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Environmental Agenda in the Context of the Global Governance and Rules for the Post-2015 Era

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1. Introduction

Despite some advance in the last decades, the state of the environment continues to decline. According to the UN Secretary-General in his report to the Preparatory Committee for the Rio+20 “the environmental pillar is perhaps where progress has been the slowest” and that “most indicators of environmental improvement have not demonstrated appreciable convergence with those of economic and social progress; indeed, the overall picture is one of increased divergence” (UN, 2012a).

Possibly the phase-out of ozone depleting substances production under the Montreal Protocol, which is expected to lead to a recovery of the ozone layer in the forthcoming decades, is the only example where the impacts are reverting. Overall, however, the global environment continues to show signs of degradation (UNEP, 2013a).

The present chapter develops a revision of the main problems of the international environmental agreements, and delineates key elements for the post-2015 agenda. The roles of technology in sustainable development and mitigation and adaptation strategies for climate change have been discussed in a previous CDP book (Alonso et al., 2014). In this chapter the role of sustainable production and consumption in the context of the limits of growth and global environmental agenda is raised.

2. The state of the environment continues to decline

After the Earth Summit in 1992, three UN conventions were formed to address major global environmental threats: the UN Framework convention on Climate Change (UNFCCC); the UN Convention on Biological Diversity (UNCBD), and the UN Convention to Combat Desertification (UNCCD). Because of their importance we will put more emphasis on these conventions and the problems they address.

2.1. Energy and climate change

Climate change is possibly the most dangerous of all environmental threats. Climate is changing mainly as a result of human activity (IPCC, 2013). Increased use of fossil fuels, particular industrial processes, land use change and heavily fertilized agriculture, have augmented greenhouse gas (GHG) emissions and their concentration in the atmosphere, leading to an increase in the Earth's surface temperature with consequences on sea level, hydrological cycle, and higher presence and intensity of extreme events (IPCC, 2007a; IPCC, 2013). Regardless of the UNFCCC commitment to reduce emissions in order to maintain warming below 2°C to prevent *dangerous* climate change; there is a significant gap between the actual GHG emission trends and the pathways that are needed to keep the increase in global average temperature, that would require a 50 to 80 percent reduction in global GHG emissions by the year 2050 in relation to 2000 emissions (IPCC, 2007b; IEA, 2012a; IEA, 2012b).

A revision of trends in carbon dioxide emissions (CO₂) from fossil fuel combustion (that in 2004 represented 57% of GHG emissions) makes this gap evident. From 1990 to 2011, CO₂ emissions from fossil fuel combustion increased by 2 percent/year; and from 2005 to 2011 the years of the Kyoto protocol, the raise was 2.4 percent/year (USEIA, 2013). Emissions could have increased more during this period but the 2009 economic recession represented a global reduction of -0.1 percent from 2008 to 2009.

By 2011 China and US contribution was 44 percent (27% and 17% respectively), but total emissions have increased mostly in BRIC countries (Brazil, Russia, India, and China). Nevertheless per capita emissions continue to be higher in developed than in developing countries (Figure 8.1).

Figure 8.1 CO2 emissions from fuel combustion by the 12th top emitting countries

Note: In this graph we compare per capita emissions of the top total emitting countries. In 2011, the top emitting countries in per capita emissions were United Arab Emirates; Netherlands Antilles; Trinidad and Tobago; Singapore; Qatar; Kuwait; Bahrain; Luxembourg; Brunei; Saudi Arabia; Nauru; Australia; United States (USEIA, 2013).

Source: (USEIA, 2013).

Despite the scientific alert (IPCC, 2013), the international community is not responding as fast as it is needed. The UNFCCC has not reached a post-Kyoto consensus and efforts to reduce GHG emissions are by now set voluntarily by National and regional commitments.

