# Chapter 16
# From Resource Efficiency to Responsible and Dematerialized Societies

**Matthias Koller and Jens Günther**

## 16.1 The Policy Landscape – Where We Are

As far back as 1713,[1] the German Johann Carl von Carlowitz described the necessity of a regardful and careful handling of nature and its resources in his publication Sylvicultura oeconomica[2] as a direct reaction on the wood scarcity and high degradation of forests at this time. Today his work on forestry within the natural regeneration capacity is seen as the starting point of the term "sustainability". In 1798, the British economist Thomas Malthus recognized that population growth and the increased production of the means of substances might not have the same pace and suggested the inevitability of a hunger crisis.[3] To tackle this, he already supported measures as we discuss today, like duties on imported resources to boost domestic production and guard against the dependency on foreign states. These are just two examples showing that resource scarcity and the overuse of natural resources, exceeding the natural regeneration capacity, are not new phenomena in politics.

With its prominent publication Limits of Growth[4] the Club of Rome brought back the discussion on finite resources as limiting factors on economic development on the political agenda, whereas the starting point of our today's discussion on the sustainable use of natural resources was set on the Earth summit 1992 in Rio de Janeiro. Here, politicians worldwide recognized the problem of an unsustainable use of natural resources and started various initiatives to tackle this. On the world

[1] Independently from the developments in Germany the Concept of a sustainable forestry had already evolved in Japan at the end of the seventeenth century, see e. g. http://de.wikipedia.org/wiki/Nachhaltigkeit_%28Forstwirtschaft%29#Die_eigenst.C3.A4ndige_Entwicklung_in_Japan

[2] Carlowitz (1713).

[3] Malthus (1977).

[4] Meadows et al. (1977).

M. Koller (✉) • J. Günther
Federal Environment Agency (Germany), Wörlitzer Platz 1, 06844, Dessau-Roßlau, Germany
e-mail: matthias.koller@uba.de; jens.guenther@uba.de

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summit on sustainable development in Johannesburg in 2002 the protection of our natural resources was set as the basis of all our economic activity and therefore as a fundamental principle of sustainable development. Currently this was assured at the Rio+20 conference in Rio den Janeiro in 2012. In the final declaration "The future we want" 191 states agreed on the concept of a Green Economy, for which a sustainable and efficient management of the natural resources is essential. With respect to these high level and meaningful conferences on nearly all levels from international to local, various policy initiatives with relevance to natural resources were started and sustainable use of natural resources is continuously rising on the political agenda.

Although all of these manifold initiatives, strategies and processes are addressing the sustainable use of natural resources in one way or another, their main foci differ. The first cluster is characterized by embedding sustainable use of natural resources, resource protection or a sustainable resource management as an important pillar of sustainable development and future growth in an overall strategy and is therefore directly linked to the Earth summit in 1992. The Agenda 21 document, the Marrakesh process on sustainable consumption and production, most of the national sustainable development strategies worldwide as well as the different green growth strategies under development can be included here for example. The initiatives and strategies in this cluster are setting qualitative, overarching targets on sustainable resource management, but mostly lacking clear visions on how to implement the concept or actual policy measures and quantitative targets on resource use. On the other hand, these overarching processes with its social, ecological and economical dimensions allow system-wide approaches and offer different entry points for policy measures to foster a sustainable resource use.

The activities of the European Union are dominating a second group of initiatives. Based on the agreements of the Earth summit and recognizing the importance of a sustainable resource management for future growth, the EU started several initiatives and strategies to implement a sustainable use of natural resources: the Gothenburg Strategy,[5] the sustainable development strategy of the EU, in 2001, the Thematic Strategy on sustainable use of natural resources[6] in 2005 and the flagship initiative "A resource-efficient Europe",[7] one of the seven flagship initiatives under the Europe 2020 strategy. The detailed implementation of the flagship initiative is described in the "Roadmap for a resource-efficient Europe".[8] All these documents underline the need for a sustainable use of natural resources for a sustainable growth of the EU and to secure our well-being today and in future. They tackle a wide range of natural resources including raw materials, energy resources, land, soil and water. Although all strategies include actual policy measures and visions, the Roadmap for a resource-efficient Europe provides the most detailed set of instruments including some targets and indicators.

[5] COM (2001) 264.
[6] COM (2005) 670.
[7] COM (2011) 21.
[8] COM (2011) 571.

