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SUSTAINABILITY: CHALLENGES AND TRENDS

THE HAGUE CENTRE FOR STRATEGIC STUDIES AND TNO



SUSTAINABILITY CHALLENGES AND TRENDS
THE HAGUE CENTRE FOR STRATEGIC STUDIES (HCSS) AND TNO

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The TNO and *The Hague* Centre for Strategic Studies (HCSS) programme Strategy & Change analyzes global trends in a dynamic world affecting the foundations of our security, welfare and well-being.

The programme attempts to answer the critical question: what are the policies and strategies that must be developed to effectively anticipate on these emerging challenges?

Strategy & Change provides both a better understanding and feeds the agenda for a sustainable future of our society.

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LIST OF ABBREVIATIONS

BRIC	Brazil, Russia, India, China
CSR	Corporate Social Responsibility
EU	European Union
ICT	Information and Communication Technologies
IEA	International Energy Agency
IEEP	Institute for European Environmental Policy
NGO	Non-Governmental Organization
UN	United Nations
OECD	Organization for Economic Co-operation and Development

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INTRODUCTION

Our drive for wealth and well-being has fuelled rapid economic growth and unprecedented demand for resources that exceed the Earth's carrying capacity. In the coming decades, increases in population, income and health will put additional pressures on our planet's biosphere. To meet the needs of future generations, we need to adapt our ways of living and definitions of economic development. Sustainability is about reconciling economic objectives with environmental concerns. A transition to a more sustainable world is imperative if we want to stop depleting the Earth's resources more quickly than it can regenerate them.

This paper is part of a series of Strategy & Change Synthesis Papers and focuses on the thematic area sustainability. Its purpose is three fold. First, it gives an overview of emerging issues within the sustainability field that have increasing relevance for the policy debate (signaling function). The emerging issues are identified based on previous HCSS and Strategy and Change publications, ongoing research and discussions within Strategy & Change and important publications in the field, both from academics and international organizations. Second, this Synthesis Paper provides input for new Strategy & Change project proposals for 2012 (agenda setting function). Third, the Synthesis Paper reviews developments that may contribute to the solutions to the identified problems (valorizing function). While focusing on the thematic sustainability, this paper touches upon issues that are related to other thematic areas of Strategy & Change, including Security, Economy & Society and Technology& Innovation.

Synthesizing current sustainability challenges and detecting emerging issues, this paper proceeds in four parts. Chapter 1 elaborates on the definition of sustainability and provides a contextual analysis of sustainability in a multipolar world. Chapter 2 analyzes the systemic trends that are affecting sustainability. It explains how demographic shifts,

economic growth, changing lifestyles, new technologies and geopolitical developments drive sustainability issues. Chapter 3 gives an overview of the most pressing sustainability challenges that the world is facing today. It discusses how the growing demand for energy contributes to the depletion of fossil fuels and climate change; how the growing demand for raw materials contributes to resource scarcity; and how current developments put increased pressure on the Earth's biosphere and contribute to ecological degradation. Finally, Chapter 4 examines trends, such as the transformation of our normative framework, economic system and governance, that may indicate we are moving towards a more sustainable future.

1 SUSTAINABILITY: DEFINITION AND BACKGROUND

1.1 DEFINING SUSTAINABILITY

Sustainability entered the sphere of international and national policy making with the publication of the report *Our Common Future* from the United Nations (UN) World Commission on Environment and Development in 1987.¹ This Commission - also named the Brundtland Commission after its chair Gro Harlem Brundtland - was established to address the growing need for sustainable economic and social development in the context of the accelerating deterioration of the human environment and natural resources. The report provided a discussion of the world's environmental and economic conditions and the strains that poverty, economic inequality, economic development and population growth put on the environment and well-being of future generations.

This Strategy & Change Synthesis paper subscribes to the Brundtland Commission's vision on sustainability. Present generations live beyond the world's ecological means and are putting the Earth's limited carrying capacity under pressure. The Earth's biosphere has only a limited capacity to absorb human activity and therefore, "a process of change [is required] in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs."² The Brundtland Commission defines sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs".³ This definition is the most commonly used definition by

1 Sanford Gaines, "Sustainable Development and National Security," *Environmental Law & Policy Review* 40, no.2 (2006):339.

2 World Commission on Environment and Development, *Our Common Future*, 1987, 9.

3 World Commission on Environment and Development, *Our Common Future*, 1987, 8.

governments, international institutions, think-tanks, academics and non-governmental organizations (NGOs).⁴

Central to mainstream thinking about sustainability are the three dimensions of sustainable development: the environmental, social and economic dimension. At the 2005 World Summit, the international community agreed that these three dimensions need to be balanced.⁵

The concept of equity also plays an important role in definitions of sustainability. First, international equity between industrial and developing countries; the Brundtland Commission considered poverty and inequality as a the crux of the world's environmental and development problems. Second, intergenerational equity which requires understanding that the future is important enough to give up something today. Economic theory and the concept of discount rates posits that the future is increasingly discounted when present needs become more important.⁶ Third, intragenerational equity which implies that also present generations have access to resources and development opportunities. The Brundtland Commission noted that the concept of intergenerational equity "must logically be extended to equity within each generation."⁷

In the private sector, many companies have integrated international sustainability norms into their business models under the influence of the corporate social responsibility (CSR) movement. John Elkington, a leading thinker from the corporate responsibility movement, developed a vision on sustainability which encourages companies to generate profit from business cases that contribute positively to people and the environment. Elkington coined the term People, Planet, Profit in the early 1990s and introduced it in his seminal book *Cannibals with Forks: The Triple Bottom*

4 Aurélie Basha i Novosejt and others, *Sustainability in a Multipolar World*, HCSS and TNO, 2010, 15.

5 United Nations General Assembly, "2005 World Summit Outcome", Sep. 15, 2005, <http://www.unep.org/greenroom/documents/outcome.pdf>

6 Aurélie Basha i Novosejt and others, *Sustainability in a Multipolar World*, HCSS and TNO, 2010, 15.

7 World Commission on Environment and Development, "Our Common Future", 1987, 43.

Line of 21st Century, which asks whether capitalism is sustainable.⁸ The triple bottom line, or the three 3Ps, are still a guiding principle for sustainable development in the private sector today.

1.2 CONTEXTUAL BACKGROUND

The Brundtland Commission noted that due to the interconnectedness of economic and environmental challenges and the interdependence among states, achieving economic growth that is equitable and environmentally sustainable requires a global approach, informed public participation and political will. Together with the Club of Rome, the Commission played a key role in bringing about this political will and they initiated an international momentum for sustainable development.⁹ This resulted in the codification of sustainability in various international frameworks and multilateral agreements, such as Agenda 21 and the Rio Declaration on Environment and Development.

The momentum, however, gradually waned under the influence of changes in the international system, including the power shift to the East. This transition to a multipolar world, in which states tend to focus more on their narrow national interest rather than common good issues, made international cooperation on sustainability issues increasingly difficult. The failure of the 2009 UN Climate Change Conference in Copenhagen highlighted that states have different national interests based on their level of economic development, cultural and philosophical traditions. Research shows that this results in different national definitions of sustainability and a different prioritization of the economic, environmental and social-political dimensions of sustainability.¹⁰ The rhetoric at the Copenhagen Summit revealed that although sharing one planet, the developed and developing

8 John Elkington's internet page, accessed September 5, 2011, <http://www.johnelkington.com/pubs-books-business.htm>

9 Aurélie Basha i Novosejt and others, *Sustainability in a Multipolar World*, HCSS and TNO, 2010, 9.

10 Aurélie Basha i Novosejt and others, *Sustainability in a Multipolar World*, HCSS and TNO, 2010, 23-27.

world live in their own realities.¹¹ Speeches of representatives of the global North and South demonstrated different views on the urgency of climate change, on which nations are responsible for causing climate change and what the proper course of action is to deal with this challenge.

Despite this divergence, a multipolar world does not exclude international cooperation and joint sustainability strategies. International alignment of interest is most likely with regards to certain key issues, such as climate change and energy security, which are driven by systemic trends that affect us all. In what follows, this paper will analyze these trends and the resulting sustainability challenges, after which it will discuss emerging sustainability strategies.

11 Teea Kortetmäki, "Copenhagen Failure and North-South Dynamics", presentation at the conference on Trends and Future of Sustainable Development, Tampere, June 9-10, 2011.

2 SYSTEMIC TRENDS AFFECTING SUSTAINABILITY

Sustainability is about reconciling the objective of economic development with the objective of reducing the negative impact of human activities on the biosphere. The impact of human activities is determined both by our numbers and the way we use nature's resources, and can be represented by the following formula: I (impact) = P (population) \times C (consumption) \times E (efficiency). This formula captures important drivers and trends that affect sustainability and will be discussed in the following section. They include demographic trends, economic development and changing life styles, new technologies, and geopolitical developments.

2.1 DEMOGRAPHIC SHIFTS

In the coming decades, the size and composition of the world population will continue to change. Several demographic trends have important implications for sustainability. First, the world population will grow due to declining mortality rates in combination with a stable global fertility rate. According to the UN Population Fund, the world population will surpass 9 billion people by 2050 and hit 10,1 billion by 2100.¹² Population growth will be unevenly distributed around the planet. While declining or low fertility rates will stagnate or even reverse population growth in some regions, including Europe, Japan and Russia, population growth will be booming in Sub-Sahara Africa, the Middle East and South Asia. The majority of growth will take place in developing countries, with a high proportion in cities.¹³

12 UN Population Fund, "Population Trends", accessed Sep. 2, 2011, <http://www.unfpa.org/pds/trends.htm>

13 United Nations, Division for Sustainable Development - Department of Economic and Social Affairs. "Trends in Sustainable Development: Towards Sustainable Consumption and Production", New York, 2010, 11, http://www.un.org/esa/dsd/resources/res_pdfs/publications/trends/trends_sustainable_consumption_production/Trends_in_sustainable_consumption_and_production.pdf

Second, age structures are changing worldwide and the global median age is rising. Due to improved sanitation, healthcare and healthier and wealthier lifestyles, life expectancy is climbing in both the developed and developing world.¹⁴

Third, urbanization is expected to continue and the number of mega-cities with more than 10 million inhabitants will increase.¹⁵ Urban development will reduce the availability of uncultivated land and increase the development of infrastructure for sanitation, water, transport and other public services with the potential of contributing to environmental degradation and pollution.