2.2. Biodiversity loss

In the Rio+10 Conference held in Johannesburg in 2002, the world leaders agreed to substantially reduce the rate of biodiversity loss by 2010 as “a contribution to poverty alleviation and to the benefit of all life on Earth.” However, the target was not met and there are multiple indicators of continuing decline in biodiversity in all three of its main components—genes, species, and ecosystems (Butchart et al., 2010; UNCDB, 2010).

In its Global Biodiversity Outlook 3, the UNCDB presented several examples of the decay in biodiversity, some of them are: (a) Species which have been assessed for extinction risk are on average moving closer to extinction. Amphibians face the greatest risk and coral species are deteriorating most rapidly in status, also 40 percent of bird species are declining in population. Nearly 25 percent of plant species are estimated to be threatened with extinction; (b) The abundance of vertebrate species, fell by nearly a third on average between 1970 and 2006, and continues to fall globally, with especially severe declines in the tropics and among freshwater species; (c) Crop and livestock genetic diversity continues to decline in agricultural systems (UNCDB, 2010a).

In addition to the Cartagena and Nagoya protocols, in 2010, the CDB adopted a revised Strategic Plan for Biodiversity, including the Aichi Biodiversity Targets, for the 2011–20 period, whose plan is to consider better goals in the conservation and restoration of biological diversity (UNCDB, 2013; UNEP, 2007).

2.3. Desertification, Land Degradation, and Drought

Other major global environmental problem is Desertification, Land Degradation and Drought (DLDD) resulting from various factors, including climatic variations and human activities. Desertification refers to land degradation in arid, semi-arid, and sub-humid areas, where more than 2,000 million inhabitants are found, most of them in developing countries. Dry lands support 50 percent of the world's livestock, 44 percent of all cultivated land and store 46 percent of the planet's carbon inventory. Desertification reduces the ability of the land to provide ecosystem services such as production of crops, forage, fuel, and wood as well as the availability and quality of water resources; thus desertification is linked to hunger and food security (Vogt et al., 2011). About half of all dry land inhabitants are poor and marginalized (UNDP, 2013). Climate change is expected to worsen the situation (IPCC, 2007d). Approximately 6 million km² of dry lands (about 10%) are already affected by desertification (MA, 2005; UNCCD, 2011).

2.4. Water and air quality problems

There are other important environmental problems such as air and water quality, inadequate access to clean water and sanitation, air pollution, increased production of hazardous chemicals, etc., that continue to be detrimental to the human condition.

Air pollution (out-door and in-door) continues to be a major problem mainly in developing regions. Based on exposure to particulate matter it is estimated that annually between 3.1 and 3.7 million people worldwide die prematurely (UNEP, 2012a; WHO, 2009; Annenberg et al., 2010). Surface ozone air pollution is responsible for an estimated 0.7 million respiratory deaths globally each year, more than 75 percent of which are in Asia (Anenberg et al., 2010; UNEP, 2012a).

On the other hand, it is projected that by 2015, 600 million people will still lack access to drinking water and currently about 35 percent of the world population do not have improved sanitation facilities, with poor rural population being the most affected. It is estimated that at any given time, over half of the world's hospital beds are filled with people suffering from water-related diseases (UNDP, 2006; UNEP, 2012a). Diarrheal diseases make up more than 4 percent of the global disease burden, 90 percent being linked to environmental pollution and lack of access to safe drinking water and sanitation (Prüss-Üstün et al., 2008; UNEP, 2012a; Olmstead, 2010).

Other health problems related to pollution are linked to the intense use of inorganic pesticides and fertilizers. The risks are much higher in developing countries where 99 percent of current global deaths from pesticide exposure occur, both from occupational exposure and from casual exposure resulting from lax or absent health and safety controls (UNEP, 2012a). Also, arsenic and mercury pollution in mining areas and their impacts on health have been documented in different parts of the world (WHO, 2009).¹

3. A critical review of multilateral environmental agreements (MEAs)

3.1. A brief account of the MEAs

The international community has developed an important set of agreements and institutions that constitute complex international environmental governance (IEG) that includes organizations, policy instruments, financing mechanisms, rules, procedures, and norms that regulate the processes of global environmental

protection. International environmental instruments already consist of 1,190 MEAs, 1,500 bilateral environmental agreements, as well as declarations, judicial decisions, and others, most of them since the 1972 UN Conference on the Human Environment that led to the creation of UNEP (Mitchel, 2013; Ved and Pring, 2012). Within this enormous number, it is possible to identify twenty MEAs with global coverage.