The third cluster of initiatives is narrowing the sustainable use of natural resources mostly to raw materials, but therefore offers also the most concrete set of policy implementation. The main principle "Reduce, Reuse, Recycle" in this cluster is described for example in the 3R-Initiative of the G8. Along the whole product chain several policy measures should reduce the material input to the economy and increase the proportion of reused products and recycled materials. This policy approach is described by the OECD as "Sustainable Materials Management (SMM)" and represents the different impacts of the raw material production or harvesting (source of material), material processing along the production chain and the end of life of products. The OECD SMM policy approach can be classified by natural resource policies addressing raw material extraction or harvesting, product life cycle policies dealing with material flows in the industrial and societal systems and waste management policies addressing the end of life of products.[9]

On the national level the SMM approach is used for example in Germany or Austria. The Germany Government adopted in February 2012 the German Resource Efficiency Programme (ProgRess).[10] The goal of ProgRess is to structure the extraction and use of natural resources in a sustainable way and to reduce associated environmental pollution as far as possible. Based on four guiding principles for a global sustainable resource management, the programme identified 20 strategic approaches from securing a sustainable raw material supply, raising resource efficiency in production, making consumption more resource-efficient, enhancing resource-efficient closed cycle management and using overarching instruments.

Nearly all of the strategies and programmes following the main policy approach of a sustainable materials management describe the implication of our consumption levels, relate the steady increase of resource consumption with the supposed locked-in in a perpetual economic growth and see an important trigger for resource conservation in a transition into "dematerialized" society. But most of them are only focusing on technical approaches for the efficient use of resource in production and product policy, whereas just a few provide also detailed policy measure on e.g. change behaviour or a reduction of consumption.

## 16.2 Challenges

> We have a decade to act before the economic cost of current viable solutions becomes too high. Without action, we risk catastrophic and perhaps irreversible changes to our life-support system. (Ostrom 2012)

Despite the above described political activities on national and international level, the natural resources are still exploited and managed in unsustainable ways. Every day 75 million tons of carbon dioxides are emitted into the atmosphere,

[9] OECD (2012).

[10] BMU (2012).

350,000 tons of fish caught, 20,000 ha of arable land converted or deteriorated, up to 100 species extinct and 50,000 ha of forests destroyed.[11] In the last century the size of global social metabolism has increased by a factor eight with a transition from the dominance of renewable biomass towards mineral materials.[12] The extraction of construction materials grew by a factor of 34, ores and minerals by a factor of 27, fossil fuels by a factor of 12 and biomass by a factor of 3.6.[13] A relative decoupling can be observed within some countries following very different development paths,[14] but no absolute reduction as extraction and consumption grow faster than improvements in resource productivity. The overarching objective to reduce resource consumption and the associated environmental pressures in a way that the ecological boundaries are fully respected and without jeopardizing the welfare of present or future generations is within the current policies out of reach.[15] That would imply an absolute decoupling of resource consumption from the development of the economy and an absolute reduction of the environmental impacts caused by resource consumption. The decoupling report of the UNEP states that such a (absolute) decoupling will require significant changes in government policies, corporate behaviours and consumptions patterns by the public.[16]

Still fundamental questions like the followings are so far not sufficiently addressed:

- To whom belong the natural resources in a globalized world and which institutions and policy settings we need to manage them accordingly?
- How can we achieve a fair distribution of natural resources and the access to them within the current generations but also with respect to future generations?
- What means well-being for humankind with respect to resource use and which material standards for living are globally feasible within the planetary boundaries[17]?
- What levels of sufficiency are imposed on mankind by living within the ecological boundaries and how would the economic systems then look like on national and supranational level?
- Which priorities must be taken when managing limited resources to make sure that basic human needs like food, safe water, housing, closing an mobility are fulfilled?
- How should resource policies be connected accordingly with other policies to avoid unwanted side effects and how can conflicting interests be solved in a peaceful and constructive way?
- What balance do we need between resource efficient and resilient infrastructures?

[11] Sources: OECD (2008), Meadows et al. (2004).

[12] Krausmann et al. (2009).

[13] UNEP (2011).

[14] For more details see UNEP (2011) and Dittrich et al. (2012).

[15] We suppose that in Germany a reduction of resource use at least by a factor of 10 by 2050 is necessary in order to achieve a level of 6–10 tons per capita and year, which seems acceptable according to current knowledge; for more details see Chap. 3.

[16] UNEP (2011).

[17] Rockstroem et al. (2009).

On the policy level, one of the biggest challenge for designing effective resource policies seems to be to find the right balance between more single resource specific implementation orientated approaches, which risk to be too narrow and too much focused on single aspects, such as resource efficiency and broader concepts which deal with the inter-linkages between the various natural resources and integrate all aspects of sustainability, but risk to be too general, complex and not being suitable for implementation. In the following section we outline some building blocks, which we think are essential for a more fundamental change towards a society which manages their natural resources in a sustainable way.

