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International Resource Politics

New challenges demanding new governance approaches
for a green economy

By Raimund Bleischwitz, Bettina Bahn-Walkowiak, Felix Ekardt, Heidi Feldt, Lili Fuhr



Wuppertal Institute
for Climate, Environment
and Energy



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Edited by the Heinrich Böll Foundation in cooperation with Wuppertal Institut

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FOREWORD

Since ambitious environmental targets have not been achieved, and a technology-driven efficiency revolution is missing to date, the 20th anniversary of the UN Conference on Sustainable Development (Rio+20) in Rio de Janeiro in 2012 aims to give new impetus to the debate on how to meet the tremendous global environmental and development challenges. Many global institutions and national governments, NGOs, major groups, and stakeholders have expressed their views regarding the green economy and green growth strategies. However, the discussion is less consistent and integrative than one would wish for. Strategies for a comprehensive transition toward more sustainable production and consumption patterns remain largely unexplored, and the relationship between the green economy concept and the concept of sustainable development is still in need of clarification. Although it has been acknowledged that the old resource-intensive, fossil fuel-based development model does not increase opportunities for development for the majority of people, the green economy concept and its consequences are distrusted in developing countries. The concern is that the green economy will cement the global economic structures and the increased use of efficient technologies may reinforce the dominance of the developed countries. From the perspective of many developing countries, the trade policies of industrialized countries, which further call for the opening of the markets, and their resource policy pushing for free access to raw materials, are raising fears that a green economy could ultimately do more harm than good.

This study – a collaboration of the Heinrich Böll Foundation; the Wuppertal Institute for Climate, Environment and Energy; and the University of Rostock – wants to contribute to the Rio+20 conference theme. It emphasizes the interactions of green technologies that can accelerate the transition to a green economy, the resulting demand for more critical raw materials, and the interrelated socio-political dimensions worldwide. A number of studies on the criticality of raw materials have been conducted in recent years and they almost all have one thing in common: the negligence of the socio-political dimension of criticality. For instance, the rare earth elements have attracted a great deal of attention due to China pursuing a restrictive export policy. However, attention is usually drawn to scarcities; supply shortages and barriers; price increases and volatility; high import-dependencies, as well as environmental problems caused by application and use from the high-tech producing countries' perspective. Less attention is given to questions concerning the mining and supply conditions; deficient equity and resource distribution; overconsumption in the North; and the factors

contributing to the fact that potential benefits are often not realized in resource-rich and developing countries through selling raw materials.

While there has been a rise in the number of initiatives in the last years – for example, the UN Framework on Business and Human Rights, the Extractive Industries Transparency Initiative (EITI), the Natural Resource Charter, and others aiming at improving the governance of natural resources – Germany and the EU still have good reasons to accept their responsibilities for a serious upgrading of the principles for a fair and sustainable resource policy, which is needed if the existing resource market deficits and challenges of the future are to be met. The EU is the largest commodity importer of the world, and Germany is the major manufacturing hub within the EU, meaning that its industries and its agriculture are both importers and exporters of resources. Moreover, a stronger international outreach is deemed necessary. The study calls for institutional strategies, such as an International Resource Management Agency and a Multistakeholder Forum, as well as European and international phosphorus and metals policies and other approaches, in order to bring all these issues to light. It will hopefully challenge all those involved in the extraction, trade, and use of raw materials to think again about collective behaviors toward the often ignored implications of prevailing production, consumption, and trade patterns.

Wuppertal/Berlin, May 2012

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EXECUTIVE SUMMARY

Natural resources are back on the agenda. After the rise of new economic powers such as China, India, and Brazil, global competition has perceptibly increased strategic concerns as regards high commodity prices and possible supply shortages. Germany, the EU, the United States, and many others have formulated raw material strategies that put concern over access and supply at center stage.

This paper underlines a new dimension of international relations and pleads for new approaches, called international resource politics. What is new – and will be stressed throughout the paper – is the interconnectivity across critical resource shortages, which presents two challenges:

- the *environmental challenge* to cope with impacts from using resources along their lifecycle;
- the *socio-political challenge* to cope with human rights, poverty, and freedom internationally.

These two dimensions are often neglected in strategic studies. However, this paper emphasizes their strategic character for the worldwide endeavor of a green economy and the forthcoming Rio+20 summit in Rio de Janeiro: Firstly, environmental benefits in industrialized countries may coincide with a shifting of problems to the poorer regions in the world. Biofuels are one recent example of such problem-shifting. Many of the key sectors in transition (for example energy, transport, agriculture) and innovative green technologies (solar, wind, electric cars, etc.) will continue to rely on the use of finite mineral resources that are often mined in countries with a weak governance structure and a poor record on human rights. Secondly, economic benefits of resource-efficiency measures in manufacturing sectors are dissatisfactory as long as the corresponding products end up as hazardous waste in poorer regions. Without an explicit international dimension, resource-efficiency strategies face an uphill battle against existing distortions and unfair competition. Thirdly, a finite planet with “planetary boundaries” for key environmental parameters (some of which have already been transgressed) sets limits on substituting one finite resource (such as land) with another (such as fossil fuels) or vice versa. Business as usual is not an option – not for any actor nor for any country.

This paper attempts to raise awareness for an international resource politics, which can be used as a new element for ongoing debates concerning a green economy and transition strategies.

Chapter 2 explains the multidimensionality of critical resources and illustrates profiles of five minerals with relevance for a green economy: *phosphorus*

is an indispensable mineral for the agriculture sector and world food production; *coltan/tantalum* is a so-called conflict mineral due to its illicit trade and the fueling of regional conflicts, especially in Africa; *rare earths elements (REEs)* show a strong reliance on one exporting country, China; *platinum group metals (PGMs)* (here platinum and palladium) are very difficult to substitute at present; *copper* is a mass material with great importance for green high-tech products but also indispensable for all energy infrastructures (see Table 1 in Section 2.6).

The key message is that criticality is a multidimensional concept that should also include the environmental dimension as well as human rights. Critical metals are increasingly relevant for green technologies; the mineral phosphorus is essential for food supply. However, risks and threats of the extraction of those resources are to be derived from a holistic concept that takes into account geopolitics, the governance of using this material, as well as climate change and other challenges.

Chapter 3 addresses potential goal conflicts and competing interests of a variety of actors – it is thought this will also stimulate debate about opportunities, synergies, trade-offs, and transformation strategies. Along the supply chain of resources, one sees a large variety of actors: mining companies and ministries, refineries, smelters and processors, manufacturing industry, green industry, NGOs, concerned citizens, end consumers. Resource management interconnects the globe; understanding resource governance should follow a bottom-up approach of multilevel and polycentric governance, where the variety of actors and institutions on different levels is taken into account. A key is to acknowledge the global shifts from the OECD countries to new actors in the rest of the world. The complexity of global supply chains hinders transparency: While the main responsibility is upstream in the mining sector – where profits and innovations are often low – the main credibility is associated with industries downstream in the technology sector, where innovation is high and growth is created. Thus, the ability to act requires an enhanced cooperation with incentives along the supply chain of material flows.

Chapter 4 discusses the need for visions and proposes principles for a fair future of using natural resources. The need for visions follows basically from the current disorientation: Will prices continue to go up? Shall developed countries reduce their use of resources, even if geophysical scarcities are disputed? Given our proposals on the multicriticality of resources, and given the heterogeneity of actors and their interests, such visions and new principles shall provide orientation, help to guide decision-making during uncertainties, and line up normative requirements such as human development and sustainability. The chapter starts with a short discussion of seven practical principles of sustainable resource management. It goes a step further and elaborates on freedom as a normative requirement toward elementary *preconditions of freedom* – the provision and maintenance of an adequate resource base, in particular for food and water supply, but also life-supporting functions of natural resources and ecosystem services. Poverty eradication thus goes hand-in-hand with a provision of adequate supply

of natural resources for the poor. Conversely, one can argue in favor of reducing resource consumption in the industrialized countries for the reasons of reducing environmental pressure and providing development space for the poor.

Chapter 5 takes a look at governance and market deficits as well as lessons learned from existing initiatives, instruments, and approaches. In the last years there have been a number of initiatives aiming at improving the governance of natural resources. While acknowledging such promising actions in general, this paper will focus on transparency, certification, and the ways in which initiatives and politics interact, surely without being able to give a full-scale evaluation. The strength of tools such as the Extractive Industries Transparency Initiative (EITI), the Dodd-Frank Act, and a number of others, is their tight focus on a narrow issue that has demanded action. However, the challenges will require stronger governance mechanisms and economic incentives to combat global overuse of resources, rebound effects, and problem-shifting and address the corresponding opportunities and responsibilities in industrialized countries. Thus, they will need a serious upgrading regarding the normative principles for a fair and sustainable international resource politics if all existing deficits and challenges of the future are to be met. In a broader sense, it seems that new hybrid forms of governance emerge, where formal regulations and stakeholder-driven initiatives co-evolve on the levels of industrialized countries, local groups in developing countries, NGOs, and business. Such hybrid forms of governance become more powerful if they leverage market access in the United States and the EU.

Chapter 6 proposes new response options for a number of stakeholders, business, NGOs, civil society, and governments alike. Germany and the EU have good reasons to accept their responsibilities in that regard. The EU is the largest commodity importer of the world (not China or the United States), and Germany is the major manufacturing hub within the EU, meaning that its industries and its agriculture are both importers and exporters of resources. Moreover and against all current odds, the EU is the largest internal consumer market of the world – with numerous leverage capacities for market access.

Leadership indeed will need to be demonstrated at home: Future commitments of the EU and its member states toward resource savings, that is, an *absolute decoupling* of resource use (measured in total material requirements or any similar comprehensive indicator) from GDP should be central in any such strategy; similar commitments by major corporations (against sales rather than unit-based) should be encouraged. Putting one's own house in order is a key ingredient for credibility and preparing market actors for long-term changes.

An international resource politics could be launched with a strengthening of existing initiatives and move from knowledge to action via an international data hub, an international resource management agency, and a multistakeholder forum. Further activities should include policies on phosphorus, an international recovery of metals, and transformation of bilateral agreements toward sustainable resource management. The long-term perspective is a transition toward a sustainable world economy (see Table 3 in Chapter 7).

1 Introduction

This paper underlines a new dimension of international relations and pleads for new approaches, called international resource politics. The authors wish to share their concerns about trends and their impacts as well as discuss a number of response options. Key activities addressed are the responsibility of industrialized countries, most notably and for illustrative reasons in the EU and Germany.

Following price increases for all commodities in the last 10 years, mineral resource scarcity has recently been analyzed in great detail. Experts and agencies widely agree that many materials are abundantly available – such as iron ore, sand, bauxite, etc. – while the situation for others is seen as being critical. Criticality concepts stem partly from geology and partly from concerns about access and security. The recent German and European Raw Materials Strategies (BMW 2010; EC 2008) as well as a number of related reports (Mildner 2011a; PBL 2011; Kooroshy et al. 2010; etc.) document these findings. A common belief is that the growing demand from emerging economies could cause shortages of supply and that this needs to be addressed by means of international strategies to enforce free trade and create good investment conditions against rising resource nationalism. However, such strategies could result in a greater use of resources on a global scale without lowering the risks. Even the most resource-efficient technologies will continue to rely on finite resources and those using them will eventually be faced with the challenge of finding a political answer to the rebound effect (Madlener and Alcott 2011). In addition, there is a need to fundamentally question the growth-driven development paradigm and seriously discuss alternative prosperity models as well as consumption patterns (Jackson 2009).

With the observation that the political will for global cooperation is rather weak in major countries, a spiral of more resource-related risks, dangers, and conflicts seems likely, as does the emergence of regional niches for the better management of individual resources. The challenges for any form of sustainable resource management on a global scale thus should not be underestimated. What is new – and what will be stressed throughout this paper – is the interconnectivity between critical resource shortages and two other challenges:

■ The *environmental challenge* to cope with impacts from using resources along their lifecycle. According to the International Resource Panel (UNEP 2010), environmental impacts such as the greenhouse gas emissions generated from using mass metals and agricultural goods are as high as those generated from the use of fossil fuels, which causes global temperatures to rise. Other materials such as critical metals, which are used in much smaller quantities,

have recently been put on the research agenda. With other words: Climate change, land use, water shortages, and other critical ecosystems interconnect with the use of natural resources worldwide.

■ The *socio-political challenge* to cope with human rights, poverty, and freedom internationally. While impacts of mining on human rights have been under scrutiny for quite some time, the larger context of livelihoods and equity has yet to be addressed: People fight for access to – and affordable prices for – water and food, whose shortages result, inter alia, from the overuse of resources and the subsequent environmental impacts. A recent survey involving researchers worldwide shows that they consider this topic a high priority (UNEP 2012). That is to say, global approaches addressing a fair distribution of natural resources and strategies to benefit the poor are at stake.

A further challenge is the increasing complexity of resource systems (see Figure 1) and the hardly predictable interactions between environmental and social impacts. Obtaining increased quantities of minerals requires a subsequent increase in the amount of water and energy needed to generate them; critical thresholds may be surpassed at the local and regional levels and cause unpredictable feedbacks at the national and international levels (Bündnis Entwicklung Hilft 2011).

The concepts of a green economy or a “green growth” strategy (e.g., UNEP 2011a; OECD 2011a; EC 2011a; UNCTAD 2010) that are currently being put forward in the run-up to the Rio+20 conference provide valuable contributions toward addressing those challenges.¹ Targets such as a drastic reduction of greenhouse gas emissions, a switch to 100 percent renewable energies, Factor Ten improvements in resource efficiency, etc., provide orientation and guidance in a number of economic sectors. However, most of these concepts fail to address the question of how to create an economy that is not only green but also equitable, socially just, and that manages to overcome the governance deficits of our current “brown economy” (for example the influence of corporate lobbyists; the omnipresent protection of investors at the expense of the environment and the people; corruption, etc.). A green economy that rises to that challenge requires a fundamental transformation not only in all economic sectors but also in the underlying power relations between various actors (political, economic, social).

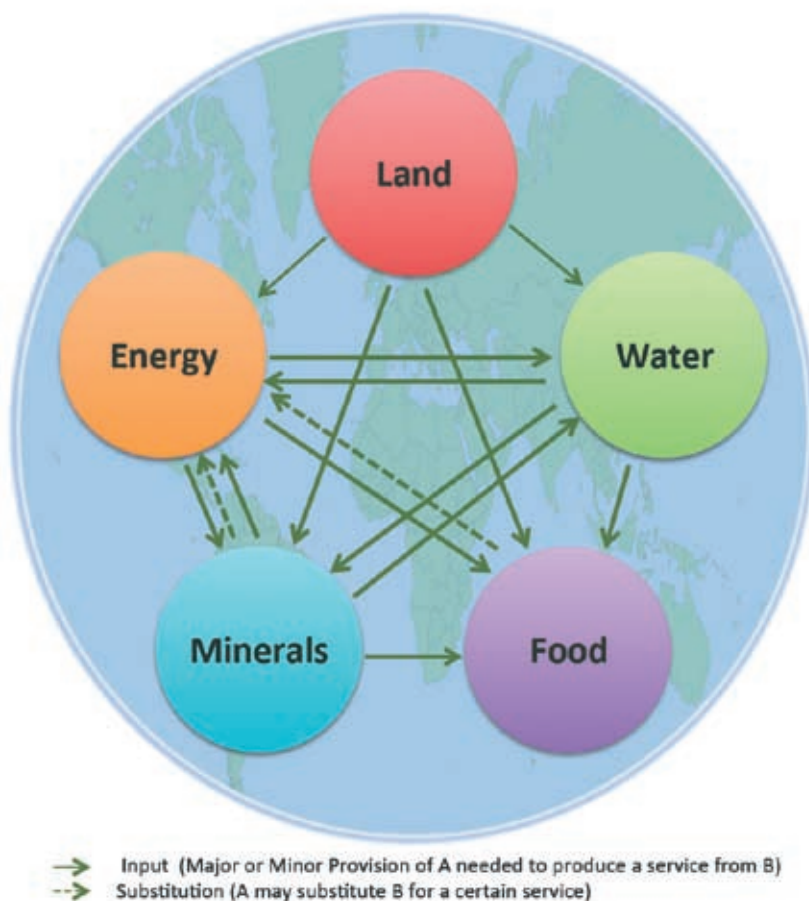
When such strategies are pursued, moreover, there is a risk that their effects are selective: Firstly, environmental benefits in industrialized countries may coincide with the shifting of problems to the poor regions of the world. Biofuels are one example of such a shift. From a resource politics perspective, it is important to realize – and take into account – that for many of these key sectors (for

1 The UNEP definition is: “A green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive” (UNEP 2011a).

Figure 1: The resource nexus

The Global Resource Nexus

Linkages and Feedbacks



Source: Transatlantic Academy 2012, inspired by PBL (2011)

example energy, transport, agriculture) as well as for innovative green technologies (solar, wind, electric cars, etc.), pioneers will continue to rely on finite mineral resources (see Chapter 2). Secondly, the economic benefits of resource-efficiency measures in the manufacturing sector will continue to be unsatisfactory as long as the corresponding hazardous byproducts and waste end up in poor regions. The related risks of a “resource curse” in mineral-rich developing countries as a downside of a green economy in the North and poorly governed international trade should be assessed with care. Thirdly, a finite planet with “planetary boundaries” (some of which have already been transgressed) sets limits on substituting

one finite resource (such as land) with another (such as fossil fuels) or vice versa (Rockström et al. 2009).²

Approaches to counteract negative consequences of prevailing resource consumption patterns – integrated lifecycle assessment, transparency, producer responsibility, etc. – certainly exist. Tools such as Strategic Environmental Impact Assessment and Material Flow Analysis, and initiatives such as the Model Mining Development Agreement (MMDA), the Resource Charta, and the Extractive Industries Transparency Initiative (EITI) have emerged over the last years and are supported by an encouraging number of actors. The Dodd-Frank Act in the United States and the proposed directives by the European Commission (EC 2011b, 2011c) will give a push for responsible mining and supply chain management. Yet, all these approaches seem largely fragmented, often even disconnected from one another, and they seem to lack a broader perspective as outlined above. Discussions about their strengths and possible limitations and a need for stronger mechanisms with a long-term perspective are certainly needed.