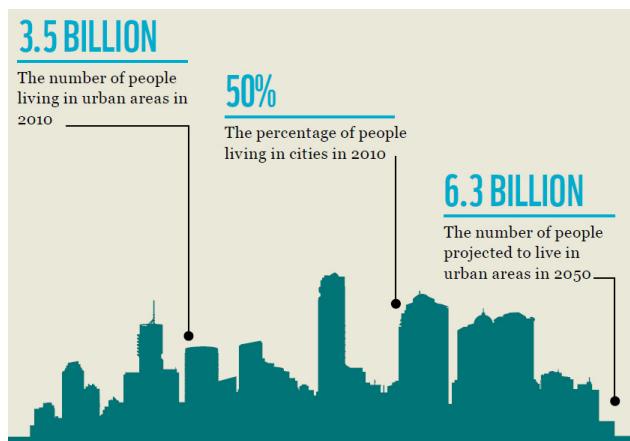


FIGURE 1. IN THE FUTURE MORE PEOPLE WILL LIVE IN CITIES. SOURCE: WNF, LIVING PLANET REPORT, 2010

Cities currently account for approximately 80% of global CO₂ emissions. Urbanization also brings about sustainability challenges related to the lack of sanitation and freshwater in urban areas. According to a report by the OECD in 2030 more than 5 billion people will lack connection to public

14 Stephan de Spiegeleire and others, *Strong in the 21st Century*, HCSS, 2010, 18-21.

15 Population Reference Bureau, "Human Population: Urbanization", accessed September 2, 2011, <http://www.prb.org/Educators/TeachersGuides/HumanPopulation/Urbanization.aspx>

sewerage.¹⁶ The World Bank also expects that freshwater in rural and urban areas will become scarcer.¹⁷

Finally, forced and voluntary migration will increase due to various economic and environmental push and pull factors. As most migration will be towards urban areas where opportunities for employment are better, migration is likely to augment sustainability problems related to urbanization. In addition, migration may contribute to environmental degradation and environmentally induced conflict when migrants have to compete over natural resources with the host-country's population.¹⁸

Combined, these demographic trends are putting increased pressure on the Earth's natural resources and ecosystems. The more people live on our planet and the longer they live, the more need for water, food, land, energy and other resources, and the more emissions from power generation, transport, industry and homes that may contribute to climate change.¹⁹ At the same time, the World Bank points out that through population growth wealth gets diluted, which may result in negative changes in wealth per capita and therefore poses a challenge for sustainable development.²⁰

2.2 ECONOMIC DEVELOPMENT AND CHANGING LIFE STYLES

Economic development and changing life styles are other important drivers of sustainability issues, as they contribute to growing pressure on the Earth's bio-capacity. Historically, economic growth has correlated strongly with environmental degradation. A study by the WWF has shown that already since approximately twenty years, consumption patterns are exceeding the Earth's carrying capacity.²¹ The Global Footprint Network has estimated that in 2007, humanity used natural resources twice as fast

16 OECD, 2008.

17 The World Bank Group 2010, 12.

18 Islam Qasem, Teun van Dongen and Marjolein de Ridder, "Environmental Migration: Security Implication of Climate Change," World Foresight Forum, 2011.

19 UK Government Office for Science, "The Taboo Solution: Can Population Management Be a Solution to Climate Change?", accessed August 2, 2011, <http://www.sigmascan.org/Live/Issue/ViewIssue.aspx?Issuelid=406&SearchMode=1#Sources>

20 The World Bank Group 2010, 10.

21 World Wild Fund for Nature, Living Planet Report, 2006.

as nature could regenerate. More than 80% of the world population lives in countries that are using more natural resources than are available within their national borders.²²

The consumption of natural resources is not evenly distributed around the world. Only 25% of the world's population is responsible for 70% of the general use of fossil fuels and 85% of chemical products. The use of water resources is similarly distributed.²³ High income countries account for the greatest per capita share of global consumption. According to the UN Division for Sustainable Development, the 15% of the world's population that lives in developed countries has an average per capita income above \$40,000 while the 80% in developing countries has an income of less than \$2,000 per capita.²⁴ Countries with cultures of consumerism, like the US and Canada, consume ecosystem services at far higher rates than the Earth's regenerative capabilities. The UN Development Index associates increased development and GDP with negative environmental impact.²⁵

22 Global Footprint Network, "Climate Change is Not The Problem", Annual Report, 2010.

23 IFAD, "Combating Environmental Degradation", Conference on hunger and Poverty, accessed August 5, 2011, <http://www.ifad.org/events/past/hunger/envir.html>

24 United Nations, Division for Sustainable Development - Department of Economic and Social Affairs, "Trends in Sustainable Development: Towards Sustainable Consumption and Production, New York, 2010, iii.

25 The World Business Council for Sustainable Development, "Sustainable Consumption Facts and Trends", 2008, 13.

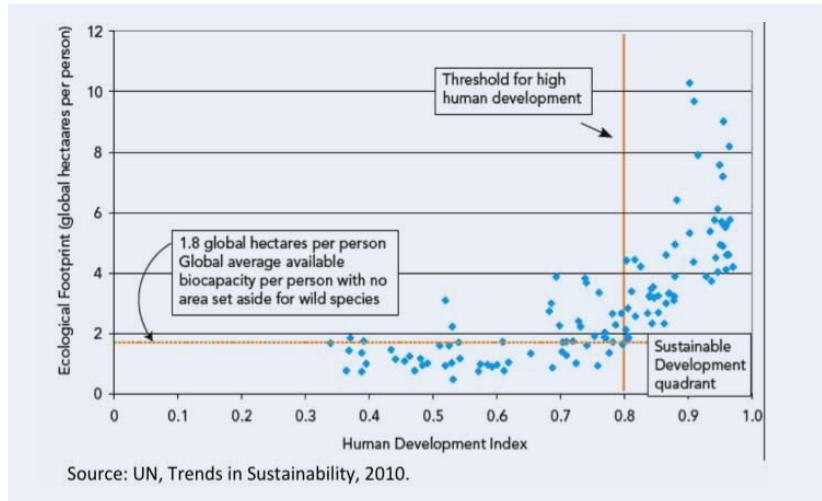


FIGURE 2. HUMAN DEVELOPMENT INDEX AND ECOLOGICAL FOOTPRINT

For a long time, high levels of natural resource consumption and the concurrent stresses on the Earth's biosphere were primarily associated with the consumption and production patterns and lifestyles in the developed world. Today, however, the accelerated growth of non-Western economies has become an additional sustainability concern. Particularly the economic transition of the so-called BRIC countries (Brazil, Russia, India and China) have contributed to a growing strain on natural resources, such as energy, water, metals and minerals. The total energy use, for example increased by 40% in developing countries between 1990-2006 while in high-income OECD countries it increased only by 20%.²⁶

With economic growth, prosperity levels in emerging economies and the developing world are rising and changing lifestyles and consumption patterns. In addition, economic growth has been coupled with population growth, creating more users of resources.²⁷

26 United Nations. Division for Sustainable Development - Department of Economic and Social Affairs, "Trends in Sustainable Development: Towards Sustainable Consumption and Production", New York, 2010, 1.

27 Klaus Hubacek, Dabo Guan and Anamika Barua, "Changing lifestyles and consumption patterns in developing countries: A scenario analysis for China and India", *Futures*, Vol. 39 (9), 1084 - 1096, 2007, 2.

The rapidly growing middle classes of countries like China, whose middle class is expected to increase by four times between 2004-2025, are contributing to an increased demand for luxury consumer goods and better food. Globally, the middle class is expected to triple by 2030. If this materializes, almost 80% of the world population will be part of the middle-income class, which will result in higher demand for goods and services, such as water and energy use, car ownership, travel and food.²⁸ It is estimated that some 3 billion people in the developing world are moving up the food chain, wanting to eat more meat, eggs and dairy products.²⁹ The production of this type of products is resource intensive. Food and drink have the highest ecological impact per dollar spent, followed by household equipment and transport.³⁰

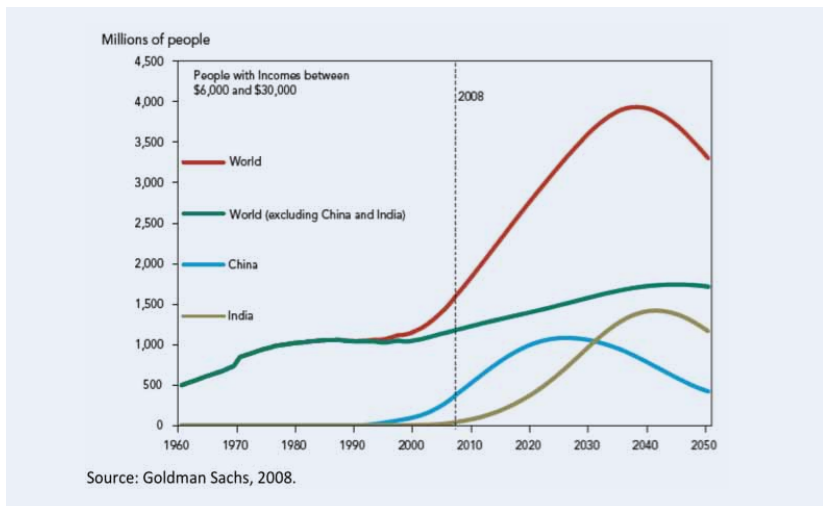


FIGURE 3. PROJECTED POPULATION THAT ENTERS THE MIDDLE CLASSES

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- 28 World Business Council for Sustainable Development, "Sustainable Consumption: Facts and Trends", 2008, 8, http://www.wbcsd.org/DocRoot/19Xwhv7X5V8cDIHbHC3G/WBCSD_Sustainable_Consumption_web.pdf
 - 29 Lester R. Brown, "The New Geopolitics of Food," Foreign Policy, May/June, 2011, accessed June 28, 2011, http://www.foreignpolicy.com/articles/2011/04/25/the_new_geopolitics_of_food?page=full
 - 30 WWF, One Planet Business: Creating Value Within Planetary Limits, 2007, http://assets.wwf.org.uk/downloads/one_planet_business_first_report.pdf

From a development perspective, it is legitimate to seek economic growth, to eradicate poverty and famine, and to improve access to modern consumer goods. From an environmental perspective, however, it poses a real problem. The WWF has estimated that it would require five planets if everyone were to adopt the consumption patterns of the average North American.³¹ The real challenge is to bridge the economic development gap between the developed and developing world without exceeding the Earth's carrying capacity. In other words, "[l]iving standards of the poor must rise even as humankind's ecological footprint shrinks."³²

2.3 TECHNOLOGICAL PROGRESS

Technology plays an essential role in determining everyday life and patterns of both production and consumption in societies around the world. Technological developments coupled with economic growth have been driving sustainability issues in both a positive and negative way.

On the one hand, the spread of technology throughout society has increased the demand for resources and contributed to environmental damage, resource depletion and high levels of pollutions. Recently, high-tech systems and devices like smart-phones and LCD-TVs have contributed to the growing demand for specific minerals and metals, such as rare earth elements. The extraction of these materials may have a negative environmental impact if done in an unsustainable matter. Most of the global supply of rare earth comes from China, where the extraction and processing is a polluting and health endangering business. The environmental problems associated with rare earth production in China include the air emission of harmful elements such as fluorine and sulfur, the release of radioactive material and wastewater containing excessive acid.³³

31 WWF, Living Planet Report, 2006.

32 United Nations, Division for Sustainable Development - Department of Economic and Social Affairs, "Trends in Sustainable Development: Towards Sustainable Consumption and Production", New York, 2010, 1. http://www.un.org/esa/dsd/resources/res_pdfs/publications/trends/trends_sustainable_consumption_production/Trends_in_sustainable_consumption_and_production.pdf

33 Lindsey Hilsum, "Are Rare Earth Minerals Too Costly for Environment", Independent Television News, Transcript (Video report, Air date Dec. 14, 2009), accessed Sep. 2011, http://www.pbs.org/newshour/bb/asia/july-dec09/china_12-14.html

On the other hand, technology is also an important driver of solutions to sustainability challenges. Technology can help countries to deliver improved levels of economic development and well-being while reducing their ecological footprints.

