuming elaborations.

Nowadays, many specialized sw interfaces have been developed, to search and download satellite images, for a given area and temporal interval, providing useful help in selecting only specific regions and bands and in discarding bad quality

images (e.g. cloudy frames), as per step.esa, plugin.qgis and schihub.copernicus references (see Webliography).

Typically, 'products' of different 'levels' (that imply several enhancement steps, to provide accurate information) are available, instead of raw images, which are corrected after several geometric and radiometric distortions (radiometric calibration, atmospheric effect, geometric distortions due to topography and central projection, georeferencing in the due coordinate system, cloud masking, and so on), to let frames be actually representative of the Earth surface (Bottom of Atmosphere, BOA). Furthermore, some derived maps are included in downloadable files, together with quality indicators, auxiliary data and metadata (see sentinel.esa reference in Webliography).

For customized mapping purposes, the most useful products are the BOA orthophotos, which are orthogonal reprojections, in a geographic or cartographic reference system, of images, pixel by pixel, on a 3D terrain model (DTM). The orthophoto can be, then, overlapped with existing digital cartography. Other useful products are 'pansharpened' images, that are true/false colour images, with increased GRs compared to the original raw ones.

The 'products' coordinate and reference system must be checked carefully, before using them to create new maps, but also to overlay or integrate other geolocated data; a common (shared) reference system is mandatory to ensure the spatial coherence of different datasets. It is very important to check also the images georeferencing accuracy, which is the precision in pixels positioning, that is often of the same order of the pixel size (e.g. 10 m for SPOT images, as per providers).

Nowadays, satellite images are available at many different GSTRs (ranging from 1 km to 0.5 m) and bands (3 visible ones, MultiSpectral - MS, from 4 to 12 bands, Hyperspectral - hundreds of bands), revisiting from monthly to daily. Free images at 10–30 m resolutions come from Landsat, Sentinel, SPOT and other satellite systems, with revisiting times from 15 to 1 day, and many spectral bands. Commercial images can reach geometric resolution of less than 1 m and very short revisiting time, but most of them have few bands, thus preventing advanced processing. Many websites and providers can be found helping in the search of free or commercial images (e.g. see directory.eoportal, satimagingcorp, gisgeography and landinfo references in Webliography). Some companies release free of charge archive data for research or specific purposes (Fig. 10.4).

From a MS SI, specific features can be extracted by visual inspection, with the help of a GIS, to digitize specific maps, but it is more convenient to implement automatic feature extraction methods. The human view process, that lets us recognize different kinds of surfaces/objects by observing a colour image, has been partially translated into algorithms, that can automatically separate them. The use of more than three (RGB) bands enhances the automatic recognition. To detect the three main classes of LU/LC - vegetation (green), water (blue), built-up (grey), multiband classification analyses are much more effective compared to RGB images. Near Infrared (NIR) highlights vegetation, whilst water is more visible in different IR bands (SWIR short wave infrared).

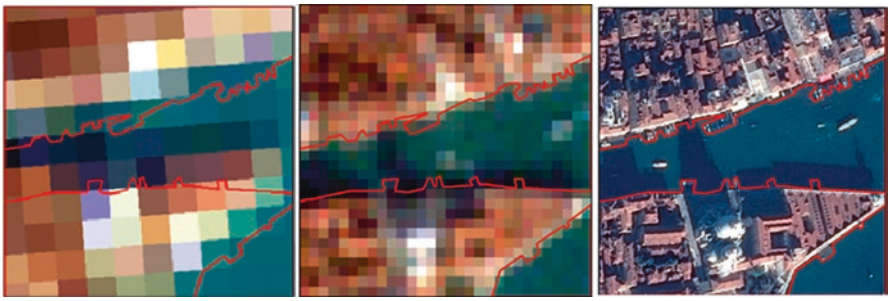


Fig. 10.4 Portion of SIs: Landsat 8 (30 m), Sentinel 2 (10 m), and Pleiades (50 cm). (From Wang et al. 2018)

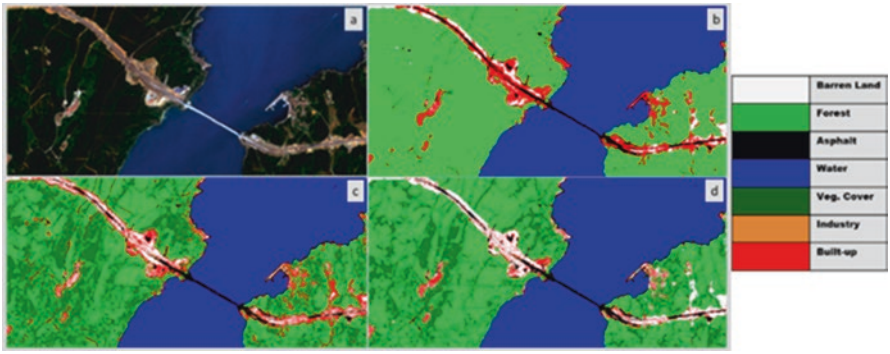


Fig. 10.5 (**a**) Sentinel-2A RGB image, (**b**) classified Sentinel-2A, (**c**) classified multi-index (NDBI, NDVIre, and MNDWI, (d) classified multi-index (NDTI, NDVIre, and MNDWI). (From Osgouei et al., 2019)

To enhance automatic classifications, it is possible to combine raster bands through specific computations, generating raster of 'indices' that emphasize a given kind of surface: NDVI (Normalized Difference Vegetation Index, computed with Red and NIR bands) to highlight vegetation, NDWI (Normalized Difference Water Index, computed with Green and NIR bands) for water bodies and NDBI (Normalized Difference Built-up Index, computed with SWIR and NIR bands) for bare surfaces. Many studies, with the aim of accurately extracting these features, using similar indices, highlighted that their values are affected by many factors. E.g., the NDBI cannot properly separate bare soil from built-up areas, therefore the Built-Up Index should be used (BUI = NDBI – NDVI). Similarly, NDVIre (with Red Edge band in place of NIR) gives better results for vegetation, and MNDW (Modified NDWI, with SWIR band in place of NIR) enhances water bodies selection.

The main issue in using indices is, then, the choice of the value (threshold) that marks a specific coverage (f.i. NDWI >0.5 = water). Better results can be reached by combining the indices of the three main classes (Osgouei et al., 2019) (Fig. 10.5).

To increase the cover classes accuracy and number, and produce more detailed maps, advanced analyses use 'classification' algorithms, that automatically group image pixels according to their radiometric intensity. The two main kinds of classification algorithms are called 'unsupervised' and 'supervised'. The first group can create pixels classes with similar radiometry in all bands, identified ex-post; the second one is 'trained' to group pixels by matching the radiometry of 'samples' target surfaces (water, asphalt, roofs, grass, and so on). The training samples are extracted from images, sometimes adding in-field surveyed information (ground truth). GIS and Remote Sensing software packages include programs that perform these classifications, and, with proper check on 'validation samples', yield maps with associated classification accuracies. By using satellite images with high geometric and spectral resolutions, very detailed maps can be created. The simultaneous use of images at different dates (multitemporal datasets) enhances classifications of some surfaces, typically vegetation (forests, crops), that show strong seasonal phenological changes (Immitzer et al., 2019).

Another relevant set of tools comes from DTMs, which contain the metric description of Earth surface and provide complementary information for geospatial analyses. The most used formats are regular cell grids of given size with associated heights in each of them (raster), or a list of 3D coordinates for many points (vector, Triangular Irregular Network). Maps of local slopes, exposure (aspect) and isolines (level curves) can be computed using a GIS, and a selection of slopes or heights can support specific studies (Hirt, 2015).

Many global and local DTMs are available, coming from satellite or aerial surveys, with spatial resolutions ranging from 100 km to 5–10 m; again, the coordinate and reference system must be checked carefully, as different countries use distinct systems, as well as the height data accuracy (see landinfo and gisgeography references in Webliography).

10.3 Comparing Metropolitan Contexts Using Maps for Possible Future Developments

Detecting the evolution of GGBIs to a worldwide level, starting from metropolitan contexts, can be a significant way to understand past and future dynamics, using protocol maps (Contin et al., 2014a). Comparing metropolitan areas using a prospective indicators research can provide new experimental understandings, relating and evaluating different urban systems using one single method, to be adapted to local specific factors. To create a common informative background, a protocol to create appropriate and accurate maps is needed, starting from a common set of definitions and operations:

1. Data should be retrieved from existing databases, having common features (resolution) worldwide, using similar algorithms to define different elements of the GGBIs in a common and comparable way.

2. Using the same aerial photographic and satellite image interpretation techniques, GGBIs should be extracted in a homogeneous and comparable way (e.g. through specific algorithms, as described in the previous paragraph), using the same definition to maximize comparative levels.
3. Sending vector data to local authorities is due to validate the GGBIs detection and improve data accuracy levels, crossmerging information with existing raster and vector databases (possibly, using official Geoinformation portals), e.g. datasets coming from official cartographic platforms or other geographic services, such as DUSAF, that is an Italian project aimed at producing elaborations about agriculture and forestry coverage for the Lombardy area. The last version (2018) started from orthophotos and ASIs to classify data in 5 hierarchical levels, including Corine Land Cover classes (urban, agricultural, forestry, seminatural, humid and water), further defined in local subclasses intersecting information with secondary databases. Another possible example comes from ERSAF, the Lombardy Region Agriculture and Forestry Agency, which used multitemporal images (2014), including NDVIs (calculated with ISODATA unsupervised algorithm), to detect the green areas evolution through ERDAS Imagine SW, comparing RGB false color images. The result is a multilevel classification, ensuring the correct recognition of green areas, deselecting high-reflectance pixels (built-up) and cleaning datasets by excluding single or small groups of pixels and comparing them with existing vector ones.
4. Data post-processing to detect possible evolution trends.
5. Definition of comparison maps to build a protocol mapping dataset to different scales (XL to XS).

Actually, from the point of view of metropolitan trends and dynamics, the problem of finding different definitions to represent metropolitan aggregates and their possible limits can be effectively solved using a geographical approach, instead of a purely statistical one, which embodies the traditional governance management style, based on authorities and institutional architectures (Contin et al., 2014a). Describing metropolitan aggregates using open source data becomes, then, the most effective way of building protocol maps to outline the GGBIs in urban areas, delineating the balance between GGIs, hazard elements, instable and changing borders (e.g. with buffer mixed zones), landscape and development units, ecosystem services and other hot topics (WHO, 2017). Relating a set of selected, comparable data will, then, help highlighting past and future trends.

The correct planning of urban contexts can help moderating some of the most important risks for human health, even in the built environment, through the correct identification and monitoring of green, grey, and blue infrastructures (GGBIs). The poor localization choices of settlements can even trigger multiple risks, causing significant effects and deaths reasons, that can be easily prevented by correctly teaching urban managers and citizens how to deal with these issues. The goal is to highlight a new planning and design approach for developing countries, using modern technological tools to drive conscious localization choices, even in highly fragmented urban contexts, where self-constructed housing is the standard.

The changing conditions of metropolitan planning basics, that determine the variability of our local and national contexts, can be effectively measured thanks to quantitative and qualitative indicators (Pandolfi, 2019). These values could be calculated through procedures implemented thanks to GIS, using elements of geostatistics and numeric cartography. The speculative basics of the need of using GIS for the localization analysis is strongly connected to the necessity of finding a steadier definition of its variability in time and space (Campi et al., 2017).

In the light of the general and specific measure provided by local authorities, it is crucial to implement new tools for the identification and assessment of metropolitan areas, using quantitative and qualitative procedures that can be widely applied using the same process, to be referred as best practices. This is even more important in the light of the fact that many international establishments demand for specific best practices to be implemented in all the relevant fields (see WASH_1.0, 2017). The process of identification and assessment is still far to be closed, as it is lacking a common methodology, that a set of some basic standards could spread.

This is why a worldwide research program based on protocol maps should be addressed to identify tools, indexes, methods, and best practices for the metropolitan planning best practices definition, to assess the correct planning approaches related to moderating some of the most important risks for human health (WHO, 2017), even in the built environment, considering the values assigned to them by the interested parties and populations. Most of these objectives and measures could be efficiently implemented through GIS procedures, involving quantitative and qualitative analysis techniques, that could lead to the complete identification of the relevant factors which metropolitan aggregates consists of, to define quality objectives for Planning rules.

References

Campi, P., Pandolfi, A., & Terlizzi, L. (2017). Gis and landscape analysis. *International Journal of Social Science Studies, 3*(1), 629–643. https://doi.org/10.20319/pijss.2017.s31.629643

Contin, A., Ortiz Castano, P. B., & Zammataro, A. (2014). Towards a metropolitan approach for the definition of a network of intermediate cities. *Regional Development Dialogue, 35*, 103–117. Handle:11311/1017068.