For sure, business as usual is not an option – not for any actor nor for any country. Successfully meeting the needs of the world's poor for more access to resources, avoiding destabilization of the economies both of the developing and the developed countries, reducing resource-related violence, and honoring democratic values require that all resources must be produced more wisely to increase the benefits that can be derived from them. At the same time, the impacts must be better managed in the mineral-producing regions and the benefits of which must be provided locally. These are enormous challenges. This paper attempts to raise awareness for an international resource politics, which can be used as a new element for ongoing debates concerning a green economy, transition strategies, and a revitalization of the commons (e.g., Bleischwitz et al. 2009; French et al. 2009; Helfrich et al. 2009; Schepelmann et al. 2009; German Advisory Council on Global Change 2011). It will hopefully challenge all readers to think again about the strengths and weaknesses of good initiatives as well as to conceive a broader picture.

The structure of the paper is as follows: Chapter 2 explains the multidimensionality of critical resources and illustrates five minerals with relevance for a green economy. Chapter 3 addresses potential goal conflicts and competing interests of a variety of actors – it is thought this will also stimulate debate about opportunities, synergies, trade-offs, and transformation strategies. Chapter 4 discusses the need for visions and proposes principles for a fair future of using natural resources. Chapter 5 takes a look at governance and market deficits as well as lessons learned from existing initiatives, instruments, and approaches. Chapter 6 will propose new response options for a number of stakeholders, business, NGOs, civil society, and governments alike. Chapter 7 concludes the discussion and provides a brief outlook for the future.

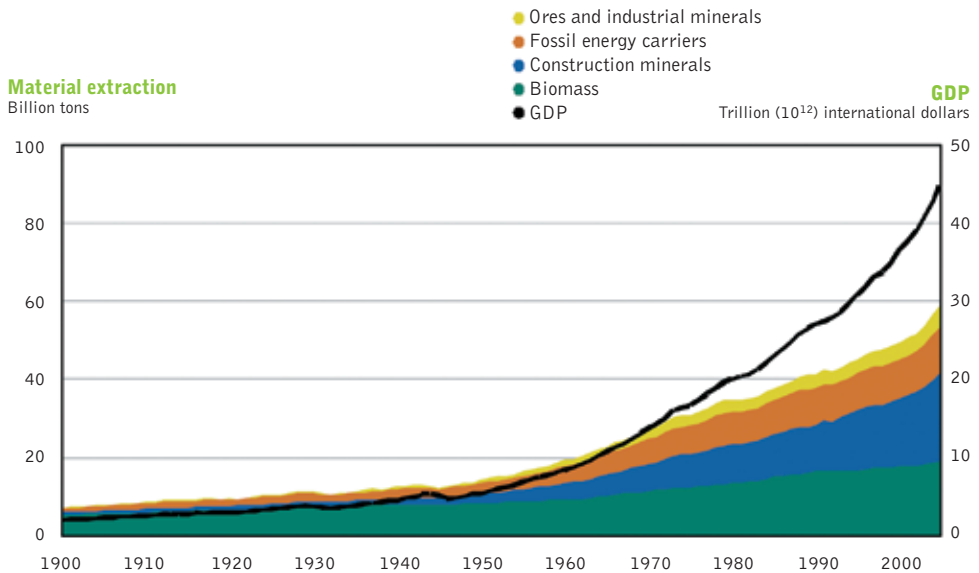
2 See, for example, <http://www.sei-international.org/planetary-boundaries>.

2 Critical resources in a green economy

Challenges ahead

This chapter aims to draw attention to the dilemma that may arise from the increased application of critical resources in a green economy. The world is being subject to an unremitting trend of rising demand for resources (UNEP 2011b; see also Figure 2). As of 2010, the EU was the largest importer of resources world-wide. Some hopeful signs in a few countries show that a relative decoupling of welfare from resource consumption may be possible; new initiatives promoting green economies emphasize the opportunities presented by a development path that does not require an increase in use of resources. But overconsumption in the countries in the northern hemisphere – above all as related to the areas of food, transport, and construction – make it difficult to achieve substantial progress.

Figure 2: Global material extraction in billion tons, 1900–2005



Source: UNEP (2011b, 11), after Krausmann et al. (2009)

Moreover, green economies and the related resource- and energy-efficient technologies increasingly rely on the utilization of rare, critical minerals due to their specific characteristics (Knoke and Binnewies 2011). Future sustainable technologies like electrical/electronic equipment and photovoltaic technologies (used for high-tech products to increase the quota of renewable energies in the energy sector) and battery technologies and catalysts (used in the transport sector for more sustainable transport modes) require specific materials (UNEP and UNU 2009; Angerer et al. 2009). Accordingly, extraction has risen sharply for certain minerals, with prices show an unprecedentedly high volatility, which is often perceived as an economic threat.

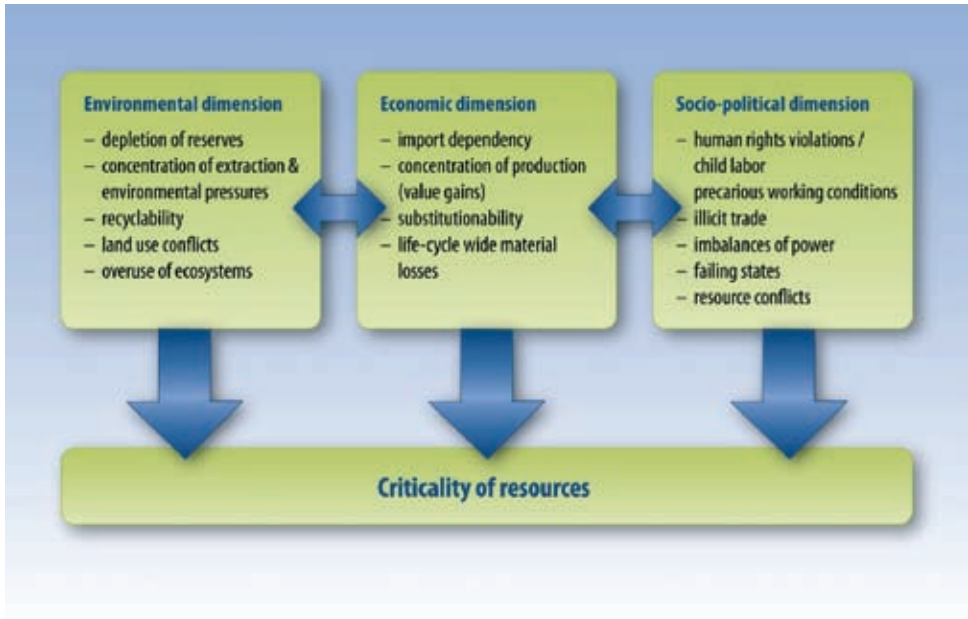
At the same time, the world food problem has not been solved, nor many interlinked problems concerning resources such as energy and water in connection with climate change. A number of advances were made in the past in developing an understanding of resource criticality (e.g., JRC 2011; Erdmann et al. 2011; EC and DG Enterprise 2010; Lutz 2010; MacLean et al. 2010). These efforts have not been adequately reflected on the environmental and socio-economic dimensions. And, despite imminent scarcity, the mineral phosphorus is rarely mentioned in studies concerning critical resources (vbw 2011). The dominant definition and political interpretation of the criticality of minerals³ as being mainly a supply risk (EC 2008; BMWi 2011) is far too narrow. It does not take into account the following: the risk of escalating prices for food and water as a result of overusing other resources, with severe impacts on the poor; risks of a “resource curse” as a consequence of corruption, poor governance, and traditional conflicts; newly emerging risks when green industry requires critical materials; resource-related conflicts; prevailing incentives for illicit trade; and remaining or new precarious working conditions. It has to be emphasized though that green technologies and a rising demand for natural resources may offer new opportunities for developing countries to catch up and compete in the world market, when accompanied and supported by appropriate national and international policy approaches (UN DESA 2011).

This paper will therefore bring out a “multidimensional criticality” based on three dimensions of sustainable development and, as such, comprise an environmental, economic, and socio-political dimension (see Figure 3). Environmental, economic, and social risks determine the degree of criticality of a metal or mineral. The understanding is that the use of critical minerals seems to be essential for sustainable development, but they risk causing serious threats to developing countries at the same time. Hence, many minerals can be considered critical regarding the criteria suggested by our paper (in particular for the poor). Going beyond critical minerals, our paper also stresses the need to manage all

3 The EU considers 14 raw mineral materials as critical: antimony, beryllium, cobalt, fluor-spar, gallium, germanium, graphite, indium, magnesium, niobium, PGMs (platinum group metals), rare earths, tantalum, and Tungsten – some of which are forecasted to triple in their demand by 2030. See also a new study by JRC (2011).

resources more sustainably and argues for a reduction in global demand from the industrialized countries.

Figure 3: Criticality of resources as a multidimensional concept



Source: Own compilation, inspired by PBL (2011)

Selected materials to illustrate the challenges ahead

In order to give illustrative insights and accentuate important aspects of the issue, the following materials have been selected from a list of potential critical minerals. Each material illustrates a specific main dimension of criticality but not all of them are going to be critical, in the sense of being currently scarce or facing a lack of supply in the near future.

- *Phosphorus* is an indispensable mineral for the agriculture sector and world food production.
- *Coltan/tantalum* is a so-called conflict mineral due to its illicit trade and the fueling of regional conflicts, especially in Africa.
- *Rare earth elements (REEs)* currently show a strong reliance on one exporting country.
- *Platinum group metals (PGMs)* (here platinum and palladium) are very difficult to substitute at present.
- *Copper* is a mass metal with great importance for green high-tech products but also indispensable for all energy infrastructures.

Differences between each of the materials and the related problems that reach into the supplier countries will become apparent. For all materials, the following interconnected dimensions are discussed:

1. The *environmental dimension* is briefly sketched out through reference to the (known) major impacts or environmental pressures, the specific recycling situation, and options for substitution.⁴ In this context, the relevance for green technologies and the associated estimated future demand will be referred to.
2. Within the *economic dimension*, critical minerals are characterized by the concentration of production in certain exporting countries, the import-dependency of certain importing countries, and other factors such as material leakages due to open loops globally. Due to complex structures and material flows within the supply chains, snapshots aim to show important aspects and actors for the particular material.
3. The *socio-political dimension* will be touched upon by exploring the human rights aspects and working conditions within the extraction countries, the imbalances within the relations between contracting countries, the regional conflicts, etc.

It is important to note that the scale of the industries connected with the minerals selected and the absolute and relative environmental impacts are dramatically different due to the differences in the quantities produced and the qualities of the materials.⁵ The differentiation has been made knowing that the three dimensions are interrelated and that the environmental and economic concerns have great impact on the human rights of the local people. The aim of this presentation, however, is to raise awareness about the complexity of the issue and – also by advancing to minerals – to provide background information that will contribute to the discussion of critical metals.

2.1 Phosphorus – necessary to feed the world

Phosphorus is a core component of conventional mineral fertilizers and thus essential for industrialized agriculture – a key sector for a socio-ecological transformation. As a plant nutrient, phosphorus is a non-renewable resource and sometimes described as the most critical tradable commodity (Wellmer and Becker-Platen 2008; Werland et al. 2010).

Environmental dimension: The environmental relevance of phosphorus is very high; phosphorus mining, processing, and marketing are very resource- (e.g., water, energy) and emission-intensive (Ekardt 2011). In addition, phosphorus frequently occurs in combination with heavy metals, which may contaminate

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- 4 Worth noting: The International Resource Panel (UNEP 2010) has started to look at the priority materials from an environmental point of view, but has not yet comprehensively addressed the materials considered in our paper.
 - 5 Notice by Luke Danielson, Jaako Kooroshy, and Imme Scholz.

soils and compromise the entire food chain. The excessive use of phosphate fertilizers reduces biodiversity and leads to soil acidification. Due to an extraordinary dissipative structure of application and through the wastewater, strong fertilizing also leads to excessive algae growth in lakes and seas worldwide (eutrophication), even to the emergence of “dead” zones in oceans (Wittmer et al. 2011).⁶

The material losses of the “mine to fork” global phosphorus path are extremely high: Only one-fifth of the mined mineral is finally consumed by humans (Schröder et al. 2010; see also Figure 4). Recycling is only in the experimental phase while historical traditions of recycling, namely the application of animal manure and human excreta to agricultural soils, are relegated to the background (Jaakkola et al. 2011). A lifecycle-wide resource-efficient management of phosphorus is indispensable for the future.

Economic dimension: The extraction and thus the environmental impacts through mining are concentrated mainly in China (37%), the United States (15%), and Morocco (15%), representing two-thirds of world production. The largest reserves are estimated to be in Morocco and Western Sahara (77%) while the EU relies exclusively on imports.

The special geological situation in North Africa is important. Huge phosphate deposits originate from a shallow sea at the turn from Cretaceous to Tertiary, which ranged from today’s Morocco to Egypt. Next to Morocco and the Western Sahara, Tunisia is also a remarkable phosphate producer. Both Morocco and Tunisia export phosphate mainly to India, but also to Pakistan, Brazil, and several other countries (Zepf 2009, 63f.)

About 90 percent of the global output of phosphorus is processed into fertilizer. In addition, and to a lesser extent, it is used for the production of detergents and cleaning agents, the production of cattle feed, and in various industrial areas (Cordell 2010). The worldwide consumption of phosphorus-containing fertilizers is estimated in the order of 45 million tons for 2015/2016 (IFA 2011; Werland et al. 2010) while the demand is predicted to increase 50 to 100 percent by 2050 (Jaakkola et al. 2011). Main importers will be South Asia, Latin America, and western Europe; the main contributors to an increase in world consumption will be the rapidly growing economies of South Asia, East Asia, and Latin America (FAO 2008). Since phosphorus is non-substitutable in food/biological production, one can certainly speak of a “technology lock in” in current industrial agriculture. Figure 4 shows a snapshot and indicates the difficulty in identifying the key players within the supply chain of phosphorus while stressing the high material losses.

6 Rockström et al. (2009) estimate the “quantity of phosphorus flowing into the oceans” at 8.5 to 9.5 million tons, while the proposed planet boundary is considered to be at 11 million tons.

Figure 4: Supply chain snapshot – phosphorus



Source: Own compilation

Socio-political dimension: The phosphorus peak is expected around 2035 and, although estimations vary enormously, a full depletion of the resource is expected in 80 to 120 years (Schröder et al. 2010; Scholz 2011; Jaakkola et al. 2011). Against this background, the authors emphasize that “(w)ith only a few countries controlling the world’s remaining high-quality reserves,” all importing countries are vulnerable to supply shortages and price volatility and other market forces. However, particularly affected by such shortages will be poor countries, where the feeding of the population is a problem and there are farmers who work with phosphorus-deficient soils – as is the case in much of sub-Saharan Africa (Schröder et al. 2010). It is a severe problem today that “many poor farmers do not have access to the phosphate fertilizer market (...), due to low purchasing power and access to credit, farmers in sub-Saharan Africa – where fertilizers are most needed – have to pay 2-6 times more than what European farmers [pay]” (World Resources Forum 2011a). A contributing problem is the global spread of diets containing increasingly more meat and dairy products, requiring even more phosphorus in the form of fertilizers for agriculture. Demand for non-food uses such as biofuels further increase global food problems (Schröder et al. 2010).

In the extracting countries, human aspects (e.g., Morocco) are touched whenever “the rights of workers to organize and to negotiate with employers are not respected in practice. Union representatives are harassed or dismissed as soon as they are elected. (...) The right to strike is constantly flouted“ (ITUC 2011). Morocco has an ongoing conflict with Western Sahara over phosphorus

reserves. The Human Development Index (HDI) rank of the country is 114 and the Failed State Index (FSI) has issued a warning.

2.2 Coltan/tantalum – a conflict mineral

The name coltan is derived from the old name of columbite (now niobite) and tantalum, and almost exclusively refers to the niobium-tantalum mixed ore found in the Congo. Tantalum is a rare transition metal also found in several other countries. Due to its temperature stability, corrosion- and acid resistance, and thermal and electric conductivity, coltan/tantalum is an important material for high-tech and green technologies.

Environmental dimension: Coltan/tantalum is found in riverbeds, sediments, and soft rocks, and the extraction does not require great technical effort. In Central Africa, widely artisanal and small-scale production has emerged, causing land erosion and water pollution. Due to illegal hunting of “bush meat” by miners, a serious threat is posed to the gorilla population in Central and West Africa. Coltan/tantalum is characterized by a strong dissipative and dispersed usage due to very small quantities used, which strongly limits its ability to be recycled. Australian tantalum is contaminated with uranium.

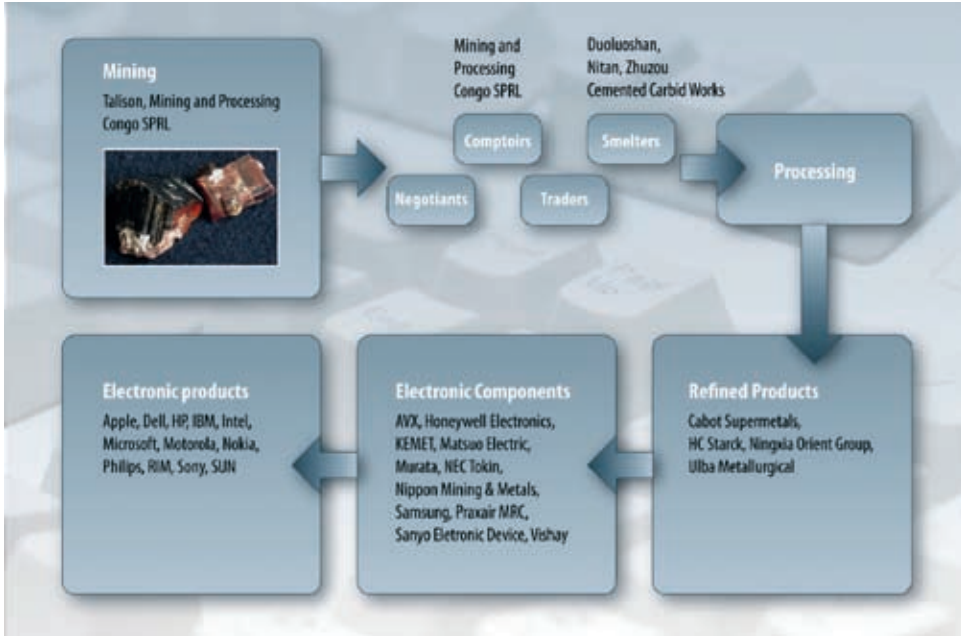
Economic dimension: Coltan/tantalum is needed for applications such as miniaturized ICT applications (computer, measuring and control electronics, communication technologies), for example tantalum micro capacitors (mobile phones, pager, laptops, navigation systems, consumer electronics), which comprise about 40 percent of current world production, and special steels resistant against extreme conditions that are used for turbines for power generation and aircraft construction (Figure 5).