The spread of Information and Communication Technologies (ICT) is probably the most important technological advance in the past years. This development perfectly illustrates that technology is a two-edged sword when it comes to sustainability. On the one hand, ICT proliferation has generated new material flows for the production of equipment and increased energy demand for both the production and use of ICT equipment. On the other hand, it has enabled resource efficiency and waste reduction. The Climate Group estimates that ICT applications' ability to mitigate the carbon emissions is five times larger than the carbon footprint of the ICT sector.³⁴

Technology is an enabling component of the "green economy", a new economic paradigm in which "material wealth is not delivered perforce at the expense of growing environmental risks, ecological scarcities and social disparities."³⁵ In the green economy, technological innovation plays an essential role in increasing resource efficiency and minimizing the negative environmental impact of consumption and production processes across a range of important economic sectors, such as agriculture, forestry, fisheries and energy.

In the energy field, for example, technology is considered an essential part of both the solution to climate change and energy poverty. Renewable energy technologies, such as wind and solar power, have the potential to significantly contribute to reducing greenhouse gas emissions, which are responsible for global warming and caused by the widespread use of fossil

34 Climate Group, "SMART 2020: Enabling the low carbon economy in the information age", London, 2008, 15. http://www.smart2020.org/_assets/files/02_Smart2020Report.pdf

35 United Nations Environmental Program (UNEP), *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers*, 2011, 1. http://www.unep.org/greeneconomy/Portals/88/documents/ger/GER_synthesis_en.pdf

fuels in the current “brown” economy. Innovation in climate change mitigation has led to increased patents for renewable energy and energy efficiency in buildings and lightning.³⁶ Nanotechnology is expected to make a significant contribution to energy saving technologies.

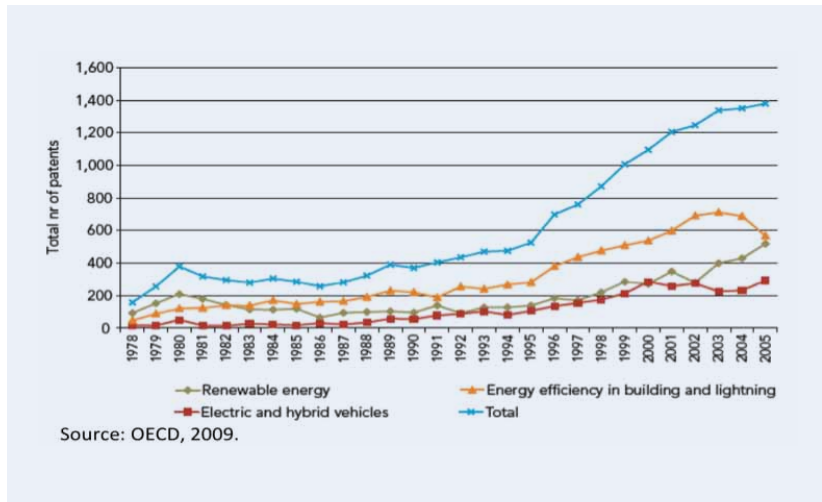


FIGURE 4. CLIMATE CHANGE MITIGATION PATENT (WORLD, TOTAL)

For the 1,6 billion people in the developing world that currently lack electricity, technology offers the opportunities to reduce the costs and health hazards associated with the use of kerosene, coal and traditional biomass, such as wood, for cooking and lighting.³⁷

Technological innovation has been key to the progress of the past years with regards to eco-efficiency. The World Business Council for Sustainable Development defines eco-efficiency as the delivery of “competitively

36 United Nations, Division for Sustainable Development – Department of Economic and Social Affairs, “Trends in Sustainable Development: Towards Sustainable Consumption and Production”, New York, 2010, 31.

37 UNEP, Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication – A Synthesis for Policy Makers, 2011, 11-12. http://www.unep.org/greeneconomy/Portals/88/documents/ger/GER_synthesis_en.pdf

priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle to a level at least in line with the Earth's estimated carrying capacity."³⁸ Companies are increasingly innovating products and design to reduce the ecological impact of products and services.

The transition to an economy based on green technologies has the potential to generate new employment opportunities and to alleviate poverty, famine and environmental degradation in developing countries. Transfers of environmentally sound technologies from the global North to the global South can play an important role in the elimination of inequitable development and in reconciling economic, social and environmental objectives.

2.4 GEOPOLITICAL ISSUES

At the heart of the debate about sustainability, is the problem of inequality. Countries are not equally endowed with natural resources nor are they completely self-sufficient. In addition, demand and supply vary across regions. Some resources are concentrated only in a few places and the amounts that are available differ per country. This makes resources politically volatile commodities.³⁹

When resources become scarce, this unequal distribution can become a source for international cooperation or conflict. While resource scarcity has led to tension and conflict throughout human history, globalization and the growing economic interdependence have also increased the need for international cooperation. Due to population growth and economic development, the mismatch between global demand and supply, however, will continue to grow in the coming decades. Over the past years, the world has seen an increase of economic competition and the return of nationalist and protectionist approaches to deal with the prospects of scarcity. This development has gone hand in hand with an increased focus on narrow national interests and the declining influence of international organizations, such as the United Nations.

38 The World Business Council for Sustainable Development, "Sustainable Consumption Facts and Trends", 2008, 24.

39 Islam Qasem, Resource Scarcity in the 21st Century: Conflict or Cooperation?, HCSS, 2010, 26.

The role of governments has increased in many areas that were previously thought of as exclusively regulated by the market. In the resources domain, governments have moved away from a regulatory role to a more pro-active role in the collection of economic rent through taxation and ownership. In an international system that is witnessing the return of government interference, there will be winners and losers.

Developing countries are more vulnerable and more reliant on natural resources. Rising prices triggered by scarcity will be felt most severely by people already living in deprivation. The rising oil prices, for example, pose a real threat to households in the developing world where fossil fuel is the main energy source. Many of the environmental problems in developing countries are related to limited access to modern energy sources and the negative environmental impact of fossil fuels and deforestation. However, implementing measures aimed at increasing energy efficiency are not always considered a priority due to cost issues.⁴⁰

Transitions towards low-carbon dioxide technologies are costly, complicated and require long-term planning.⁴¹ In the short-term, economic sustainability is determined by local conditions, such as economic factors and resource reserves.⁴² In the medium and long term, good governance and the capacity of governments to motivate and manage reforms within the local context is decisive. If governments wish to attract investments that can advance environmental goals, they need to act in a predictable manner, having stable policies.⁴³ Many resource endowed countries in the

40 George Matheson and Laurie Giroux, "Capacity Development for Environmental Management and Governance in the Energy Sector in developing Countries", OECD Environmental Working Papers, no. 25, OECD, 2010, 22.

41 Jacque de Jong, "The Scarcity Issue: energy, raw materials, and the EU", Clingendael International Energy Programme (CIEP), (Essay for the Conference: Enriching the Planet, Empowering Europe - Optimising the use of natural resources for a more sustainable economy, The Hague, 26-27 April, 2010, 4. <http://www.clingendael.nl/resource scarcity>

42 Aurelie Basha i Novosejt and others, Sustainability in a Multipolar World, HCSS and TNO, 2010, 77.

43 Nick Johnstone, et al., "Environmental Policy Design Characteristics and Technological Innovation", OECD Environmental Working Papers, no. 16, OECD, 2010, 23.

developing world, however, are dealing with unstable regime and repeatedly changing policies, which are a setback for investors.

The lack of financial means, technical knowledge and adequate enforcement to ensure environmental protection is a real obstacle to the advancement of sustainability objectives in the developing world.⁴⁴ Globalization is also contributing to the outsourcing of resource- and energy-intensive and therefore polluting industries to developing countries, where production costs are lower.⁴⁵

As a consequence, the transition to the green economy is taking place at a different pace around the world. Without proper transfer of knowledge, human and physical capital, the divide between the level of sustainable development in the developing world and the developed world will grow ever larger.

Hence, it is in the developing world that tensions and conflict are most likely to occur as a consequence of resource scarcity. In turn, tension and conflict can generate further environmental degradation and unsustainable management of resources. Observers, among who Jeffrey Sachs, argue that the coming decades will see the emergence of the 'geopolitics of sustainable development.'⁴⁶

44 George Matheson and Laurie Giroux, "Capacity Development for Environmental Management and Governance in the Energy Sector in developing Countries", OECD Environmental Working Papers, no. 25, OECD, 2010, 22.

45 United Nations, Division for Sustainable Development – Department of Economic and Social Affairs, "Trends in Sustainable Development: Towards Sustainable Consumption and Production", New York, 2010, 12.

46 Jeffrey Sachs, "The New Geopolitics", Scientific American Inc. June 2006, p 30, <http://www.atmosedu.com/ENVS109/articles/NewGeoPolitics.pdf>

3 PRESSING SUSTAINABILITY CHALLENGES

The description of the systemic trends and drivers above, shows that that the issues already described in the report of the Brundtland Commission in 1978 are still relevant today. In the coming decades, the world will be dealing with three pressing challenges – a growing demand for energy, a growing demand for raw materials, and growing stress on the biosphere – and their associated consequences.

3.1 GROWING DEMAND FOR ENERGY: FOSSIL FUEL DEPLETION AND CLIMATE CHANGE

Ongoing economic development and population growth will continue to raise the global demand for energy. In the projections of the International Energy Outlook of 2010 of the US Department of Energy, the total world consumption of energy increases with 49% between 2007 and 2035.⁴⁷ The rise in demand will be highest in non-OECD countries, accounting for up to 93% of the expected increase in world energy demand. Emerging economies will shape the global energy landscape, and China and India will be the largest contributors to the global increase in demand.⁴⁸ The key variables that drive this demand are prospects of economic growth, changes in the economic structure, developments in energy and environmental policies and the rate of urbanization.⁴⁹

Fossil fuels will remain the most dominant sources of energy in the coming decades, particularly oil, which will account for approximately 28% of the energy mix, although demand will gradually decline due to high prices and environmental policies. The growth in demand for natural gas by contrast

⁴⁷ US Energy Administration Information, "International Energy Outlook 2010," US Department of Energy, 2010, 11.

⁴⁸ International Energy Agency (IEA), "World Energy Outlook 2010", 2010, 5.

⁴⁹ IEA, "World Energy Outlook 2010", 2010, 6.

will be higher due to its more favorable environmental attributes.⁵⁰ The dominance of fossil fuels in the energy mix has been made possible by the availability of cheap oil in the past decades. The world is, however, in a transition to an economic system that is less dependent on fossil fuels which are for many reasons unattractive sources of energy.

First, due to the high costs and technological requirements for exploring new reserves, production cannot be increased fast enough to meet the growing demand. Even higher prices lead only to modest increases in production.⁵¹ Global oil supply will increasingly come from unconventional sources, such as Canadian oil sand, Venezuelan extra heavy oil and oil shales, but they require large upfront capital investments. The environmental costs of unconventional oil are also high; typically emissions are between 5-15% higher than for conventional oil.⁵² Second, oil and gas are finite resources and economically profitable reserves risk to be depleted. There are many uncertainties surrounding the long-term production prospects of conventional and unconventional oil reserves. The International Energy Agency (IEA) subscribes to the view that global oil production will peak one day close, but that this is unlikely to happen before 2035. Third, the price of fossil fuels is likely to rise steadily. The IEA projects that the price of crude oil will reach \$113 per barrel (in year-2009 dollars) in 2035 and that short-term price volatility will remain high.