Contin, A., Paolini, P., & Salerno, R. (2014). Innovative technologies in urban mapping: Built space and mental space. *SXIINNO, 10*, ISBN 978-3-319-03797-4. https://doi.org/10.1007/978-3-319-03798-1

Copernicus. (2020, August 12). https://scihub.copernicus.eu/dhus/#/

Costa, C., Santana, P., Dimitroulopoulou, S., Burstrom, B., Borrell, C., Schweikart, J., Dzurova, D., Zangarini, N., Katsouyanni, K., Deboseree, P., Freitas, Â., Mitsakou, C., Samoli, E., Vardoulakis, S., Dell'Olmo, M. M., Gotsens, M., Lustigova, M., Corman, D., & Costa, G. (2019). Population health inequalities across and within European metropolitan areas through the Lens of the EURO-HEALTHY population health index. *International Journal of Environmental Research and Public Health, 16*(5), 836–852. https://doi.org/10.3390/ijerph16050836

ERSAF, Regione Lombardia. (2014). *Rapporto sulla consistenza del suolo agricolo e sue variazioni.* https://www.ersaf.lombardia.it/it/b/2248/rapporto-sulla-consistenza-e-variazioni-suolo-agricolo

ESA Sentinel. (2020, August 12). https://sentinel.esa.int/documents/247904/3681608/Sentinel-2-Level-1C-2A-TOA-processing-full.png
GIS Geography. (2020a, August 12). https://gisgeography.com/free-global-dem-data-sources/
GIS Geography. (2020b, August 12). https://gisgeography.com/free-satellite-imagery-data-list/
Hirt, C. (2015). Digital terrain models. In E. W. Grafarend (Ed.), *Encyclopedia of geodesy*. Springer. https://doi.org/10.1007/978-3-319-02370-0_31-1
Immitzer, M., Neuwirth, M., Böck, S., Brenner, H., Vuolo, F., & Atzberger, C. (2019). Optimal input features for tree species classification in Central Europe based on multi-temporal sentinel-2 data. *Remote Sensing, 11*, 2599. https://doi.org/10.3390/rs11222599
ISPRA Ambiente. (2020, August 12). http://www.isprambiente.gov.it/it/temi/biodiversita/documenti/corine-land-cover-clc
Lan, F., Da, H., Wen, H., & Wang, Y. (2019). Spatial structure evolution of urban agglomerations and its driving factors in mainland China: From the monocentric to the polycentric dimension. *Sustainability, 11*(3), 610–639. https://doi.org/10.3390/su11030610
Leyk, S., Balk, D., Jones, B., Montgomery, M. R., & Engin, H. (2019). The heterogeneity and change in the urban structure of metropolitan areas in the United States, 1990–2010. *Scientific Data, 6*(321). https://doi.org/10.1038/s41597-019-0329-6
Li, Y. (2020). Towards concentration and decentralization: The evolution of urban spatial structure of Chinese cities, 2001–2016. *Computers, Environment and Urban Systems, 80*, 25–43. https://doi.org/10.1016/j.compenvurbsys.2019.10142
Osgouei, P. E., & Kaya, S. (2017). Analysis of land cover/use changes using Landsat 5 TM data and indices. *Environmental Monitoring and Assessment, 189*, 136. https://doi.org/10.1007/s10661-017-5818-5
Osgouei, P. E., Kaya, S., Sertel, E., & Alganci, U. (2019). Separating built-up areas from bare land in Mediterranean cities using sentinel-2A imagery. *Remote Sensing, 11*, 345. https://doi.org/10.3390/rs11030345
Padrò, J. C., Muñoz, F. K., Planas, J., & Pons, X. (2019). Comparison of four UAV georeferencing methods for environmental monitoring purposes focusing on the combined use with airborne and satellite remote sensing platforms. *International Journal of Applied Earth Observation and Geoinformation, 75*, 130–140. https://doi.org/10.1016/j.jag.2018.10.018
Pandolfi, A. M. (2019). The importance of including the value of soil in metropolitan planning strategies. *International Journal of Engineering Research & Technology, 8*(12), 664–669. https://doi.org/10.17577/IJERTV8IS120359
QGIS. QGIS Python Plugins Repository. (2020, August 12). https://plugins.qgis.org/plugins/SemiAutomaticClassificationPlugin/
Regione Lombardia. (2020, August 12). https://www.dati.lombardia.it/Territorio/Dusaf-6-0-Uso-del-suolo-2018/7rae-fng6
Satellite Imaging Corporation. (2020, August 12). https://www.satimagingcorp.com/satellite-sensors/
Sharing Earth Observation Resources. (2020, August 12). https://directory.eoportal.org/web/eoportal/satellite-missions/
Step. (2020, August 12). https://step.esa.int/main/toolboxes/snap/
The open platform and marketplace for Earth data and analytics. (2020a, August 12). http://www.landinfo.com/products_dems-satellite.html
The open platform and marketplace for Earth data and analytics. (2020b, August 12). https://www.landinfo.com/satellite-imagery-pricing.html
The open platform and marketplace for Earth data and analytics. (2020c, August 12). http://www.landinfo.com/satellite-imagery-search.htm
Toure, S. I., Stow, D. A., Clarke, K., & Weeks, J. (2018). Patterns of land cover and land use change within the two major metropolitan areas of Ghana. *Geocarto International, 35*(2), 209–223. https://doi.org/10.1080/10106049.2018.1516244
UN, Population Division of the Department of Economic and Social Affairs of the United Nations. (2017). *The World's cities in 2016, Report from the World Urbanization Prospects: The 2016*

revision. http://www.un.org/en/development/desa/population/publications/pdf/urbanization/the_worlds_cities_in_2016_data_booklet.pdf

UN, Population Division of the Department of Economic and Social Affairs of the United Nations. (2018). *Revision of World urbanization prospects*. https://population.un.org/wup/DataQuery/

Wang, Z., Liu, J., Li, J., & Zhang, D. D. (2018). Multi-Spectral Water Index (MuWI): A native 10-m multi-spectral water index for accurate water mapping on sentinel-2. *Remote Sensing, 10*, 1643. https://doi.org/10.3390/rs10101643

WASH_1.0 Open WASH. (2017). *Study session 5. Urbanization: Trends, causes and effects*. http://www.open.edu/openlearncreate/mod/oucontent/view.php?id=79940&printable=1

WHO, World Health Organization. (2017). *Healthy housing: Raising standards, reducing inequalities*. https://www.who.int/social_determinants/publications/housing-factsheet/en/?

Zhao, C., Jensen, J., Weng, Q., Currit, N., & Weaver, R. (2019). Application of airborne remote sensing data on mapping local climate zones: Cases of three metropolitan areas of Texas. *US Computers, Environment and Urban Systems, 74*, 175–193. https://doi.org/10.1016/j.compenvurbsys.2018.11.002

Part III
The Metropolitan Landscape Tool

Chapter 11
A Social Cohesion and Equity Methodology for Emerging Metropolitan Areas and Bioregions

Blanca Del Espino Hidalgo, Emilio J. Mascort-Albea, Domingo Sánchez Fuentes, and Carlos Tapia

11.1 Resilient Relations and Bioregion: Metropolitan Metabolism, Environmental Justice and Heritage System

We must face metropolises as complex and adaptive socio-ecological systems[1] whose continuity is based on their resilience and the adjustment capacity of the metabolism for metropolitan socio-ecosystems to the biocapacity and biohazard of

[1] Based on the following definition: "a complex adaptive system is one that is made up of a dynamic network of adaptive agents, which act and react to the actions of other agents, on which their behavior depends. These systems can have very diverse natures, both of biological origin, and artificial, material, immaterial, etc. (Holland, 1996). Therefore, these systems "are pattern seekers. They interact with the environment, learn from experience and adapt as a result" (Cardona et al., 2011)

B. Del Espino Hidalgo
Instituto Andaluz del Patrimonio Histórico, Universidad de Sevilla, Sevilla, Spain
e-mail: bdelespino@us.es

E. J. Mascort-Albea
Department of Buildings Structures and Soil Engineering, Universidad de Sevilla, Sevilla, Spain
e-mail: emascort@us.es

D. Sánchez Fuentes
Department of Urban and Territorial Planning, Universidad de Sevilla, Sevilla, Spain
e-mail: dsanchez@us.es

C. Tapia (✉)
Department of Architectural History, Theory and Composition, Universidad de Sevilla, Sevilla, Spain
e-mail: tava@us.es

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_11

natural ecosystems as well as to climate change.[2] All of this has been conceived in the context of a common territorial model, regardless of administrative delimitations, with the need to reach "almost zero" carbon balances before coming to the central decades of this century. Besides, another requirement should be the reconnection of the metropolises with the related rural spaces, as renewed examples of the new healthy distances, promoting management around the bioregions (Prats et al., 2017).

Resilience applied to spatial planning and management at all scales requires: biological, landscape, social and economic diversity; ecological versatility; implementation of a modular system; slow variables and boundary control; social memory; social capital; innovation; overlaps in governance and maintenance of ecological services (Díez Medina & Monclús, 2018). This approach represents the capacity, and the opportunity, for urban managers to confront a crisis condition, and rebuild the process to propose new alternatives, safeguarding interpersonal rights while socializing responsibility for public health.

Therefore, the resilience of the metropolitan socio-ecosystem must be based, within the scope of the bioregion (see example in Fig. 11.1), on the correct definition and configuration of its Heritage System, on the balance of its, let's say at least for now, Metropolitan Metabolism, and on the establishment of Environmental Justice. These elements must assume a fundamental role in the formulation of new

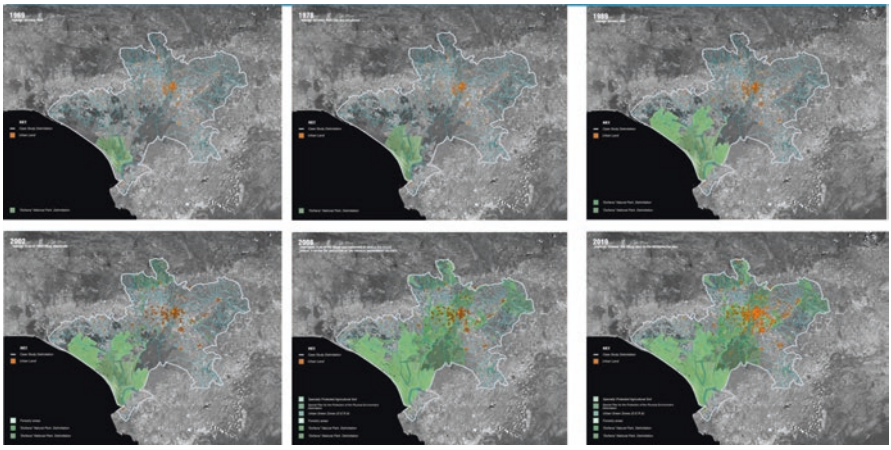


Fig. 11.1 Seville's Bioregion proposal: towards sustainable landscape cartography. Territorial areas with an ecological and cultural significance, characterized by similar biophysical features, land use and socio-economic context. It is necessary to achieve that the bioregion tends to its sustainability as a socio-ecosystem, promoting "a harmonic, balanced and equitable relationship between a maintained functionality of the natural systems and rational exploitation of the multiple benefits that these generate". (Borja Barrera & Montes del Olmo, 2008)

[2] The concept from resilience of regions and communities facing the effects of climate change is necessarily linked to these ideas: "flexibility, adaptability, persistence, self-regulation and self-organization, etc." (García García, 2016).

development logics that allow us to "move towards soberer and simple economies, with balanced ecological, energy and carbon footprints concerning the biocapacities of the bioregion" (Walker & Salt, 2006).

In turn, these new patterns of action must offer adequate support for life, optimize self-sufficiency and proximity in basic resources and environmental services, and integrate urban, rural and natural realities in a compatible approach.

11.2 The Importance of Landscape Equilibrium in Metropolitan Metabolism

This new socio-ecosystemic infrastructure must be supported by the positive network of the bioregion, organized as a modular and polycentric configuration. In this particular context, the modular concept refers to the ability to formalize larger structures or systems from modules or assemblies that are connected but not overlapping. Each of these modules is flexible and capable of adapting to external conditions, without disturbances affecting the whole ecosystem (Walker & Salt, 2006). Additionally, it must be constituted by its Heritage System, that is, by the set of cultural or immaterial, natural or anthropic goods that have a social value, as well as by their relationships and interconnections. The ability of this landscape structure to articulate and promote socio-territorial identity –uncoerced- will help to improve the function of ecological systems as green infrastructures, as connectors for biodiversity and also as elements of adaptation to climate change (Gallardo Ramírez, 2019).

Likewise, it is compulsory to analyze the complex interactions that are established in the exploitation of the ecosystems of the bioregion, as an integral part of the new infrastructure proposed. The aim is to understand and simultaneously manage these relationships to preserve their capacity to generate supplies and cultural (non-material) services, to regulate the benefits obtained (Millennium Ecosystem Assessment, 2005). It is precisely these benefits that form the basis of economic, social and cultural development (Montes del Olmo, 2007) and the improvement of the health and well-being of the inhabitants of the metropolises.