## 16.3 Building Blocks for a Responsible and Sustainable Resource Management

### *16.3.1 Getting Fair, Responsible and Just*

The history of anthropogenic use of natural resources has been in many cases a history of depletion of non-renewable resources, of the irreversible destruction of ecosystems, of the violation of human rights, of wars and armed conflicts, of unfair distribution of the revenues, of an organized irresponsibility and ignorance of the needs of current and future generations, of an "don't see, don't hear, don't talk" approach of all the relevant stakeholders.

Whereas most countries have committed themselves to the concept of sustainable development and its basic idea that the needs of the present should be met without compromising the ability of future generations to meet their own needs,[18] the mankind depletes and disperses resources that nature has build up and accumulated over millions of years within a few generations. As future generations cannot have a saying and voting now, it's about us to give them a voice and not to limit their options by restricting their access to the richness of natural resources. The concept of strong sustainability which argues that the stock of natural resources and ecological functions are irreplaceable has therefore to be deeply anchored in the way we manage the natural resources. "Leave the earth as reach as you have found it" could and should be a general maxim for every generation for dealing with natural resources. As this won't happen by itself, guardianships who take care of the interests of future generations should be institutionalized. These stewards should have a saying when decisions to which degree natural resources are exploited, are taken.

Besides taking care of possible needs of future generations a more even distribution of resources and its benefits amongst the current living generations has to be achieved. Currently roughly three quarter of the global raw materials are consumed by just 20 countries, whereas the 100 countries with lowest material consumption

[18] UN (1987).

used together only 1.5 % of the global material extraction.[19] But in a world with limited resources the overconsumption in the industrialized world is limiting the possibilities and chances of less developed countries. To give the developing countries a chance to meet their increasing material needs, the industrialized countries have to reduce their resource consumption at least by a factor 5.[20] With respect to a fair distribution of the revenues of the resources the terms of trades between resource importing and resource exporting countries should comply with internationally agreed high standards of mutual fairness and a readiness by the industrialised countries to support the less developed countries in building up their own industries and by this enabling them to get a higher share of the revenue generated along the value chain. International trade policies and initiatives like the 'General System of Preferences' (GSP)[21] and 'Everything but Arms' (EBA)[22] should be maintained and further developed according to the needs of the developing countries and not be used a political weapon against the respective countries in case of trade disputes.

Trade importing countries and its public and private enterprises must also be aware of their responsibility for the possible impacts of their activities on the environment and on human right issues (human rights due diligence). The import of resources must not endanger the environment and ecosystems or destroy the livelihood of the people in those countries. By doing so, it can reduce the risk of resource motivated regional conflicts and provide stimuli for a peaceful and sustainable development in the supplier countries. This must also include the questions of occupational health and safety and child labour. The extraction and processing of resources has to go hand in hand with development of transparent and participatory concepts and regulations which improve the living conditions of the people substantially and with a long term perspective. All countries should comply with the 'Guiding Principles on Business and Human Rights: Implementing the United

[19] Dittrich et al. (2012).

[20] UNEP (2011), Dittrich et al. (2012).

[21] Under GSP schemes of preference-giving counties, selected products originating in developing countries are granted reduced or zero tariff rates over the MFN rates. The least developed countries (LDCs) receive special and preferential treatment for a wider coverage of products and deeper tariff cuts (source: http://unctad.org/en/Pages/DITC/GSP/About-GSP.aspx)

"… the objectives of the generalized, non-reciprocal, non-discriminatory system of preferences in favour of the developing countries, including special measures in favour of the least advanced among the developing countries, should be:

(a) to increase their export earnings;
(b) to promote their industrialization; and
(c) to accelerate their rates of economic growth." (Source: Resolution 21 (ii) taken at the UNCTAD II Conference in New Delhi in 1968).

[22] In February 2001, the EU Council adopted Regulation (EC) 416/2001, the so-called "EBA Regulation" ("Everything But Arms"), granting duty-free access to imports of all products from LDCs, except arms and ammunitions, without any quantitative restrictions (with the exception of bananas, sugar and rice for a limited period), for more details see http://ec.europa.eu/trade/wider-agenda/development/generalised-system-of-preferences/everything-but-arms/index_en.htm

Nations "Protect, Respect and Remedy" Framework'[23] which were endorsed on 16 June 2011 by the UN Human Rights Council. By these guiding principles for the first time a global framework for the implementation of the protection obligation of the state and of the corporate responsibility with respect to business and human rights was created. This may include efforts of the importing states and enterprises to take care that in the supplying countries good governance is build up and strengthened, that rights and livelihood of the local and indigenous populations are protected and that environmental and social standards are supported. The state should only award exports credits, investment guarantees and untied loans when enterprises can prove that impact assessments on the environment and on human rights have been conducted which must be certified by independent experts. Enterprises should also comply with ISO 26000[24] which give guidance how enterprises can comply with the requirements of corporate social responsibility.