Finally, fossil fuels have a negative impact on the environment. Fossil fuels are the largest emitters of greenhouse gases, contributing to the majority of all CO₂, methane and other greenhouse gas emissions that contribute to climate change. Since 1751, CO₂ emissions have been rising steadily, with the half of approximately 329 billion tons of carbon being released in the atmosphere since the mid 1970s.⁵³

50 IEA, "World Energy Outlook 2010", 2010, 5.

51 IEA, "World Energy Outlook 2010", 2010, 6.

52 International Energy Agency, "World Energy Outlook 2010", 2010, 7.

53 United Nations, Division for Sustainable Development – Department of Economic and Social Affairs, "Trends in Sustainable Development: Towards Sustainable Consumption and Production", New York, 2010, 3.

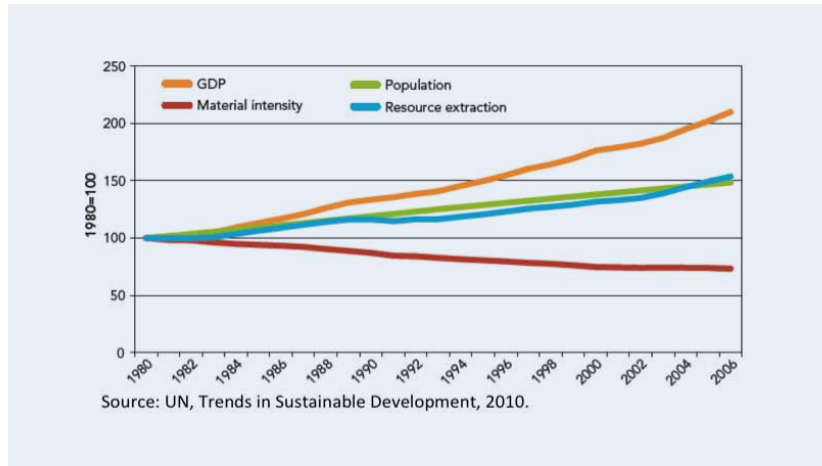


FIGURE 5. CARBON EMISSIONS FROM FOSSIL FUELS.

Reducing the emission of greenhouse gasses has become an internationally agreed policy objective. At the Copenhagen Summit, the international community pledged to reduce greenhouses emissions so that the rise in global temperature would not exceed two degrees Celsius above pre-industrial levels. The G8 countries called to cut global emissions by at least 50% by 2050.⁵⁴

3.2 GROWING DEMAND FOR RAW MATERIALS: SCARCITY AND ENVIRONMENTAL RISKS

In recent years, the demand for raw materials has grown explosively. Despite technological innovation that has increased material efficiency, the per capita use of mineral resources has increased steeply.

⁵⁴ Larry Elliott and Patrick Wintour, “Global polluters agree needs for cuts in emissions – but not how or when”, *The Guardian*, July 9, 2008, accessed Sep. 2011, <http://www.guardian.co.uk/environment/2008/jul/09/climatechange.g8>

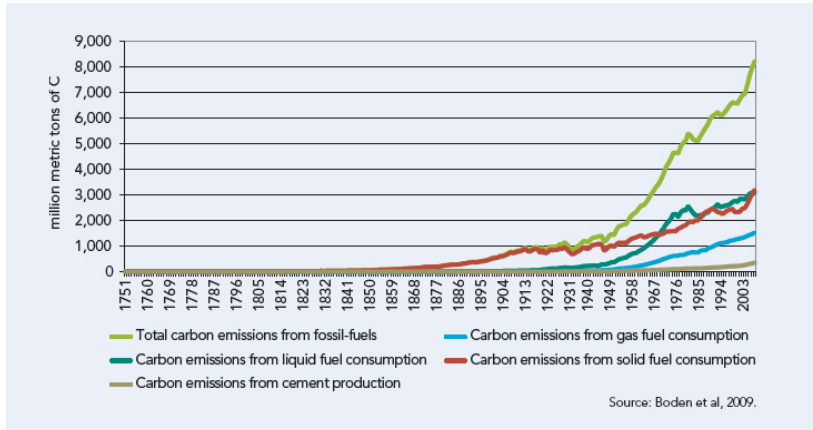


FIGURE 6. TRENDS IN GLOBAL RESOURCE EXTRACTION, GDP AND MATERIAL INTENSITY (1980-2005), 1980=100.

This is to a large extent due to population growth, economic development and higher levels of income and consumption in emerging economies, particularly in China.⁵⁵ Between 2002 and 2006 China mounted its share of global imports for aluminum ores and concentrates from 11.7% to 22.6%, and from 13.5% to 18.7% for copper ores and concentrates.

The Institute for European Environmental Policy (IEEP) indicates that metal ores will see the highest rate of increased extraction. By 2020 extraction is expected to be nearly the double of 2002 levels. Despite absolute increases, supply has generally struggled to keep up with the rapidly growing demand for raw materials. This is problematic, particularly for countries that are highly import dependent. Indicators show that, while self-sufficient in construction minerals, the EU is highly dependent on imports of metallic minerals and high-tech metals. As these materials are essential for many environmentally sound technologies, the availability of these materials is crucial to achieve the objectives that EU has set for itself with regards to climate change, the development of a knowledge economy and the competitiveness of its industries.

55 Islam Qasem, *Resource Scarcity in the 21st Century: Conflict or Cooperation?*, HCSS, 2010, 25.

As a consequence of the steady economic growth in developing economies and the continuously growing demand, the market for raw materials has changed significantly. Prices have raised to unprecedented levels and have become increasingly volatile.⁵⁶ The price spike between 2002 and 2008 showed a deviation from the characteristic cyclic pattern motioned by supply and demand levels.⁵⁷ According to a recent report of the European Commission, this trend is likely to continue in the future due to the ongoing growth of emerging economies and the spread of enabling technology.⁵⁸ Global prices will continue to rise in response to mounting demand, especially in developing countries, whereas overall supply will be restricted due to insufficient investment.⁵⁹

High prices are indicative of scarcity. Scarcity of raw materials can be evaluated in terms of physical scarcity or economic scarcity.⁶⁰ Market prices are a more accurate indicator of how scarce a mineral resource is than geological availability, as they reflect the levels of global demand in relation to supply.⁶¹ In response to scarcity, countries have designed policies that are mostly aimed at securing supply and using local resources efficiently.⁶² In many countries, governments have increased their control over the ownership, extraction, import and export of minerals and metals.⁶³ In addition, the competitive nature of the market has precipitated a tendency

56 European Commission, "Tackling the Challenges in Commodity Markets and on Raw Materials", Brussels, 2nd February 2011, 2.

57 European Commission, "Tackling the Challenges in Commodity Markets and on Raw Materials", Brussels, 2nd February 2011, 6.

58 European Commission, "Tackling the Challenges in Commodity Markets and on Raw Materials", Brussels, 2nd February 2011, 6.

59 Committee on Critical Mineral Impacts of the U.S. Economy, Committee on Earth Resources, National Research Council, "Minerals, Critical Minerals, and the U.S. Economy", *The National Academic Press*, 2008. <http://www.nap.edu/catalog/12034.html>

60 Van Gansewinkel Groep, "Raw Materials Scarcity as a Business Case", In Focus: Waste no More.

61 Jaakko Kooroshy and others, "Scarcity of Minerals: A Strategic Security Issue", HCSS, 2010, 33.

62 Jaakko Kooroshy and others, "Scarcity of Minerals: A Strategic Security Issue", HCSS, 2010, 9.

63 Islam Qasem, Resource Scarcity in the 21st Century: Conflict or Cooperation?, HCSS, 2010, 27.

towards “strategic partnerships”. Through bilateral agreements, countries seek to gain guaranteed access to raw materials that they fear will become scarce and therefore more expensive on international commodity markets.⁶⁴ Unequal access and distorted trade flows, however, contributes to tighter supply.⁶⁵

Against the background of increasing demand, sustainable extraction and management of resources becomes an imminent challenge. Many mine sites and processing plants produce waste that is problematic for the environment because it contains hazardous substances, such as heavy metals, acids, chemicals and even radioactivity.

3.3 GROWING STRESS ON THE BIOSPHERE: ECOLOGICAL DEGRADATION OF GEOGRAPHICAL SPACE

Due to the increased pressure on the Earth’s carrying capacity, the biosphere of our planet is under ever more stress. To sustain ourselves, humanity needs biologically productive land and water to provide renewable resources and space for infrastructure and vegetation to absorb CO₂. The Ecological Footprint tracks “humanity’s competing demand on the biosphere by comparing human demand against the regenerative capacity of the planet.”⁶⁶ The WWF found that in 2007 (the most recent year, for which date is available) the Ecological Footprint exceeded the Earth’s biocapacity by 50%. This means that it would take the Earth 1,5 years to regenerate the renewable resources that people used in 2007 and to absorb CO₂; or in other words, that people used the equivalent of 1,5 planets to support their activities.⁶⁷

The quality and availability of suitable geographical space is being reduced due to urbanization, rising sea levels, erosion, salination, pollution and

64 Islam Qasem, *Resource Scarcity in the 21st Century: Conflict or Cooperation?*, HCSS, 2010, 27.

65 European Commission, “Tackling the Challenges in Commodity Markets and on Raw Materials”, Brussels, 2nd February 2011, 6.

66 WWF, “Biodiversity, biocapacity and development”, *Living Planet Report 2010*, WWF International, 2010, 32.

67 WWF, “Biodiversity, biocapacity and development”, *Living Planet Report 2010*, WWF International, 2010, 34.

decreasing biodiversity. Between 1970 and 2007, global biodiversity has declined with almost 30%.⁶⁸

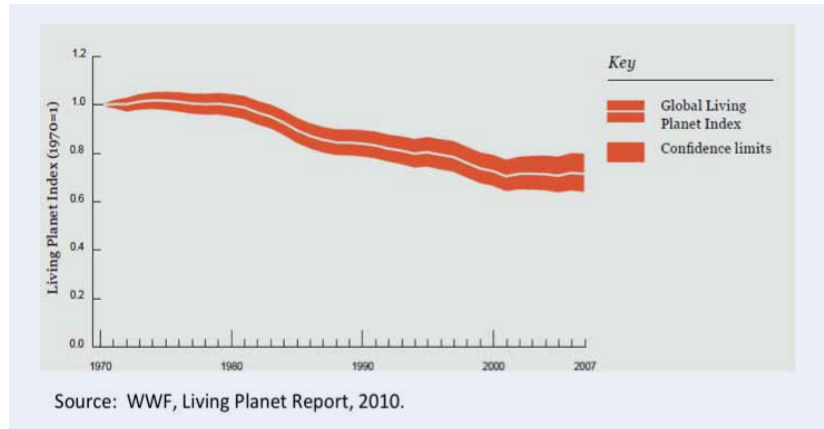


FIGURE 7. THE LIVING PLANET INDEX, SHOWING A 30% DECLINE IN BIODIVERSITY OVER TIME

Biodiversity is essential to the health of ecosystems which provide essential services, upon which human life depends. Ecosystem services including the provision of goods (food, water, fiber and fuel), the regulation of natural systems such as climate, cultural benefits including recreation and education, and other supporting benefits, such as primary production and soil formation.⁶⁹ According to the Millennium Ecosystem Assessment, human activity has degraded ecosystem services by 60% over the last 50 years.⁷⁰ It is estimated that while human activity is improving the quality of only 16% of total land, about 24% of all vegetated land has suffered degradation.⁷¹

68 WWF, "Biodiversity, biocapacity and development", Living Planet Report 2010, WWF International, 2010, 6.

69 United Nations, Division for Sustainable Development - Department of Economic and Social Affairs, "Trends in Sustainable Development: Towards Sustainable Consumption and Production", New York, 2010, 4.