Based on the "recognition that human beings and their culture are an integral part of ecosystems and, therefore, the objectives of environmental management are of an eminently social nature" (Paredes Castillo, 2016), the third essential element of the new socio-ecosystemic infrastructure of the metropolises should be the promotion of Environmental Justice.

We refer to the generation of a more inclusive community, through the definition of strategies of proximity, gender, recovery of identity and promotion of the local economy. These achievements should be based on the production of hybrid spaces for the generation of food and energy, for recycling and new technologies, shaping a territory equipped and suitable for a community rooted in the place, and capable of identifying possible emerging community spaces (Montes del Olmo, 2007).

11.3 Principles for a Methodology Towards Social Cohesion and Equity for Emerging Bioregions

If equality at the political level could be defined as a political ideology for the common goods governed by laws, equity at the social level would be a type of "positive discrimination" in favour of the recognition of differences. An expanded perception of this would be undermined if we said that equality is not possible without -previously- inequity. But that in knowing that nothing prevents capitalism from maintaining its order, either we are unfair in improving the disadvantaged, or there will be no improvement at all.

What do we mean by equity? Equity, as a hypothesis in our assumptions, is composed of several principles, as a constitution, which would establish a basic charter, which on the territory of the city could have a title for its mandate: Urban Political Ecology (UPE according to Fraser (Fraser, 2013) and Swyngedouw (Cook & Swyngedouw, 2012). But it should free itself from its manifestation by the urban, reaching a territorial rooting more by the approach of nature and society intertwined as a single entity. Perhaps you could bet on the bioregion. In a bioregion, urban metabolism does not establish that vital factors (water, energy, food, etc.) become commodities to be manipulated by specialized labour and high profit for a few. A Bioregional Political Ecology would have four principles, (adding health as a non-separate perspective): Environmental Justice, The Common, Senses of Belonging, and the Rights (to the city, to the landscape, to inclusiveness, to dignity, etc.). Beyond them, an operational scheme can be described formulating a more accurate attempt to a methodology, as seen in Fig. 11.2.

For Environmental Justice, we would break down four essential aspects that are complexly intertwined (based on Iris Marion in 1990 and cited by David Schlosberg in 2007 (Schlosberg, 2007)): a Distributional Justice (which would be the need for environmental ills not to be concentrated in or near disadvantaged communities but (re)distributed more equitably), a Procedural Justice (the need for a more just and democratic decision-making process and the participation of disadvantaged groups in it), a Capacity Justice (the need to build 'the capacities needed for a healthy and functional community') and an Acknowledgement Justice (the need for recognition and respect for disadvantaged communities suffering from environmental injustice and for those involved in their struggle) (Cook & Swyngedouw, 2012).

For its part, the use of the term "the Commons" or "the Common Goods", refers to a change of mentality, more than to great ideas that are renewed, but that struggle to disapprove the senses attributed to basic notions, apparently immovable, that can shape societies, as David Bollier has written in the chapter entitled "The Growth of the Commons Paradigm" (Bollier, 2007). Reorganizing the guidelines of the so-called "Global Public Domain" is its function. The archetype of the commons is not primarily based on a system of property, contracts and markets, but on social rules and norms, as well as legal mechanisms that allow people to share ownership and control of resources.

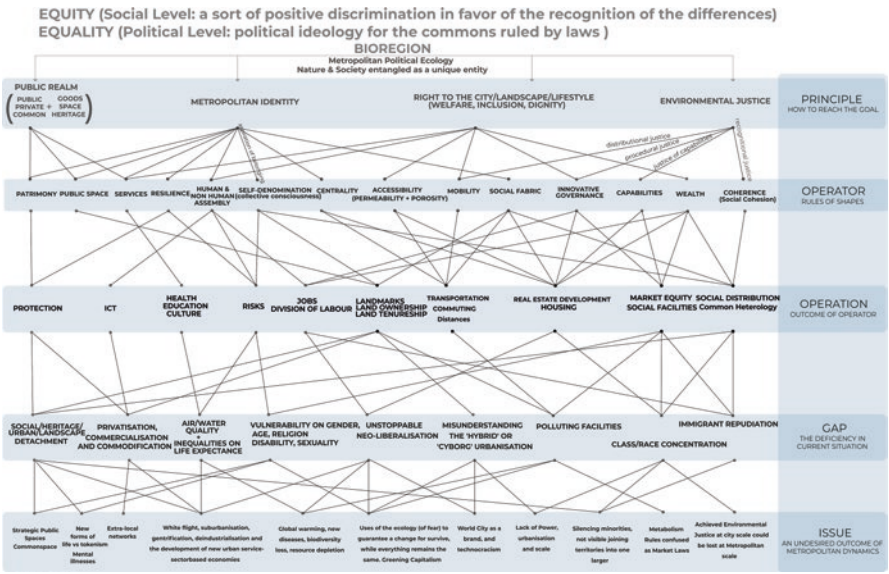


Fig. 11.2 Proposal for a Methodology of actions in emergent bioregions

Nancy Fraser (Fraser, 2013) stated, based on Foucault, that if Fordist regulation aspired to universality despite its persistent inequality, post-Fordist governmentality, in turn, separates and channels individuals according to their degree of efficiency and risk prediction, enunciating a "dual society" of the hyperconnected and the excluded. Thinking the Commons, bends, or at least, pretends, the vector of inequality by counterbalance.

Regarding the sense of belonging, self-designation or collective consciousness, it can be said that the communities do not respond to the regulations and projects located on traditional boundaries (municipal, district, etc.), but rather, in a more complex manner, new territorialities are opened in the old boundaries, now areas of confluence. These can range from the emergence of new metropolitan areas, processes in the so-called post-metropolis, communities in transition, etc. Their operators would be the assembly of the human with the non-human, the centrality, the resilience of communities, and mainly, the heritage. Nevertheless, when we speak of sustainable metropolitan heritage, we must consider another of the most recognized definitions of heritage, enunciated by George-Henri Rivière, who clarifies that it explains people and their ascendants' common territory (Rivière, 1993). In this way, a shared guardianship, in terms of possessions common to a group of people who share a legacy or a culture, causes the emergence of common identity which, in this way, becomes a quality proper to cultural heritage (Keitumetse, 2013). It is particularly this understanding that heritage offers us of the territory in which it is embedded, and which gave it meaning that will interest us most when we speak of metropolitan heritage.

Finally, Rights. Everyone is familiar with the research carried out by Lefebvre at the end of the 1960s, under the name of "the right to the city" (Lefebvre, 1967). Understood in its origin, it must be considered as an enthusiastic postulation of a new and radical type of urban policy. Today, it is difficult to reconstruct this origin, although it is common to try to invoke it unaltered in more reformist contexts. It was Harvey, in his 2008 essay "The Right to the City'', who re-articulated Lefebvre's central belief, arguing that "the right to the city is much more than individual freedom to access urban resources: it is a right to change ourselves by changing the city''. Despite Lefebvre's mistrust of giving architects a place in this urban policy, we in architecture have believed that we can find a solution to give all citizens a degree of equity that is based on our actions to achieve the participation and appropriation of public space by the inhabitants.

11.4 Conclusions

It is not time to extend a "principle of hope" in the sense of Ernst Bloch, nor even in the sense of responsibility for that of Jauss, it does not have an alter-globalization posse. It is a matter of locating practices that are based on the four principles and the subsequent articulations as shown in our proposed diagram and succeeding methodology. With this, the aim is to understand the daily life of an architectural intelligence in gestation, along with other social practices. Such a meeting could be called a bioregion, blurring the limits imposed by a city on the rise in terms of economy and representation. The concept of bioregion seeks to test formulas of analysis and socio-territorial management, supplanting the dualistic logic of nature/culture with the comprehension that natural and human dynamics are always linked. Those who best describe the definitive limits of a bioregion are the very people who have lived it, and they do so through human recognition of the realities of living on the site.

Only through the conception of a reality that must be valued in a collective and synergic way due to its environmental, historical, social, cultural and productive charge, will it be possible to articulate conducts that allow the development of a balanced urban metabolism in the scope of the bioregions. All this, thanks to the construction of individual visions that, within the framework of a common imaginary, assume the landscape as a reality capable of condensing all those potentialities that should allow a sustainable future, assumed as a legacy in equity for future generations.

References

Bollier, D. (2007). The growth of the commons paradigm. In C. O. E. Hess (Ed.), *Understanding knowledge as a commons* (pp. 27–40) http://hdl.handle.net/10535/4975

Borja Barrera, F. & Montes del Olmo, C. (2008, January). La gestión ecosistémica como herramienta territorial para la toma de decisiones. Ecorregiones e integración funcional de carreteras y espacios naturales protegidos in *II Congreso Nacional de Medio Ambiente en Carreteras.*

Cardona, R., Bustos, G., & Martin Fiorino, V. (2011). Circadiana en el paisaje urbano desde la epistemología compleja. *Orbis Rev Científica Electrónica Ciencias Humanas, 6*(18), 82–115. https://www.redalyc.org/articulo.oa?id=70918499005

Cook, I. R., & Swyngedouw, E. (2012). Cities, Social cohesion and the environment: Towards a future research agenda. *Sage Jorunals, 49*(1), 1959–1979. https://doi.org/10.1177/0042098012444887

Díez Medina, C., & Monclús, J. (2018). *Urban visions*. Springer.

Fraser, N. (2013). ¿De la disciplina hacia la flexibilización? Releyendo a Foucault bajo la sombra de la globalización. *Rev Mex Cienc Polit Soc, 46*(1), 15–33.

Gallardo Ramírez, C. (2019). *Método de evaluación para la regeneración integrada del espacio turístico litoral: la costa del sol occidental.* [Doctoral dissertation, Universidad de Sevilla]. Open. https://idus.us.es/handle/11441/81513

García García, M. (2016). Desmontando la paradoja de la sostenibilidad. *Ambienta, 125*(4), 4–22. https://dialnet.unirioja.es/servlet/articulo?codigo=5898199

Holland, J. H. (1996). *How adaptation builds complexity*. Basic Books.

Keitumetse, S. (2013). Cultural resources as sustainability enablers: Towards a Community-Based Cultural Heritage Resources Management (COBACHREM) model. *Sustainability., 6*(1), 70–85. https://doi.org/10.3390/su6010070

Lefebvre, H. (1967). Le droit à la ville. *L' Homme la société, 6*, 29–35. https://doi.org/10.3406/homso.1967.1063

Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being. Synthesis*. Island Press.

Montes del Olmo, C. (2007). Del desarrollo sostenible a los servicios de los ecosistemas. *Ecosistemas, 16*(3), 1–14. https://doi.org/10.1098/rstb.2006.1989

Paredes Castillo, D. (2016). *Enfoque ecosistémico y corredores de conservación de la biodiversidad*. Andrade Pérez, Ángela (Ed.).

Prats, F., Cuchí, A., & Oscariz, J. (2017). *Ante el antropoceno. Reflexiones sobre la cuestión biorregional en el País Vasco.* Departamento de Medio Ambiente, Planificación Territorial y vivienda https://www.euskadi.eus/contenidos/informacion/revision_dot/es_def/adjuntos/Aproba-cion%20incial/Informe%20y%20Anexo_Biorregional_Pa%C3%ADs%20Vasco_FPrats.pdf

Rivière, G. H. (1993). *La museología*. Akal.

Salazar-Galán, SA. (2020, March 10). *Crisis sistémica y coronavirus* (I). https://ctxt.es/es/20200302/Politica/31295/coronavirus-epidemia-crisis-capitalismo-recesion-joan-benach.htm

Schlosberg, D. (2007). *Defining environmental justice*. Oxford University Press.

TELL_me. (2020). *TELL_me Project Inaugural Book. Politecnico di Milano*, Milan, Italy (in progress).

Walker, B., & Salt, D. (2006). *Resilience thinking: Sustaining ecosystems and people in a changing world*. Island Press.

Chapter 12
Envisioning Metropolitan Landscape Through Metropolitan Cartography Metropolitan Landscape Dynamic Interactions in the Milan Case Study

Valentina Galiulo

12.1 Introduction

Envisioning Metropolitan Landscapes through Metropolitan Cartography allows for the comparison of the complex scenarios of the metropolitan territory in heterogeneous contexts, from macro to micro scales, in order to allow direct observation of the phenomena of territorial alterations. According to this goal, Metropolitan Cartography is presented as a methodological tool able to make the Metropolitan Landscape readable and understandable through a new sémiology graphique (Bertin, 1967).

Metropolitan Cartography is a research product of the European co-financed project TELLme Erasmus + Training for Education, Learning, and Leadership towards a new Metropolitan Discipline, 2017–2020. It is the outcome of an experimental process. It starts from the Metropolitan Discipline theoretical approach in order to express itself as a methodology of data research and the construction of cartographic projects as a technical tool of territorial analysis able to restore an image of symbolic reactivation in the fragile metropolitan territory and its landscape.