Tantalum minerals are mined in Australia, Brazil, Canada, Democratic Republic of Congo, China, Ethiopia, and Mozambique and as a by-product of tin mining and smelting in Thailand and Malaysia. Coltan from Central Africa was only a minor source of tantalum until 2008, but figures vary largely. According to Huy et al. (2011) in 2008, around 1,400 tons of tantalum were mined; in 2009, between 800 and 900 tons were mined. There were 200 to 250 tons that came from the areas of the Great Lakes in East Africa. From 1995 to 2008 African countries provided 12 to 34 percent of the annual production of tantalum. After the withdrawal of Australian and Canadian producers in 2009, more than 50 percent of the tantalum supply came from Africa (Huy et al. 2011).⁷ There is a strong concentration of coltan/tantalum reserves in Brazil (ca. 68%) and Australia (ca. 30%); Central Africa is usually not included in the data. The metal shows no

7 The extent of illegal mining and illicit trade is not transparent but investigated by Bleischwitz et al. (2012). On December 14, 2010, the EITI Board designated The Democratic Republic of the Congo as an EITI candidate country that is “close to compliant.” The Democratic Republic of the Congo was granted six months (until June 12, 2011) to complete the remedial actions needed to achieve compliance. The Board retains the right to require a new validation if the remedial actions are not completed within the next six months.

acute shortages; despite low reserves, a long period of availability is foreseen. The material is partly substitutable, but this is difficult in the field of microelectronics due to the very low quantities applied.

Figure 5: Supply chain snapshot – tantalum/coltan



Source: Own compilation with data of Resolve (2010)

Socio-political dimension: Some recent studies estimate that one-fifth of the world market of coltan is illicitly traded (Bleischwitz et al. 2012), mostly to capacitor producers in China. Coltan is a so-called conflict mineral⁸ because it is, inter alia, being mined in the DRC, where the revenues are assumed to have been used in and for armed conflicts (Nest 2011). A definition of the term “conflict mineral” is provided in the U.S. Declaration of Conflict Minerals (the so-called Dodd Frank Act) and encompasses the materials tantalum and columbite-tantalite (coltan), tin/cassiterite, tungsten/wolframite, gold, and their derivatives. In addition, it specifically refers to materials “determined by the Secretary of State to be financing conflict in the Democratic Republic of the Congo or an adjoining country”⁹ and stipulates that products shall be DRC conflict-free. An alternative definition of a “conflict resource” is provided by Global Witness: “natural resources whose systematic exploitation and trade in a context of conflict contribute to, benefit from, or result in the commission of serious violations of human rights,

8 See for an overview of legislation: <http://www.ipc.org/ContentPage.aspx?pageid=Conflict-Minerals#legislation>

9 Section 1502 (the “Conflict Minerals Provision”) of the Dodd-Frank Wall Street Reform and Consumer Protection Act.

violations of international humanitarian law or violations amounting to crimes under international law” (Global Witness 2006).

In addition, the working conditions in the artisanal and small-scale mining operations in DRC are considered inhuman (ITUC 2011). In connection with the conflicts, the situation of women is supposed to be one of the worst in the world. The HDI ranks DRC at 168 (of 169). It is estimated that four to five million people have died as a direct or indirect result of the two wars in the Congo since 1998.¹⁰ The Second Congo War is sometimes called the “coltan war” because much of the conflict has focused on gaining control of the abundant natural resources of Congo. The FSI 2010 alerts that the situation is “critical” for DRC, and issues a warning for the neighboring country Rwanda, which is considered to be a preferred trade route.

2.3 Rare earth elements – a scabrous monopoly

Due to their use in the high-tech sector, particularly for environmental technologies, rare earth elements (REEs) are considered to be of great strategic importance.¹¹ Different than the name might suggest, not all of the 17 individual elements of the REE group are actually that rare. While lanthanum, cerium, and neodymium are the most abundant of the REEs, lutetium is the rarest, yet still more abundant than gold or platinum. However, the concentration of the elements in mineable minerals is usually very low, so that only a few deposits are worth mining. The term “rare” originates from the early discovery of the mineral when it was initially classified strange and rare.

Environmental dimension: Environmental impacts from mining, production, and use are non-transparent and partly controversial. During the extraction processes, chemicals are needed – these are generally hazardous, meaning that millions of tons of toxic substances are accumulated in the meantime. Another problem are specific emissions which are being released during the mining processes. Uranium and thorium sometimes occur in conjunction with neodymium; during further processing, not only toxic but also radioactive substances have to be handled. These may be released and get into the surrounding water and the air, which can create dangerous environments (Öko-Institut 2011; Murphy & Spitz Research 2011). The development of secondary raw material cycles, the recycling of REEs, is necessary but complicated because REEs are typically used in very small quantities in a variety of different applications (dispersed usage).

Economic dimension: REEs are especially needed for automotive catalysts or fluorescent lamps and they are increasingly important in high-strength permanent magnets, computer hard disk drives, hybrid cars, and wind turbines (here

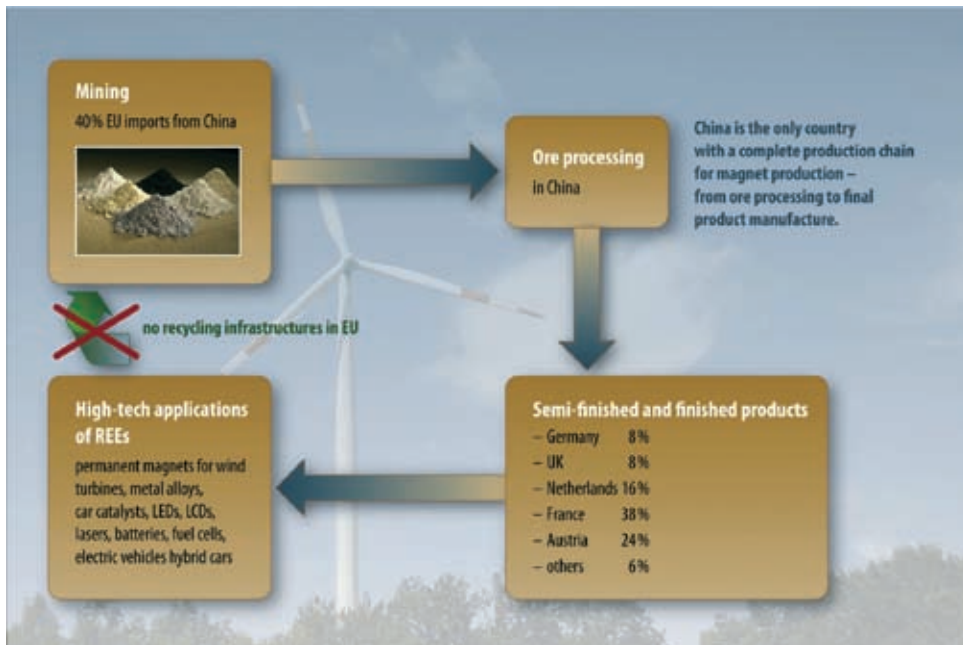
¹⁰ Information by Luke Danielson.

¹¹ Fifteen elements within the chemical group consist of lanthanides plus yttrium and scandium and are called rare earth elements.

particularly neodymium) (Du and Graedel 2011; see also Figure 6), flat screen and touch screen technologies, and partly strong concentrations in military technologies. The concentration of production is extremely high, but very large reserves over a very long range (more than 200 years) are estimated. China is by far the largest producer (97%) of REEs, despite deposits of only ca. 48 percent of the reserves (Öko-Institut 2011). Large deposits of REEs are assumed to exist in the Pacific seabed and in Greenland. There is no production in the EU, thus Europe is 100 percent reliant on imports. Twenty-five years ago, the United States was the largest producers of REEs – the Mountain Pass Mine (owned by Molycorp Inc.) was closed but it is expected to open again in 2012.

The global demand for REEs is projected to double in 2014 (JRC 2011). Although new mining sites and suppliers are expected to enter the market, demand may become critical in the short term (3-5 years). Due to their environmental impacts and the hazardous waste produced, new sites are often highly controversial, such as a planned REE refinery in Malaysia.¹²

Figure 6: Supply chain snapshot – rare earth elements



Source: Own compilation with data from Öko-Institut (2011)

Socio-political dimension: The current non-substitutability of some REEs and the monopoly position of China in extraction, and partly further processing, make

¹² See, for example, the Malaysians protest against rare earth refinery; <http://www.guardian.co.uk/world/2012/feb/26/malaysians-protest-rare-earth-refinery>; notice of Stacy VanDeveer.

the supply situation politically delicate on the international scale (Adelphi and Wuppertal Institute 2010). After China restricted its exports of certain materials (bauxite, zinc, coke, magnesium, and phosphorus), some countries successfully complained to the WTO (Mildner 2011a), which improves the chances of a successful lawsuit of the EU, the United States, and Japan against Chinese export restrictions of REEs. This, however, only reflects the political and economic interests of the importing countries and does not refer to social mining standards.

According to the International Trade Union Confederation (ITUC) World Survey 2011 “labor activists in China are regularly harassed and groups shut down“ (ITUC 2011), but it is not known whether these findings apply to the extraction of REEs. It seems beyond discussion though that the environmental standards for mining in China are comparably low and REEs have a tendency to be illicitly traded (Hurst 2010a). “What is ironic about the rare earth dilemma is that China needs to cut back its production and regain control of its industry so that it can figure out how to decrease the environmental damage caused by the industry. Meanwhile, the rest of the world needs these REEs to help clean up the environment through the innovative application of green technologies. (...) It appears impossible for the country to meet the global demand for REEs, while also meeting its own domestic environmental and safety needs” (Hurst 2010b). There is no transparency concerning financial transfers. China is not a member of the Extractive Industries Transparency Initiative.

2.4 Platinum group metals – no substitution for green-tech at present

Platinum group metals (PGMs)¹³ have important physical and chemical properties, such as a high corrosion-resistance and non-toxicity, and that is why they are increasingly applied in green and high-tech solutions in the transport and medical areas. Platinum metals are expensive and rare.

Environmental dimension: PGMs tend to occur together in the same mineral deposits. The mining and smelting of PGM ores is very resource-intensive. Large amounts of mining waste are accumulated; it consumes large quantities of energy and water, and carries extremely heavy “ecological rucksacks” (Saurat 2008, 2009). For the production of a single ounce of platinum, a volume of 7 to 12 tons of ore have to be processed (UNCTAD 2007).

The structures of the secondary loops within the processes are very different. The production of industry catalysts and glass operate in almost closed loops, and therefore rely mainly on secondary inputs, whereas electronics and car catalysts use mainly primary resources (Saurat 2008, 2009). For the global recycling of platinum metals, only catalysts of end-of-life vehicles are available as scrap; thus the recycling rate is low (Lucas and Wilts 2011; Angerer et al. 2009; see also Figure 7).

13 The platinum group metals (PGMs) refer to six metallic elements: ruthenium, rhodium, palladium, osmium, iridium, and platinum.

The projected future demand is estimated to increase up to a factor of 1.5 by 2030. Considerable impacts on palladium demand may arise due to the need for seawater hydrogenation technologies (Angerer et al. 2009). The largest share of the present demand for platinum is for jewelry, which is relevant for three reasons: First, jewelry is rarely discarded or recycled (Wilburn and Bleiwas 2004); second, a use-conflict could arise; and, third, the term “critical” must be used with caution, as long as large parts of the world supply are used for luxury goods.

Economic dimension: For green technologies, PGMs are applied in vehicle emission control devices and electronics as well as industrial catalysts such as hydrogenation, air cleaning, seawater desalination, etc. A critical need may arise for platinum with the widespread use of fuel cells for electric vehicles. The production by volumes is, compared to other materials, rather low and the range is considered to be very long (more than 200 years) (Wittmer et al. 2011). An acute shortage is no danger at present.

Figure 7: Supply chain snapshot – platinum¹⁴



Source: Own compilation, with data from UNCTAD (2007)

South Africa contributes 75 percent and Russia 13 percent of platinum production, while South Africa is estimated to deposit 95 percent of the reserves. There are not more than 10 significant platinum mining companies in the world – large

14 Main operators in the mining sector in South Africa are Anglo American plc, Aquarium platinum plc, Arcelor Mittal, Areva, Barrick Gold, BHP Billiton, CAMEC, Codelco, Debeers, Holcim, Imerys, Incitec pivot limited, JNMC, Lafarge, Ionmin, Mineral Commodities Ltd, Rio Tinto, Trivalence Mining Corp, Vale, and Xstrata.

corporations with a high degree of vertical concentration. As it is a precious metal as well as an industrial metal, the enterprises often have different divisions dealing with the refining, processing, and trading as well as research divisions for new applications and investment activities (e.g., Umicore) (UNCTAD 2007). Substituting PGMs is currently very difficult as the resulting products usually do not show the expected properties.

Socio-political dimension: Europe relies 100 percent on imports; the supply chain is characterized by high material losses, in particular in its use for cars that are not recycled within Europe but exported to other territories without recycling structures. The transparency of financial flows is difficult to monitor due to material leakages and unreliable players (Hagelüken 2011). According to the ITUC World Survey 2011, human aspects come into play in South Africa when workers' rights are neglected and difficult to implement (ITUC 2011). As regards the HDI, South Africa ranks 110. The FSI issues a warning for the country in 2010 as well as for Russia. Neither country is an EITI member, so the financial transfers related to PGMs are not fully transparent. Another important producer is Zimbabwe, where platinum is one of the most important export products. As the mines are isolated, there is no information about the situations at the mining sites.

2.5 Copper – indispensable for infrastructure worldwide

Copper has been used by human beings for more than 10,000 years and it is one of the key metals of industrialization. Due to its excellent thermal and electricity conductivity, its corrosion-resistance, and flexibility, it has many end-uses (Ayres et al. 2002).

Environmental dimension: Copper is considered to be among the top 10 environmentally-intensive materials (Voet et al. 2005). The average ore grades have been declining in recent years to less than 1 percent, partly due to exhausting copper deposits, but also due to the introduction of new technologies allowing for economical extraction of copper with significantly lower grades.¹⁵ As a result, the associated volumes and the environmentally problematic issue of disposal are increasing significantly (Erdmann et al. 2004). The largest producer, Chile, uses groundwater for extraction and is increasingly faced with water stress.

Apart from copper-based paints and its use for algaecides for swimming pools, copper is predominantly not used in a dissipative manner and is therefore almost fully recyclable. That is why one does not speak of consumption – as in the case of fossil energy resources – but of use. The recycling rate, for example, is 55 percent in Germany and 13 percent worldwide (RWI et al. 2006). Although there is no geological shortage of copper, recycling of copper has always been

¹⁵ Declining ore grades are no issue for smelters though. On the contrary, the commodities markets may appreciate prices at a steadily high level (Hotter 2011).

done for economic reasons. It is estimated that 90 percent of human-produced copper is still in use today.

Economic dimension: Refined copper and copper products are used in many applications, mainly for electrical cables (48%), electrical equipment (8%), construction and buildings (27%), engineering (12%), transport (3%), and other industrial applications (2%) (ECI 2011). Copper is the most important material for the conduction of electricity due to rarer and more expensive alternatives such as gold, silver, and aluminum. It is therefore very important for all electric and electronic future technologies such as wind energy plants, geothermal energy, and fuel cells, and it is an essential component of solar thermal systems made of copper. It is also directly linked to a better life for the world's poor, as electrification is critical, for example, for the rural (and urban) poor of Africa, Asia, and Latin America.

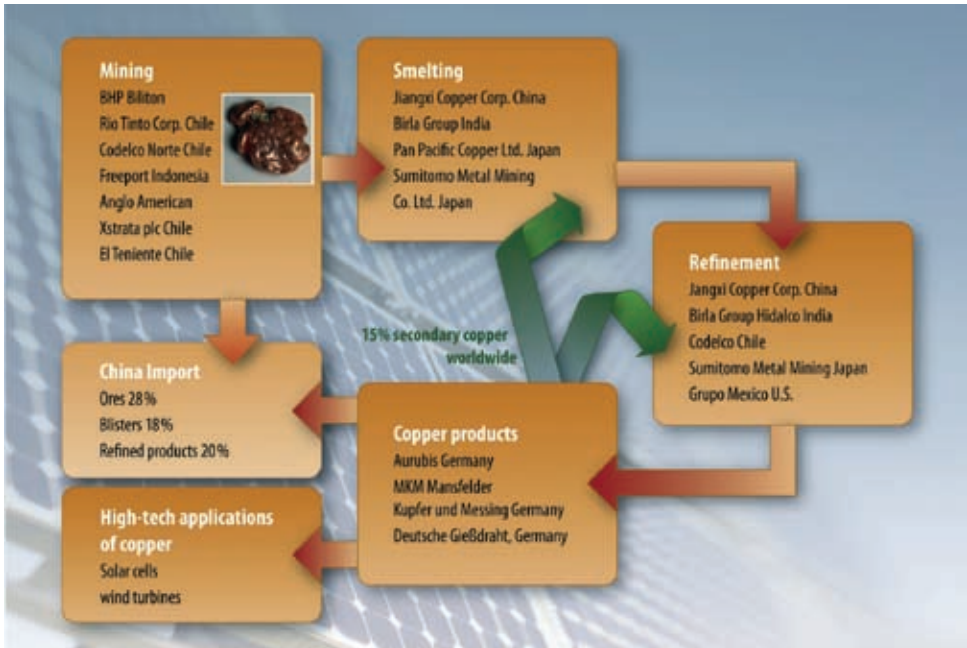
Due to the growth in China and other emerging countries, demand for copper has increased dramatically, from 13.6 million to 16.1 million tons, or by 18 percent worldwide between 2001 and 2010 (ICSG 2011), with the main drivers being infrastructure development and electrification. The main copper-importing countries and regions are the EU27, China, the United States, Japan, and South Korea, which partly re-export it as refined or semi-finished products (ECI 2011; see also Figure 8). The projected demand for 2030 created by new green technologies and the growing need for infrastructure development in emerging countries is expected to grow by a factor of 2.6 (Angerer et al. 2009). Copper shows huge production quantities that are mainly concentrated in Chile (ca. 34% of world production), Peru (ca. 8%), and the United States (ca. 7%).