As a complement to the MEAs, in 1992 the Global Environmental Facility (GEF) was created as a financial mechanism for key international environmental conventions. Since then \$11.5 billion USD have been invested directly, \$57 billion in co-financing in more than 165 countries (GEF, 2013). There are other environmental funds that operate under the GEF such as the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF); and in other institutions, the Adaptation Fund and the Green Fund. On the other hand, an increase in scientific knowledge of the environment has also been promoted by different MEAs (e.g., the assessments developed by the IPCC, the panels and conferences on biodiversity, desertification, ozone depletion, and many others).

MEAs are also part of economic international organizations. Since its formation, the General Agreement on Tariffs and Trade (GATT) for example, recognized environmental exceptions for free trade, to protect human, animal, or plant life and health (art. XX para. b), or in relation to the conservation of exhaustible natural resources (art. XX, para. g). An additional recognition to the environment was set up in 1994, with the creation of the Committee on Trade and Environment (CTE) that was incorporated in the World Trade Organization (WTO), and in 2001 when a chapter of the Doha Declaration of the WTO was devoted to the negotiations on “trade and environment” (WTO, 2013; Brack and Gray, 2003; Poletti and Sicurelli, 2012).

Additionally international efforts outside the UN and financial international institutions are developing voluntarily mechanisms such as environmental and quality standards of the International Organization for Standardization (ISO), or the promotion of Corporate Social Responsibility (CSR) from several firms.

From this overview it is clear that governments, private organizations, and international organizations, have addressed global and local environmental problems by different mechanisms that go from strength regulations and bans that affect international trade, to economic instruments (such as those developed by the Kyoto Protocol or carbon tax developed in EU), and voluntary mechanisms. The reality, however, is that the international efforts to revert environmental degradation have not been enough; or have not been

developed in the right directions or do not really address the causes of the decline (Afionis et al., 2012).

3.2. Strengthen the global institutional framework

There is a large volume of literature on the analysis of IEG and reasons for success and failure particularly on the institutional problems such as insufficient coordination, fragmentation of the system; overlapping, conflicting mandates between organizations, lack of a central organization, insufficient role of UNEP, etc. (Andersen, 2007; Bierman, 2009; Vogt et al., 2011; Ivanova, 2012; Young, 2012; Vijge, 2013).

The necessity to strengthen the global institutional framework for sustainable development was addressed in the Resolution of the Rio+20 United Nations Conference on Sustainable Development, titled “The future we want” and endorsed by the UN General Assembly (UN, 2012b; UN, 2012c). It promoted the strengthening and upgrading of the UNEP in the following manner: Universal membership; Secure, stable, adequate, and increased financial resources; Fulfill its coordination mandate within the United Nations; Promote a strong science-policy interface; Disseminate and share evidence-based environmental information; Provide capacity-building to countries, support, and facilitate access to technology; Progressively consolidate headquarters functions in Nairobi; Ensure the active participation of all relevant stakeholders. The first Universal Session of the Governing Council took place in February 2013 (UNEP, 2013b).

In addition, the resolution establishes a universal, intergovernmental, high-level political forum in substitution of the Commission for Sustainable Development (CSD). This forum was set up to provide political leadership and recommendations, follow-up and review progress in commitments, enhance the integration of economic, social, and environmental dimensions of sustainable development, have a focused, dynamic, and action-oriented agenda, and consider new and emerging challenges. It is mandate to meet every four years at the level of Heads of State and Government under the auspices of the General Assembly, and every year under the auspices of the Economic and Social Council—for eight days, including a three-day ministerial segment.