The investigation aims to define an innovative open-source data geographical mapping system to plan inter and multi scalar Metropolitan Architecture projects (Contin, 2015), allowing an operational relationship between the built-up areas and perceptible space through a preliminary mental projection. The study also aims to develop an experiment on new possible land uses, urban heterotopia (Shane, 2005) or new urban morphotypes (d'Alfonso, 2016) as potential factors for structural change in the dynamic metropolitan landscapes. To reach these goals, the definition

V. Galiulo (✉)
Department of Architecture and Urban Studies, Politecnico di Milano, Milan, Italy

Phd Student at Universidad de Sevilla in Doctorate Program in Architecture, Seville, Spain
e-mail: valentina.galiulo@polimi.it; valgal@alum.us

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_12

of the Metropolitan Approach to Complexity (Contin et al., 2017), in the construction of the Metropolitan Discipline, was the first step to outline the principles of urban and architectural planning, intending to improve the coordinated interdisciplinary territorial strategies by optimizing the processes of growth and sustainable urban development in order to improve the inhabitant and temporary users quality of life.

Metropolitan Approach to Complexity is the preliminary analytical action framework for the construction of the mapping project. It is the introductory phase to the definition of criticalities arising from the metropolitan regions, physical and spatial transformations such as vulnerability, spatial fragility due to climate change, health hazards, social inequality and environmental injustice, including deterioration and consumption of the environmental and natural and historical heritage according to territorial management policies that influence the dynamics of rapid changes. The innovative TELLme project, through Metropolitan Cartography (MC), consists of thinking of a tool that can tune the principles of the Academy with Decision Makers' and Local stakeholders' demands, head of the possible capitalization of hybrid, marginal and disputed metropolitan area territories. For this reason, Metropolitan Cartography presents itself as an innovative methodological device in which the act of representation is not only descriptive but also explanatory to the process of:

– selection and extraction of information;
– taxonomy of concepts of the Metropolitan Discipline;
– inter-scalar relational link between space elements;
– map-making development facilitates in multidimensional decision-making processes.

In particular, concerning the urban and architectural planning at the metropolitan scale, open-source maps describe the complex interrelation of geographical and social factors in the geo-historical scenarios.

12.2 Metropolitan Cartography Synthetic Analysis-Based Approach to Interpret Metropolitan Landscape

The MC is the methodological tool that allows the invention of forms placed in the space of reality. We are looking for the logical and constructive structure of sustainable form to order and structure the information determining a new spatial configuration. Metropolitan Cartography deals with a logical sequence of choices defined by rules of sustainability that guarantee the conformation of a preliminary mental map (Semantic Package, Fig. 12.1), to allow the composition of geo-referenced maps in space through the correspondence between concept and informative layer. The maps are constructed following a procedure that aims to inform the form. The link between a metropolitan glossary, that holds and orders the sustainability key words and related concepts, and maps to represent the territory elements, allows to

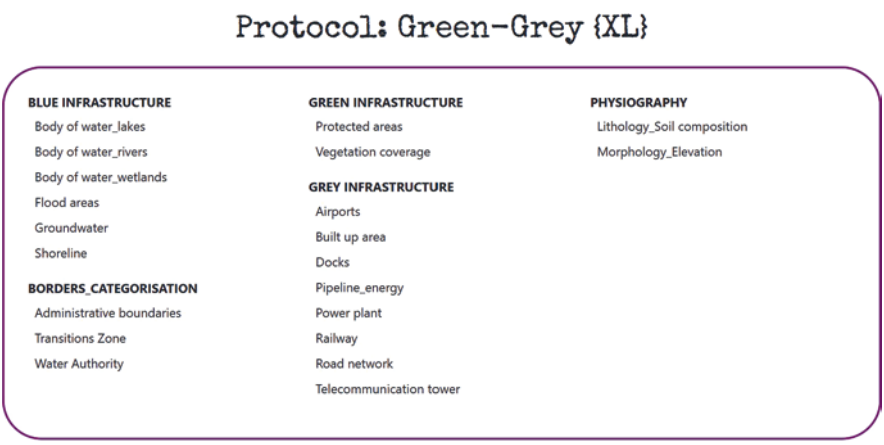


Fig. 12.1 Semantic Package Green Grey Infrastructure Map XL. From TELLme MGIP Glossary

create combinations of data through multiple disciplinary visions and interpretative readings of the metropolitan territory. Metropolitan Cartography therefore is the methodological tool to represent the infinite possible relationships between spatial elements in order to seek a new meaning of qualitative and quantitative data represented in different metropolitan contexts.

Knowing how to read the dynamic correspondence system between qualitative factors and quantitative spatialized data means being able to understand the principles of selection, order, hierarchy and composition of the cartographic project, so that Metropolitan Cartography (MC) can allow to elaborate maps through a process of synthesis that helps metropolitan experts to interpolate the different perspectives of interdisciplinary specialists with the narrative of local agents. The Challenge of Metropolitan Cartography is working on information in different metropolitan area contexts that can facilitate readability and usability of territorial elements changes in meaning. For this reason, the research formalizes two types of maps: Protocol Maps and Maps of Dynamics.

The Protocol Maps are tools that facilitate the reading of relationships of development and change factors in the metropolitan region. They are maps that reveal the metropolitan topographic structure by crossing the numerical and qualitative features of geographic, historical, and social data. The purpose of Protocol maps is to identify and mark the force lines in the territory, loading them with new meanings. With the Protocol maps, it is possible to highlight the morphological and tectonic data of the territory which, through the interpretive reading of the metropolitan expert, become objects that permit the identification of new relationships of spatial hierarchies.

The research provides a set of maps built from the collection of open-source data, with global and local extension, in order to allow an analytical comparison between Protocol Maps produced for different metropolitan cities with different degrees of vulnerability. Additionally, the production of a set of Protocol Maps

allowed the researcher to verify how an equivalence of meaning of a concept, explained in the Semantic Package, can have a different semantic value in the formal and spatial representation of the information (Fig. 12.2).

Maps of Dynamics are generated using open-source data, according to global and regional coverage, selected on the correspondence between the theoretical concepts (the qualitative data were chosen among the keywords and related concepts inserted in the glossary of the Metropolitan Discipline) and the associated level of information (the quantitative data or the elements described by a map legend). They generate maps that can determine the quality of a metropolitan context on a local scale: a values chart of sorts.

Through the Semantic Package it is possible to choose the essential concepts for the description of the phenomenon that develops in the analyzed context, generating Perspectives or Zones of Readings that the expert selects interactively and dynamically through the MGIP TELLme Glossary. These are perspectives related to users' experience, zones of reading that the metropolitan expert can interpolate with those of other multidisciplinary experts in order to understand metropolitan phenomena from interdisciplinary points of view with the aim of pointing out the practical interactions between the dimensions of geographic, social, economic and governance management.

The practical purpose of the experimentation through Maps of Dynamics is to understand the condition set out in territorial weakness according to different interdisciplinary points of view. The Maps of Dynamics are, therefore, maps that describe the progression of alteration developments. At the same time, they allow active cooperation among the metropolitan agents in the Decision-Making debate. Maps, thus, cannot be deprived of the planner and user's point of view.

The intent is to identify operational strategies to promote the sustainable development of the Metropolis and this is possible through the cartographic support of Protocol Maps and Maps of Dynamics that allow verifying as the meaning of a concept, explained by the Semantic Package, which can have a different and potential semiological quality, due to the plus-value that the metropolitan maps add to the spatial information.

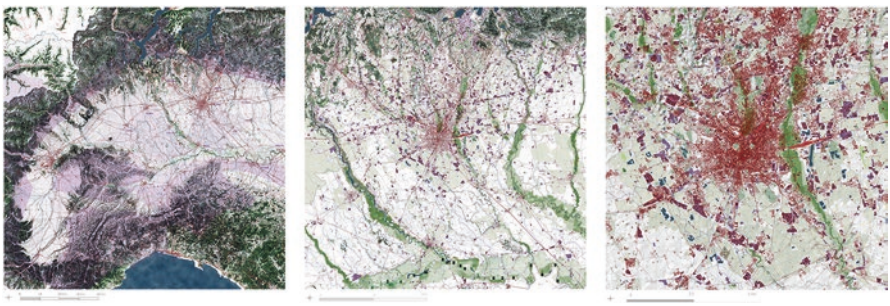


Fig. 12.2 Green Grey Protocol Map XL,L,M. Milan. Own Elaboration, 2019

The process of association of the level of information with its spatial projection in QGIS (Geographic Information System), is essential to extract the intrinsic cultural value of the Metropolitan Landscape by analyzing its alteration factors. For this reason, a differentiated cultural analysis approach is necessary for each Metropolis, in order to frame the complex metropolis reality as a single system. The maps produced by Metropolitan Cartography are not simulations of physical space, but rather inventive instruments through which, on the large scale of the abstract space of GIS, the change of coefficients of impacts, not yet visible on the territory, shall be specified. It is therefore interesting to understand how to read not only the fragility of the metropolitan territory but above all the causes of their vulnerability in time.

In short, we need to communicate a new metropolitan spatial vision that departs from functional practice to reconsider, as a priority, the citizen's quality of life in the metropolitan area planning process. The main aim of the proposed research is the definition of synthetic analysis-based approach to interpret dynamic interaction flows of Metropolitan Landscape that can be shared: free, participatory and replicable in different evolving metropolitan contexts.

12.3 The Need for Reading the Metropolitan Landscape Through Urban Biography

Maps of Metropolitan Cartography (MC), that represent the metropolitan region change phenomena, allowed to re-codify new relationships between the spatial physical and social variables. This process permitted the metropolitan expert to interpret the biographical condition of the study area subject to socio-environmental risk events. MC maps deal with a dynamic narrative that integrates the morphological and geological territorial image with the citizen's and inhabitant's agenda, which interpreted and transformed the Urban Biography. Metropolitan Cartography meets the need of generating new spatial signs, recognizable as mental maps and closely linked to the theme of local identity. In fact, the project intention of recognizing and identifying the practicable space, through identity images of new urban users as multiple citizenship (intermediate citizenship), is becoming ever stronger.

Reading the Metropolitan Landscape through maps that narrate the Urban Biography and the time evolution of the city means understanding the historical and geographical importance of the metropolis and its active metabolic processes. Urban Biography considers the temporary functioning of the city and its territory: the time of the city must be understood as a variable of possibilities to build new scenes and places in which relational exchanges are carried out between the physical space and the inhabitants. It means working according to a strategic purpose that aims to align the principles of transformation of individual private and public projects with those of the community in order to ensure new forms of common space (Contin et al., 2017).

To guarantee the balance between the private entities and agents, it would be necessary to replace, transform and maintain the public space reconfiguring it as a common urban space, through Urban Metabolism operations. These are actions that would also allow to re-establish an individual interest that can coincide with the social project of the community. Therefore, metropolitan innovation projects should generate new spaces of social evolution that can ensure a balance between the dimensions of the city: physical, social, political, and economic. The transformation of places and the image of the city is therefore necessary to restore the progressive evolution of the metropolitan biography while maintaining the goal of sustainability.

MC maps help the metropolitan expert to identify the territorial force lines and potential development directions according to the determinations of the local morphological elements: disposition, orientation, spindles (d'Alfonso, 2016). The interpretation of MC maps are supported by territorial morphology that allow to identify the river basins, the mountain crests, the valleys and the plains intended as geographical points of support (Lefebvre, 1976) for Metropolitan Acupuncture Charts settings in the metropolitan regions. These are local geographical components that, although intertwined in complex spatial systems, ensure the restoration of the global image of the metropolis and its Landscape (Fig. 12.3).