### *16.3.2 Changing Institutions and Institutional Standards*

To enable a transformation towards a sustainable management of resources the economic, financial, education and legal framework must be changed in a way that a sustainable resource use will be better rewarded by the market and the society. This may require as well a change of the institutional settings as a change of culture within the institutions.

#### 16.3.2.1 The Policy Framework

The sustainable use of natural resources is a global task and cannot be handled only at a regional or a national level. And some natural resources such as the climate, the atmosphere, the oceans and the rainforests are already increasingly acknowledged as global goods which are or should be managed and taken care of by international institutions and international conventions and regulations. But especially raw materials are still mostly considered as an national issue and asset. This could lead to

[23] Source: A/HRC/17/31. These Guiding Principles are grounded in recognition

(a) States' existing obligations to respect, protect and fulfil human rights and fundamental freedoms;
(b) The role of business enterprises as specialized organs of society performing specialized functions, required to comply with all applicable laws and to respect human rights;
(c) The need for rights and obligations to be matched to appropriate and effective remedies when breached

and apply to all States and to all business enterprises, both transnational and others, regardless of their size, sector, location, ownership and structure. For further information see also http://www.business-humanrights.org/Home

[24] ISO 26000:2010. Guidance on Social Responsibility.

discrimination of those countries, which depend on imports of these resources and could cause violent conflicts and wars when these countries want to make sure that they have sufficient access to these resources.[25] As few countries produce all of the raw materials required for use in their industries, it is imperative that global standards are established for the fair and sustainable trade of these resources. One approach could be to further investigate if the concept of common goods could be successfully applied to the management of raw materials. Research by Ostrom[26] and other has shown that goods can be very fairly and effective managed when certain rules[27] are observed and the necessary institutional settings are available. But especially the policy field of raw materials is characterized by a startling lack of international regulation. And while there are already multilateral environment agreements and various international organisations a high level umbrella institution that is coordinating them is still missing. This role could be filled out by establishing a United Nations Environmental Organization (UNEO) as it was proposed after the 58th meeting of the UN General Assembly by the member states of the European Union to transform the UNEP into the United Nations Environmental Organization. A strong UN Organisation would have a better standing to systematically pool the scientific knowledge on sustainability and environmental issues and help to define global environmental strategic guidelines.

This could also include activities on the development of internationally accepted framework agreements[28] and sustainability and transparency standards and corresponding certification procedures and processes. The current practice of bilateral resource partnerships has to be watched carefully as their main purposes are to establish exclusive access on land and strategic resources as rare metals. Also the role of existing international organisation of high relevance like the WTO[29] should

[25] Especially as some of these raw material such as rare earth metals are of high strategic importance for industrialized economies.

[26] See among other Ostrom (1990) und Ostrom and Hess (2006).

[27] Ostrom (1990):

- Clearly defined boundaries (effective exclusion of external un-entitled parties);
- Rules regarding the appropriation and provision of common resources that are adapted to local conditions;
- Collective-choice arrangements that allow most resource appropriators to participate in the decision-making process;
- Effective monitoring by monitors who are part of or accountable to the appropriators;
- A scale of graduated sanctions for resource appropriators who violate community rules;
- Mechanisms of conflict resolution that are cheap and of easy access;
- Self-determination of the community recognized by higher-level authorities;
- In the case of larger common-pool resources, organization in the form of multiple layers of nested enterprises, with small local CPRs at the base level.

[28] As e.g. recommended by the German Advisory Council on the Environment (SRU) with respect to raw materials (SRU 2012).

[29] For a critical discussion how the WTO could better pursue its commitment to sustainable development see Cosbey (2009).

be critically discussed with respect to how they could better enable a sustainable management of natural resources.

But also at the local, regional and national level the political institutions should be transformed in a way, that the concepts of sustainability and of sustainable resource management are taken into consideration in all relevant policy processes and that instead of a single or few overarching binding agreements there is a variety of overlapping policies at city, sub-national, national, and international levels, which is then more likely to provides essential safety nets should one or more policies fail.[30]

Numerous laws and regulations have direct or indirect impacts on resource efficiency but don't address resource efficiency explicitly.[31] Therefore, when developing new or revising existing regulations, the governments should ensure that the concept of sustainable use of natural resources is integrated in an adequate way. The observance of human rights should be anchored as extraterritorial duty of states. The governments should also think about issuing a specific 'resource conservation' law, which could define general aspects of a sustainable use of natural resources like principles, objectives and terms and also include cross sectional approaches and instruments. That may include the obligation for the governments to report regularly on measures taken to ensure a sustainable management of natural resources.