Copper scrap is traded on international markets (Lucas and Bleischwitz 2008). Due to the price volatility of copper, aluminum has gained interest as an electrical conductor in electrical systems. In addition, aluminum offers a high potential to reduce weight, but it shows generally poorer mechanical properties and requires new connection technologies and connector concepts (Lucas and Bleischwitz 2008). In ICT-related technologies, copper may also be substituted by glass fiber.

Socio-political dimension: The supply vulnerability of copper is low for industrialized countries due to very large reserves, which are also estimated to be mainly concentrated in Chile (24% in 2010), where, however, working conditions and contracts remain precarious in some copper mines (ITUC 2011). The growing copper industry in Zambia has led to increasing migration to the cities and the development of shanty towns (World Resources Forum 2011b).

Copper projects strongly influence the surrounding communities, due to conflicts over water and land use (Bebbington 2007; Scurrah 2008; Danielson et al. 2010). In particular, (ground)water and energy use for mining processes cause shortages for the communities, for example in Chile and Peru (Chile Sustainable 2010; SDSG 2010). The mining of copper provides a typical example of how local communities suffer from environmental and social costs resulting from resource exploitation (e.g., Grasberg in West Papua or the mining and refining site at Oroya

Figure 8: Supply chain snapshot – copper



Source: Own compilation with data from Five Winds International and ICMM (2010)

in Peru) (Scurrah 2008). Auty (2006) emphasizes that mine construction creates a large and relatively well-paid workforce that generates transient local business opportunities; but this workforce bids up the price of local labor, housing, and food. In the Peruvian Andes, for instance, mining creates islands of welfare among poor indigenous communities.

There is an imperative for more long-term analyses of the risks of new copper projects with regard to social and environmental conflicts with local communities and the serious impacts on the social situations of the communities around the mining sites (e.g., Pebble Mine, Alaska, Tampakan Project, Philippines, Minera Panama, Panama, Oyu Tolgoi, Mongolia).

2.6 Assessment of factors within the multicriticality concept

In order to summarize the facts provided above, the following table assesses the critical factors within the environmental, economic, and socio-political dimensions through the categories of very critical (red), alert (yellow), and currently non-critical (green). It has become obvious that industries in these markets often are shrouded in secrecy, and transparency is very low. Accordingly, losses and material leakages are high. The global equity dimension becomes most apparent with the use of phosphorus, which is indispensable for feeding the world. It is treated in a very inefficient manner and without any prioritization toward basic preconditions of freedom and development.

Table 1: Assessment of critical factors within the multi-criticality concept

Resources		Phosphorus	Coltan	REE	PGM	Copper
Environmental dimension	Depletion of reserves				large demand for jewelry	
	Concentration of extraction and environmental pressures					
	Recyclability					
	Use-conflicts				often by-product	Water
	Overuse of ecosystems					
Economic dimension	Import-dependency					
	Lifecycle wide material losses					
	Concentration of end-use production (value gains)					
	Substitutability					
	Weak institutional setting in export country / Resource curse threat		(Africa)			
Socio-political dimension	Human rights violations / Child labor					
	Precarious and dangerous working conditions					
	Illicit trade		primary materials		secondary materials	secondary materials
	Imbalances of power					
	Failing states involved in supply chain					
	(Potential) resource conflicts					

Note: Red: critical; yellow: should be observed; green: not critical. It has to be noted that the classification is based on experts' estimates. A similar coloring based on weightings can be found in vbw (2011).
 Source: Own compilation

Despite a lack of transparency, the snapshots of the supply chains and the assessment of the five materials regarding their criticality give first hints of the relevant actors needed for further action. Green high-tech products are usually not differentiated according to whether the required materials are “green”, in the way that the specific environmental and social conditions and impacts in the extracting and processing countries are respected and considered. The following chapter will focus on the different interests and intervention levels.

Key message: Criticality is a multidimensional concept that should also include the environmental dimension as well as human rights. Critical minerals are increasingly relevant for green technologies; phosphorus is essential for food supply. However, risks and threats of the extraction of those resources are to be derived from a holistic concept that takes into account geopolitics, the governance of using this material, as well as climate change and other challenges.

Open issues and diverging views: Critical minerals are usually used in relatively small units, while – ostensibly inconsistent – the global demand for all natural resources requires comprehensive approaches. While it is clear that fossil fuels, base metals, and agricultural goods are relevant, it is less clear to what extent construction minerals and individual resources should be targeted. Methodologies such as Material Flow Analysis and Life Cycle Analysis have different strengths and weaknesses; the governance dimension is an emerging key topic.

3 A landscape of actors and interests for critical resources

There has been a change in the market for resources in the last 20 years. The major mining companies consolidated and broadened their influence, while at the same time the mining industry came under more public scrutiny, with local communities and NGOs challenging current extraction patterns. Countries like China, India, and Brazil, with their often state-owned enterprises, became major players, both as supplying and importing countries. The conditions under which the minerals are produced, however, are virtually the same as before. Until now, there has been no socio-ecological transformation as far as mining conditions are concerned. And it would be difficult to single out a specific part of the resource economy as being green. Enterprises in the green economy depend on the same structures within the minerals sector as the conventional economy. The examples presented in the previous chapter demonstrate that enterprises providing green technologies need the same mainstream minerals (like copper) and that they are integrated in the same trade structures. They are confronted with the monopolies created by countries or companies producing minerals and also have to deal with artisanal mining and the associated trade structures, which are difficult to control. The upswing for eco-industries in the North may have a dark side for the South, namely the resource-rich countries being moved onto paths of rapid extraction that exceed the limits of the ecosystems and socio-economic institutions of those regions and fuel civil wars with resource rents (Bringezu and Bleischwitz 2011).

3.1 Brief stakeholder analysis and action levels

The actors respond to different interests and their relationship amongst each other is characterized by an imbalance of power. Some of the underlying problems result from the existing goal conflicts and competing interests of key actors. Only by understanding them will we be able to identify the most promising approaches to address the problems in the resource supply chain. This chapter is not meant to give an exhaustive analysis of the actors, but rather to spotlight the key actors and main interests.

3.1.1 National level

High-tech and green-tech producing countries: Their interests can be assumed to lie in stable resource supply, good prices, and free access to resources (EC 2008; BMWi 2010). Countries like those in the EU – including Germany – the United States, and Japan, as well as the emerging economies are looking mainly for national solutions that promote transparency in addition to looking for bilateral agreements with resource-rich countries (Knoke and Binnewies 2011); the EU and Japan are developing strategies to promote resource efficiency. Internationally, they are trying to secure access by removing trade barriers, while emerging economies like China are trying to protect their vulnerable industrial processes through state intervention and trade barriers. At the same time, some governments, as with the German government, are refusing to become directly involved in the resource supply by building national stockpiles of strategic or other minerals and metals. But they are encouraging their industries to “vertically reintegrate,” or to invest directly into extraction projects.

In the past, German industry seemed to perceive limited accessibility to resources as a greater threat than price instability, and enterprises were quite cautious to invest directly into extraction. Recently, new raw material alliances that the Federation of German Industry established with 12 major German enterprises aim to improve and consolidate the supply through direct investments in resource projects. They lobbied for years (e.g., the German industry association Bundesverband der Deutschen Industrie) to get more direct support from the governments for securing their resource supply (Bäuerle et al. 2011). There are companies that have started looking into recycling as a means of securing their supply, but that has not become a major trend yet.

Resource-rich developing countries: The economy of many resource-rich countries is dependent on resource extraction and export. This makes these economies vulnerable to price volatility and to shifting demands in high-tech and green-tech producing countries (the substitution of minerals or development of new technologies, e.g. lithium). These countries can be assumed to be trying to profit from the recent high prices by bringing their deposits into production (e.g., Peru). In most cases in Africa or Central Asia, the countries themselves do not control their mineral production. In Ghana, Mali, Zambia, and Mongolia, the mining sector is 100 percent under the control of foreign companies (Bäuerle et al. 2011). Former national state-owned mining companies (as in Zambia) have been dismantled, national private companies have not been established, and foreign investors have entered the national market. In other resource-rich countries such as Indonesia, Kazakhstan, South Africa, or Mexico, national private and public companies account for 20 to 80 percent of mineral production. Although in theory countries without any national companies or investments in the mineral industry could safeguard their interests via good long-term contracts

with the extractive industry, in practice this is seldom the case.¹⁶ While African countries are trying to attract foreign investment, some Latin countries like Bolivia and Ecuador are attempting to rebuild their national mining industries. They are interested as well in establishing their own processing and manufacturing industries, bringing into question the traditional international division of labor. New mining countries are often interested in rapid and high payments in order to invest in infrastructure and social systems.

3.1.2 Sectoral level

Mining Industry: The mining industry is dominated by 150 enterprises worldwide that control about 80 percent of worldwide mineral production (Ericsson 2009). Vertically integrated transnational mining companies like BHP Billiton, Anglo American, Vale, Rio Tinto, and Freeport McMoRan dominate the sector. During the last 10 years, the mining industry witnessed a period of major mergers in the sector, consolidating the hegemony of those companies. But Vale, Rio Tinto, and BHP Billiton not only control a high share of iron production but almost 70 percent of the maritime trade, which enables them to increase the iron price as well as to alter the contracts (e.g., reduce the contract terms to only three months). Mining companies of emerging economies are on the rise.

Other important developments are:

- Former trading companies like Glencore and Xstrata, which merged this year, are rapidly increasing their share of worldwide mining production;
- Chinese mining companies are trying to invest directly into production sites worldwide or to increase their share in existing companies (e.g., when BHP announced its intent of the takeover of Rio Tinto, Chinalco increased its share in Rio Tinto by 12%);
- Some of the critical minerals (e.g., coltan) are mined by artisanal mining, giving more economic and social importance to that sector (Hruschka and Echavarria 2011).

Manufacturing industry: The manufacturing has traditionally focused on securing supply – most managers have a deep-rooted belief in declining resource prices. The previous years have begun to erode such a paradigm, with more emphasis being put on resource productivity and savings in material costs. This indeed has put more of a focus on mass materials, energy, and water, and less of one on critical materials. The overall trend is not yet certain and can be assumed to be dependent on many other trends and policies. With mixed information on new discoveries such as shale gas as well as on business opportunities for resource efficiency, it is very hard to predict in what direction industry will move. The

¹⁶ That might be illustrated by the anecdote Peter Eigen, the former chairman of EITI, gave: When Mozambique negotiated several mining concessions, the state secretary of that country was confronted with 20 international jurists on the payroll of the mining company. This gives insight into the imbalance of power in those kind of negotiations.

emergence of some three billion middle-class consumers in the years to come will lead to increased manufacturing and the subsequent demand for resources (McKinsey 2011). As for today, major investments in radically new systems using eco-innovation on an international scale can hardly be expected.

Green high-tech industry and suppliers: Green-tech manufacturing industries have an interest in the smooth supply of the materials they need at reasonable prices. As a business field, green technologies have not yet taken over responsibilities for upstream mining or production methods. As long as material certifications and material responsibility are not standard requirements for green products/technologies, complex value chains and international trade relations will continue to pose barriers to transparency with regard to the origins of specific minerals and the backgrounds of their extraction for end-consumers. Yet, these industries can be assumed to be in favor of better governance, be it for reasons of reputation or stable supply or simply because it belongs to their corporate principles.

Recycling industry: The recycling industry seems to be technologically capable of recycling critical materials to a high quality and recovering phosphorus from wastewater streams (Buchert et al. 2012). Yet, their market development is uncertain, given the high amount of material leakages and international distortions (Hagelüken and Meskers 2010). Potentially, they might integrate horizontally with refineries and capacitor producers that contain huge technological capacities for the production of essential material inputs and could be seen as major customers for secondary materials (UNEP 2011c).

Non-governmental organizations and civil society: Civil society and the NGOs have an essential and indispensable role to play for citizens/consumers, states, markets, and policy for awareness-raising and ethical reflections of macro-economic decisions and processes.¹⁷

Consumers: The emergence of three billion middle class consumers worldwide will put increased pressure on the resource base. Yet it is unclear whether they all will emulate Western lifestyles. The enormous levels of environmental pollution in emerging economies may lead to increased awareness for the material intensity and carbon footprints of goods and services, and information is key to putting pressure on companies and governments.

3.1.3 Local and regional levels

Artisanal and small-scale mining: There is a big difference between industrial and artisanal mining. Not only do they have conflicting interests concerning the access to deposits (for example, in Peru or Venezuela), but artisanal mining also comprises a completely different structure. Artisanal mining provides employment for about 25 million people worldwide – mainly to those who do not have any other alternatives – and feeds at least 150 to 170 million people (Hruschka

¹⁷ See, for example, the British campaign: <http://www.ethicalconsumer.org>.

and Echavarria 2011). The work is highly precarious and carries high environmental and health risks.

Local communities and indigenous people in resource-exporting countries: This points to a very complex issue because the communities living on the land used for mineral extraction do not need the resources for their livelihoods. The interest in extracting the minerals is fueled by those who need technologies for a structural economic change in other countries. Resource-use conflicts arise because land, soil, forests, and water are essential resources for survival (Neumann and Schöppner 2011; Feldt and Ströbele-Gregor 2011); the export-driven extraction model and internationally operating mining companies often make self-determined management impossible.¹⁸

Current resource extraction models make it impossible for communities to manage their resources on a sustainable basis. Private as well as state-owned enterprises have proven incapable of managing the extraction activities in a way that improves living conditions for the majority of the local people (there are many examples from Peru, Ecuador, Colombia, Guatemala, Philippines, Indonesia, Zambia, etc.). First signs of a vague trend from coercion toward consent can be noticed, since brutal human rights abuses can be made public much faster using the Internet (Danielson 2011). Nevertheless, there seems to be a need for new management models that enable local people to participate in decision-making and be able to develop their own resource strategies, such as Community Development Agreements (Padilla et al. 2008) or Impact Benefit Agreements.

3.2 Competing interests

Mapping potential conflicts and drawing potential scenarios for international relations is a huge task with enormous uncertainties; the European Commission's Joint Research Center (JRC) recently published an online tool¹⁹ that will help to conduct such an analysis. All such scenarios should also keep in mind that cooperation will also be an option (Mildner 2011a). The following section thus seeks to help provide a better understanding of the main lines of potential conflicts rather than drawing conclusions about main trends.

3.2.1 Access to resources for strong states vs. loss of sovereignty in weak states

There is a clash of interests between industrialized and emerging economies over access to resources, which is aggravated by impacts on weak developing countries. This competition might shift power relations, worsen the relations between resource-poor states, and spill over into other countries, as the Stock-

¹⁸ Notice of Luke Danielson and Imme Scholz.

¹⁹ Global Atlas & Information Centre for Conflicts and Natural Resources: <http://nareco.jrc.ec.europa.eu/>

holm International Peace Research Institute fears: “The interstate tensions explored in the resource geopolitics literature have not, at least to date, involved armed conflict. Instead, political and commercial disputes are seen as worsening relations between states, with potential security ramifications. However, competition between powerful geopolitical actors around resource issues can spill over into third countries, thereby contributing to instability and the emergence of weak states, making them more vulnerable to the rise of armed groups” (SIPRI 2011: 42). Almost unnoticed, the security of resource supply became part of the military strategy of the North Atlantic Treaty Organization (NATO) and their members. “Key environmental and resource constraints, including health risks, climate change, water scarcity and increasing energy needs will further shape the future security environment in areas of concern to NATO and have the potential to significantly affect NATO planning and operations.”²⁰ This is mirrored by similar statements in Russia, China, India, and others.

3.2.2 Reducing commodity imports vs. export-financed development

Some industrialized countries are beginning to strive to reduce their resource use while resource-dependent countries want to sell their minerals at the best price possible. However, many developing countries have not profited from exporting resources in recent decades (Collier and Venables 2011). Demands for compensation where a resource is being substituted or displaced have been put forward by resource-dependent countries. There is no international mechanism beyond the markets that could balance the different interests (Barma et al. 2012). The International Resource Panel could provide knowledge but has no political mandate and is by and large too weak. It can also be argued that most extractive companies have failed to extend their scope toward a broader resource management, including recycling, etc.

3.2.3 Recovery of material losses vs. international open systems with low environmental standards

The EU – including Germany – the United States, Japan, and others in the last decades have not put enough emphasis and research/resources into recycling, efficiency, and substitution to reduce primary input-dependency. They have failed to implement sustainable production and consumption patterns. Instead, electronic goods that quickly become waste (incl. hazardous and industrial waste) are exported to countries where there are no recycling infrastructures or capacities to tackle the problem sufficiently. About 70 percent of all discarded computers, mobile phones, and other electronic equipment are ultimately

20 NATO, “Active Engagement, Modern Defence: Strategic Concept for the Defence and Security of the Members of the North Atlantic Treaty Organisation,” Lisbon, Nov. 19, 2010, available at: <http://www.nato.int/lisbon2010/strategic-concept-2010-eng.pdf>.

recycled in China (Greenpeace 2009). The situation is quite similar as regards end-of-life vehicles, whereby many countries have an interest in the re-use and exploitation of old cars (Wilts et al. 2011).

It should be noted that the lines of conflict can be found between and within individual countries and between and within stakeholder groups for one reason or another. As expressed above, not all conflict lines must result in genuine conflicts; they may raise opportunities for common action or cooperation and should be considered as risks or potentials.

3.2.4 Responsible actors

The recent debate on mechanisms and solutions to the governance problems in the resource sector globally has focused almost entirely on voluntary and multistakeholder initiatives, including due diligence and certification. The most prominent one, the Extractive Industries Transparency Initiative, which is mainly attempting to improve information transparency, is far from being able to solve the problem of corruption and bribery in the extractive sector (Feldt and Müller 2011). Activities of intergovernmental organizations, such as specialized United Nations agencies, have attempted to provide a level playing field for poorer countries, for example through commodity agreements, which basically have failed. The only commodity agreement on metals ever negotiated was on tin, but it never became relevant because – among other things – it lacked the support of important producers like Brazil and China. After some major developments in the follow-up to the Johannesburg Conference in 2002, such as the founding of the International Council on Mining and Metals, the publication of the Mining Minerals and Sustainable Development Report (IIED 2002a, b, c) and the introduction of the World Bank Extractive Industries reviews (see, e.g., World Bank Group 2011), the importance of mining-related topics has declined again. Mining is not part of the Rio+20 agenda for 2012.