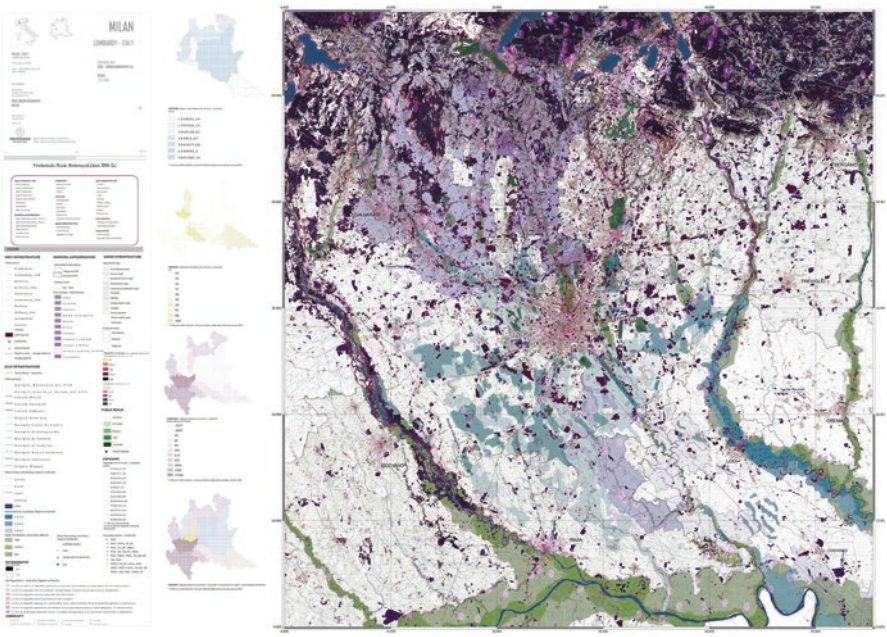


Fig. 12.3 Risk Metropolitan DNA Protocol Map L - Milan. Own Elaboration, 2019

12.3.1 Ecosystem Services and Risk Metropolitan DNA Protocol Maps to Re-decode Metropolitan Landscape New Spatial Relations

According to reports from the Millennium Ecosystem Assessment (MA, 2005) over the past 50 years, humans have contributed to ecosystem change faster than any other comparable time frame in human history. This process has resulted in a rapid loss of biodiversity, especially in high-density urban settlements and the most populated metropolitan cities. The changes in ecosystems, of which the city and the metropolitan region are part, have contributed to increasing human well-being and economic development, paying a high degradation cost in terms of eco-systemic services. Protecting and reducing the consumption of natural capital and reactivating the eco-systemic services of the metropolis, according to sustainability rules, is one of the future city development objectives according to SDGs 11 (target 11.4 – strengthen efforts to protect and safeguard the world's cultural and natural heritage).

The challenge of intervening in the processes of degradation of local ecosystems, while satisfying the growing demand for services of the population, can be met by implementing transformation scenarios that would involve the rearrangement of urban morphotype dispositions through urban metabolism operations. Activating the metabolic actions of maintenance, substitution, and transformation in urban and architectural projects could foster synergy processes combined with ecosystem services.

For this purpose Ecosystem Services (ES) are useful to measure and order the degree of interdependence between the human and natural environment. According to the definition of the MA (2005), Ecosystem Services can be divided into four categories: regulating services, provisioning, and cultural services. Mapping ES (Burkard & Maes, 2017) is a strategic action aiming to support biodiversity maintenance programs. The EU considers the mapping of ES as a monitoring strategy to support the 2010–2020 sustainability targets in all EU member states (Biodiversity Information System for Europe, 2010).

The theoretical and practical research for Protocol Maps construction allowed to define a transversal and comparative reading between them. Therefore Ecosystem Services Protocol Map should be read together with Green-Grey Infrastructure and Risk Metropolitan DNA maps, as value chart to support the assessment of vulnerability framework in the study area. This can be made possible through the re-coding of new spatial relationships between data related to the exposure and impact of locally active degradation phenomena. The definition of the intensity, the frequency and duration of certain events is useful to understand and measure quantitatively and qualitatively the existing natural and anthropic subsystems on site with the aim of adopting new transformation measures to reduce the environmental impact indices to scale subway.

Specifically, the ES Protocol Map is one of the possible methodological support tools to acquire information that can support the future metropolitan projects plans. It is the map that allows to identify areas of particular environmental sensitivity or

high eco-systemic potential value through the existing services-based analysis or by detecting areas in which it would be appropriate to activate them. Green-Grey Infrastructure and the Blue Infrastructure in ES maps are the territorial structural matrices that allow to put in relation the spatial variations offered by potential ES. The interpolation of ES with the values of demographic occupation and land consumption, enables to identify the discrepancy between demand and supply of ES in vulnerable case studies.

In this context the role of maps for the metropolitan expert is to evaluate the physical impacts on site, in order to be able to take strategic forecasting decisions in large metropolitan transformation projects that reflect the local and regional priorities of the community. The methodological support of Metropolitan Cartography maps would help to define the strategic geographic position of new collisive sites (Lyster, 2016) on a metropolitan scale, considered as locations for metabolic interventions able to reactivate the geographical area at different scales thanks to social inclusion and the activation of cultural ecosystem services and regulating those as a one-time action. These are multiple points of intersection of networks, but also exchange and collision points that encompass both physical interventions and social activities, linking sustainable urban development to economic growth and social inclusion through a new model of social innovation (Fig. 12.4).

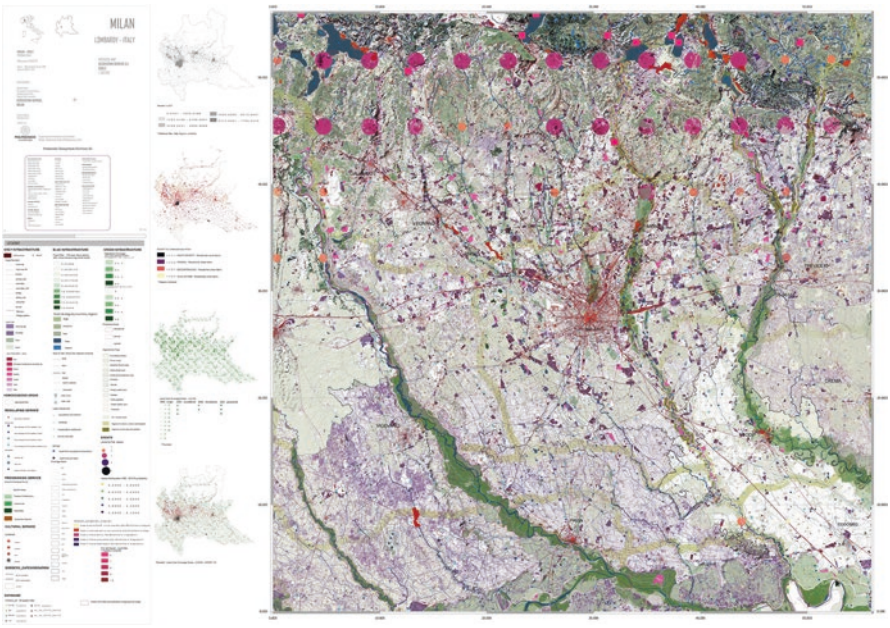


Fig. 12.4 Protocol Maps Ecosystem Service L – Milan. Own Elaboration, 2019

12.4 Metropolitan Landscape Dynamic Interactions at Interregional and Metropolitan Scale: The Case of Segrate, Milan (Italy)

According to the first principle of OECD urban policies (OECD, 2019) to ensure the implementation of the 2020–2030 sustainability goals, the new spatial planning logics should focus more on the urban form and on the quality of urbanisation processes instead of focusing exclusively on the quantitative evaluation of indices based on volume ratios and speed of urbanization. For this reason, the Metropolitan Cartography research focuses on the possibility of linking the methodological construction of maps to the design of urban morphotypes capable of constituting new urban places as places of urban-rural connection to metropolitan and interregional scale, through the experimentation of urban hybrid buildings that can ensure innovative intimate spaces (Choay, 2004).

In the theoretical and practical experimental path, from Metropolitan Cartography in search of new urban morphotypes, the Milan case study was an opportunity for academic research. The study area has been a source of inspiration for a paradigmatic project that reveals the intrinsic qualities of a context rich in history and authentic landscapes, subjected to rapid change processes because of the overlapping road (motorways – urban roads – waterparks – airport), rail and water infrastructure systems. In the Segrate Golfo Agricolo project area it was possible to test a new centrality in a multiscale metropolitan context, introducing the possibility of identifying a new practicable space for the urban agent, commuters, and temporary users: a new image of metropolitan identity in which the intimate time space of the citizen and the time of infrastructure meet.

Historically, the analyzed context has been the subject of important infrastructural changes related to the implementation of the Tangenziale Esterna Ovest that connects Milan East with the main arteries of the Italian highways: Milan-Naples and Turin-Venice. The interregional infrastructural plan (2014) is strongly tied to a territorial hyper connection that guarantees the high speed railway connection between Milan and Venice.

The project proposes the activation of a new railway station directly connected with Linate Airport, integrating the project of Metropolitan Architecture with an ecological framework in continuity with the Lambro Park. This vision of development is deeply rooted in the local and global relationship of the permanent Green-Grey Infrastructure, so that it is possible to re-configure new urban morphotypes of Linkage Urban – Rural that can operate through the interaction between the water, green infrastructure and the urban/rural fabric to ensure the spatial continuity of the binomial city-country system.

The morpho-infrastructural components that characterize the project area are determined by the current motorway ring, historically a barrier between city and countryside, now a permeable border between the compact city and the fragmented fabric of the eastern side of Milan. The new ring road and the river Lambro, the margins of the Agricultural Park and its protected areas, Idroscalo Park and the

Linate Airport act as physical barriers but, at the same time, as infra-territorial attractr for the incorporation of the existing agricultural system in the hyper connected metropolitan city. The transition, from the macro to the micro scale of the metropolitan project, is determined by the identification of a convergence point where different eco-tones intersect, ensuring a new proximity to the place and new dynamic interactions that can define the contemporary metropolitan identity and a new sense of belonging to the place. To determine the new metropolitan centrality, the project suggests the definition of new patterns of Linkage Urban-Rural reforming of the territorial water irrigation system and marginal land intended for new common space. The new urban morphotypes, through Metropolitan Architecture projects, could allow to redefine the built margins of Golfo Agricolo project area in which a project of an axial link in continuity with existing Green-Grey Infrastructure and Ecosystem Services can be rooted to the ground.

The results of the research show how Metropolitan Cartography operates through an eco-systemic and synthetic analysis-based approach that enhances the integration of the Metropolitan project at different scales with the management of water and soil resources according to the conservation and maintenance of the territorial identity its resources. It is a proposal for a theoretical-practical approach to guarantee the inter-scalar leap, from small to large and vice versa, indicating the new possible projects of Linkage Urban-Rural patterns as places of relationship for the new metropolitan conviviality. Therefore, investigating fragile territories by tracing Metropolitan Landscape dynamic interactions flows with Metropolitan Cartography means being able to assess a methodology capable of ensuring an ordered territorial structure that arises from a preliminary anthropological-geographic investigation which aims to re-codify the new hybrid metropolitan spaces. In conclusion, the experimentation through MC maps has made possible to define Metropolitan Cartography as a strategic and structural tool intended to set a system of rules to inform the form, allowing to order the essential spatial factors for understanding the vulnerability phenomena of the metropolitan territorial context.

References

Bertin, J. (1967). *Sémiologie Graphique: les diagrammes, les réseaux, les cartes*. Paris: EHEES.

Biodiversity Information System for Europe. (2010). *Mapping and assessment of ecosystems and their services*.Retrieved from https://biodiversity.europa.eu/maes. (Consulted 04/08/2020).

Burkard, B., & Maes, J. (2017). *Mapping ecosystem services*. Sofia: Pensoft.

Choay, F. (2004). *Espacements. Figure di spazi urbani nel tempo*. Milan: Skira.

Contin, A. (2015). *Questo. Metropolitan architecture*. Milan: Maggioli.

Contin A., Kim S., Musetta A., & Manfredini F. (2017, 21 November). *Metropolitan Cartography as a tool for the metropolitan approach to complexity: The Ugandan Key Study*, UN FUTURO AFFIDABILE PER LA CITTÀ. Apertura al cambiamento e rischio accettabile nel governo del territorio URBANPROMO XIV EDIZIONE PROGETTO PAESE, a cura di M.Talia, Planum Publisher, Roma.

d'Alfonso, E. (2016). *Milano: capitale del moderno*. Retrieved from http://www.arcduecitta.it/2015/12/milano-capitale-del-moderno/. (Consulted 03/08/2020).

Lefebvre, H. (1976). *Spazio e politica. Diritto alla città II*. Milan: Moizzi Editore.
Lyster, C. (2016). *Learning from logistics: How networks change our cities*. Berlin: Walter de Gruyter GmbH.
Millennium Ecosystem Assessment. (2005). *Ecosystems and human well being*. Washington, DC: Island Press.
OECD. (2019). *OECD National Urban Policy Programme*. Retrieved from: https://www.oecd.org/fr/gov/national-urban-policies.htm. (Consulted 03/08/2020).
Shane, G. D. (2005). Recombinant urbanism. In *Conceptual modeling in architecture, Urban design, and city theory*. Hoboken: John Wiley & Sons.

Chapter 13
MIDA Metropolitan Impacts and Drivers Assessment

Iacopo Neri

13.1 Introduction

Urban Sustainability has become a crucial global concern. However, the evaluation of sustainability remains a complex topic, not only due to the availability of relevant data but also because of the infinite methods in which analysis and indicators at different scales are considered. A metropolis is a condition that implies multiple uses of the territory with several dimensions of influence, visible and invisible, and many times immeasurable (Lanfranchi & Contin, 2017). What is certain are the consequences that increasingly threaten the climate balance and affect ecosystems, and consequently the society.

Adopting multi-scalar mapping, MIDA aims at enhancing the comprehension of urbanity and its influences from the territory to the street level; from global to local. By structuring the immense availability of open source data as well as the great GIS asset of the R programming language, MIDA offers a computational protocol to synthetize complex issues into information-rich maps: catalyzers of analytical and communicative purposes.