70 Millennium Ecosystem Assessment, "Ecosystems and Human Well-Being. Synthesis", Report 2005, 1, <http://www.millenniumassessment.org/documents/document.356.aspx.pdf>

71 GO - Science, "The Future of Food and Farming", Foresight Report, London, 2011, 15.

Service	Sub-category	Status	Notes
Provisioning Services			
Food	crops	▲	substantial production increase
	livestock	▲	substantial production increase
	capture fisheries	▼	declining production due to overharvest
	aquaculture	▲	substantial production increase
	wild foods	▼	declining production
Fiber	timber	+/-	forest loss in some regions, growth in others
	cotton, hemp, silk	+/-	declining production of some fibers, growth in others
	wood fuel	▼	declining production
Genetic resources		▼	lost through extinction and crop genetic resource loss
Biochemicals, natural medicines, pharmaceuticals		▼	lost through extinction, overharvest
Fresh water		▼	unsustainable use for drinking, industry, and irrigation; amount of hydro energy unchanged, but dams increase ability to use that energy
Regulating Services			
Air quality regulation		▼	decline in ability of atmosphere to cleanse itself
Climate regulation	global	▲	net source of carbon sequestration since mid-century
	regional and local	▼	preponderance of negative impacts
Water regulation		+/-	varies depending on ecosystem change and location
Erosion regulation		▼	increased soil degradation
Water purification and waste treatment		▼	declining water quality
Disease regulation		+/-	varies depending on ecosystem change
Pest regulation		▼	natural control degraded through pesticide use
Pollination		▼*	apparent global decline in abundance of pollinators
Natural hazard regulation		▼	loss of natural buffers (wetlands, mangroves)
Cultural Services			
Spiritual and religious values		▼	rapid decline in sacred groves and species
Aesthetic values		▼	decline in quantity and quality of natural lands
Recreation and ecotourism		+/-	more areas accessible but many degraded
Source: Millenium Ecosystem Assesment, 2005			

FIGURE 8 STATE OF ECOSYSTEMS EVALUATED IN THE MILLENNIUM ASSESSMENT.

The five greatest pressures on biodiversity caused by human activity are 1) the conversion of land and water for agricultural and aquacultural activities, industrial or urban use; 2) the overexploitation of animals and plants at a rate above the reproductive capacity; 3) pollution, mainly from pesticides, fertilizer and urban and industrial waste; 4) climate change due to greenhouse gas emissions from fossil fuel burning and forest clearing and industrial activities; and 5) deliberate or inadvertent introduction of invasive species.⁷²

72 WWF, “Biodiversity, biocapacity and development”, *Living Planet Report 2010*, WWF International., 2010, 12.

As a consequence, it is expected that the competition between the various sectors using land, will be intensified in the future.⁷³ Particularly the allocation of land for energy versus agriculture will become an increasingly pressing sustainability issue.

Against the backdrop of a growing and ever more prosperous world population, achieving food security has become an important policy priority for many countries around the world. The current food system, however, is unsustainable and has many negative consequences for the environment. Agriculture is a resource intensive industry. Fossil fuels are the main input for agriculture, contributing to the depletion of fossil fuel reserves, energy dependency on unstable suppliers, greenhouse gas emissions and pollution.

Agriculture is also an important consumer of water. Already 70% of total “blue water” (which are sources of water people use but do not return) is used for agriculture. Particularly the production of meat, dairy products, sugar and cotton are water-intensive.⁷⁴ In many countries, agriculture has low water use efficiency and contributes to pollution of groundwater, rivers and lakes. By 2030 water demand for agriculture is expected to rise with 30%.⁷⁵ This is problematic given that water will become an increasingly scarce resource in many parts of the world. Driven by agricultural, industrial and domestic use, global water demand will rise 35-60% between 2000-2025 and by 2050 it may have doubled.⁷⁶ Already 71 countries are experiencing water stress, with nearly two-thirds experiencing moderate to severe stress.⁷⁷ Besides for food production, water stress has important implications for the health of ecosystems and human well-being.

73 Alex Evans, “Resource Scarcity, Climate Change and the Risk of Violent Conflict”, (Background Paper World Development Report 2011), Center on International Cooperation, New York University, September 2010, 3.

74 United Nations, Division for Sustainable Development – Department of Economic and Social Affairs, “Trends in Sustainable Development: Towards Sustainable Consumption and Production”, New York, 2010, 7.

75 GO - Science, “The Future of Food and Farming”, Foresight Report, London, 2011, 15.

76 GO - Science, “The Future of Food and Farming”, Foresight Report, London, 2011, 15.

77 WWF, “Biodiversity, biocapacity and development”, *Living Planet Report 2010*, WWF International, 2010, 8.

To feed a growing world population, agriculture and fishery have become increasingly intensive industries over the past century. This has vastly reduced the biodiversity of landscapes and ecosystems and contributed to the loss of fertile soil and the degradation of water. Agricultural intensification reduces natural pollinators, for example, on which 75% of the world’s crops rely. In many parts of the world, agriculture has become based on the large scale homogenous production of crops, such as corn and soy.

In Paraguay, for example, the traditional landscape of the Atlantic forest has suffered from deforestation to make place for a vast green sea of adjacent soy plantation fields. Due its extremely high levels of biodiversity, the Atlantic forest has been identified as a top priority ecosystem for biological conservation.⁷⁸ Nonetheless, the region’s forest cover has been reduced from 73,4% in 1973 to 24,9% in 2000.

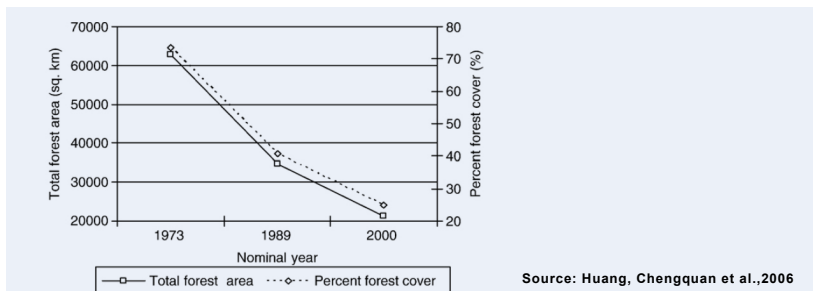


FIGURE 9. COVER FOREST IN PARAGUAY’S ATLANTIC FOREST ECOREGION IN 1973, 1989 AND 2000.

78 Chengquan Huang et al., “Rapid loss of Paraguay’s Atlantic forest and the status of protected areas — A Landsat assessment”, Remote Sensing of the Environment, 2006.

In the oceans, intensification of fishery activities has led to pollution and over-fishing.

At the same time, the quality of landscapes has also been affected by the developments on the energy markets. The rise in energy demand and prices have contributed to an increased production of biofuel. This development has diverted land for food to produce biofuel crops, such as grain, corn, and sugar cane.

Once again, the issues of ecological degradation are closely related to the prevailing problem of inequality between richer and poorer parts of the world.

First, the differences between the Ecological Footprints of developed and developing countries. Even though the per capita footprint of BRIC-countries is lower than in OECD countries and over twice as many people live in BRIC-countries as in OECD countries, the total footprint of BRIC countries is nearly similar to OECD countries. This means that the four BRIC-countries could soon exceed the Ecological Footprint of the 31 OECD countries.⁷⁹

Second, the ecological footprint shows that the consumption of food, fiber, materials and energy is much higher in high-income countries than in middle- and low-income countries. As the production and consumption of these resources are the most important drivers of biodiversity loss, this suggests that the loss of biodiversity in middle- and low-income countries is partially attributable to consumption patterns in high-income countries.⁸⁰ The loss of biodiversity in the Brazilian rainforest, for example, is too a large extend caused by timber exports to the rest of the world.

79 WWF, "Biodiversity, biocapacity and development", Living Planet Report 2010, WWF International, 2010, 40.

80 WWF, "Biodiversity, biocapacity and development", Living Planet Report 2010, WWF International, 2010, 78.

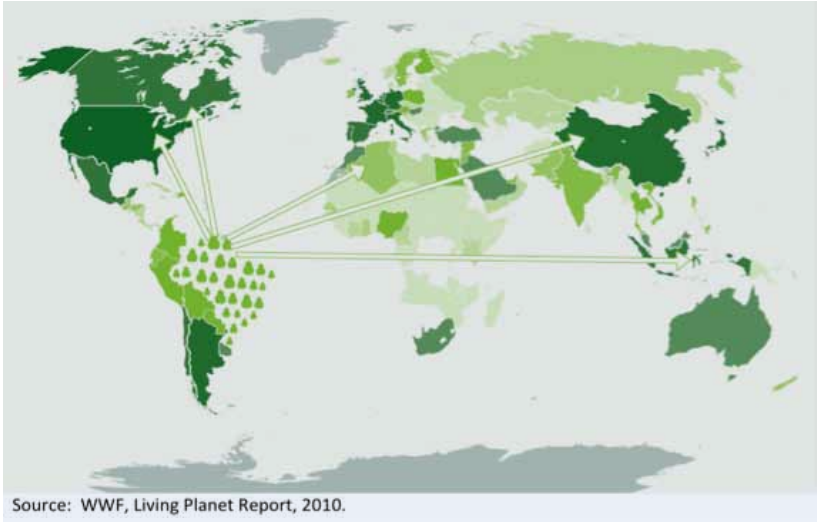


FIGURE 10. EXPORT FLOWS OF TIMBER AND WOOD PRODUCTS FROM BRAZIL TO THE REST OF THE WORLD

Third, ecological degradation is experienced on a different level depending on the local conditions of life, with the developing countries being the most vulnerable to ecological degradation.⁸¹ In poorer countries the local depletion of natural resources causes immediate suffering as they are essential for sustaining a livelihood.⁸² As stated by the WWF, “[w]ithout access to clean water, land and adequate food, fuel and materials, vulnerable people cannot break out of the poverty trap and prosper.”⁸³

81 United Nations Development Program (UNDP), “Scaling Up to Meet the Challenge”, Environment & Energy Group, 2008, 9.
82 IFAD, “Combating Environmental Degradation”, Conference on hunger and Poverty, accessed August 5, 2011, <http://www.ifad.org/events/past/hunger/envir.html>
83 WWF, “Biodiversity, biocapacity and development”, Living Planet Report 2010, WWF International, 2010, 9.