#### 16.3.2.2 The Financial and Economic Sectors

The financial and economic sectors have to be aware of its responsibility for a sustainable management of natural resources[32] too. But so far especially in the financial sector sustainable resource use is only of minor importance. When it comes e.g. to evaluate the performance of enterprises, the relevant indicators so far don't reflect whether the enterprise is taking care of a sustainable resource management. Therefore it is important to establish responsible and sustainable use of resources as a key decision factor for investors within the financial sector and to develop resource related behaviour standards and certificates like developed within the Kimberley process,[33] the extractive Industry transparency Initiative (EITI)[34] or laid out in the sections 1502–1504 of the of the so called Dodd-Frank Act[35] which could provide a guidance for evaluating and monitoring, how far an enterprise is taking care of sus-

[30] A.o. see Ostrom (2012).

[31] In Germany e.g. the Federal Mining Act (Bundesberggesetz), Regional Planning Act (Raumordnungsgesetz), Environmental Audit Act (Umweltauditgesetz), Construction Products Act (Bauproduktegesetz), EIA-Act (UVP-Gesetz).

[32] For an impressive case study on the dubious role of Switzerland as a hotspot for the trade of raw material commodities see Erklärung von Bern (2011).

[33] See http://www.kimberleyprocess.com/

[34] http://eiti.org/

[35] Dodd-FrankWall Street Reform and Consumer Protection Act. Section 1502: Conflict Minerals; Section 1503: Reporting requirements regarding coal or other mine safety; Section 1504: Disclosure of payments by resource extraction issuers.

tainable resource management. Sustainable resource use related key performance indicators (R-KPIs) could serve as a basis for assessment and decision-making processes within the financial sector. They could be used at the various levels within the financing system in order to integrate resource issues in the daily work of financial service providers. These standards and R-KPIs should also be used by the financial supervisory authorities in further developing the legal rules for the risk management and ethical behaviour carried out by financial service provider sand could also be fed into international processes for the regulation of financial markets (e.g. Basel III) and be an obligatory part of business reporting. Also a stronger regulation of over-the-counter-trade in speciality metals as well as safeguards against anti-competitive practices could help ease market tensions and bottlenecks.[36] Generally the trade system should contribute to correct the imbalance between rich and poor countries, to reduce the problem of exclusion and social marginalization, to promote good governance and the rule of law and to return the use of natural resources and ecosystems to sustainable levels.[37]

Economic instruments like environmental taxes have become a regular part of economic and environmental policies. They may have steering effects and give stimuli for a more efficient management of natural resources. Taxes induce higher costs at first but lead in the medium term to an increase in efficiency, innovation rate and competitiveness of enterprises. With respect to natural resources, enterprises become less dependent on raw materials and are less threatened by insecurities of supply and/or volatile prices. As the building and construction sector is very resource intensive, a first approach could be to impose a tax on the extraction and import of primary construction materials, a measure which produced very positive results in Great Britain (EEA 2008). The use of primary construction materials such as sand, gravel and crushed rock has a massive direct and indirect environmental impact along the entire value chain. Imposing a tax on primary construction materials supports a shift to secondary materials.

Often state subsidies hamper a sustainable and efficient use of natural resources by stimulating the consumption of resources.[38] In Germany the state promotes for example saving for building purposes by means of the home building bonus (Wohnungsbauprämie), the employee savings allowance (Arbeitnehmer-Sparzulage) and the Home Ownership Pensions Act (Eigenheimrentengesetz). These subsidies increase the incentive to build individual homes favour and therefore may cause higher resource consumption than the refurbishment of existing buildings. Another example is a distance-based income tax deduction for commuters. Employed persons can set off expenditure on journeys to and from work against income tax as a business expense. The loss of tax revenue due to the distance-based tax allowance amounts to €4.350 billion (Umweltbundesamt 2011). This offers incentives to live

[36] Lee et al. (2012).

[37] Cosbey (2009).

[38] A report of the German Federal Environment Agency indicates that the total volume of environmentally harmful subsidies amounted to around 48 billion EUR in 2008 (Umweltbundesamt 2011).

in the countryside and causes additional resource consumption (e.g. fossil resources for commuting and land use). Governments should therefore systematically identify all subsidies that directly or indirectly contribute to the squandering of natural resources in order to reduce and/or abolish those subsidies.