Although the algorithmic nature of the tool – built in R – allows us to apply it anywhere in the world, for the purpose of this paper, Guadalajara (Mexico) has been used as a case study. As the third most populated city in Mexico, Guadalajara is also a strategic geographical point for migrating bodies. This dynamic and complex nature of the city makes it a relevant testing subject for the tool. It works, therefore, along a multidimensional and dilated time line to include different cycles and natural and anthropic processes.

I. Neri (✉)
Department of Architecture and Urban Studies, Politecnico di Milano, Milan, Italy
e-mail: iacopo.neri@mail.polimi.it

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_13

13.2 Methodology

The metropolis is analyzed as an intricate system of independent issues, each related to a scale of influence. The project disassembles the concept of the city into three core factors: land-exploitation, commuting and living.

Each of the core factors corresponds to the three scales: XL, L and M. The XL scale embodies the dynamics of soil consumption and territorial resources exploitation; the L scale studies the phenomena of commuting and urban attraction and allows to access the M scale, where the subject of analysis becomes the quality of life in respect to the presence and accessibility of services for the citizens.

Each scale produces two maps; the first – investigative, and the second - evaluative. The first map is used to understand the radius of extensions in correspondence to the topic, whether it is its pressure on the territory for land consumption, the pool of users involved on a daily base, or the municipality's reference citizens. It also gives the spatial dimensions for the second map analysis, and is technically achieved through three different simulations: The Metropolitan Ecological Footprint, The Agglomerative Space, The Sense of Adequacy.

Whereas, the second map assesses the subject study of the corresponding scale. Specifically, it first converts non-uniform data to harmonized dot-grid map layers to ensure interoperability (Neri & Totaro, 2017). Secondly, it arithmetically aggregates the preprocessed data layer according to established indexes, respectively: The Environmental Performance Index (EPI), The City Attractiveness Index (CAI), The Urban Better Life Index (UBLI).

The resulting MIDA protocol is structured as:

- XL dimension – Land consumption
  - investigative: The Spatialized Metropolitan Ecological Footprint
  - evaluative: The Environmental Performance Index (EPI)
- L dimension – Work
  - investigative: The Agglomerative Space
  - evaluative: The City Attractiveness Index (CAI)
- M dimension – Living
  - investigative: The Sense of Adequacy
  - evaluative: The Urban Better Life Index (UBLI)

13.2.1 XL – Land Consumption

In order to understand the metropolis' pressure on land exploitation, the research grounds on the concept of Ecological Footprint (EF) (Rees & Wackernagel, 1995) as the principal quantitative reference. Since the 1970s, humanity has been in

ecological overshoot, with annual demand on resources exceeding what Earth can regenerate each year. In 2018, humanity is using the equivalent of 1.7 Earths to provide the resources we use and absorb our waste. This means that the magnitude of our consumption is unbearable by the ecosystem we live in, and yet, the perception of the consequences are poorly perceived.

The research answers visually to this complexity by finding the closest and most accessible areas that would be consumed by the city if it would operate only with local resources. Although there are worldwide attempts to move to local, the research asks the question: to what extent does the term local apply? Does it render a feasible scenario?

Giving a scale – XL- to this portion of territory, MIDA connects the metropolis to its environmental responsibility, which will be questioned through the Environmental Performance Index to test the efficiency of its land use policies.

13.2.2 The Spatialized Metropolitan Ecological Footprint

The Spatialized Metropolitan Ecological Footprint analysis evaluates the closest and most accessible areas influenced by a city consumption if it would operate only by proximity over local resources. It exploits the Ecological Footprint consumption outputs considering the population of the settlement and the pro capita consumption according to the average national values. The EF produces a globally covered analysis of the pro capita consumption, by nation, over six categories of productive surface areas: cropland, grazing land, fishing grounds, built-up land, forest area, and carbon demand on land (rendered as forest), expressed in global hectares – globally comparable, standardized hectares with world average productivity.

For this research, the EF pro capita values on agricultural land, forest (both for logging and for CO2 absorption), grazing land, and water extent, are summed on the population of the city of study (as referred by the GEONAMES database).[1] The so-obtained pro city consumptions are used to query specific amounts of the relative land typologies of the ESA CCI land cover,[2] previously classified and ranked with a cumulative cost analysis (Fig. 13.1).

[1] GeoNames. GeoNames. http://geonames.org/. Accessed 10 June 2019

[2] ESA. Land Cover CCI Product User Guide Version 2. http://maps.elie.ucl.ac.be/CCI/viewer/download/ESACCI-LC-Ph2-PUGv2_2.0.pdf. Accessed 10 June 2019

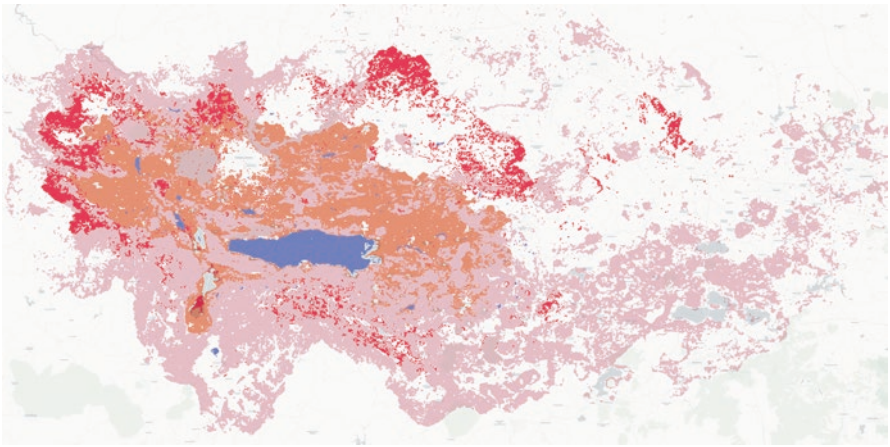


Fig. 13.1 The Spatialiazed Metropolitan Ecological Footprint analysis of Guadalajara

13.2.3 The Environmental Performance Index

Once the city extensions of its consumption on land is analyzed, a spatial analysis based on the Environmental Performance Index (EPI) (Wendling et al., 2018) framework is carried out in order to visualize the commitment of the city to the protection of the ecosystem. To meet the targets outlined in the United Nations 2015 Sustainable Development Goals (SDGs) and the Paris Climate Agreement, cities must integrate environmental performance metrics across a range of pollution control and natural resources targets.

The EPI reveals a tension between two fundamental dimensions of sustainable development: Environmental health, which rises with economic growth and prosperity, and Ecosystem vitality, which comes under strain from industrialization and urbanization.

The by-layering construction of the tool allows to picture an effective and trustful image of the health / sickness of the ecosystem, therefore allowing a deeper understanding of the factors that affect the system, picturing which sub-indicator is influenced where.

The analysis makes visible the unsustainable magnitude of the metropolis habits (Fig. 13.2).

13.3 L – Work

The L dimension discusses the physical expansion of the city. It evaluates the daily influence of the city towards its surrounding; in respect to work, commuters, and opportunities for city users.

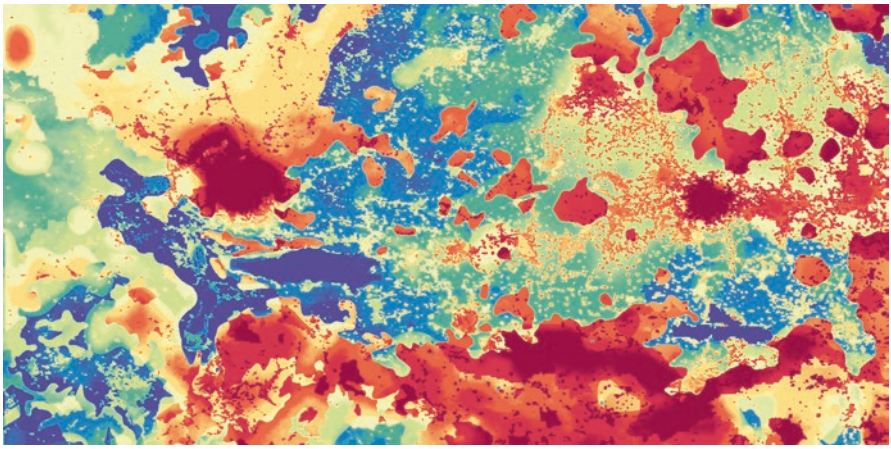


Fig. 13.2 The Environmental Performance Index map of Guadalajara

The metropolis expands based on its road infrastructure and the relationships with the peripheral settlements, functional nodes on the territory, often according to an agglomerative nature. Considering such behavior of the city, the Agglomerative Space Analysis is conducted setting the field of action from the metropolitan gates (the intersection between the primary road highway and the continuous urban texture) to the closest reachable area according to national commuting time.

Finally, the City Attractiveness Index evaluates how much the city is a catalyzer for opportunities for both its rural and urban periphery.

13.3.1 The Agglomerative Space

Based on the concept of agglomerative economies and inspired by the Agglomeration index (Uchida & Nelson, 2010), the Agglomerative Space analysis aims at finding the pool of actual and possible city users of the metropolis. This becomes crucial to understand city growth or shrinking phenomena based on its economic and infrastructural attractivity over its surrounding.

The first step of the analysis is to extract the urban continuous area related to the case study, through a point selection using the location of the city and interpolating it with the GHSL Settlement type layer,[3] previously cleaned from the rural data.

[3] ESA, GHS built-up grid, derived from Landsat, multitemporal (1975–1990–2000-2014), http://data.europa.eu/89h/jrc-ghsl-10007. Accessed 10 June 2019

Based on the OECD national survey commuting data,[4] the analysis computes time-limited isochrones analysis with Open Route Service[5] starting from specific location obtained as the intersections between the aforementioned urban continuous area and the main road infrastructure obtained by Open Street Map.[6] The result of which is the daily dynamic city buffer (Fig. 13.3).

13.3.2 City Attractiveness Index

After the Agglomerative Space analysis, the City Attractiveness Index (CAI) analyzes its capacity to be a catalyzer of growth.

The CAI questions the urban-rural linkage of the metropolitan area. It analyzes five chapters, gathered into two main indexes to stress on the dialogue between the green infrastructure (biodiversity, energy and patrimonial system) and the gray infrastructure (urban growth, infrastructure load).

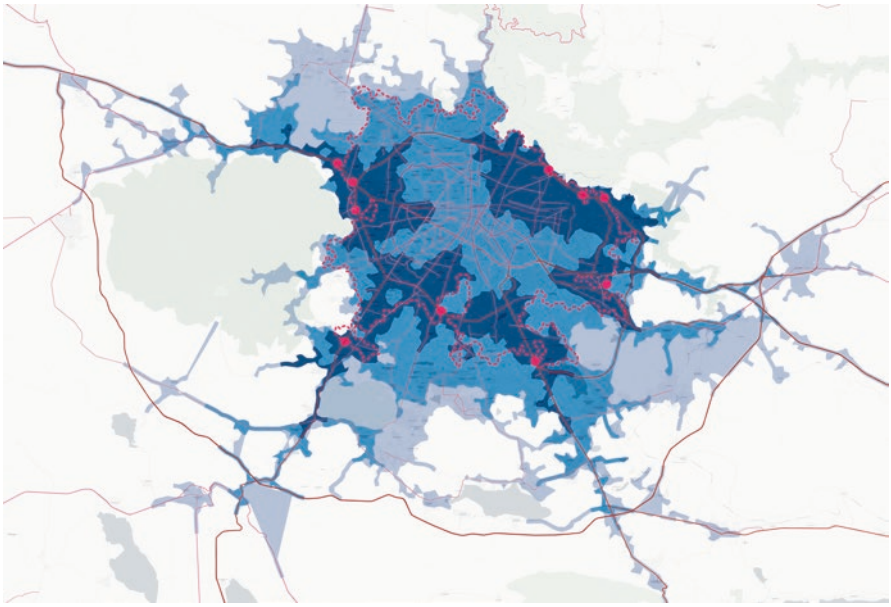


Fig. 13.3 The Agglomerative Space analysis of Guadalajara

[4] OECD, OECD Family Database, www.oecd.org/els/family/database.html. Table: LMF2.6 Time spent travelling to and from work. Accessed 10 June 2019

[5] The Heidelberg Institute for Geoinformation Technology. Open Route Service, https://openrouteservice.org/. Accessed 10 June 2019

[6] Open Street Map, Open Street Map. https://www.openstreetmap.org/. Accessed 10 June 2019

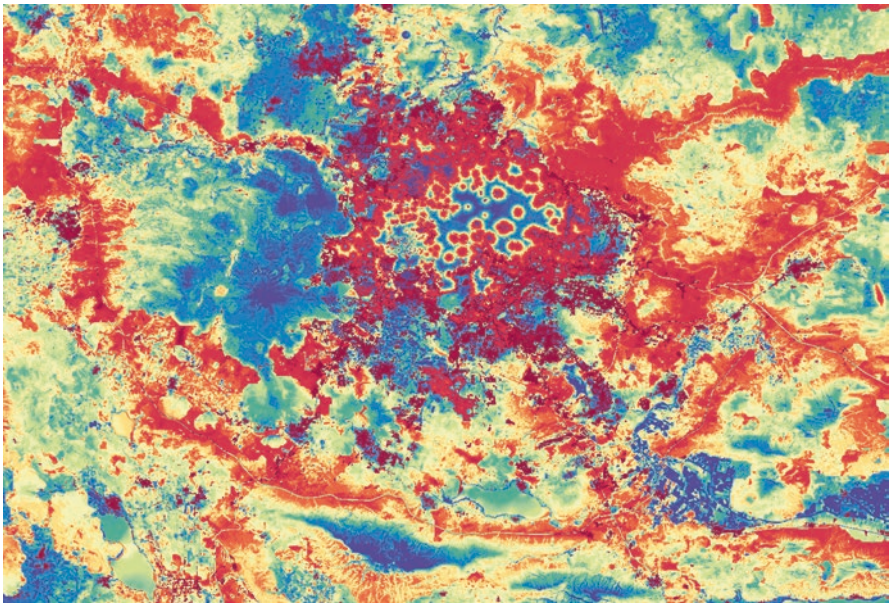


Fig. 13.4 The City Attractiveness Index of Guadalajara

As a recent index, the CAI exploits the potentialities of the Google Books nGram Viewer (Michel et al., 2010) tool to weight its chapters and indicators, using their names as tags. The recurrence of those tags becomes an experimental proxy to evaluate the importance of the topics for the scientific community and so, their proposed relevance in the overall assessment (Fig. 13.4).