It is too soon to analyze the impacts of UN institutional changes, but reforms go in the direction to highlight the environmental pillar, strengthen institutions, and avoid overlap with existing structures, bodies, and entities. How these bodies will enhance MEAs is something that needs to be developed. Also, the relation between environmental governance, MEAs, and the multilateral trading

system needs more covenant efforts. Under this, although there have been some advances, there is still much more way to go in order to clarify trade limits and their implementation, and to solve disputes in the benefit of the environment.

3.3. Montreal versus other environmental protocols

The Montreal Protocol (MP) is often described as the international environmental agreement par excellence. The MP successfully led to the phase-out of almost 95 to 98 percent of all chlorofluorocarbon (CFC) use (Gareau, 2010; Andersen et al., 2013). The ozone layer has not grown thinner since 1998 over most of the world, and it appears to be recovering because of reduced emissions of ozone-depleting substances (ODS). Antarctic ozone is projected to return to pre-1980 levels by 2060 to 2075 (USEPA, 2007).

The phase-out of the use of ODS regulated by MP was made principally by the substitution of CFC through the adoption of hydrochlorofluorocarbons (HCFCs). The HCFCs are also ozone-depleting substances but with much less Ozone Depletion Potential than the CFCs (USEPA, 2010, 2013). The most recent adjustments to the MP, adopted in 2007, now accelerate the phase-out of HCFCs—widely used for refrigeration and air-conditioning (Andersen et al., 2013). In addition, there are other gases that are important to control in order to continue protecting the ozone layer, such as Nitrous oxide (N_2O), but its control is much more difficult, because it is widely used for synthetic fertilizers in agriculture (IPCC, 2007c).

According to different studies, the achievements in the contention of the depletion of the stratospheric ozone layer were due to several factors, some of them: (a) the foundation of stratospheric ozone depletion theory (which was pioneered by Molina and Rowland, 1974); (b) the confidence of some scientists concerned enough to confront corporate stakeholders; (c) the construction of an international treaty based on the precautionary principle to avoid irreversible effects from ozone depletion predicted by a theory, even when not yet proven to the satisfaction of the political and corporate interests; (d) the use of trade measures as one of the enforcement mechanisms (parties to the treaty are required to ban trading with nonparties in ODS) accompanied by (e) finance and technology transfer mechanisms to meet the incremental costs of developing country parties in complying with MP requirements (Zhang, 2009; Benedick, 1998; Andersen and Sarma, 2002; Andersen et al., 2013).²

However, some authors suggest that the success of the MP was also deeply entrenched in the economic opportunities for certain multinational firms

that were made available to phase out CFCs. Big chemical corporations such as Dupont, for example, supported the MP once they valued the economic opportunity of the ODS phase-out (Gerau, 2010).³ This can explain also that many companies phased out far more rapidly than required by the MP and often at a lower cost than originally projected by industry and governments (Miller and Mintzer, 1986; Cook, 1996; Le Prestre et al., 1998; Andersen and Sarma, 2002; Andersen et al., 2007; Andresen et al., 2012).

Under this review it is fair to raise the following question: Is it possible to address other global environmental problems only by following the MP example? It is of essential importance to take merit of the outstanding achievement of the involved scientists, UNEP, and other national and international institutions in the MP, and the recognition of the relevance of certain implementation instruments; however, from our point of view, the technical and socioeconomical differences between the substitution of CFC and other ODS by certain substances; and the changes that are needed to reduce GHGs, biodiversity loss and land degradation, are related to a very different scale in the number of stakeholders, and responses represent very different levels of scale and intensity as compared to the MP.

According to the IPCC (2007c) GHG mitigation to avoid dangerous climate change requires technological (accompanied by different regulatory and economic instruments) and behavioral changes made in many different sectors. Not one sector or technology can address the entire mitigation challenge but different technologies and measures from energy to agriculture and forest to waste management are needed in order to contribute to the total reduction of global GHG emissions.