It is therefore all the more important to focus attention on the different clusters of actors and their specific constellation of interests (IIED 2002a).

- *Mining companies* – often operating on an international scale and are not resident in the country where they conduct mining business (multinationals, partly including smelting and refining); coltan is mainly extracted through small-scale and artisanal mining .
- *Smelters and refiners* – are often small-scale or small and medium-sized enterprises, Sometimes on site or in the mining country (e.g., PGM, REE, phosphorus from the United States, coltan) or the refining processes take place in another country (e.g., phosphate rock from Morocco, fertilizer production worldwide); however, copper mining companies are vertically integrated with their own smelters (e.g., CODELCO, Rio Tinto, BHP, Freeport, etc.)
- *Industrial suppliers of key components* and processes to green-tech industry: for example, capacitor industries, manufacturing of magnets, manufacturing

of catalysts, computer components, etc. They are also indispensable for a material flow management because they are active in the input, byproduct, and recycling areas.

- *Material-intensive, large enterprises* using critical resources that are sensitive to customer and consumer behavior: electronic goods, automobile, agriculture, etc.
- *Suppliers of green technologies* that should be sensitive to consumer awareness, for example wind energy; alternative agricultural methods; photovoltaic, fuel cell, and battery technologies, etc.
- *Suppliers of recycling and waste management technologies*, for example mono-incineration plants for phosphorus recovery, waste separation technologies, etc.
- *Final consumers* are in charge of their purchase decisions and their consumption patterns when using products containing mineral commodities.
- *Developing-country governments*, including good and bad practice examples in the way resource rents are distributed for development; countries are becoming more sophisticated in advocating their interests.
- *Communities and indigenous people affected* by environmental impacts and resettlement through mining and processing; this group of actors can be found in all countries involved in the supply chain and at all production stages.

Since those actors sketched above have different time horizons and interests concerning the issue, it is most important to give priority to awareness-raising in supply chain issues. Given that, for example, key actors such as smelters and refineries often have a very high material-flow competence, but little influence on the demand and downstream use, the end-product industry and the consumers in Europe must not be forgotten within an international resource approach.

Responsibility thus should entail the whole lifecycle of materials, including the end-of-life stage of products, infrastructure planning, and land use management. In that regard, pioneering activities from suppliers of green technologies could create a momentum with recyclers, smelters, and refiners and other key suppliers, actively promoted by groups of consumers who compel larger parts of the manufacturing industry to innovate.

The following additional actors have to be taken into account for regulatory instruments, policies, and alliances (see Table 5 in the annex for an overview):

- NGOs/civil society in the field of mining, recycling, material-flow management
- Leadership of communities affected by development in minerals industry
- Indigenous peoples in the field of mining
- NGOs/civil society in the area of transparency and good governance
- Governments of resource-dependent industrialized countries (Germany, Japan, European member states, and also emerging markets like India and China)

- Governments of resource-rich countries that would benefit from cooperation. This is currently weak due to countries like China that offer attractive investment policies; that is, the strengthening of democracy in those countries is also a prerequisite for cooperation with the EU.
- International institutions and organizations, such as ILO, UNEP, UNDP, FAO, World Bank, etc.
- Further stakeholders such as associations of industries, multistakeholder initiatives, global networks, etc.

Key message: The diversity and number of actors involved in the critical-resource supply chains are enormous and, by nature, interests diverge. Global shifts from the OECD countries to new actors in the rest of the world can be observed. The complexity of global supply chains hinders transparency: While main responsibilities are upstream in the mining sector, where profits and innovations are often low, the main credibility is associated with industries downstream in the technology sector, where innovation is high and growth is created.

Open issues and diverging views: The heterogeneity of actors, combined with a lack of information and uncertainty about future trends, may counterbalance rational interests in favor of resource savings. Views about industries' strategic interests differ: while some argue in favor of a "resource revolution" (McKinsey), others point at examples of ongoing irresponsible behavior, such as mining in sensitive ecosystems and questionable new technologies.

4 Normative principles for fair and sustainable international resource politics

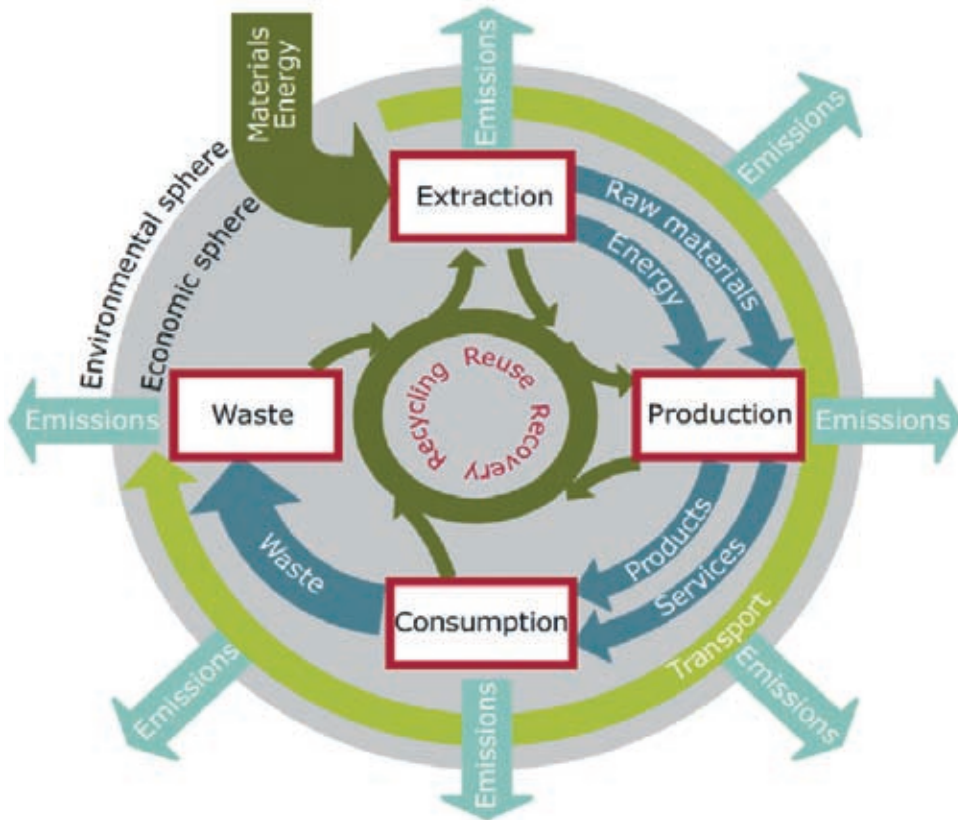
While international relations hardly appear to favor enhanced cooperation and multilateralism lately, many governments are preparing for harsher times of increasing resource-related conflicts in the years ahead: The discovery of minerals in Afghanistan worth \$1 trillion creates a race of interested firms and supporting governments to get permissions, with likely repercussions in Afghanistan itself and with neighbors such as Pakistan. The Indo-Pacific region witnesses a naval arms race to enforce access to offshore fishing and resources. Norway and other Arctic powers invest in coast guards and air systems just in case the race for Arctic minerals gets serious. Huge dam projects under way in China, Ethiopia, and Sudan ring alarm bells in downstream river countries. These are but a few headlines that indicate a possible future world where the law of the jungle and a “live and let die” mentality prevail.

It is high time to take action. Along with it, developing visions, principles, and scenarios toward new models of prosperity should be on the agenda. They should be characterized by a reduction in resource demand, social innovations in resource-use patterns, a greater decision-making role of affected local communities, and a culture of responsibility and cooperation. An international resource politics needs visions and new principles. Given our proposals on the multicriticality of resources and given the heterogeneity of actors and their interests, such visions and new principles shall provide orientation, help to guide decision-making under uncertainty, and line up normative requirements such as human development and sustainability. Today, the behavioral and institutional mindsets are often biased toward issues such as providing access to “our” resources and providing cheap resources as a fuel for economic growth, etc. To enable behavioral change and fresh institutional mindsets, new normative orientations are necessary to develop politics that lead to goals and instruments as well as to evaluate the effectiveness of those orientations. It is also relevant for hybrid governance processes that deal with conflicting interests because claims of acting in favor of common interests are in need of such normative criteria.

Developing such visions and new principles certainly will require a participatory process that utilizes stakeholder consultations and new means of communication such as using mobile apps (see Anna Hazare’s Anti-Corruption Movement in India), human microphones (such as the ones used in the Occupy Wall Street

movement), living laboratories, etc. However, there should be a departure from the prevailing narrow focus on access and supply. What is needed is the insight to work on a comprehensive, lifecycle view of resources and their use in societies today as well as for future generations.²¹ Figure 9 illustrates today's use of resources with environmental impacts across the lifecycle.

Figure 9: Resources and the environment



Source: EEA (2011)

Especially the metals considered in our analysis are usually demanded because of their characteristics and their ability to deliver certain qualities; these aspects can be maintained, or even improved, during their lifecycles. Usually, citizens expect certain services and not the resource per se. Moreover, a comprehensive view will also challenge the paradigm of resources being perceived as private commodities isolated from their environments, and stress the collective-goods dimension of resources *and* the environment.

²¹ On the following legal and ethical dimensions, see in detail Ekardt (2011: para. 4, 5).

Box 1 maps what can be seen as the dawn of a coming age of responsible sustainable resource management with the resulting political initiatives.

Box 1: Principles and visions of sustainable resource management

1. Secure, adequate supply and efficient use of materials, energy, and land resources as a reliable biophysical basis for creation of wealth and well-being in societies and for future generations.	Resource-efficient and recycling-based industry
2. Maintain life-supporting functions and services of ecosystems.	
3. Provide for the basic institutions of societies and their co-existence with nature while maintaining the resilience of local communities and economic sustainability of resource extraction in producer countries.	Steady-stocks society
4. Minimize risks for security and economic turmoil due to dependence on resources. Respect for Human Rights of peoples living in mining areas. Benefits from extraction should accrue fairly to both current and future generations.	
5. Contribute to a globally fair distribution of resource use and adequate burden-sharing at the international, national, and local levels.	Solarized Technosphere Balanced bio-economy and beyond
6. Minimize problem-shifting between environmental media, types of resources, economic sectors, regions and generations.	
7. Radical scaling-up of resource productivity (total material productivity), at least at a rate higher than GDP growth, and go beyond GDP.	

Source: Adapted from Bringezu and Bleischwitz (2009, 155ff)

For the perspective of our paper – a perspective that addresses both ethics and constitutions (in international, European, and national law matters) – the resource topic *offers quite different perceptions on human rights*: On the one hand, the well-protected *freedom rights of consumers and companies*; on the other hand, proclaimed rights to the *elementary preconditions of freedom* such as food, water, climate stability, security, energy access, a *basic supply of essential resources*, an absence of wars and civil wars, etc. To understand these conflicting perceptions in more detail, it is necessary to give a (both ethical and legal) reinterpretation of the basic term “human rights,” which is freedom. As with any (re-)interpretation, it is not just a vision, but something normatively binding. The starting point is the idea of liberties, as in classical-liberal guarantees of self-development. But one should also consider some extensions that are highly relevant for international resource politics:

■ Freedom also has an *intergenerational and global dimension*, since at their point in life, the young and future generations of people are, of course, human beings and are therefore protected by human rights – today this applies to people in other countries. And the right to equal freedom must be directed precisely in that direction where it is threatened – in a technological,

globalized world, freedom is increasingly being challenged across generations and across national borders. Local decisions can have far-reaching impacts on distant persons. Purchasing a mobile phone, for instance, may have impacts on local miners in Central Africa. Therefore, it should become clear that fundamental rights also apply intergenerationally and globally, that is, in favor of the likely victims of the current handling and overuse of resources such as critical minerals, food, water, etc.

■ The classical-liberal understanding of freedom, which mainly focuses on the economic freedom of those alive now, leads to short-sighted time horizons for decision-making. It is important to interpret freedom rights unambiguously in such a way as to include the abovementioned elementary *preconditions of freedom* – the provision and maintenance of an adequate resource base, in particular for food and water supply, but also life-supporting functions of natural resources and ecosystem services.²² For without such a subsistence level and without life and health, there is no freedom. By and large, the recent discussion on human security leads in a similar direction toward the preconditions for human development.²³ This fundamental right to the elementary conditions of freedom is explicitly provided to the extent that life and health are concerned (see Article 2, paragraph 2 of the German Constitution; Articles 2 and 3 of the EU Charter of Fundamental Rights; Articles 2 and 8 of the European Convention of Human Rights; Principle 10 of the Rio Declaration).²⁴ This leads to important implications for future international resource politics:

- To ensure a proper food supply (which is also based on phosphorus) on a worldwide and intergenerational scale;
- To acknowledge the principle of materials stewardship of all actors that deal with natural resources management and a lifecycle perspective of natural resources – this is especially relevant for metals;
- To take responsibility for maintaining life-supporting functions and services of ecosystems;
- To adopt policies of resource-savings in fairness to the poor and to future generations.

■ Our understanding of “Protection of freedom where it is endangered” implies a right to protection (by public policy) against fellow citizens (and not only

22 In liberal democracies, there are also “further” (in contrast to “elementary”) preconditions of freedom such as macroeconomic stabilization, or protecting biodiversity, etc. Such “further” preconditions of freedom are usually seen not as human rights per se but as obligations of the public policies (without corresponding rights of individuals). This does not mean at all that these “further” conditions are less important.

23 Here one may refer to the UNDP report on Human Security (UNDP 1994) or the recent discussions about environmental security, see for example Brauch et al. (2011).

24 One could argue that the German Constitution, Article 2, paragraph 1, has a counterpart in Article 6 of the EU Charter of Fundamental Rights as a general EU right to freedom (using an interpretation in accordance with its wording). The same is true for Article 5 of the European Convention of Human Rights and other similarly structured bills of rights.

in exceptional circumstances). For autonomy is not only threatened directly by the state, but also by private actors, whose actions are “only” approved or tolerated by the state. This implies a protection, for example, against destruction of life-supporting ecosystem services or basic social institutions or resilience of local provisioning systems, which threatens freedom and its conditions, such as overuse of resources, *by any public power against such fellow citizens, including companies.*

- Protection rights in the environmental context are not excluded, despite the fact that, for instance, many resource problems concern only forthcoming *hazards* of fundamental rights. That means that human rights are not only relevant for definite encroachments, but also provide a foundation for the precautionary principle.²⁵

The trade-off between the “environmental” and “social” aspects of human rights and the classical liberal guarantees of freedom for consumers and enterprises offers some leeway and requires a balancing procedure. Nevertheless, especially with regard to the overuse of resources in most industrialized countries, some binding principles can be derived:

- The *polluter pays principle* can be derived from the principle of freedom itself. For freedom must include responsibility for the foreseeable (including environmental or social) consequences of one’s own actions – even in other countries and in the future, and also for the unpleasant consequences of one’s own life plan. The negative consequences of an action that would otherwise benefit me (for instance, of cheap free resources today) must always fall back on me, if only by way of cost recovery for the damage created by that action. This implies:

- To minimize problem-shifting of different types: between environmental media, types of resources, economic sectors, regions, and generations;
- To establish responsibility and accountability in international commodity markets;
- To operationalize criticality of minerals as outlined above.

- Remaining uncertainties do not preclude action in favor of those freedom rights: Just as uncertainties about the magnitude of climate change are no excuse to refrain from action for reducing greenhouse gas emissions, the *need to recover phosphorus and critical metals* is obvious.

- The task of politics is to address and balance the trade-offs between one’s own and another’s freedom and, in addition, to provide institutions and

25 Undoubtedly, future trends are not per se predictable and therefore “uncertain.” However, such an objection would fail, because impairments of fundamental rights, which are “only possible” are *not* irrelevant with respect to fundamental rights, especially under the threat of irreversibility of the “possible” infringement. Otherwise, fundamental rights would no longer serve the very purpose of legal fundamental rights: to guarantee the protection of autonomy exactly where autonomy is threatened with impairment.

incentives that realize external freedom preconditions. However, this does *not* mean that the political and democratic process has to provide an *equal distribution* in the sense that certain material goods (like resources) would necessarily have to be equally distributed. Rather, with respect to elementary preconditions of freedom, equal treatment – as with liberties themselves (that is, unlike for “further” freedom-promoting conditions) – is necessary to ensure that *everyone is able to receive* essential services and goods derived from ecosystems and the natural resource base (Hayward 2006). This is supported by four arguments:

- Without a *right to an equal absolute minimum level of elementary freedom preconditions*, freedom would be of no value for the poor – and liberal constitutions respecting human rights *guarantee* equal liberties. This “equal subsistence” means specifically two things: Everyone must have a minimum level of resources, energy, etc., available – however, all must be (because this is also basic) protected from disastrous encroachments such as climate change. A normative implication is that resource exploitation and damages caused by Western lifestyles must be reduced absolutely. With regard to food provision, industrial countries shall recover phosphorus to facilitate that every person (worldwide and also in the future) can enjoy affordable food supported through the use of a certain minimum of phosphorus – and many people thus far worldwide do not come close to reaching their “equal” per capita share. To fight energy poverty, critical materials should be prioritized toward supporting clean energy for the poor. These illustrations remind us to be cautious about translating inequalities, with regard to resources, into too detailed resource-related targets.
- Since the collective good character of life-supporting and non-substitutable resources like phosphorus become obvious, it seems plausible to turn usage rights – or the “proceeds” of an unequal distribution (e.g., use of the atmosphere) – into equal parts for all persons as far as possible, for no one can claim for themselves that they have accomplished a special “performance” to produce that good. This second argument can also be seen as an argument *e contrario* of the polluter pays principle (which also follows from the principle of freedom). This leads to a theoretical justification of a principle of *common heritage of mankind applied to geological and anthropogenic stocks*. The latter is also of relevance for critical materials that can and shall be recovered from products and infrastructures. Furthermore, this can also mean a participation of local people in rents derived from resource exploitation.
- Sometimes a minimum use of natural resources can hardly be defined per se – but freedom of mankind in general may be endangered by overuse of resources. Therefore, international resource politics should contribute to a globally *fair distribution of resource use and an adequate burden-sharing*.