13.4 M – Living

As the last step, the M scale focuses on the local features that determine the core of a city: its degree of livability. Yet, due to the specificity of its subject of study, the M scale is bound to a location. The availability of global data to fulfill the requirements for such a detailed issue is currently insufficient. A phase of local data collection is therefore necessary; the extension of the scale as well as the weights for the analysis are custom defined.

Finally, the research constructs the gradient of locality of its inhabitants through the Sense of Adequacy analysis, for the city to assess its desired livability through the Urban Better Life Index.

13.4.1 The Sense of Adequacy

Through the analysis of Twitter data, MIDA produces the gradient of citizens engagement with the city affair, and by so, an evaluation of the bond between inhabitants and municipality.

Following the trend in using social network contents for the understanding of urban phenomena, the research collects tweets from the Twitter API that contain, within their hashtags, the name of the city. Once the geotagged ones are selected and converted into spatial features, a kernel density map is calculated to evaluate spatial concentrations. Finally, through a set of contours of the density map, the tool gives the possibility to select reference areas based on the twitter activity and proceed to the assessment phase.

13.4.2 The Urban Better Life Index

Once the threshold of adequacy has been set, the research focuses on the assessment of the urban quality of life, regarding the accessibility to services.

The Urban Better Life Index (UBLI) takes great inspiration from the OECD Better Life Index (OECD, 2011), repurposing its framework focused on the spatial patterns of its indicators. In addition, a chapter on sustainable mobility is added.

The Organisation for Economic Co-operation and Development published the BLI in 2011 as an answer to the call for internationally comparable measures of well-being, after the inconsistency of Gross Domestic Product indicators in assessing current and future well-being. The index is structured in 12 chapters – 24 indicators, around the issues of material living conditions (housing, income, jobs) and quality of life (community, education, environment, governance, health, life satisfaction, safety and work-life balance) which are composed together with crowd collected user specific weights. The difference in using the quality of life index by different institutions shows that in different local contexts the conditions are differently weighted and perceived. Hence, in the UBLI the weighting procedure is left open to the city to decide the importance of each chapter through its own vision.

Lastly, the analysis of mobility is added to understand the distribution of spatial inequalities in the provision of urban services. The analysis discusses three layers: walkability, public transport, and bikeability (Fig. 13.5).

13.5 Conclusion

This research aims at understanding the dimension of the Metropolis through the analysis of three main scales and factors sustaining the city: Scale XL – Land Consumption, Scale L – Work, and Scale M – Living.

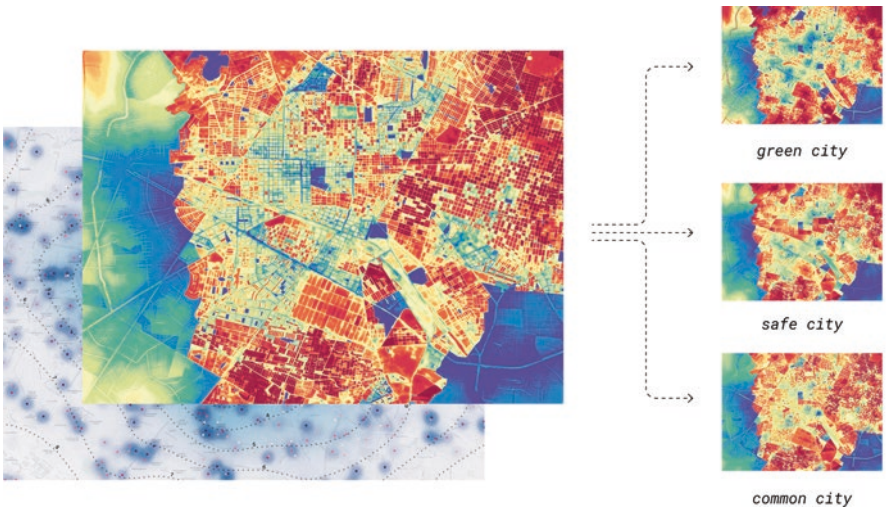


Fig. 13.5 The Sense of Adequacy and the Urban Better Life Index map of Guadalajara with proposed city's visions

The methodology behind the experiment implies an algorithmic type of research that conducts a double analysis on each of the scales: investigative and evaluative.

The study looks at how our culture sees our time and the map becomes an efficient instrument to show it. The data is a great tool to access the knowledge accumulated by different areas of studies, which in the MIDA are brought together in comparable scales. An important feature of the project is that all information are brought to a comparable 0 to 1 quantitative scale, which on one side rises methodological concerns about the consistency of conversion procedures, on the other side permits to access knowledge otherwise inaccessible.

The output of the research suggests that MIDA can serve as a tool for citizens, civil servants, decision makers, etc. to visually and analytically approach city's complex issues through explicitly exhibiting urban features, dynamics and other emerging factors.

References

Lanfranchi, G., & Contin, A. (2017). The rise of a new discipline to manage metropolitan urban systems. In D. Gómez-Álvarez, R. Rajack, E. López-Moreno, & G. Lanfranchi (Eds.), *Steering the metropolis. Metropolitan governance for sustainable urban development* (pp. 113–123). Inter-American Development Bank.

Michel, J., Shen, Y. K., Aiden, A. P., Veres, A., Gray, M., Brockman, W., The Google Books Team, Pickett, J., Hoiberg, D., Clancy, D., Norvig, P., Orwant, J., Pinker, S., Nowak, M. A., & Lieberman Aiden, E. (2010). *Quantitative analysis of culture using millions of digitized books*. Science.

Neri, I., & Totaro, S. (2017). Hey Sants! Accessible complexity. In A. Markoupoulou, C. Farinea, & M. Marengo (Eds.), *Responsive cities symposium 2017* (pp. 61–65). Institute for Advanced Architecture of Catalonia.

OECD Organisation for Economic Co-operation and Development. (2011). *OECD better life initiative. Your better life index*. Retrieved June 16, 2011, from http://www.oecdbetterlifeindex.org/

Rees, W. E., & Wackernagel, M. (1995). *Our ecological footprint: Reducing human impact on the earth*. New Society Publishers.

Uchida, H., & Nelson, A. (2010). *Agglomeration index: Towards a new measure of urban concentration* (WIDER working paper 2010/029). Helsinki.

Wendling, Z., Esty, D., Emerson, J., Levy, M., & de Sherbinin, A. (2018). *The 2018 environmental performance index report*. Yale Center for Environmental Law and Policy.

Chapter 14
The Landscape Inequalities: How Inequalities and Social Injustices Can Be Affected and/or Orient the Development of Urban Landscape

Christian Wade

14.1 Introduction

Inequality is a term that refers to the difference in size, degree, and circumstance. It has been prevalent in society since the beginning of civilization, a state-of-being where some benefit and others do not. How do we solve inequality? To pose this question can be unintentionally reductive. The truth is that there is no single state of inequality, therefore there is no single act of solution. It is a component of reality, connected to every system of society. In the quest to promote equality, one must promote access. Inaccessibility is the prime factor in the disparaging growth of inequality in all realms – from wealth and income gaps to the social, racial and gender injustice to environmental inconsistencies. It is proposed that the architect, the designer of the built environment, has the tools and sensitivity to lessen these inequalities through strategic design intervention that will ultimately restructure space in such a way that promotes equality through accessibility in this landscape.

This work will serve as a synthesis of information found in The Landscape of Inequality by Christian Wade. It ultimately leads to a design proposal that responds to the many inequalities found, but not limited to the region of Rio de Janeiro, Brazil. The material found here is an exploration of inequality via historical, cultural, economic, environmental, and diversities that have directly influenced and affected the built environment. The aim is to develop these ideas to inform and challenge the designer and their role in combating this obstacle: the unequal distribution of access as it pertains to income, wealth, politics, gender, race, and health.

C. Wade (✉)
School of Architecture & Design (2019), New York Institute of Technology, New York, NY, USA
e-mail: cwade531@gmail.com

A. Contin (ed.), *Metropolitan Landscapes*, Landscape Series 28,
https://doi.org/10.1007/978-3-030-74424-3_14

14.2 The Imbalanced Landscape

The imbalanced landscape refers to the inequality of political, social and economic distributions within society.

14.2.1 Global Inequalities Throughout History

The current societal imbalances stem from political hierarchies and their arrangement of social classification in conjunction with the economic benefits that can be made from this organizational system. It is imperative that the origin of these hierarchies and their presence in some of the first civilizations known to man are understood due to their complex history. Global inequalities in a historical context will reveal the origin of political hierarchy and how it directly influenced the social class systems within society as well as the economic consequences of these classifications throughout time.

14.2.2 The Origin of Social Hierarchies and How They Create Unequal Societies

Mesopotamia (from the Greek, meaning 'between two rivers'), refers to the region of southwest Asia in the Tigris and Euphrates river system. It is known as one of the beginnings of human civilization and contributed innovations in several fields including the concept of time, mathematics, sailing, maps, writing, and agriculture. As time passed, Mesopotamia changed drastically in terms of culture as the region was taken over, time and time again by other rulers.

Social hierarchy has been an organizational tool of the most powerful civilizations throughout history. Mesopotamia had a variety of cities within their civilization, like Uruk, which had a population of approximately 50,000 people around 2300 BCE. Each of these cities had a clear and distinct level of separation in terms of social class which was organized as follows: the king and nobility, the priests and the priestesses, the upper class, the lower class, and the slaves. Naturally, a society with a system such as the one Mesopotamia created for themselves is rooted in inequality. This means that the king, nobles, and priests held the wealth, power and influence whereas the upper class tend to have some wealth in terms of resources (mainly rich agricultural land) and the lower class having less access to these resources (usually due to their geographical location being too far from the water or too small for large amounts of farming). The slaves in this society have no power.

What this classification system conveys is that urbanization of large populations tends to be a catalyst for social and wealth inequality. This is because as populations increase resources must be divided and distributed. When these resources are not

distributed evenly, due to greed and concern for the upkeep of social hierarchy and power, is when social inequality becomes more apparent.

14.3 The Current Unequal Society

Present day inequalities refer to the disparities of distribution within realms of society. As with the ancient world, political decisions have a direct correlation with the social and economic implications on individuals within a civilization.

14.3.1 Political Inequality: Movement of Political Power and Its Impact on Distribution

Politics refers to the activities surrounding the governance of a country or area. Political inequality is when a certain group of persons or individuals have a greater influence over political decision-making and gain benefit from the outcome of those decisions despite proper political procedures set in place according to democratic regulations. So, political inequality derives directly from the abuse of power in the political realm for gain or profit. Politics can be used to reorganize the distribution of services in order to aid those who are disproportionately affected by the lack of access to such resources.

Political inequality tends to be the catalyst for many other forms of social and economic inequalities, including education, gender, income, health, racial, etc. This is since politics are used to shape the way a country or region operates, when those placed in power make decisions that are not inclusive to all parties it affects, inequality is formed.

14.3.2 Economic Booms and Turmoil and How They Influence Inequality Amongst Inhabitants

Sociologists have theorized about the presence of inequality in the modern context for several years. There has been a noticeable jump in the disparities between the social classes of the modern world, technological innovation has been characterized as a main reason for these inequality levels. The advancements in technology since the 1990s make the skilled worker a redundant part of civilization. This caused the global financial crisis in 2008. “bottom line: economic disparities increased over the centuries and technology played a role” (Shaer, 2018). With the middle-class worker out of commission, the gap between the rich, middle class, and poor widens, as the

middle class grows significantly larger and poorer while the rich grow richer yet smaller in quantity.