4 TRENDS TOWARDS A MORE SUSTAINABLE WORLD

Projections by the World Wild Fund (WWF) suggest that global consumption might rise to 200% of the global carrying capacity by 2030.⁸⁴ Without dramatic changes in the way goods and resources are produced and consumed, the challenges described above will not be solved and the world is likely to be confronted with multiple interrelated global crises.⁸⁵ Incremental progress in sustainability is not sufficient. Making economic development compatible with the goal of reducing the negative impact of human activity on the environment, requires a fundamental transformation of the global patterns of production, consumption and management of resources, goods and services.⁸⁶

As stated by John Ehrenfeld, executive director of the International Society for Industrial Ecology, “[u]nsustainability is a systematic failure”.⁸⁷ The transition to a more sustainable work cannot be done through a fragmented set of activities but should be dealt with on a fundamental level, aimed at transforming our normative framework, our economic system and governance. These transformations, which will now be elaborated, are yet slowly taking place and will continue to shape the sustainability agenda in the coming years.

84 WWF, Living Planet Report, 2008.

85 Deloitte Touche Tohmatsu and the World Economic Forum, Redesigning Business Value: a roadmap for sustainable consumption, January 2010 Report, 7.

86 Doreen Fedrigo-Fazio and others, “EU Natural Resource Policy: Signposts on the Roadmap to Sustainability”, IEEP, May 2011.

87 John R. Ehrenfeld, “The Roots of Sustainability”, MIT Sloan Management Review, vol. 46, no. 2, (2005): 24.

4.1 SUSTAINABILITY AS THE NEW NORM(AL)

The causes of unsustainability derive from deeply entrenched cultural values and commonly accepted lifestyles.⁸⁸ Hence, to advance sustainable development, cultural and normative frameworks have to be changed.⁸⁹ Besides cultural differences, the variance in income and consumption patterns between societies around the world have been a complicating factor to achieve such change.⁹⁰

However, the awareness of the importance of sustainability is growing. It is increasingly recognized that we need to transform present consumption and production patterns into a more sustainable system. Already in 1994 the transition to a more sustainable production and consumption (SCP) model was placed at the heart of the discussion on sustainable development at the UNEP symposium on Sustainable Consumption in Oslo.⁹¹ The goal was to create a system, that would respond to human needs and improve lifestyles, while minimizing the use of resources and the harm to the environment involved in the production-consumption cycle, so as to secure their availability for future generations.⁹²

This ambition was endorsed again at the Johannesburg Summit in 2002, when world leaders called for the development of a 10-year framework for SCP. This resulted in the Marrakesh Process, which was meant to provide a framework for the implementation of regional, national or international sustainable consumption and production programs. However, a report from 2011 states that only 35 countries have come up with a national strategy or are in the process of doing so. With the exception of some states, the progress in the implementation of concrete sustainable consumption and production plans around the world has not been remarkable.⁹³

88 John R. Ehrenfeld, "The Roots of Sustainability", MIT Sloan Management Review, vol. 46, no. 2, (2005): 24.

89 John R. Ehrenfeld, "The Roots of Sustainability", MIT Sloan Management Review, vol. 46, no. 2 (2005): 24.

90 Deloitte Touche Tohmatsu and the World Economic Forum, "Redesigning Business Value: a roadmap for sustainable consumption", Report, January 2010, 11.

91 UNEP, Global Outlook on SCP Policies: Taking action together, UNEP Report, 2011, 6.

92 UNEP, Global Outlook on SCP Policies: Taking action together, UNEP Report, 2011, 6.

93 Deloitte Touche Tohmatsu and the World Economic Forum, Redesigning Business Value: a roadmap for sustainable consumption, Report, January, 2010, 14.

Nonetheless, progress has been made with regards to the acceptance of sustainability as a new norm, which can include divergent perspectives and interests.⁹⁴ The global financial and economic crisis of the past years has forced consumers, businesses and policy makers to reflect on the resilience of our global system. The need to restore the balance between demand, supply and availability has triggered a process of redefining values and adjusting ideas about prosperity, in which sustainability plays an increasingly important role. For example, it is increasingly common place to say that GDP is not the best or certainly not the only way to measure prosperity and that ultimately, development is about personal and societal well-being.

Sustainability is becoming an essential element of policies and both corporate and consumer culture.⁹⁵ Our normative framework is slowly being transformed, with sustainability becoming the new normal:

“The sustainable future is not just about greater resource efficiency within businesses, or even about greater resource efficiencies within and across value chains. It is not just about making standard business practices “less bad” – it is about mainstreaming those practices which are “actively good”. The old paradigm for the global economy – focused on throughput of resources, consumption of products, limited measures of prosperity and underpricing of externalities – is being discarded. A new normal must be defined, and a path set out to achieve it.”⁹⁶

This normative transformation is a contributory factor to the significant achievements that have been made in the field of sustainability despite the global recession of the past years. In the US and Europe, but also China, Brazil and India, stimulus packages in response to the financial crisis have

94 Aurelie Basha i Novosejt and others, *Sustainability in a Multipolar World*, HCSS and TNO, 2010, 74.

95 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 11.

96 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report January 2010, 16.

given particular importance to “green growth”.⁹⁷ Governments have also increased the allocation of investments for support and evaluation of sustainable projects. Also, they have started working on the establishment of regulatory frameworks to encourage businesses to develop and invest in sustainable production and service delivery.⁹⁸

Despite these encouragements, the World Economic Forum points out that in 2010, the changing normative framework did not yet catalyze sufficient opportunities for businesses.⁹⁹ Sustainable products are still not competitive enough on the market.¹⁰⁰ They need to be made accessible and attractive by keeping the prices within the norm of the relevant market and by offering quality.¹⁰¹ Nonetheless, businesses are shifting their focus from profit maximization to value creation in response to the demands of consumers, who have become increasingly aware of sustainability.¹⁰² Consumers are becoming more and more active in the creation of a sustainable normative framework, demanding greater transparency in the origin and content of goods.¹⁰³ The altering business model is reducing the throughput of resources in the production chain and results in concrete environmental and social benefits, while reducing production costs and increasing profitability.¹⁰⁴

Changes in consumer consideration, and the spread of supportive international and national policy frameworks have supported new

97 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 12.

98 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010.

99 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 11.

100 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 11.

101 OECD, “Promoting Sustainable Consumption: Good Practices in OECD countries”, 2008, 45 – 46.

102 UNEP, *Global Outlook on SCP Policies: Taking action together*, UNEP Report, 2011, 26.

103 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 11.

104 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report January 2010, 16.

investments in sustainability. Responsible investments from the investment community will grow significantly over the coming decades and will be an important driver of progress in sustainable development.¹⁰⁵

Although positive, the trend of cultural transformation is not sufficient to tackle the most pressing sustainability challenges if it is not backed by ambitious policies at a global level to transform the economic system.

4.2 TOWARDS A MORE SUSTAINABLE ECONOMIC SYSTEM

The Johannesburg Plan of Implementation of 2002 stated that “[f]undamental changes in the way societies produce and consume are indispensable for achieving sustainable development.”¹⁰⁶ The old paradigm of economic development, in which demands for economic growth exceed our planet’s capacity, is slowly being transformed into a more sustainable economic system.¹⁰⁷ Business as usual is no longer accepted and there is a sense of urgency to develop greener economies that put lighter claims on the Earth’s biosphere.

In the coming years, reducing the ecological footprint of our economy and making our consumption and production patterns more sustainable will be a central dimension of sustainability. At the international level, the OECD’s Green Growth Strategy, for example, is helping governments to design and implement policies that will shift their economies onto greener paths. The organization argues that “going green can be a long-term driver for economic growth, through, for example, investing in renewable energy and improved efficiency in the use of energy and materials.”¹⁰⁸

105 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 13.

106 Johannesburg Plan of Implementation, 2002, iii. http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIChapter3.htm

107 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 16.

108 OECD internet page, *OECD work on green growth*, accessed Sep. 16, 2011, http://www.oecd.org/document/10/0,3746,en_2649_37465_44076170_1_1_1_37465,00.html

Renewable energy and improved efficiency in the use of raw materials are the most important emerging issues that signal the trend towards a more sustainable economic system. Currently, renewable energy resource meet only a fraction of the total energy demand. In the Netherlands, for example, renewable energy accounts only for less than 5%. This is, however, expected to change since governments are increasingly encouraging a transition to more sustainable sources of energy. Emerging economies are spearheading this development: Brazil is a leading power in the production of biofuels, while China and India are ahead of the rest of the world in wind and solar power.

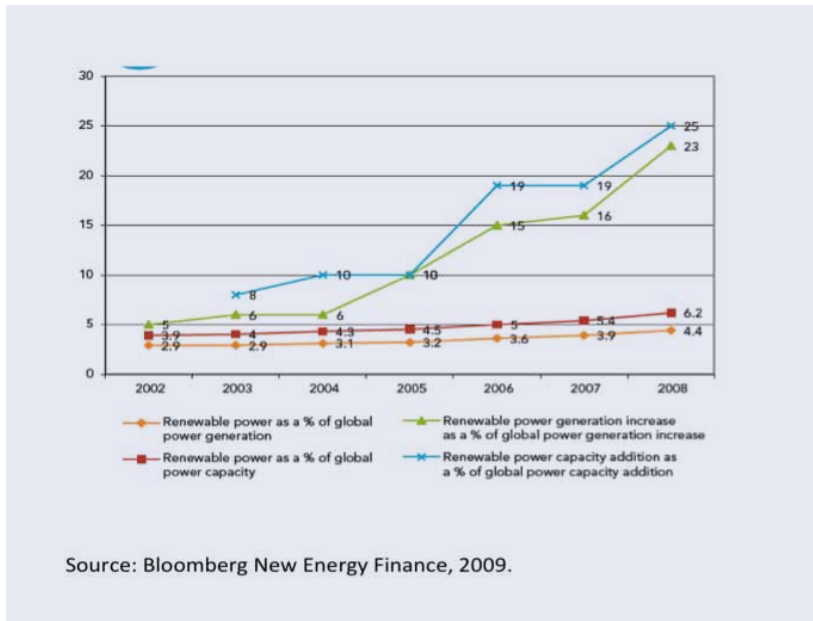


FIGURE 11. RENEWABLE POWER GENERATION AND CAPACITY AS PROPORTION OF GLOBAL POWER (2002-2008)

In the context of the global financial and economic crisis, governments around the world have made the development of low-carbon technologies part of fiscal stimulus packages. The green stimulus spending of China was

largest in absolute terms, whereas South Korea has the largest green share of stimulus spending.¹⁰⁹

At the G20 summit in Pittsburgh in 2009, world leaders committed to “phase out over the medium term inefficient fossil-fuel subsidies that encourage wasteful consumption.”¹¹⁰ This goal has also been endorsed by the Asia Pacific Economic Cooperation organization.¹¹¹ According to the IEA, these recently announced policies, if implemented, would make a real difference in terms of the energy demand and CO₂ emissions. The Agency estimates that between 2008-2035 the use of modern renewable energy will triple and that its share in the energy mix will increase from 7% to 14%.¹¹² Under the New Policies Scenario of the IEA, world primary energy demand would grow on average with 1,2% per year between 2008-2025, compared to 2% per year over the previous 27 year period. These developments signal that the first steps on the path to an environmentally sustainable system have been made.