- A “*fair*” *distribution of resources* could seek to minimize risks for security and economic turmoil due to dependence on resources.

Discussion: The transition toward renewable energies and energy efficiency may require more demand for copper than in business-as-usual scenarios. Shall copper nevertheless be governed toward an absolute reduction? Even if this has a trade-off against low-carbon technologies? Even if environmental and social effects of copper mining and production can be drastically reduced? Shall human beings have a “right for copper” that is distributed equally across the globe and generations, despite the fact that they need functions and services rather than the material itself?

- On a preliminary basis, a *higher access rate to resources* for developing countries could be justifiable for their fight against poverty.
- Another important consequence of the principles justified above is: Colliding human rights and interests described in Chapter 3 call for *distinct rules for public authorities – not only with regard to those countries where freedom and democracy are at stake*. Purely voluntary solutions will probably not be enough.
- On a procedural basis, colliding human rights imply a *broad participation of all stakeholders* in all legislative and administrative decisions with relevance to resources.

The *implications* of all this might be a process to formulate visions with targets along the following lines:

- Absolute reduction of material use in industrialized countries; that is, absolute decoupling of resource use from GDP for OECD countries.
- Relative decoupling for developing countries, including newly industrializing countries; partnerships and cooperation between these and OECD countries, especially with resource-rich countries; provision of adequate supply of natural resources for the poor.
- Emerging economies will aim for absolute decoupling after per capita threshold benchmarks comparable to resource-efficient industrialized countries are within reach.
- Radical up-scaling of resource productivity (total material productivity), at least at a rate higher than GDP growth.

Key message: Those who say technology and markets will fix it are wrong: The main challenge of addressing the multicriticality, as expressed in Chapter 2, is about normative orientation of international governance

processes. Freedom, in our understanding, should include the necessary preconditions for human development and a provision of adequate supply of natural resources for the poor.

Open issues and diverging views: Principles such as preconditions of freedom and the collective goods dimension of resources require further thoughts as well as specifications. The UN Framework on Business and Human Rights (protect, respect, access to remedy) is not yet specific with regard to extractive industries and resources. One more specific issue: How should the allocation of critical materials be organized toward priorities of poverty reduction?

5 Prevailing governance and resource-market failures

In the last years there have been a number of initiatives aimed at improving the governance of natural resources. While acknowledging such promising initiatives in general, our paper focuses on transparency, certification, and the ways initiatives and politics interact. Our argument is that these initiatives will need a serious upgrading toward the principles mentioned above if all existing deficits (see Table 2) and challenges of the future are to be met. Bringing these issues to the front will hopefully challenge all those involved in these initiatives to think again about collective behaviors toward the often ignored implications of prevailing consumption patterns. At the same time, it should also be clear that the connotation of many resource-related security discussions is by far too narrow to capture the impacts and response options on the ground.

On transparency in resource markets and politics, *the Extractive Industries Transparency Initiative (EITI)* is a good example of (a) a new initiative gaining ground in a number of countries, and (b) how voluntary and binding regulations might interlink. Constant lobbying by NGOs such as Publish What You Pay, Revenue Watch, and others, as well as the adoption of OECD due diligence guidelines (OECD 2010, 2011b), led to a section in the Dodd-Frank Wall Street Reform and Consumer Protection Act (2010)²⁶ in the United States, which obliges extractive companies listed on the US stock exchange to report their payments on a country-by-country and project-by-project basis. The EU Commission²⁷ released its communication on annual financial statements October 2011, proposing a mandatory country-by-country and project-by-project disclosure from extractive industries and loggers of primary forests. There are four interesting aspects to observe:

1. The country-by-country and project-by-project reporting would not have been included in the Dodd-Frank Act without EITI and the lobbying power of the Publish What You Pay coalition, even though EITI transparency is high on the international resource agenda. In the case that the Dodd-Frank regulation starts to deliver information, NGOs in resource-rich developing

²⁶ Section 1504 (the “Disclosure of payments by resource extraction issuers”) of the Dodd-Frank Wall Street Reform and Consumer Protection Act).

²⁷ European Commission, Proposal for a directive of the European Parliament and the Council on the annual financial statements, consolidated financial statements and related reports of certain types of undertaking, COM (2011) 684/2.

countries will be able to use the information – thanks to national EITI multi-stakeholder platforms.

2. The extractive industry uses EITI as an argument against the Dodd-Frank Act, arguing that binding regulation would undermine the (voluntary) efforts in the context of EITI. Despite such lobbying efforts, however, one can observe changes globally in the industries toward compliance, encouraging political shifts, for example, in the DRC's mining sector.
3. EITI itself seems to be unable to broaden its scope to address the wider agenda of bribery and corruption in the extractive sector.
4. The Dodd-Frank Act (Art. 1502) requires companies to disclose whether they are sourcing conflict minerals from the DRC or neighboring countries in the Great Lakes Region. However, implementation is still pending. Certification schemes are under development, and the EU might develop its own approach to due diligence and certification schemes.

To counteract the risks of a “resource curse,” the *Natural Resource Charter* (including Paul Collier and Karin Lissakers) has developed 12 precepts of good governance in resource-rich developing countries. It offers rich and experience-based knowledge for practitioners in those countries. Being endorsed by, for example, the African Development Bank, the African Union, politicians, and some countries, it seeks to establish a process of mutual support and exchange in the future. However, this will remain a science-driven, voluntary initiative and therefore will lack binding enforcement mechanisms – similar to guidelines and studies released by the International Council on Mining and Metals – unless legally binding mechanisms are introduced. It also seems to be focused almost entirely on necessary reforms at the national level and may fall short of dealing with concerns of the local communities that have too often been abandoned by their own governments (e.g., Niger Delta, West Papua).

Another useful tool is the *Model Mining Development Agreement for Sustainability (MMDA)*, where the Mining Law Committee of the International Bar Association, with administrative support from the Sustainable Development Strategies Group, has assembled a 200-page model contract that covers all stages of mining project development in a country. As it is web-based and publicly available, it provides an agenda for negotiations and stakeholder consultations, with special emphasis given to the needs of local groups. This tool is especially useful for new mining countries (Central Asia, Central Africa), where the capacities in public administrations and local NGOs are weak compared to well-equipped mining corporations.

Further ahead in the lifecycle of using resources, efforts to increase resource efficiency have been gaining ground lately. The European Commission has launched a flagship initiative on a resource-efficient Europe, supported by many efforts at the level of member states and regions. Japan, China, and other Asian countries have related strategies about the 3Rs (reduction, reuse, recycling).

Other relevant initiatives are, for example, the Voluntary Principles on Security and Human Rights and the Kimberley Process Certification Scheme. Their common denominator is a multistakeholder participation including industry, governments, and NGOs (from the South and the North). These initiatives and a number of others at the regional level are briefly summarized in an annex to this paper. They address a number of deficits in resource markets that have been identified by research (Table 2), especially illicit trade and risks of a “resource curse.” In line with our paper, however, more needs to be done to address the environmental dimensions and human rights.

Box 2: The UN Framework on Business and Human Rights

Business and human rights

The issue of business and human rights has been part of the global policy agenda since the 1990s. It became necessary as the economic activities of transnational companies rose dramatically while the capacity of many governments to control those companies diminished. The Special Representative of the UN Secretary-General on the issue of human rights and business, John Ruggie, explained in his report to the Human Rights Council the reason why this issue is a topic for the UN: “The root cause of the business and human rights predicament today lies in the governance gaps created by globalization - between the scope and impact of economic forces and actors, and the capacity of societies to manage their adverse consequences. These governance gaps provide the permissive environment for wrongful acts by companies of all kinds without adequate sanctioning or reparation. How to narrow and ultimately bridge the gaps in relation to human rights is our fundamental challenge.” (Human Rights Council, A/HRC/8/5, 2008, 3)

The extractive industry has been high on that agenda. According to a survey by John Ruggie, of 65 violations reported by NGOs, the extractive sector dominates this sample with two-thirds of the total. The extractive industries also accounted “for most allegations of the worst abuses, up to and including complicity in crimes against humanity, typically for acts committed by public and private security forces protecting company assets and property; large-scale corruption; violations of labor rights; and a broad array of abuses in relation to local communities, especially indigenous people.” (UN Doc. E/CN.4/2006/97, 2006, 25)

As an answer to the question about what the UN, states, and business enterprises should do to narrow the aforementioned gap, he proposed a framework that is based on three pillars “Protect, Respect, and Remedy,” grounded in:

- The duty of states to respect, protect, and fulfill human rights and fundamental freedoms;
- The corporate responsibility to comply with all applicable laws and to respect human rights;
- The need for greater access by victims to effective remedies, judicial as well as non-judicial.

The framework and the Guiding Principles for its implementation demand “that business enterprises should act with due diligence to avoid infringing on the rights of others and to address adverse impacts.” (A/HRC/17/31, 6)

The Human Rights Council endorsed the framework (2006) and the Guiding Principles for the implementation (2011). John Ruggie himself described the Framework and Guiding Principles as an end of the beginning because there are still gaps to fill. At the moment, the Guiding Principles are implemented partly on the level of pilot projects. There is still a need for an international framework to make them “normal practice.”

In light of the previous chapters, this is good news. In particular, the transparency and certification efforts will tackle the main deficits of markets for critical resources (see next table). Despite all potential shortcomings, the existing conflict

mineral provisions, along with the OECD due diligence guidelines, set a very important precedent in the development of standards for companies operating in and sourcing from any conflict area. If such systems were to be implemented on a larger scale, positive effects on governmental revenues, price volatility, and property rights in general could be expected that would also benefit the poor in those regions. For that reason, a strong emphasis should be given to full implementation of these initiatives with a further push toward empowerment and enforcement. Furthermore, emerging economies such as China, Russia, and Brazil should get involved – and the EU and the United States should fully acknowledge these principles with regard to their domestic extraction activities.

Following Haufler (2010) and her analysis of the Kimberley certification process, the elements of establishing inclusive and relatively strong institutions can be seen as key elements for success.

In a broader sense, it seems that new hybrid forms of governance emerge (Avant et al. 2010), where formal regulations and stakeholder-driven initiatives co-evolve on the levels of industrialized countries, local groups in developing countries, NGOs, and business. These new governance processes are beginning to overlap on agendas such as ethical concerns, corruption, and conflicts. They involve a number of stakeholders or “governors”²⁸ with some power in bargaining and shaming, thus going beyond the more traditional voluntary agreements that almost exclusively establish secret gentlemen clubs between industry and governments. Hybrid governance coalitions with NGOs and empowerment of civil society in developing countries may therefore trigger the development of better institutions and a legal framework in those countries, in the EU and the United States, and internationally.

As for the status quo, however, a critical discussion should address four main potential shortcomings:

1. Implementation, dissemination, and enforcement of environmental, social, and human rights standards remain uncertain.
2. If a focus on a limited number of minerals remained that only addressed the specific situation of the DRC (such as the Dodd-Frank Act in the United States), it could lead to potentially negative impacts in that country and others because (a) illicit trade may shift to other natural resources and activities; (b) companies may decide to purchase their commodities from other countries, thus lowering the income in those poor regions; and (c) any relocation may shift environmental burdens to other regions.
3. The substantive standards for transparency and certification need to be enlarged over time to fully address bribery and corruption in the extractive sector and beyond. Any such attempt should also include the dimensions of environmental pressure and downstream applications.

28 Defined as “authorities who exercise power across borders for the purpose of effecting policy” (Avant et al. 2010: 356).

4. Global overuse of natural resources, that is, the demand from industrialized countries and the growing number of middle class consumers worldwide, remains entirely beyond the scope of this discussion. Along with the principles above, the patterns and distribution of consumption ought to be addressed as well.

Such hybrid forms of governance become more powerful if they leverage market access in the United States and the EU. The Kimberley process has been relatively successful with regard to markets for rough diamonds.²⁹ Regarding domestic attempts by the EU, the Registration, Evaluation, Authorisation, and Restriction of Chemicals (REACH) Directive for the chemical industry; the proliferation of standards through, for example, the Industrial Emissions Directive (IED); the Ecodesign Directive; the Waste of Electrical and Electronic Equipment (WEEE) Directive; as well as the certification schemes for biofuels and other renewable energies could have an impact on global producers if such market leverage becomes legally binding for relevant consumer markets and *if* the global industry considers this market leverage as a driver for global markets (Schreurs et al. 2009; Jänicke and Rennings 2011). It is thus an interesting perspective to develop resource politics that have a regional focus in resource-rich developing countries and manufacturing outside the EU and align it with market access in the EU. From a governance perspective, this also underlines the need to complement a focus on actors and capacities with institutional reforms that, by necessity, address governments and legal frameworks as well.

Pioneering action for leveraging market access in Germany, in the EU, and in OECD countries will also serve self-interests along important agendas:

- Green industries and consumers that seek to establish sustainable supply chains will encounter an uphill battle against information deficits, illicit trade, and conflicts around mining operations as long as weak links in global management efforts exist.
- Aims to increase resource efficiency and lower greenhouse gas emissions – as pursued in the EU’s 2020 strategy – are undermined by system failures of (a) providing materials at a price that does not reflect the full social costs, and (b) gaps in downstream recycling and disposal activities internationally. A rebound effect – more demand for natural resources – and problem-shifting are likely side effects as long as international cooperation remains underdeveloped.

²⁹ Note that Global Witness seems to have announced its definite disengagement from the Kimberley Process on December 5, 2011, stating that the certificate is losing its meaning.

Table 2: Deficits in resource markets, theoretical explanations, and potential solutions

Deficits		Theoretical explanation	Risks and threats	Possible solutions
Environmental deficits	Environmental degradation	Negative externalities	International and global overuse of ecosystems; deprivation and hunger; riots; migration	Internationalization of external effects, e.g., standards for mining and economic incentives; incentives to reduce "ecological rucksacks"; capacity-building
	Depletion	Unclear property rights, legitimate claims of future generations	Interruption of supply chains; drag on green industries and high-tech industries; windfall profits for a few; arms races	Property rights including long-term responsibility; incentives for anti-cyclical investments; sustainable resource management plans; consideration of future generations; economic incentives; capacity-building
	Suboptimal input; inadequate recycling	Incomplete information; knowledge gaps; dissociated markets	Overuse of resources; health and ecosystems endangered (if hazardous substances are used)	Improved monitoring, international metal-covenant; organization of recycling and material-flow management in developing countries; capacity-building
Socio-economic deficits	Price hikes and volatility	Incomplete information; speculation	Food and water for the poor become prohibitive; riots; business at risk	Better information about projected market demand; reduce incentives for speculation, e.g., taxation of speculative profit
	Illegal trade	Unclear property rights; lack of transparency	Organized crime; corruption; piracy; reputational risks for companies	Market transparency; certification; transformation of the OECD Due Diligence principles in WTO and internationally (EITI, Dodd-Frank Act)
	"Resource-curse"	Imperfect competition; macroeconomic instability; policy failures	Lack of revenues; corruption; countries stuck at the bottom; civil wars extended	Resource taxation; decoupling of investment activities from short-term profits; macroeconomic and political institutions (Natural Resource Charter, MMDA); capacity-building
	Violation of Human Rights	Market and policy failure	Resettlements; conflicts and civil wars; migration	Strengthen human rights (UN Framework on Business and Human Rights)

Source: Own compilation, see also Bretschger et al. (2010)

To sum up, today's global governance of natural resources is highly fragmented and spots a few areas in resource-rich developing countries.

In line with the visions and principles outlined above, a responsibility-driven, comprehensive approach that brings together international stakeholder initiatives and politics in the EU and other OECD countries will trigger new types of system innovation. These stronger governance tools will have to be introduced with an international perspective and in cooperation with resource-exporting countries. Policy efforts should focus in first instance on the environmental and human rights effects of mass metals and phosphorus, while emphasis on critical metals should gradually expand.

At least in the long run, it is therefore necessary to develop an international resource politics that captures the required holistic perspective. As regards resource scarcity, primarily a real decrease in the total quantity of all resources used (ultimately on a global scale) and at the same time much more enhanced resource-recycling can actually achieve the necessary resource conservation, while at the same time alleviating ecological and social impacts.³⁰

Key message: A number of promising initiatives have emerged that seek to better govern extractive industries and international resource markets. Their strength is a tight focus on a narrow issue that has demanded action. However, the challenges will require stronger governance mechanisms to address global overuse of resources as well as opportunities and responsibilities in industrialized countries.

Open issues and diverging views: Many actors support current initiatives, while some experts remain skeptical about their prospects. Since the future of foreign policy in both the United States and Europe is rather uncertain, and since the UN may continue to suffer from chronic weakness, civil actors may have to find entirely new coalitions and governance mechanisms. The role of states and the EU is probably more important for the years ahead compared to global governance and multilateral agreements. However, the aggregated impacts of all these local impacts will require global solutions in the long run.

³⁰ Central to this thinking is the realization that creating regulations solely focusing on efficient resource input will not be sufficient. For instance, any reduced resource input “per plant” in the current food crop system represents prima facie a gain. However, if at the same time the area of currently unused land is increasingly used for, for example, feed crop cultivation (triggered by globally rising meat consumption) or for bioenergy plants, the required absolute reduction in phosphorus use cannot be met. Global quantity regulation could work by means of public charges or cap-and-trade systems – or by global bans (without exceptions) for certain undesirable behavioral patterns, for example, in resource exploitation. Alternatively, a solely European strategy would be possible, maybe combined with a system of border adjustments to avoid international relocating effects and to push more and more states to participate in a global resource governance approach.

6 New approaches to kick-start international resource politics

Incorporating environmental challenges and human rights in approaches to international resource markets is not an easy task. Doing this and making best use of critical materials according to the principles outlined above calls for an international resource politics. The relentless efforts of many people involved in ongoing initiatives – NGOs, academics, politicians, business, and numerous citizens throughout the world – should be seen as an encouraging sign of support. However, it is questionable whether the current system of international environmental governance – with its maze of interlocking multilateral agreements – offers a suitable platform for such an endeavor. Resources have many characteristics that call for a coordinated bottom-up approach, a polycentric type of politics with a high level of participation and transparency. Essential pillars of such international resource politics may also be developed in coordination with business, rather than fighting against them: Consumers and investors are increasingly concerned about environmental and social performance, and the need for a level playing field is widely acknowledged.