The discrepancy in this narrative is that there have been inequalities in society since the first civilizations, such as Mesopotamia, rose to fruition. The basis is that political power creates inequality because politics, or those who are politically in charge, are in the position to create their governances as equal, or inequal as they see fit. The issue is that those who are in power have been in power for decades and have no interest in changing the scales in any realm, whether it be social, political, or economic. "the richest 10% of adults in the world own 85% of global household wealth; the bottom half collectively owns barely 1%" (Davies et al., 2006).

14.3.3 Social Inequalities in History and Their Interconnectivity in the World

Social inequality speaks to the unequal opportunities and rewards for those who belong to different social groups or positions within a society. Examples of these inequalities can be gender, race, health, and wealth. The major areas and examples of social inequality include the access to voting rights, property rights, educational access, health care, quality housing, the right to assemble, transportation, and freedom of speech, among other things. For example, out of 187 countries that were studied by the world bank, only six of them have given women equal working rights as men. These are the facts that speak to these issues at the global scale. "At the current rate of progress, it will take another 108 years to reach gender parity" (Schwab, 2018).

14.4 Localized Unequal Space. Detroit, Michigan, USA

Detroit is a brilliant but greatly affected city suffering from levels of economic disparity and social inequality. Detroit is home to some of the most affluent members of American society, many of them being professional athletes or businessmen and women. Historically, Detroit was made into one of America's central hubs for transit of goods and services, alongside New York and Chicago. Detroit took another route with the automotive industry as well. The city was the home of General Motors, Chrysler, and Ford. This made Detroit a hotspot for the middle class American, as the amount of available work was high, and the suburban surrounding neighborhoods made it easier to raise a family.

By the 1950s Detroit had simultaneously hit its peak and its downfall. The American automotive industry hit a stand still because of the influx of foreign cars, made mostly in japan, because they were more fuel efficient. Subsequently, all the American automobile factories shutdown and ran out of business. Racial tensions

were also growing, many Black Americans moved to Detroit around this time, which caused a lot of the white communities to move out. The infamous Twelfth Street Riot went on for 5 days. Black Americans fought against the police in the streets as a result of police brutality due to high racial tensions. From this moment forward, the city was unable to regain its momentum from former days. By 2013, Detroit was forced to file bankruptcy which happened to be the largest filing of an American city to this day.

In terms of space, the rezoning of large portions of Detroit and the outer suburbs in the present day plays a large part in the rise of social inequalities through political control. As a result of this redlining, the historical districts which serve predominantly black communities are impoverished. In many cases, these communities will remain impoverished. However, there are circumstances where wealthier developers are interested in these areas. Once this happens, there are a couple outcomes that begin to present themselves. One is people are forced to move in order to find higher quality of life elsewhere. These homes are then bought, repaired and sold to richer or more sought-after families. In other cases, poor families who do not own their homes cannot remain on track with their payments which leads to foreclosure. In downtown Detroit, the vacancies are being re-purposed for big businesses to move in. This seems like a positive reuse of these left-over spaces; however, the surrounding local businesses cannot keep up with the rising property taxes due to this gentrification.

14.5 Balancing the Landscape

There are several groups working toward creating more equal opportunity for desperate communities, at both macro and micro scales. While think tanks and economists work on equality through policy, the architect works in the realm of space. Architectural interventions at the local scale work in a way that bridges the gap between the unequal spaces in which it resides. This is to create better living, working, transitional spaces in the present day until the governmental policies change.

14.5.1 Global Financial Integrity: Illicit Flows

Global or international inequality refers to the major differences present when comparing countries to one another – typically based on their individual economies as well as medical and education systems. Global Financial Integrity is a think tank based in Washington DC, USA. They focus primarily on illicit flows globally and how the "unseen" currency moves illegally through the globe and the effects that these movements have on countries' inequality levels. One of the major solutions that GFI proposes targets illicit flow activity directly. "Trade mis-invoicing has impacted emerging markets and developing countries for decades by siphoning

capital out of economies and denying governments vitally important domestic resources" (Illicit Financial Flows, 2020). This form of illicit flows can be manifested through, over, or under invoicing through imports and exports. This results in a loss of billions of dollars' worth of revenue annually for several developing or developed countries. For solutions, Global Trade Integrity has created a series of steps including but not limited to an economic analysis, policy overview and a risk management assessment.

14.5.2 Quinta Monroy/ELEMENTAL

The Quinta Monroy project is a housing project located in Chile. The site was illegally occupied by several residents for over 30 years. Architect Alejandro Aravena of ELEMENTAL intervened with a social housing project that attempts to make use of the land for social and economic benefit of the people while also housing as many families as possible in the most comfortable way. "In the end, when the given money is enough for just half of the house, the key question is, which half do we do. We choose to make the half that a family individually will never be able to achieve on its own, no matter how much money, energy or time they spend. That is how we expect to contribute using architectural tools, to non-architectural questions, in this case, how to overcome poverty" (Fracalossi, 2008). By creating housing that has the ability to expand, the families are able to invest in their community directly. The project is 50% self-built, using local, cheap, but proper materials. "We think that social housing should be seen as an investment and not as an expense. So, we had to make sure that the initial subsidy can add value over time" (Fracalossi, 2008).

14.6 The Proposal

This design proposal finds itself in Rio de Janeiro, Brazil. Rio de Janeiro is recognized as one of the world's most beautiful and interesting urban centers. The site analysis is made of a variety of scales, each introducing a new understanding of some of the dynamics of the region from the Global scale (Fig. 14.1), to the South American, Brazilian, Rio Metropolitan, and the Rio Urban scale. The Landscape of Vulnerability is a strategic plan analysis of some of the most vulnerable sites in Rio de Janeiro, one of the most volatile being Rocinha which became a major point of intervention in the strategic plan.

Fig. 14.1 The Global Landscape: an overall global analysis of social, cultural, technological, environmental, economic, and "dark" or illegal entities that are specifically compared to Brazil in order to determine the effects and phenomena

14.6.1 Rocinha

The strategic intervention for Rocinha (Fig. 14.2) focuses on the threshold between the built and the unbuilt space and how this threshold can be permeated in different ways. The threshold is placed on the very edge of the favela, separating the forest from the existing housing. There are openings to enter the forest along this threshold (Fig. 14.3), as well as community buildings, new housing, urban farming, markets, and other productive spaces. The flood canal behind all these new spaces is made to divert the flood water from the buildings and filter it through the new wells that can be used to aid water collection and flood management. It is not possible to stop Rocinha from growing at the rate it does, but the way it grows can be controlled. Instead of growing in a way that destroys the environment that the residents depend on, they can create and organize themselves further through cohesive building materials, open market and gathering spaces, community, health and education spaces, as well as water collection and flood prevention. In this way, the aim is to allow Rocinha to remain as an independent network within the framework known as Rio de Janeiro.

Acknowledgments I thank Professor Giovanni Santamaria (New York Institute of Technology) for his indirect assistance in the development of this Undergraduate Thesis during the Fall/Spring 2019 Academic year. I thank Teresa Ferreira, Salvador Delgado, and Yeshara Pryor for their assistance in the development of the Brazilian Site Analysis during the Fall 2019 Academic Semester.

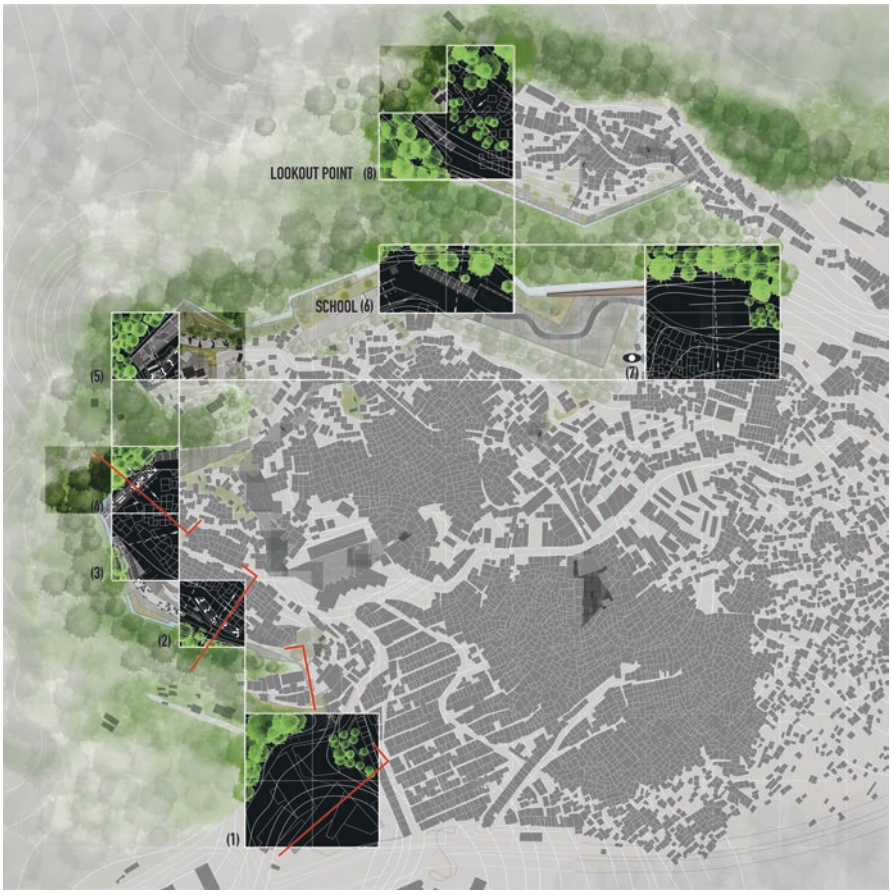


Fig. 14.2 Rocinha: a strategic map of Rocinha, a favela in the south of Rio in-between Leblon and Barra da Tijuca

References

Cann, O. (2018, December 8). *108 years: Wait for gender equality gets longer as women's share of workforce, politics drops*. World Economic Forum. https://www.weforum.org/press/2018/12/108-years-wait-for-gender-equality-gets-longer-as-women-s-share-of-workforce-politics-drops/

Davies, J., Sandström, S., Shorrocks, A., & Wolff, E. N. (2006). *The global distribution of household wealth*. https://www.wider.unu.edu/publication/global-distribution-household-wealth

Fracalossi, I. (2008, December 31). Quinta monroy/ELEMENTAL. *ArchDaily*. https://www.archdaily.com/10775/quinta-monroy-elemental

Gibson, M. G. *Map of ancient Mesopotamia*. Oriental Institute, University of Chicago. https://oi.uchicago.edu/research/projects/nippur-sacred-city-enlil-0

History.com Editors. (2017, November 30). *Mesopotamia*. History.com. https://www.history.com/topics/ancient-middle-east/mesopotamia

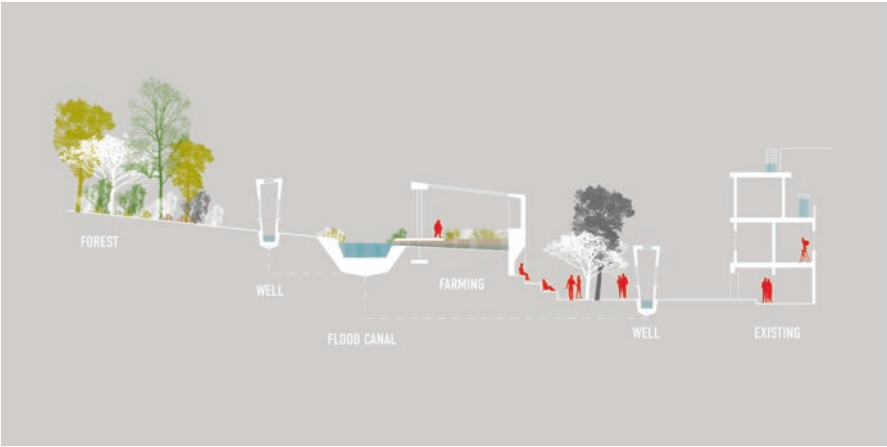


Fig. 14.3 Diagrammatic section at threshold of water collection and farming compared to existing structures

Illicit Financial Flows. (2020, June 3). *Global Financial Integrity*. https://gfintegrity.org/issue/illicit-financial-flows/

Schwab, K. (2018). (rep.). *The global gender gap report.* World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_GGGR_2018.pdf

Shaer, M. (2018, March 1). *The archaeology of wealth inequality.* Smithsonian.com. https://www.smithsonianmag.com/history/aracheology-wealth-inequality-180968072/

Solutions for Inspired Economies. (2019, May 3). *Global Financial Integrity. Global Financial Integrity*. https://gfintegrity.org/solutionsforinspiredeconomies/