The prevalence of renewable energy will lead to an adjustment of our energy infrastructure, both in terms of physical capital and institutions. The UN Secretary-General’s Advisory Group on Energy and Climate Change estimates that the transformation of the energy system by 2030 will require infrastructure investments of over \$1 trillion annually.¹¹³

Energy will be produced and distributed more locally and with the involvement of new actors, such as citizens, farmers, and local entrepreneurs. Renewable energy and energy efficiency will become

109 United Nations, Division for Sustainable Development - Department of Economic and Social Affairs, “Trends in Sustainable Development: Towards Sustainable Consumption and Production”, New York, 2010, 33.

110 “Leader’s statement: The Pittsburgh Summit”, G20 Pittsburgh Summit, Sep. 24 - 25, 2009, 3, http://www.g20.org/Documents/pittsburgh_summit_leaders_statement_250909.pdf

111 International Energy Agency Internet page, “Input to the G20 Initiative on rationalizing and phasing out inefficient fossil fuel subsidies”, accessed Sep. 16, 2011, <http://www.iea.org/weo/g20.asp>

112 International Energy Agency, “World Energy Outlook 2010”, 2010, 5.

113 UN Secretary-General’s Advisory Group on Energy and Climate Change, “Energy for a Sustainable Future”, New York, 2010, 8.

increasingly prevalent in modern architecture and the cities of the future. From a development perspective, the diffusion of renewable energy will be combined with the objective to improve energy access for the poor.¹¹⁴

In addition to the increased prevalence of renewable energy, concerns about resource efficiency have contributed to the emergence of the biobased economy. In a biobased economy, biomass is used in non-food applications in a growing number of sectors, ranging from construction to transport to health care. Fossil fuels are currently the primary resource for approximately 90% of the production processes and products in the Dutch economy. Although the share of biomass in the total mix of resources is increasing rather slowly, the use of biomass as a raw material will eventually contribute to the demise of the fossil fuel based economy. In the coming years, biomass will be used as pharmaceutical component, chemical, transportation fuel, resource for electricity and heat generation and to make bioplastics, which are made from natural materials such as starch, cellulose or protein.¹¹⁵

The biobased economy is exemplary of how scarcity of materials has contributed to a new way of thinking about resources. Improved efficiency, recycling and closed material chains are emerging issues that are illustrative of the new economic paradigm, in which waste is minimized or considered a new resource. The transition to a biobased economy will be driven by innovation, economic opportunities and policy objectives such as reducing energy dependence and greenhouse gas emissions, and increasing our energy security.¹¹⁶ The Netherlands has competitive advantages over other countries to advance the development of the biobased economy, including agricultural knowledge, good logistics and a leading chemical industry.¹¹⁷

114 United Nations, Division for Sustainable Development – Department of Economic and Social Affairs, “Trends in Sustainable Development: Towards Sustainable Consumption and Production”, New York, 2010.

115 Biobased Economy Internet page, accessed Sep. 16, 2011, www.biobasedeconomy.nl

116 Biobased Economy Internet page, accessed Sep. 16, 2011, www.biobasedeconomy.nl

117 Biobased Economy Internet page, accessed Sep. 16, 2011, www.biobasedeconomy.nl

4.3 TOWARDS A NEW TYPE OF GOVERNANCE

The state of the world today is viewed by many observers as a governance failure. The WWF points out that, “[d]espite decades of international recognition of the need to conserve biodiversity and achieve sustainable development, both these goals remain elusive.”¹¹⁸ The international momentum for an international sustainability strategy seemed to have reached its lowest point at the Copenhagen Summit. Nonetheless, a meta-analysis of foresight studies shows that an international momentum for sustainable development could reemerge, in part from dynamics between states and from the bottom up.

Traditionally, states play an important role in the formulation and implementation of sustainability objectives. In many cases states have ownership over national resources and can control transactions related to them.¹¹⁹ States are often confronted with country specific challenges and in response have developed policy solutions at the national and local level.¹²⁰ However, due to globalization and the interdependencies between economies and ecosystems an additional international approach is required.

A coherent international strategy for global environmental governance is considered paramount to achieve international cooperation and coordination to successfully implement sustainability objectives. The relative progress that was made at the UN Climate Change Conference in Cancún in 2010 can be considered a first step in the direction of improved interstate cooperation in the sustainability field. The European Union has also stated the objective to mainstream sustainable development into EU

118 WWF, “Biodiversity, biocapacity and development”, Living Planet Report 2010, WWF International 2010, 97.

119 Islam Qasem, *Resource Scarcity in the 21st Century: Conflict or Cooperation?*, HCSS, 2010, 27.

120 *Adapting for a Green Economy: Companies, Communities and Climate Change, A Caring for Climate Report* by the United Nations Global Compact (UNGC), United Nations Environmental Program (UNEP), Oxfam and World Resources Institute (WRI). 2011, 7.

policies.¹²¹ The Europe 2020 Strategy aims to tackle sustainability challenges by transforming the European economy into a smart, sustainable and inclusive system.¹²² Part of the strategy is the flagship initiative for a resource-efficient Europe, which creates a policy framework to promote economic progress while decreasing the use of resources.¹²³

The rapidly changing international context does not exclude that states will once more develop a common sustainability framework, which can include divergent perspectives and interests.¹²⁴ It is most likely, however, that the coming years will see a shift from traditional government-based regulation and standards to an approach that motivates collective action from all stakeholders.¹²⁵ In this shift away from state-centered arrangements, cooperation will be inter-national, inter-agency, interest- and capacity-based.¹²⁶ In this new type of governance, different actors, including governments, relevant international organizations, the private sector and civil society, will act together as drivers of more sustainable consumption and production patterns.

STATES

At the international level, there is no system for the regulation of sustainability initiatives. As long as countries and regions identify their own priorities and programs, progress to advance sustainability at a global level

121 European Commission, Mainstreaming sustainable development into EU policies: 2009 Review of the European Union Strategy for sustainable Development, Brussels, 24, 7, 2009.

122 European Commission Internet page, "Resource efficiency", Sustainable Development. Accessed August 25, 2011, http://ec.europa.eu/environment/resource_efficiency/index_en.htm

123 European Commission, A resource-efficient Europe - Flagship initiative under the Europe 2020 Strategy, Brussels, January 26, 2011.

124 Aurelie Basha i Novosejt and others, Sustainability in a Multipolar World, HCSS and TNO, 2010, 74.

125 UNEP, Global Outlook on SCP Policies: Taking action together, UNEP Report, 2011, 25 - 26.

126 Adil Najam and Miquel Munoz, "4 Steps for Targeted Coherence: A Modular Approach", Global Environmental Governance GEG Briefing Paper no. 3, IISD, June 2008, 2, accessed August 23, 2011, http://www.iisd.org/pdf/2008/geg_steps_coherence.pdf

will remain limited and insufficient.¹²⁷ The global economic crisis, the prospect of resource scarcity, along with a growing and wealthier population, are shared challenges that require international cooperation. Without international cooperation these challenges may lead to fierce competition among states, deep divisions and even conflict. Especially in poorer areas, the struggle for access to vital resources can turn violent and have international spill-over effects.¹²⁸ International policy makers will need to look for ways to steer international relations in the direction of cooperation.

Shared interest and growing interdependence, however, make cooperation among states likely. The following areas have the potential of becoming important elements of such interstate cooperation in the coming years. First, reducing the use of primary resources and increasing resource efficiency, as this is a shared and overarching objective fundamental to advancing sustainability. The implementation of this objective should be supported through monitoring and evaluation mechanisms and a set of political goals and economic instruments.¹²⁹ Second, climate change will remain an important matter for interstate cooperation. A number of bilateral and multilateral mechanisms have been established to support adaptation and enhance resilience of the most vulnerable countries. However, current financial assistance for adaptation is far from sufficient and endeavours and planning are still at an initial stage.¹³⁰ Third, the support to developing countries in terms of capacity building and technological development. This is important with regards to climate change, but also in general to help developing countries achieve sustainable economic growth. A considerable challenge will be to attract foreign investment in developing

127 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 14.

128 Alex Evans, "Resource Scarcity, Fair Shares and Development", *WWF-UK/Oxfam Discussion Paper*, 2011.

129 Doreen Fedrigo-Fazio and others, "EU Natural Resource Policy: Signposts on the Roadmap to Sustainability", *IEEP*, May 2011.

130 *Adapting for a Green Economy: Companies, Communities and Climate Change, A Caring for Climate Report* by the United Nations Global Compact (UNGC), United Nations Environmental Program (UNEP), Oxfam and World Resources Institute (WRI), 2011.

countries to support and stimulate economic development in line with the sustainability model.¹³¹

States will continue to play an important role in the new governance model for sustainability because governments have the capacity to establish enabling policies and regulatory instruments to moderate resource costs and measure progress in sustainability accurately.¹³² In the Netherlands, for example, the government increased energy prices for small-scale consumers by more than one-third by means of a tax levied on gas and electricity as part of the Environmental Action Plan in 2001. The revenues of the eco-tax are in part used for energy conservation measures.¹³³ Governments are also large consumers of certain goods and services and therefore have the power to induce real changes on the market. Governments have made significant contributions to sustainability by using a number of measures, such as sustainable procurement and tighter efficiency standards for automobiles, electronic appliances and new buildings.¹³⁴ Particularly local governments have been active and creative in promoting more sustainable cities and communities.¹³⁵ The following tasks are likely to emerge as particularly important in the coming years.

First, the state will play an important role in encouraging companies to use a green production model. Governments will have to come up with adequate policies and other public tools to encourage the development of sustainable business and to motivate consumers to contribute to the creation of a more sustainable economic system. Many companies and

131 United Nations Development Program, “Scaling Up to Meet the Challenge”, Environment & Energy Group, 2008, 9.

132 Deloitte Touche Tohmatsu and the World Economic Forum, *Redesigning Business Value: a roadmap for sustainable consumption*, Report, January, 2010, 16.

133 United Nations, Division for Sustainable Development – Department of Economic and Social Affairs, “Trends in Sustainable Development: Towards Sustainable Consumption and Production”, New York, 2010, 16.

134 United Nations, Division for Sustainable Development – Department of Economic and Social Affairs, “Trends in Sustainable Development: Towards Sustainable Consumption and Production”, New York, 2010, 13.

135 United Nations, Division for Sustainable Development – Department of Economic and Social Affairs, “Trends in Sustainable Development: Towards Sustainable Consumption and Production”, New York, 2010, 13.

corporate groups have already incorporated sustainability issues into their business practices, but they need to be supported with clear governmental policies to ensure that their market positions will not be undermined.¹³⁶ Second, states will encourage new research into environmentally sustainable technologies. This research can help find solutions to many of the existing challenges to sustainability. Technology will be crucial to make the transformation to a resource-efficient model of production possible.¹³⁷ Third, states will ensure the provision of more accurate data on resource availability and geographical location. There is currently insufficient information on the rate of non-renewable resource depletion, the amount of reserves and their lifecycles.¹³⁸ To make strategies for sustainable resource management a success, this information needs to be improved. In a changing international system where states increasingly have to compete with rising powers, governments may consider sustainability strategies as a means to gain economic and societal competitiveness.¹³⁹

BUSINESSES AND CIVIL SOCIETY

The nature of global environmental policy has changed significantly due to the growing importance of non-state actors and international arrangements. It is expected that this trend of transnationalized governance with non-state actors operating on various levels will continue into the future. A meta-analysis of foresight studies confirms that sustainability is likely to be implemented from the bottom up by businesses and civil society.¹⁴⁰ This trend is part of the transformation of the entire system as a whole, including the behavior of companies and individuals.