#### 16.3.2.3 Strengthening Education, Research and Transfer of Technology and Knowledge

Governments should support education systems in particular, since today's children and students will not only be tomorrow's leaders and relevant stakeholders in science, politics and industry but will also have – as consumers – the highest impact on future resource consumption patterns. Education in sustainable management of natural resources should therefore already start in the childcare systems and be more explicitly addressed in secondary schools and universities. Especially engineering students should be systematically trained in environmental issues during their studies, e.g. by attending courses at a "virtual resource university".[39] The realization of a dematerialized society needs a sound scientific understanding of the underlying complex issues, which requires research and explorations in many directions. Engineers must investigate the potentials and possibilities for more resource efficient products and production processes along the whole value chain and for substituting scarce or environmentally harmful materials and substances by more abundant or less problematic ones. Social scientists should explore how the necessary cultural and social transformation can be initiated; economist should identify the necessary economic framework conditions. Ecologists and natural scientists could provide a better understanding of the impacts of the exploitation and use of natural resources. Another important aspect is the management of existing knowledge. Governments should support initiatives and institutions which collect information about research projects, approaches, instruments and best practice examples concerning resource efficiency and make it available in a user-friendly way.

Research results and expertise must also be transferred to operational level of enterprises. However for many enterprises it is very challenging to cope with such complex issues as the sustainable management of natural resources. Especially small and medium enterprises often lack the necessary information and know-how as well as financial and technical capacities. They need support and external competence to further increase resource efficiency within their processes and products. On a national level the governments should therefore continuously seek dialogue with industry and further extend and strengthen existing networks and institutions for resource efficiency, to build up where appropriate institutions for resource efficiency competency and systematically train and qualify intermediaries. Regionally and locally based consultants should go to enterprises to help them to identify paths

[39] The idea behind the concept of a virtual resource university is to a create synergy potential by networking of existing research units working on the subject of resource efficiency. Such a network could e.g. develop, initiate and carry out joint interdisciplinary research projects.

for a more sustainable resource management which shouldn't be limited to efficiency improvement but also include stimulating awareness and responsibility for the social and environmental issues. These consultants should be continuously further trained to make sure they always provide state of the art expertise. Enterprises also can profit by cooperating within resource efficiency networks where they can exchange information and experiences as for most entrepreneurs, the most convincing examples are other entrepreneurs who have successfully moved.

### *16.3.3 Integrated Approaches – The Nexus*

Resource policy is a cross cutting issue with many links to other, not only environmental, policies. The nexus approach explores the complex inter-linkages between various resources such us renewable resources, land and soil, water, climate and biodiversity. It provides a more integrated view and allows a better understanding of resource-related questions that would be difficult to answer in the more traditional pillared approach.[40] And it integrates the various environmental policies and approaches in a way that conflicts between the different objectives are reduced to an unavoidable minimum and advantage is taken of potential synergy potentials as far as possible. A prominent example is the conflict between food, feed, fuel and fibre. The increasing demand for food and other biomasses for energetic or material use intensify the pressure on land use and other natural resource with critical ecological and social consequences. Already today agriculture contributes around 15 % of the total greenhouse gas emissions. A further expansion of land use for agriculture will induce a further loss of forest ecosystems, additional greenhouse gas emissions and increase the pressure on biodiversity and on the buffering capacity of soil, water and air. $NO_2$ emissions, land degradation, scarcity of water supply, salination are typical consequences of a non sustainable land use which not only impose additional pressure on ecosystems but also endanger the base for human food. But an use of land and biomasses which doesn't properly take care of the basic needs of human cannot be considered sustainable, even if done in a resource efficient way.[41] Another example is the use of renewable energy like wind energy. In many countries the use of wind energy can contribute considerably to a renewable energy supply and by this support climate protection. But the provision of the necessary resources for the wind energy plants such as steel, concrete, copper and rare metals induces additional pressure on the environment such as recession of ground water levels, acidification of soils, ground subsidences, erosion and destruction of habitats.

Therefore all measures and approaches for a sustainable use of resources must be mutually checked for their impacts on and consistency with other policies and follow a better policy approach as described by the OECD: "Better policies should be

[40] Andrews-Speed et al. (2012).

[41] Umweltbundesamt (2012).

based on sound evidence and a broad focus: not only on the peoples income and financial conditions, but also on their health, their competencies, on the quality of the environment, where they live and work, their overall life satisfaction. Not only on the total amount of the goods and services, but also on equality and the conditions of those at the bottom of the ladder. Not only on the conditions "here and now" but also those in other parts of the world and those that are likely to prevail in the future."[42] Likewise it is necessary that other policies like economic policy, development policy, foreign policy take the aspects of sustainable resource management adequately into consideration.