Concerning biodiversity loss and the changes in human activities that are linked to it, it is difficult, expensive, or impossible to reverse or fix through only technological solutions (Hooper et al., 2005). The main causes of biodiversity loss are land use change (habitat change), overexploitation, pollution, invasive alien species and climate change, which is expected to become the first or second greatest driver of global biodiversity loss (Hooper et al., 2005; UNCDB, 2010; Heller and Zavaleta, 2009).

The human activities associated with DLDD are mainly overgrazing, overcultivation, deforestation, poorly planned irrigation systems, and soil pollution from excessive use of chemical fertilizers. Poverty, migration, and political instability are also socioeconomic causes and consequences of land degradation (UNCCD, 2011).

This implies that the magnitude of organizational, technological, and behavioral changes needed to overturn the environmental damage go beyond the

ones observed on the MP, and also imply deeper changes in the global economic patterns as we know them today. This represents threats and challenges for many international corporations related for example to fossil fuels, extractive industries, chemical fertilizers, and pesticides.⁴

For this reason, many authors sustain that global environmental problems are expressing a deeper crisis in the shape of economic growth, patterns of production, and consumption, and in general, the logic of no limits in the exploitation of natural resources. This is not new; it was pointed out since the limits of growth by Meadows et al. (1972), however, the patterns of growth and the environmental declining show that environment continues to be an outsider of the development agenda and the limits of growth continue to be a fundamental question for post-2015 era. A broader approach to these issues is further elaborated in the subsequent sections. From our point of view the IEG needs to recognize these key queries in a broader perspective; otherwise it will continue to gain only marginal success.

4. The myths of growth and its importance in global environmental policy

Although many theories regarding human development are in place and under discussion, the dominant view that economy must grow in order for a society to reduce poverty and satisfy its basic needs for present and future generations, still prevails.

The underlying base of the international divergence toward a Post-Kyoto agreement in the UNFCCC, for example, is the idea that a reduction of GHG gases would compromise economic growth therefore it would jeopardize the influence and power of certain countries in the international economy. The United States does not agree to reduce GHG emissions if China does not do the same. China argues that absolute emission reduction will compromise the well-being of millions of inhabitants. The obligated inquiry is thus the following: is it possible to reduce GHG emission without jeopardizing human well-being?

4.1. Progress and environment

Progress in many aspects of human development has been substantial over the past forty years (UNEP, 2010), but the state of the environment continues to decline. The obvious inquiry after these opposing trends is whether progress

comes at the cost of environmental degradation irretrievably. In China for example, the 1,200 percent increase in per capita income over the last forty years came with a very important increase in per capita CO₂ emissions, and several environmental problems (UNDP, 2011; Liu and Diamond, 2005).

One approach to this inquiry argues that setting up the right signals to the market, internalizing externalities,⁵ and strengthening property rights will solve this predicament. This school of thought (rather dominant) postulates that if a stock of nonrenewable resources is consumed, technological innovation and price signals will prevent shortages. This leads to the approach of possible substitution between physical, human, and natural stocks⁶ (Turner et al., 1994; UNDP, 2011).

Another school of thought raises the limits of this approach by questioning the validity of perfect substitution. Some basic natural assets have no real substitutes and thus must be preserved, this is what sets biophysical limits to the growth of economic activities, in view of the irreversibility of certain processes that have triggered an impact on nature (ECLAC et al., 2003).⁷

Biodiversity loss is a clear example of irreversibility, not only because of the permanent loss of certain species, but because it harms the ecosystem services, including the access to water and basic materials for a satisfactory life and security (Diaz et al., 2006). Climate change is also an example of irreversibility because the major greenhouse gases can remain in the atmosphere for tens to hundreds of years after being released; thus past emissions will have future impacts.

This brings out another subjacent contradiction of this false dilemma: resource declining and environmental damage caused by human activities reverts on economic growth and human well-being. Environment cannot be later attended; environment has to be understood as part of the development process, otherwise it will harm human well-being.