136 Doreen Fedrigo-Fazio and others, "EU Natural Resource Policy: Signposts on the Roadmap to Sustainability", IEEP, May 2011.

137 Klaus Bosselmann, "Poverty Alleviation and Environmental Sustainability Through Improved Regimes of Technology Transfer", *Law, Environment and Development Journal LEAD*, (2006):21-22.

138 Doreen Fedrigo-Fazio and others, "EU Natural Resource Policy: Signposts on the Roadmap to Sustainability", IEEP, May 2011.

139 WWF, "Biodiversity, biocapacity and development", *Living Planet Report 2010*, WWF International, 2010.

140 Aurélie Basha i Novosejt and others, *Sustainability in a Multipolar World*, HCSS and TNO, 2010, 59-69.

The private sector has proven to have an important role in implementing sustainability policies. In many companies, strategic decisions are increasingly based on the three Ps of planet, people and prosperity. Leading companies, such as Unilever, Philips and AkzoNobel, have set sustainability targets and participate in global initiatives aimed at environmentally friendly corporate management, like Global Compact. Global Compact is a strategic policy initiative of the UN that helps businesses to align their operations with ten universally accepted principles in the areas of human rights, labor, environment and anti-corruption. It is the largest voluntary corporate responsibility initiative in the world that helps to advance sustainable business models.¹⁴¹

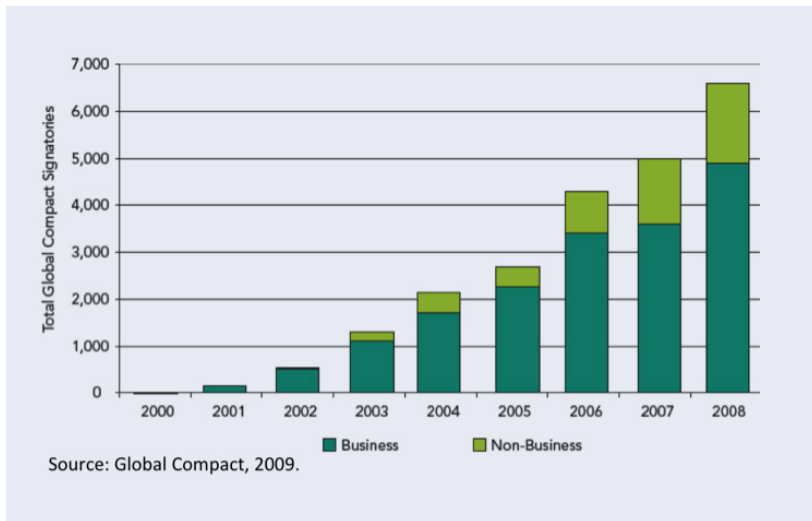


FIGURE 12. GLOBAL COMPACT SIGNATORIES

The number of participants in Global Compact has grown over the past years, and business practices that have both social and environmental benefits while making a profit will continue to spread in the years to come. The role of the private sector is likely to expand further through the

141 United Nations Global Compact Internet page, accessed September 2011, www.unglobalcompact.org

implementation of sustainable practices and the ability to moderate the negative side-effects of economic growth. It is anticipated that private companies will be partners or conduits of states in the accomplishment of sustainability objectives on a national and international level.¹⁴² Businesses can complement existing policies with market strategies. The World Business Council for Sustainable Development points out that market mechanisms can be used to conserve critical ecosystem services via certification, direct payments and tradable permits.¹⁴³ According to the Council, the private sector's approach to mainstreaming sustainable consumption is based on three pillars: 1) innovation and the development of new and improved products that deliver maximum societal value at minimum environmental costs; 2) choice influencing and the use of marketing to raise awareness and encourage consumers to make sustainable choices; 3) choice editing, which is the removal of unsustainable products and services from the marketplace.¹⁴⁴

The contributions of civil society organizations to the promotion of sustainability objectives are of diverse character. They promote partnerships, create and take part in shared initiatives with businesses, provide information, support capacity building, develop naming and shaming techniques, and set standards.¹⁴⁵ NGOs help raising awareness about the seriousness and the consequences of environmental damage and health issues. They direct attention to local problems and mobilize communities.¹⁴⁶ In the Netherlands, for example, the Centre for Learning on sustainable agriculture offers education on small-scale farming to contribute to poverty alleviation through the promotion of agro-ecological approaches.¹⁴⁷

142 Aurelie Basha i Novosejt and others, *Sustainability in a Multipolar World*, HCSS and TNO, 2010, 62.

143 World Business Council for Sustainable Development. "Sustainable Consumption: Facts and Trends", *From a Business Perspective*, 2008, 11.

144 World Business Council for Sustainable Development. "Sustainable Consumption: Facts and Trends", *From a Business Perspective*, 2008, 22.

145 UNEP, *Global Outlook on SCP Policies: Taking action together*, UNEP Report, 2011, 26.

146 Aurelie Basha i Novosejt and others, *Sustainability in a Multipolar World*, HCSS and TNO, 2010, 55.

147 *Agricultures Network* Internet page, accessed September 2011, <http://www.agriculturesnetwork.org/>

NGOs have played an important role in promoting greater awareness and interest in sustainability among consumers. The attitude of consumers towards sustainable consumption is positive, although unfortunately it remains rather passive.¹⁴⁸ In industrialized countries buyers are still more motivated by price, quality and convenience, than by the origin and content of products.¹⁴⁹ The National Geographic and Globe Scan investigated consumer attitudes in a total of 17 countries and compiled their results in a Greendex. The Greendex for 2009 shows that consumers in the developing economies of India, Brazil and China have the greenest attitude.¹⁵⁰ By contrast, Japanese, US and Canadian consumers scored lowest. The study also reported an increase in environmentally friendly consumer behavior in 13 out of the 14 countries surveyed. Further shifts from more passive to active sustainable consumption habits can be expected as sustainability becomes the new normal, the economic system is transformed and new types of governance are in place.

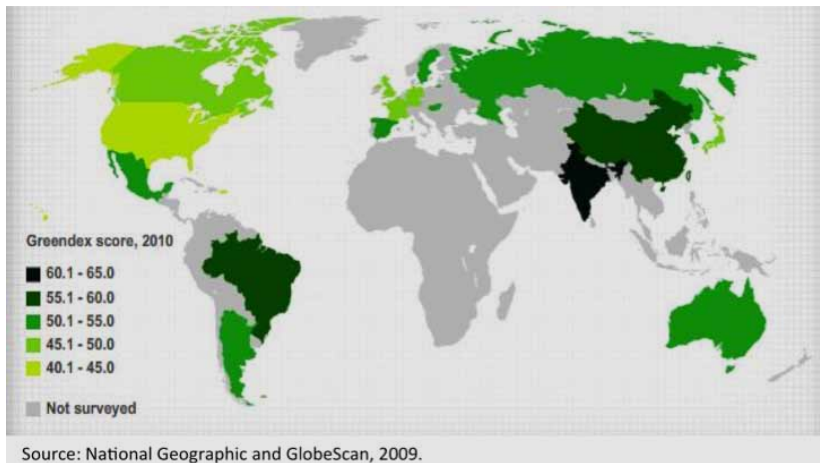


FIGURE 13. GREENDEX MAP OF THE WORLD (2009)

148 OECD, "Promoting Sustainable Consumption: Good Practices in OECD countries", 2008, 45 - 46.

149 Study conducted by Deloitte LLP for The Coca Cola Retailing Research Council, Europe

150 National Geographic and GlobeScan, "Greendex 2010: Consumer Choice and the Environment - A Worldwide Tracking Survey", 2010.

A 2011 report by the European Environmental Agency outlines a number of potential benefits that arise from the involvement businesses and civil society. The involvement of non-state actors can improve problem-solving capacities, introduce new governance mechanisms and create a more inclusive and legitimate international policymaking tools. The emergence of non-state actors as important catalysts of sustainability is a test for governmental institutions, who will have to take a “proactive” stance and support multi-actor governance.¹⁵¹

151 European Environmental Agency, “Global governance - the rise of non-state actors: a background report for the SOER 2010 assessment of global megatrends”, EEA Technical Report no 4, 2011, 4.

CONCLUSION

Sustainability was already an important policy domain when the Brundtland Commission published its 1987 report. According to the UN, it was already in 1980 that the global economy started exceeding the planet's biocapacity.¹⁵²

Ever since, the challenges that were described by the Brundtland Commission have only grown in importance. The rapid economic development of emerging economies and the high levels of consumption in the developed world, have contributed to important environmental problems. The structure of the world economic system is also highly unsustainable as it discounts future generations and contributes to growing inequality.

Systemic trends, such as demographic shifts, rising prosperity levels, changing consumption patterns, technological progress and geopolitical developments, are important drivers of sustainability issues. Whereas some developments threaten to exceed the carrying capacities of the Earth, others may contribute to solutions.

The world is faced with three major, interrelated challenges that will continue to dominate the sustainability field in the coming decades.

- First, the growing demand for energy resources is contributing to the depletion of fossil fuels and to climate change.
- Second, the growing demand for raw materials is leading to resource scarcity and environmental risks.

¹⁵² United Nations, Division for Sustainable Development - Department of Economic and Social Affairs, "Trends in Sustainable Development: Towards Sustainable Consumption and Production", New York, 2010, 5.

- Third, the biosphere is under growing pressure, which leads to weakened ecosystems and a loss of biodiversity.

Worldwide, governments, businesses, NGOs and citizens have already initiated many projects to address these challenges. Although currently insufficient, concrete action is being taken and there are trends that indicate a transformation to a more sustainable world is slowly taking place first this can be seen in the acceptance of sustainability as the new normal. Sustainable production and consumption are increasingly internalized as important norms and values. Second, the concurrent transformation of the economic system into a more sustainable one also shows this. Fossil fuels are slowly replaced as the primary energy resource and input for the manufacturing of goods and services. In the coming years, renewable energy technologies will become more prevalent and the paradigm of the biobased economy will gain momentum, in addition to waste minimization, recycling and resource efficiency. Third, new types of governance are emerging to move the sustainability agenda further. In this new model, the state continues to play an important role, but rather than being the dominant actor, it plays the role of a partner to businesses and civil society. In the multi-actor governance model, the private sector, NGOs and consumers are important drivers of the bottom up implementation of sustainability policies.

Although the issues and challenges raised in this paper were already raised back in 1978, they remain relevant today and will continue to dominate the sustainability debate in the coming decades. The overarching challenge will be to find pathways that simultaneously increase prosperity and well-being levels in developing countries and decrease the environmental impact of the use of resources that is needed for this development.

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