### *16.3.4 Sustainable Resource Use in the Practice of Daily Life*

#### 16.3.4.1 Social Innovations, Models of Change

The social trends of consumption are still moving in the wrong direction, because the individual concepts of well-being are not adequately connected with the objectives of resource protection and a healthy environment. Therefore, a fundamental cultural transition will be a necessary key towards a sustainable use and management of natural resources. Promoting such kind of a cultural transition requires new approaches within environmental policy, which are based on social innovation and new forms of environmental communication. Social innovations are often bottom-up processes and promoted and supported by civil society. The governments should establish and support structures which enhance and facilitate e.g. cooperation and networking for new ways of sharing products and services such as car sharing, second-hand services, swap shops and pioneer resource efficient civil society projects and transition communities.

#### 16.3.4.2 Sustainable Consumption

Consumers influence the resource consumption of products from purchase to disposal. It's the buying decision of the consumer that finally decides on the economic success of green and resource efficient products. Distributors/retailers are a decisive link between producers and consumers and must assume the task of enabling the consumer to become a "green consumer", e.g. by better cooperation through consumer information systems such as eco-labelling, by a better placement of resource efficient products and by promoting and offering consumer friendly take back systems. As more and more goods are sold via e-commerce systems these actions must also address electronic trade platforms with specific approaches. Resource policies should stimulate and support the extension of consumer counselling services, the

[42] See OECD (2011).

further development of product information systems and the inclusion of sustainable resource use related aspects in existing environmental labels like the EU eco-label or the labels of the Forest Stewardship Council and the Marine Stewardship Council.

#### 16.3.4.3 Communication and Awareness Rising

To build up dematerialized societies is a task which requires the engagement of the whole society. It's not only a question of optimizing the exploitation and management of resources and increasing the resource efficiency of production processes and products, it's also question of how we live and what kind of material wealth we aspire. Communication about resource efficiency must therefore address all the relevant stakeholders (including the general public) by target group specific approaches. The communication should be connected with and attuned to ongoing and future communication measures on other relevant environmental issues like protection of biodiversity and climate protection as well as to the discussion on green economy and sustainable lifestyles. As any communication campaign requires a considerable amount of financial and human resources, priority target groups and measures should be identified.

## 16.4 Outlook

A world in which the natural resources a managed and used in a sustainable way will be very different from the one we currently know, and it will be a world where humans have learnt, that with limited resources an economy which builds on concepts of unlimited growth is not feasible, even when we achieve a higher level of dematerialisation, efficiency and consistency.[43] It will be a world, in which sufficiency is not a concept politicians and economist don't dare to talk about, but a broadly accepted target for societies, which want to move forwards towards sustainability. Reducing resource use in absolute terms won't be possible by measures aiming only at increasing resource efficiency and productivity. In order to avoid efficiency gains being offset by an increased demand for resources and goods more paths towards dematerialized societies have to be developed.

Giving our lifestyle a more sustainable direction will require a higher awareness of and sensitivity for the issue of sustainable resource use as well as a fundamental cultural change. As long as we need material goods as positioning goods and for building up our self-esteem, we won't get on a sustainable track. To get sustainable resource management deeply anchored in the social and economic society a new attitude towards the natural resources is necessary, from ownership to stewardship, a new way of sharing responsibility for global well being and justice, new

[43] See a.o. Meadows et al. (1977), Paech (2005), Jackson (2009).

perspectives on sustainable global economy as an ecommony,[44] new policies with integrated approaches instead of sectoral approaches which don't take care of the mutual inter-linkages and cross-impacts. We need not only smarter and more resource efficient material infrastructure and less resource consuming business models but also new mental infrastructures,[45] which prevent us from continuing to fix the problems by the means, which caused and created them. A change of the way we think and act towards a more sustainable resource use needs inspiration by good practice examples, needs front runners and courageous people who show that more sustainable ways of living are not only possible but also fulfilling and joyful. It needs societies which encourage their citizens to participate and to explore new ways, it needs open spaces and time to experiment with less materialized lifestyles.

It is still unclear how the political, social, cultural and economic system in such world could look like and how we will get there. But at least we have rough guidance in which direction we have to walk and we can expect that the road becomes clearer as long as we are walking.