Germany and the EU have good reasons to accept their responsibility in that regard. The EU is the largest commodity importer of the world (not China or the United States), and Germany is the major manufacturing hub within the EU, meaning that its industries and its agriculture are both importers and exporters of resources. Moreover and against all current odds, the EU is the largest internal consumer market of the world – with numerous leverage capacities for market access. Leadership indeed will need to be demonstrated at home: Future commitments of the EU and its member states toward resource savings, that is, an *absolute decoupling* of resource use (measured in total material requirements or any similar comprehensive indicator) from GDP should be central in any such strategy; similar commitments by major corporations (against sales rather than unit-based) should be encouraged. Putting one's own house in order is a key ingredient for credibility and preparing market actors for long-term changes.

However, strong international outreach is deemed necessary, firstly, because a domestic strategy of using fewer resources is not conceivable, given the internationally exposed position of Germany, the EU, and most other developed societies. Otherwise, it would merely be window dressing and aggravate ongoing problem-shifting to developing countries. Secondly, better international cooperation offers manifold benefits, and in particular the opportunity of turning natural

endowments of poor countries into prosperity for its people. Formulating such international resource politics will require a creative junction of international law and private law, as well as interdisciplinary knowledge on governance and regulatory issues in a number of regions worldwide. There are a few precedents, as many common pool resources are predominantly regionally managed. As of today, a strategic interest in an improved sustainable resource management on a global scale has been expressed by the EU, Japan, some processing companies, and some producing countries. Their thoughts, however, are vague and have not yet resulted in a consistent picture. In that regard, the following strategy may encourage the formation of an international resource politics.

6.1 From knowledge to action

Generating knowledge for the actors on the ground means the provision of information plus the encouragement of learning processes to make use of it. Again, the key is to incorporate the dimensions of environmental change and human rights into a lifecycle perspective of extraction, production, and use of resources. The following proposed steps shall provide better information and generate knowledge across a large number of stakeholders (see also earlier recommendations made by IIED 2002c: 389ff).

6.1.1 An international data hub on sustainable resource management

There is a need to provide the following: harmonized, open-access geological data; geo-spatial data; data on critical materials and the resource nexus on the use of resources in economies and across industries; basic socio-economic data; environmental impacts of key materials and agricultural goods; as well as key data for scenario analysis about future use. This should be done in cooperation with existing mechanisms and agencies such as the Environmental Impact Assessment (EIA), the UN Food and Agriculture Organization (FAO), geological surveys, as well as with the UNEP International Resource Panel and research organizations.

6.1.2 An International Resource Management Agency

Furthermore, there should be an international agency to improve dissemination and learning through coordinated programs of awareness-raising and training courses, including broader policy dissemination. It could also host the proposed data hub and serve as a secretariat to the proposed multistakeholder forum (see below). Regional offices are probably good candidates for accomplishing these tasks.

These two initiatives have been suggested in earlier publications (Bleischwitz et al. 2009, 284ff; Giljum et al. 2009).

6.1.3 A Multistakeholder forum for sustainable resource management

Such a forum does not exist yet.³¹ It should comprise high-level policy representatives of the G20 plus at least 10 main resource-rich developing countries as well as industry and civil society. It should use all conceivable means to be open, transparent, and participatory. Main tasks should be as follows:

- *Discuss and critically review initiatives on transparency and certification*, such as the OECD due diligence guidelines, EITI, as well as related policies such as the Dodd-Frank Act and the proposed EU policy on mining, recycling, and waste policies; it should also have a mandate to compare and review investment agreements, bilateral raw material partnerships, and other relevant policies. More comprehensive transparency is to be achieved regarding the supply relationships within mining industries, authorities, and financial institutions as well as the supply chains and the downstream processing industry. In the end, major parts of the contracts should be publicly accessible. The existing transparency initiatives should also be accompanied by certification efforts in the form of product labeling and/or along mineral supply chains.
- *Align these activities with available knowledge on sustainable resource management* as provided by, for example, The Natural Resource Charter, the MMDA, the UNEP International Resource Panel (IRP), the World Resources Forum, etc.
- *Specify the UN Framework on Business and Human Rights* for the extractive industries. A first step might be to appoint a special rapporteur of the UN Human Rights Council on that issue, with a mandate to assess and develop recommendations.
- *Invite policymakers and corporations* to disseminate best practices and to develop international policies in a high-level forum, similar to the international energy forum.
- *Invite civil society* to share concerns, point to problematic practices, and introduce innovative solutions.
- *Prepare for and accompany an international data hub* for observation, monitoring, extraction and entire lifecycle use of materials, including data on indicators, prices, and indirect resource use (such as ecological rucksacks).
- *Discuss and develop a conflict-risk radar* for both regional and international security issues, in relation to a system of articulating emerging resource-related conflicts.
- *Establish international working groups* to develop scenarios on future resource use, as well as targeted scenarios for certain commodities, product groups, and sustainability.

³¹ Note that a similar initiative had been proposed by the Mining, Minerals and Sustainable Development Project (IIED 2002c).

Assuming that current trends remain stable over the next years, these tasks do not seem to be overly ambitious. However, it will be wise to strive for organizational support or affiliation with an international organization. UNEP certainly has many merits, but still lacks expertise and a mandate on human rights and conflicts, whereas other organizations have less expertise and no mandate on environmental issues. Thus, an affiliation might have to have two or more ties.

Four arguments in favor of legally binding mechanisms

These three institutional mechanisms, however, will not be enough. The analysis in the previous chapters has revealed at least four arguments in favor of legally binding mechanisms in international resource politics:

1. Critical minerals, as highlighted in Chapter 2, are poorly governed and almost entirely unregulated. As of today, this favors selected targeted approaches (such as the Dodd-Frank Act in the United States and a potentially similar regulation on the EU level). However, more comprehensive approaches that address the environmental dimension and incentives for managing them toward the principles outlined above should also be discussed.
2. Sustainable mining – however challenging this may be – has limitations when entire lifecycle management of resources and, in particular, the demand for resources ought to be governed. Making the mining industry a partner for sustainable resource management requires approaches that address the whole lifecycle of using resources.
3. The divergence and heterogeneity of actors as well as possible tradeoffs between competing aims call for better coordination and mechanisms to enhance consistency and strategic orientation. In particular, a global mechanism that moves toward using fewer resources, preserves the commons, and allocates essential services for the poor is desperately lacking.
4. On top of this, there is no strategy to deal with structural deficits such as negative externalities, abuse of human rights, huge volatilities, illicit trade, etc.
 - a. Any gains achieved by material-efficiency increases³² are counteracted by a destructive exploitation of resources, and the developing countries are further endangered by environmental dumping and “sleazy waste disposal.”
 - b. As for future risks, the environmental pressures and the potential for resource-related conflicts are seriously growing and are a threat to human rights and international security (HIICR 2011; Bleischwitz et al. 2009; Transatlantic Academy 2012).

32 See, for example, the results of the EU Eco-Innovation Observatory (<http://www.eco-innovation.eu>); (EIO 2011), Oakdene Hollins (2011), or Bleischwitz, Welfens, and Zhang (2010, 2011).

The following section will very briefly introduce new and innovative pillars. Since this is seen as the beginning of a debate on international resource politics, any comments and follow-ups will be appreciated.

6.2 A take on key areas of concern

In line with our analysis above, internationally coordinated action on critical materials should start now; this seems to meet a high demand from a number of stakeholders and policymakers.

6.2.1 A European and international phosphorus policy

First, it has to be noted that issues surrounding phosphorus – a limited and non-substitutable material for the food supply with very weak governance structures – still play a minor role in policy and public awareness.³³ Awareness-raising should be given a high priority. Second, policy has disaggregated the individual phenomena of phosphorus use and flow in various tasks – there is neither a holistic approach to the problem nor coordination among the actors involved. A legal basis for regulating phosphorus from agricultural sources does not exist, but there are different soft regulations that address phosphorus flows, for example within the context of detergents, wastewater, and sewage sludge. Here, perverse incentives act as barriers to changing the technical structures of recycling plants for phosphorus recovery and closed loops (Werland et al. 2010).

A holistic approach should address the international and worldwide dimensions of a sustainable phosphorus management. Due to close interactions and inter-linkages to other biotic and abiotic resources as well as core challenges such as climate change, agriculture, and nutrition, the initiative should be designed as part of an internationally aligned resource policy. An integrated phosphorus management should start with the monitoring of phosphate flows in Germany (similar to the Swiss activities in this realm) (Binder et al. 2009). In the medium term, the approach should be extended to the European scale. International scenarios have to project future demand and applications and the potential recovery of phosphate (Cordell 2010). It should be especially fruitful with regard to emerging and developing countries as well as for business (WBCSD 2009). Indeed, awareness is key, and NGOs can play an indispensable role in that regard.

The high recovery rate of phosphorus from sewage sludge (up to a 90% recovery rate from sewage sludge by means of mono-incineration) is technically feasible, but it is a downstream and costly approach. Hence, sustain-

33 However, the Nutrient Platform established in January 2011 and the Global Phosphorus Network are certainly promising steps; see, for example, the recent brief of the EU Eco-Innovation Observatory at <http://www.eco-innovation.eu>. The Dutch Steering Committee for Technology Assessment calls for the development of an EU policy for phosphates (de Haes et al. 2009).

able phosphorus management has to consider quantity regulation in order to achieve a reduction in primary phosphorus input and close loops for secondary phosphorus at the same time (Ekardt 2011), as well as to provide incentives for investments. Inter alia, it would be necessary:

- To address all actors – importers, producers, user (agriculture), research, etc.;
- To achieve a site-specific optimized fertilization that seeks harmonization with the healthy feeding of the world population, i.e. questioning the current livestock-intensive agriculture and diet;
- To generate economic incentives by introducing a pollutant charge or a phosphorus tax on the production of fertilizers;
- To legally bind recovery as a central approach, supported by appropriate incentives (such as a mixture quota for p-containing fertilizers, prohibition of subsurface filling and land-filling of p-containing waste, co-incineration ban of sewage sludge, development of long-time deposits of sewage sludge, recovery of anthropogenic urine);
- To implement a market introduction program for mono incineration plants and adequate phosphorus recovery.

6.2.2 An international metal covenant

Given the high losses (see Chapter 2) of materials through the export of used goods from developed countries, which often ends in low-quality recycling and improper disposal, legally binding mechanisms such as an international metal covenant would be a conceivable option. This could be achieved in a contract (covenant) between key manufacturers and suppliers, the recycling industry, and the relevant public authorities in major export and destination countries. The covenant should establish long-term goals for increasing resource efficiency through a high-quality recycling market. The covenant defines the responsibilities of the different actors, the policy tools, implementation, and evaluation. The parties, industrial enterprises, or their associations would commit themselves to resource protection goals, and the states would ensure a stable and supportive environment for the agreed term. In contrast to non-binding commitments, the covenant should principally be enforceable in court. At the same time, the contract should provide for effective dispute resolution and sanctions (Wilts et al. 2011).

Such a covenant has the potential to establish a framework toward closing material cycles for consumer goods more effectively at an international level and shows a number of benefits, such as the reduction of transaction costs in new partnerships between industry sectors and public bodies, the increase of states' regulatory capacities, and industry's acceptance. It prevents the undermining of the extended producer's responsibility for exports – material stewardship – and gives incentives for recycling design (Wilts and Bleischwitz 2011).

6.2.3 Transform bilateral agreements toward sustainable resource management

Bilateral trade and investment policies offer ample leeway for leadership from the EU and Germany. Any such agreement should refer to common principles such as those provided by the Natural Resource Charter, the Mining Model Agreement, and others. In line with due diligence supply chain efforts, this could be accompanied by sectoral investment agreements in areas relating to smelters and refineries, metal and recycling industries. The collaboration in the field of environmental technologies should be aligned to encourage large-scale investments into renewable energies and a green infrastructure while minimizing environmental and social risks.

The existing bilateral raw material partnerships (e.g., Germany with Mongolia, Kazakhstan) should also adhere to such principles and fulfill basic conditions of transparency, accountability, and sustainability. The EU could openly discuss market leverage into the EU as well as standards for human rights and sustainable resource management, as outlined above in this process – possibly in coordination with other OECD countries. In addition, the EU and Germany should offer support for technology transfer and capacity-building. The latter is important for measures in these countries such as national plans for sustainable resource management, extraction taxation schemes, and raw material funds; they will also help to promote constitutional legality, good governance, and the development of macroeconomic institutions in the resource-rich countries (Collier and Venables 2011; Bleischwitz 2011).

Indeed, all documents should become publicly available. The institutional implementation should be done in alignment with the international multistakeholder forum to encourage other countries to follow and disseminate experience.

6.3 Toward a sustainable world economy

The normative principles outlined above are well in line with an understanding of markets as being guided by rules and serving purposes of higher ends. The knowledge generated through the activities proposed above will lead to a better basic understanding of how resources, nature, and development processes interact. This will support the resilience of societies with a number of transition processes moving in new directions. However, the implication is not that all processes of nature or within societies are proposed to become part of the global market or any scrutinized financialization of services. To stimulate debates on how the world economy ought to be transformed, our outline of an international resource politics suggests a few directions. A more detailed discussion is certainly beyond the scope of this paper.

6.3.1 Cutting subsidies and introducing resources taxes

The EU shall go ahead and reduce environmentally harmful subsidies on fossil fuels, mining, agriculture, and land use in its member states and at lower levels of policymaking (Usubiaga et al. 2011); it should eliminate all export subsidies and refrain from using food aid to promote exports. Furthermore, it should promote this objective in bilateral and plurilateral agreements and support a Global Subsidies Initiative toward these aims.

To get the prices right and to counteract the rebound effect, the tax base should be broadened toward natural resources. Given that construction minerals account for the biggest share resources and are less sensitive to international competitiveness than most commodities, the EU should introduce a tax on construction minerals (Bahn-Walkowiak et al. forthcoming). It should also consider taxing water and land use. Such taxes can be seen as a precursor toward a more inclusive taxation of resources in general. Practical experiences with the taxes on aggregates have been gained in some EU member states (in particular in the United Kingdom, Sweden, Italy, and the Czech Republic), which all levy taxes or charges for sand, gravel, and crushed rock (EEA 2008; Bahn-Walkowiak et al. 2010).

Developing countries will have to consider their respective needs and the mixed experiences with taxing minerals extraction (ICMM 2009; Otto et al. 2006; WTO 2010, 12). However, carbon taxation is planned on being introduced in China, and more economic incentives will be a pillar of international resource politics. Taxing resources in developing countries, however, can be done in a sustainable manner and offers incentives for savings along the whole international value chains. On an international scale, coordinated domestic measures, such as an agreement to increase taxes uniformly beyond a nationally defined level, could be an option to avoid international distortions.

6.3.2 Leveraging finance for sustainable resource management

Leveraging finance for sustainable development is a task that clearly goes beyond politics and addresses the private sector (IIED 2011). The question of sources of finance is high on the political agenda in all fora that deal with international sustainability and development issues such as the UNFCCC and other conventions, Rio+20, and the G20. The public sector has a key role to play and serious regulations will be needed to increase state income, reduce tax evasion practices, and improve intranational equity. But the current financial and economic crisis makes it all the more important to think about more structural ways to redirect investment away from the old brown economy to a green, sustainable, and equitable economy. Pressing problems of food and water scarcity in many regions of the world, the infrastructure needed for better energy services for all, and the research that is still needed to use critical minerals in the most sustainable manner all require new and additional finances. It will simply not be enough to create incentives for greener products. Much caution and thought should be

given to the right design of new mechanisms to leverage additional private capital through scarce public resources. Here, some important lessons can be learned from existing practices in development finance. The current trend of financialization in the form of commodification of natural resources (or even “development benefits”) that are then turned into tradable financial market products in that context can even contribute to a distraction from the real problem. The development and ecological impacts of such measures are often highly questionable. Some current proposals on mobilizing innovative sources of finance include:

- The Global Subsidies Initiative launched by the International Institute for Sustainable Development (IISD) aims at cutting environmentally perverse subsidies (Runnals 2011). Many developing countries spend billions of dollars on such subsidies (e.g., India spends \$15 billion on fuel subsidies annually). McKinsey (2011) estimates the global amount of subsidies spent annually on resources in the order of \$1.1 trillion. Reporting on such subsidies is a first step that should be followed by coordinated efforts to reduce them. Indeed, this needs to include all unsustainable subsidies (e.g., on agriculture); it does not exclude targeted subsidies for environmental goods, for example, and it should go along with social programs and reforms.
- A levy on international aviation and shipping (eventually: taxing volatility of commodities).
- A transaction fee on international emissions trading (including auctioning) and a Financial Transaction Tax.

6.3.3 Rethinking international trade

In addition to the proposals made above – and since all attempts to govern commodities will have to take the world trade law into account – a rethinking of international trade policy is at stake. This clearly goes beyond the recent decision by the United States, the EU, and Japan to file a formal complaint against China with the WTO on the question of rare earths. In general, social or environmental resource regulations are usually seen as a restriction to free global trade by the WTO jurisdiction (see, also on the following, Ekardt 2011, § 7 C; Ekardt et al. 2009; Ekardt and Schmeichel 2009). Although the WTO rules allow for exceptions (such as Article XI: 2 GATT on critical shortages; Article XX GATT on the protection of human, animal or plant life or health; or Article IX: 3 on a possible waiver) more should be done to formally align good governance practices in countries with international trade (Meléndez-Ortiz and Biswas 2011). This effort will have to go against sweeping resource nationalism and trends favoring bilateral or plurilateral agreements – and it should exactly counteract these trends and stress the necessity of global rules for a fair trade. The proposals made above point in this direction; especially an initiative to eliminate subsidies for exports could re-open the doors in the ongoing negotiations. Using this to level the playing field for trading environmental technologies could contribute to their deployment internationally. Internalizing the externalities of international shipping and aviation should also become a priority. All this may

be seen as tinkering with the current system, however, it may not only buy time but also come closer to shifting patterns of production and consumption. Such shifts, in addition to the principles mentioned above, should trigger fresh thinking about balancing local livelihoods, resilience, and international trade.