## References

Andrews-Speed P, Bleischwitz R, Boersma T, Johnson C, Kemp G, VanDeveer S (2012) The global resource nexus – the struggles for land, energy, food, water, and minerals. Transatlantic Academy, Washington

BMU (2012) Federal ministry for the environment, nature conservation and nuclear safety. German Resource Efficiency Programme – Programme for the sustainable use and conservation of natural resources. Berlin

Carlowitz HC von (1713) Sylvicultura oeconomica. Anweisung zur wilden Baum-Zucht/Hannß Carl von Carlowitz. – Reprint der Ausg. Leipzig, Braun, 1713/bearb. von Klaus Irmer und Angela Kießling. TU Bergakademie Freiberg und Akademische Buchhandlung, Freiberg

COM (2001) 264. A sustainable Europe for a better world: a European Union strategy for sustainable development

COM (2005) 670. Thematic strategy on the sustainable use of natural resources

COM (2011) 21. A resource-efficient Europe – flagship initiative under the Europe 2020 strategy

COM (2011) 571. A roadmap to a resource efficient Europe

Cosbey A (2009) A sustainable development roadmap for the WTO. Trade and Investment Program. International Institute for Sustainable Development

Dittrich M, Giljum S, Lutter S, Polzin C (2012) Green economies around the world? Implications of resource use for development and the environment. SERI, Vienna

EEA (2008) Effectiveness of environmental taxes and charges for managing sand, gravel and rock extraction in selected EU countries. EEA Report No 2/2008. Copenhagen

Erklärung von Bern (2011) Rohstoff. Das gefährlichste Geschäft der Schweiz. Zürich

Habermann F (2009) Halbinseln gegen den Strom. Anders leben und wirtschaften im Alltag, hrsg. v.d. Stiftung Fraueninitiative, Königstein

[44] Habermann (2009).

[45] Welzer (2011).

Jackson T (2009) Prosperity without growth – economics for a finite planet. Earthscan/Routledge, London/New York
Krausmann F et al (2009) Growth in global materials use, GDP and population during the 20th century. Ecol Econ 68(10):2696–2705
Lee B, Preston F, Kooroshy J, Bailey R, Lahn G (2012) Resources futures. A Chatham House Report
Malthus T (1977) Das Bevölkerungsgesetz. dtv-bibliothek 6021, dtv-Taschenbuch, München (Originaltitel: An essay on the principle of population as it affects the future improvement of society, with remarks on the speculations of Mr. Godwin, M. Condorcet, and other writers, übersetzt von Christian M. Barth)
Meadows HD et al (1977) Limits to growth: a report for the Club of Rome's Project on the predicament of mankind. Universe Books, New York
Meadows D et al (2004) Limits to growth: the 30-year update. Chelsea Green, White River Junction
OECD (2008) OECD-UNEP conference on resource efficiency: opening remarks by Mr. Pier Carlo padoan, OECD Deputy Secretary-General, 23 Apr 2008, Paris, France
OECD (2011) How's life? Measuring well-being. OECD Publishing
OECD (2012) Sustainable materials management: making better use of resources. OECD Publishing
Ostrom E (1990) Governing the commons. The evolution of institutions for collective action. Cambridge University Press, Cambridge
Ostrom E (2012) Green from the grassroots. http://www.project-syndicate.org/commentary/green-from-the-grassroots
Ostrom E, Hess C (eds) (2006) Understanding knowledge as a commons: from theory to practice. The MIT Press, Cambridge, MA
Paech N (2005) Nachhaltigkeit zwischen Konsistenz und Dematerialisierung: Hat sich die Wachstumsfrage erledigt? Natur und Kultur 6/1(2005):52–72
Rockström J, Steffen W, Noone K, Persson Å, Chapin FS III, Lambin E, Lenton TM, Scheffer M, Folke C, Schellnhuber H, Nykvist B, De Wit CA, Hughes T, van der Leeuw S, Rodhe H, Sörlin S, Snyder PK, Costanza R, Svedin U, Falkenmark M, Karlberg L, Corell RW, Fabry VJ, Hansen J, Walker B, Liverman D, Richardson K, Crutzen P, Foley J (2009) Planetary boundaries: exploring the safe operating space for humanity. Ecol Soc 14(2):32
SRU (2012) Umweltgutachten 2012. Verantwortung in einer begrenzten Welt
Umweltbundesamt (2011) Environmentally harmful subsidies in Germany – update 2010. Dessau-Roßlau
Umweltbundesamt (2012) Globale Landflächen und Biomasse nachhaltig und ressourcenschonend nutzen. Umweltbundesamt. Dessau-Roßlau. 99 S
UN (1987) United Nations. 1987. Report of the world commission on environment and development. General Assembly Resolution 42/187
UNEP (2011) Decoupling natural resource use and environmental impacts from economic growth. A report of the Working Group on Decoupling to the International Resource Panel
Welzer H (2011) Mentale Infrastrukturen. Wie das Wachstum in die Welt kam. Schriftenreihe der Heinrich-Böll-Stiftung. Band 14