6.3.4 New legal mechanisms at the international level

In the short run, new legal mechanisms at the national level will trigger sustainable resource management. In the long run, new legal mechanisms such as an international convention for sustainable resource management will deem it necessary to constitute fundamental legal principles for sustainable resource management.

Such a convention, however, will probably be established in a stepwise manner via mechanisms such as the multistakeholder forum proposed above and, in particular, toward developing incentives for resource conservation and the legally new area of material stewardship in cooperation with industry. Thus, it is imaginable that initially mainly information exchange and certification will be undertaken (Bleischwitz et al. 2009). A main task will be to align such a legal mechanism with national and international climate politics. Areas of overlap are, for example, certification of biofuels, sectoral agreements, and product-specific regulations. Having expressed this, one should keep in mind that key actors such as business, developing countries, and emerging economies have expressed their interest to become engaged in better governance of resources, which should help to facilitate synergies.

Key message: An international resource politics is at stake. It could be launched with a strengthening of existing initiatives and move from knowledge to action via an international data hub, an international resource management agency, and a multistakeholder forum. Leadership of the EU and Germany will be essential and is supported through their dependence on imports. Further activities should include policies on phosphorus, an international recovery of metals, and transformation of bilateral agreements toward sustainable resource management. The long-term perspective is a transition toward a sustainable world economy.

Open issues and diverging views: There is a lot of strife regarding the transparency and certification agenda. Their limitations and inherent compatibilities are less rigorously discussed. The resource-efficiency agenda has not yet been transformed into a viable international strategy. International resource politics is probably closer to bottom-up and polycentric forms of governance, whereas the scope of multilateral approaches still needs to be discussed. On top of this, the relationship between our thoughts on an international resource politics and ongoing discussions about a green economy and green growth are worth exploring.

7 Conclusions on international resource politics

International resource politics is on the verge of becoming established from two different angles: Firstly, efforts on the certification of mineral supply chains addressing so-called conflict minerals and corruption in developing countries, and secondly, efforts to lower the material purchasing bills through resource efficiency. However, the complete picture embraces many more features, including the grief of the poor and greed of those who make profits. International resource politics thus potentially offers a rich field to address key dimensions of sustainable development on the ground. While millions of people are driven into poverty by rising food prices and competition over access to scarce resources, the escalating impact on international relations and the need for comprehensive approaches is obvious. Individual attempts to let equitable eco-innovations flourish are just not enough: It is a governance challenge that calls for new alliances across actors and sectors as well as for new models of prosperity that make using fewer resources attractive for all citizens. Given the vested interests in favor of extracting and producing more, however, it is also an agenda for balancing power to govern the globe via ambitious and binding mechanisms. More importantly, with the chance of managing resources more sustainably for the people and the planet, it is worth becoming engaged in such a mission. Our paper has started to develop proposals along that road and we look forward to a lively discussion on those topics.

Table 3: Approaches for international resource policies

Initiatives	Short description	Actors
International data hub on sustainable resource management	Open-access geological and geo-spatial data on critical resources and the resource nexus, socio-economic data, environmental impacts, etc.	EIA, FAO, geological surveys, UNEP IRP, research organizations
International Resource Management Agency	Improve dissemination and learning through coordinated programs of awareness-raising and training courses; host of the data hub; secretariat of multistakeholder forum; regional offices	Could be initiated by Germany and the EU; should receive support from UN and international organizations

Initiatives	Short description	Actors
Multistakeholder forum for a sustainable resource management	Discuss and critical review: EITI, Dodd-Frank-Act, EU policy, investment agreements, bilateral raw material agreements, etc.; align activities with NRC, MMDA, UNEP IRP, WRF; specify UN Framework on Business and Human Rights for extractive industries; dissemination of best practices; developing conflict-risk radar	High-level representatives of G20, at least 10 resource-rich developing countries, industry, NGOs
European and international phosphorus policy	Site-specific optimized fertilization that provides for healthy feeding of world population; economic incentives (pollutant charges or phosphorus tax); legally binding of recovery (quota); market introduction program for phosphorus recovery plants	EU policymakers, producers, importers, users (agriculture), research
International metal covenant	Closing of industrial material loops; export of recycling technologies; establishment of recycling infrastructure; recovery of important resources, e.g., copper, PGMs, etc.	Key manufacturers and suppliers, recycling industry and relevant public authorities in major export and destination countries (including the EU)
Transformation of bilateral agreements toward sustainable resource management	Referring to common principles such as NRC, MMDA, OECD due diligence; sectoral investment agreements; collaboration for environmental technologies; international dialogs; capacity-building	Germany and other raw material importing countries and EU, exporting countries, UNDP, UNEP
Cutting subsidies / introducing resource taxes	Reducing environmentally harmful subsidies on fossil fuels, mining, agriculture, land use in EU member states; eliminate export subsidies; support Global Subsidies Initiative; broaden tax base toward natural resources (e.g., construction minerals, land use, water)	EU, national governments
Leveraging finance for sustainable resource management	Abolish unsustainable subsidies; levy on international aviation and shipping; transaction fee on international emissions trading	Global reporting initiatives (on subsidies), private sector, green investment banks
Rethinking international trade	Investment treaties on basis of IISD model contract; reformulation of trade policies relying on GATT/GATS	WTO members
New legal mechanisms at international level	International convention for sustainable resource management; align with national and international climate politics	International policymakers, business, developing countries, emerging economies

Source: Own compilation.

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ABBREVIATIONS

ASM	Artisanal and small-scale mining
BDI	Federation of German Industries (Bundesverband der Deutschen Industrie)
BGR	Federal Institute for Geosciences and Natural Resources (Bundesanstalt für Geowissenschaften und Rohstoffe)
BMWi	Federal Minister of Economics and Technology (Bundesministerium für Wirtschaft und Technologie)
BRIC	Brazil, Russia, India, China
CTC	Certified Trading Chains
ECI	European Copper Institute
EEA	European Environment Agency
EIA	Environmental Impact Assessment
EICC	Electronic Industry Citizenship Coalition
EITI	Extractive Industries Transparency Initiative
FAO	Food and Agriculture Organization of the United Nations
FSI	Failed State Index
GATT	General Agreement on Tariffs and Trade
HDI	Human Development Index
HIICR	Heidelberg Institute for International Conflict Research
ICMM	International Council on Mining & Metals
IEED	International Institute for Environment and Development
IFA	International Fertilizer Industry Association
IFC	International Finance Corporation
IIED	International Institute for Environment and Development
IISD	International Institute for Sustainable Development
ILO	International Labour Organisation
IRP	International Resource Panel (UNEP)
ISI	Fraunhofer Institute for Systems and Innovation Research (Fraunhofer-Institut für System- und Innovationsforschung)
ITUC	International Trade Union Confederation
JRC	Joint Research Center (European Commission)
MMDA	Model Mining Development Agreement for Sustainability
NRC	Natural Resource Charter
OECD	Organisation for Economic Co-operation and Development
PBL	Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving)
PGM	Platinum Group Metal

REE	Rare Earth Element
RWI	Rheinisch-Westfälisches Institut für Wirtschaftsforschung
SDSG	Sustainable Development Strategies Group
SIPRI	Stockholm International Peace Research Institute
UNCTAD	United Nations Conference on Trade and Development
UN DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WBCSD	World Business Council for Sustainable Development
WRF	World Resources Forum
WTO	World Trade Organization

ANNEX

Facts about critical minerals for a green economy

Table 4: Facts about critical minerals for green technologies

Minerals	Relevance for green technologies		Environmental dimension	
	Green applications	Estimated demand	Impacts	Recycling
Phosphorus	90% of global output for fertilizers	increase by 50-100% by 2050	global peak expected in 2030; resource depletion expected in 80-120 years; extraordinary dissipative usage; frequently combined with heavy metals; impacts on biodiversity; over-fertilization	historically: by application of animal manure and human excreta today: recapturing from sewage sludge in experimental phase
Coltan/ tantalum	micro capacitors, turbines in power generation, and aircraft construction	factor 1 (of tantalum)	artisanal and small-scale production causing erosion and water pollution; dissipative and dispersed usage; threat to gorilla population	limited due to dispersed usage, est. at 20-25% (US), 20% worldwide
Rare Earth Elements (REE)	automotive catalysts, fluorescent lamps, permanent magnets for hybrid cars and wind turbines	factor of 2.5 by 2020	wastewater, radioactive substances	no data
Platinum Group Metals (PGM)	car and industrial catalysts, fuel cells	factor of 1.5 by 2030	large amounts of mining waste; very energy- and water-intensive; sulfur dioxide at smelting	industry and glass industry works with almost closed loops (secondary input), est. 45% in D
Gallium	LEDs, diodes, solar cells, thin film PVs	factor of 2.6 by 2020 (1973: 16t; 2007: 103t)	byproduct of aluminum, dissipative usage; at processing acids and complexing agents, air pollution, arsenic dust	high capacities in e.g. Germany, USA, UK, Japan
Copper	electric and electronic future technologies; e.g., ICT, wind energy plants, geothermal energy, fuel cells, solar thermal systems	factor of 2.6 by 2030	declining ore grades => growing volumes of excavation material	100% recyclable; 15% worldwide, 55% in D

Source: Compilation on basis of Angerer et al. (2009); Bäuerle et al. (2011); Jaakkola et al. (2011); Lutz (2010); Mildner et al. (2011b);

	Economic dimension		Socio-political dimension	
Substitution	Concentration of production in 2010	Est. concentration of reserves in 2010	Import-dependence	Human aspects
technology lock-in in current industrial agriculture	China (37%), US (15%), Morocco (15%)	Morocco and Western Sahara (77%)	100% import-dependence	food security; unfair allocation of access to fertilizers and prices for the mineral
partly but difficult (with loss of efficiency) using niobite, aluminum, ceramics, glass, platinum, titanium, zirconium	according to official data, strong in Australia (48%), Brazil (16%), DRC (9%) (data for 2009); assumed strong illicit trade in DRC and Rwanda Top 3 producers: 63%	Brazil (62%), Australia (38%); Central Africa usually not included in data	100% import-dependence	conflict mineral, Dodd Frank Act, strongly inhuman mining conditions, ASM
depending on element	China (97%), India (2%) extremely high (>75% in one country) Top 3 producers: 99%	China (48%), CIS (17%) very large reserves and range (more than 200 years)	no production in EU; 100% import-dependence	mining conditions widely unknown
very difficult	South Africa (75%), Russia (13% of platinum production) Top 3 producers: almost 90%	South Africa (95%) extremely high concentration but very large reserves (more than 200 years)	100% import-dependence	working conditions; use-conflicts (large parts for jewelry)
organic-based LEDs; for about 40% of applications substitution is impossible	low	no data	no data	no data
partly by aluminum and glass fiber	Chile (34%), Peru (8%), US (7%) very large production quantities (> 1,000,000 tons/year) Top 3 producers: 28%	Chile (24%), Peru (14%), Australia (13%)	low – due to very large reserves	working conditions, use-conflicts due to large groundwater input needed for mining

USGS (2011); Wäger et al. (2010)

Selected relevant governance approaches

Table 5: Selected relevant governance approaches

Initiative	Description	Actors involved
Analytical Fingerprint (AFP) Certified Trading Chains (CTC)	voluntary system of self-commitment by partners in the trading chain, verification of origin and trade volume analysis, independent audits, on-the-ground assessments of mining conditions	BGR (German Bundesanstalt für Geowissenschaften) / GIZ and the local mining authorities (DRC, Rwanda)
Dodd-Frank Act	legal obligation for US companies reporting to SEC to declare use of "conflict minerals" (tin, gold, tungsten, tantalum)	SEC (Security and Exchange Commission), SEC reporting companies
EITI (Extractive Industries Transparency Initiative) Further initiatives: Publish What you Pay Revenue Watch Institute	set of principles and procedures aimed at strengthening accountable and transparent governance in resource-rich countries through the verification and full publication of company payments and government revenues from oil, gas, and mining	governments, companies, civil society, industry associations, institutional investors, countries; World Bank 11 compliant countries (incl. Norway) 22 candidate countries (incl. Congo) 17 supporting countries (incl. Germany)
Global e-Sustainability Initiative / Electronic Industry Citizenship Coalition (GeSI / EICC) (2005)	initiative of electronics industry	electronics industry
Global Reporting Initiative (GRI)	network-based organization that produces a comprehensive sustainability reporting framework and performance indicators Supply Chain Disclosure Revision Workstream mining and metals sector supplement	stakeholders, corporate organizations
International Council on Mining and Metals (ICMM) Work program on material stewardship	industry association to address the core sustainable development challenges faced by the mining metals industry "ICMM Principles," widely regarded as a consensus statement of expectations for the social, economic, and environmental performance of mining companies "ICMM Toolkits," widely recognized as best practice guidance	21 leading mining and metal companies, 31 national and regional mining associations and global commodity associations

Part of supply chain	Strengths	Weaknesses
mining and trade (focus on companies' concessions)	synergies with other capacity building programs fingerprinting process	complex and costly implementation capacity-building needed multiple stakeholders involved can hamper the process
SEC reporting companies	link to due diligence guidelines and iTSCi impact in the US and its listed companies increases knowledge of supply chains military groups run out of money standard will spread worldwide	compliance issues questionable impact on Congolese people international repercussions yet unknown excludes artisanal mining from supply chain
governments, investors, mining industry, local companies/trading agents, processing companies	monitors cash flows principles for compliance establishes dialogs with actors synergies with capacity-building programs supports transparency in the value chain (certification) platform for mining industries puts transparency on international agenda standard for investors' decisions complementary to Frank-Dodd Act	compliance relatively weak no BRIC countries involved yet (enforcement rather unlikely) "speed of the slowest" aggregated figures allowed
smelters	proactive approach - possible interaction with capacity-building programs and other initiatives	mining operations yet unaddressed; complexity of ITC supply chain makes real progress difficult; probably no enforcement
minerals industry	increases transparency, develops guidelines for monitoring and disclosure	voluntary
mining, extraction, smelters	all company members have committed to implementing the ICMM Sustainable Development Framework and a number of supporting position statements	limited number of members; certainly no regulatory competencies; risk of weak symbolic actions

Initiative	Description	Actors involved
IFC – Performance Standards on Environmental and Social Sustainability Equator-Principles	eight performance standards establish standards that the client is to meet throughout the life of an investment of IFC	projects supported by IFC and MIGA, arms of the World Bank Group; 75 adopting financial institutions
ITSCi membership	Initiative of the tin smelting industry	smelting industry; DRC, Rwanda
Kimberley Process Certification Scheme	joint governments, industry, and civil society initiative on diamonds; certification scheme	governments, industry, civil society, regional economic integration organizations 49 members representing 75 countries (incl. EU and BRIC)
Model Mine Development Agreements (MMDA)	model clause for mining agreements	mining companies, mining investors, countries, civil society, national governments
OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas	model supply chain policy for a responsible global supply chain management of minerals from conflict-affected and high-risk areas	companies, non-governmental organizations, processing facilities, regional governments 82 companies take part in the pilot (Great Lakes region Africa for tin, gold, tungsten, tantalum)
OECD Guidelines for Multinational Enterprises	recommendations addressed by governments to multinational enterprises operating in or from adhering countries updated in 2011 to incorporate human rights into corporate duties consistent to UN Framework (see below)	OECD, governments, multinational enterprises 42 OECD and non-OECD countries
UN Framework on Business and Human Rights (Ruggie Process and follow-up mechanisms)	“Business and Human Rights,” six-year process came to its conclusion at the June 2011 UN Human Rights Council	UN, NGOs, UN council working group
UN-EU Partnership on Natural Resources and Conflict Prevention	aims at ensuring inclusion of conflict prevention and sensitivity in Natural Resource Management programs; framework of technical assistance useful to EU and UN agencies to plan and design intervention strategies where extractive industries are driving factors of conflicts	EU and UN

Part of supply chain	Strengths	Weaknesses
business activities with environmental and/or social risks and/or other impacts		
suppliers and exporters of minerals (in particular ASM)	proactive approach - possible interaction with capacity-building programs and other initiatives	mining operations yet unaddressed; commercial visibility may bias real results; need to publish data for awareness-raising; probably no enforcement
suppliers and exporters of diamonds	establishes a well-acknowledged certification scheme for diamonds (49 countries accounting for approx. 99.8% of trade with rough diamonds)	voluntary insufficient control mechanisms – no third-party monitoring no standards of production, only proof of origin further areas of application difficult because diamonds have unique features consensus bind decision-making
mining	flexible	does not cover exploration does not cover local level agreements
up / down-stream operators	gives guidelines for companies and OECD member states	voluntary practical consequences yet unknown burdensome requirements might push companies from OECD countries out of the sector application outside the OECD not in scope
up / down-stream operators	multilaterally agreed supported by implementation mechanism of National Contact Points (NCPs)	no enforcement mechanism, voluntary
	guiding principles annual forum on business and human rights	no strong implementation power
governments, extractive industries	impact still pending	contribution of other key parties is needed in order to achieve a peaceful outcome in a coordinated and constructive manner

Initiative	Description	Actors involved
Voluntary Principles for Security and Human Rights	framework to help provide security to the facilities while respecting human rights and fundamental freedoms; unveiled in 2000 by the US State Department and the Foreign and Commonwealth Office of the United Kingdom	four participating and three engaged governments, 17 corporations, eight non-governmental organizations, three observers
Washington Convention (CITES); Convention on International Trade in Endangered Species of Wild Fauna and Flora	voluntary agreement of states regulating trade with some natural resources (e.g., ivory)	governments, 175 parties

Source: Own compilation

Part of supply chain	Strengths	Weaknesses
governments, companies in the extractive and energy sector, non-governmental organizations	guidance to companies operating in zones of conflict or fragile states	voluntary
exporting / importing countries	may entail interesting legal mechanism for commodities (conflict minerals)	enforcement weak, gives incentives for illicit trade

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Natural resources are back on the agenda. After the rise of new economic powers such as China, India, and Brazil, global competition has perceptibly increased strategic concerns as regards high commodity prices and possible supply shortages. Germany, the United States, and many others have formulated raw material strategies that put concern over access and supply at center stage – but the environmental and the socio-political dimensions are widely neglected in these strategies.

This paper underlines a new dimension of international relations and pleads for new approaches, called international resource politics, which can be used for ongoing debates concerning a green economy and transition strategies.

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