4.2. Well-being and per capita emissions

There have been several efforts to develop indicators that express human development in a better way than the traditional indicators of economic progress such as per capita GDP. One of the most important efforts is the Human Development Index (HDI) developed by UNDP that besides per capita GDP includes health and education performance. The World Energy Assessment (Goldemberg, 2000) was one of the first that investigated the relation between per capita energy use and the HDI. We present in Figure 8.2 an adaptation of WEA figure by plotting energy-related per capita CO₂ versus HDI for year 2008

Figure 8.2 Per capita energy-related CO₂ emissions and HDI for 160 countries (2008)

Source: UNDP data.

for several countries. As shown, an increase in the HDI might represent an increase in per capita CO₂ because of the need for energy (in this case fossil fuels) to reduce poverty, however for higher levels, even though per capita CO₂ keeps increasing the HDI does not. The interpretation of this might be that beyond a certain point, increased consumption (in this case more CO₂/cap) provides no further increase in well-being (Goldemberg, 2004). Another important point of this figure is that if fossil fuels are substituted by renewable energy to increase HDI, overall per capita CO₂ will consequently be reduced.⁸

4.3. Poverty and emission growth

By 2010, around 15 percent of the World's population lacked access to electricity and about 29 percent of the World's population relied on the traditional use of biomass. Although energy is not a specific MDG, there is a wide consensus that the eradication of extreme poverty as well as the accomplishment of other development goals are linked to the access of modern energy, especially electrification (UN, 2005). In 2010, the IEA and the UNDP developed an assessment on universal access to energy. Results were remarkably interesting. According to this study "to meet the more ambitious target of achieving universal modern energy services by 2030, additional investment of \$756 billion or \$36 billion of US dollars per year is required. This is less than 3 percent of the global

energy investment in the New Policies Scenario of IEA to 2030. The resulting increase in primary energy demand and CO₂ emissions would be modest. In 2030 global electricity generation would be 2.9 percent higher, oil demand would have risen less than 1 percent and CO₂ emissions would be 0.8 percent higher, as compared to the New Policies Scenario⁹⁹ (IEA, 2010).

Of course these estimations are based on a minimum consumption and they will rise if consumption increases. What is important to highlight is that the main drivers of energy-related CO₂ emissions in baseline scenarios are not found in the fulfillment of basic energy needs but in the assumption of constant energy consumption per household combined with population and GDP increases.

4.4. Per capita GDP and the environmental impact

There is a thesis called the environmental Kuznets curve (EKC) that points out that the environmental impact indicator is an inverted U-shaped function of income per capita. This hypothesis was raised based on water and air pollution data for different countries (Grossman and Krueger, 1995; Harbaugh et al., 2002; Deacon and Norman, 2006). Some authors have inquired this idea using several environmental indicators, especially GHG emissions, where clearly higher per capita income in general means higher per capita GHG emissions (Stern et al., 1996; Stern, 2004; Asilandis, 2009).

According to the ecological footprint methodology, it would take three to four Earths to meet the consumption demands of the current human population, if every human consumes at the level of the average US inhabitant (Wackernagel and Reese, 1996; Wilson, 2002); and GHG emission will reach 3.8 times actual emissions if population in developing countries uses the same amount of fossil fuels per capita that developed countries use (IPCC, 2007c).

4.5. Different paths of growth

There are economic activities that may produce per capita GDP growth and have positive externalities for certain resources such as renewable and energy-efficient technologies, sustainable management of forests, fisheries, technology investments for water decontamination or for the reduction of air pollutant emissions, recycling, sustainable tourism, restoration of ecosystems, etc.

The 2011 HDR showed how among the developing countries, Costa Rica and Philippines for example, have managed to increase per capita GDP as well as other development indicators and at the same time, they rise environmental

indicators such as afforestation, air quality, water access and quality, while still reducing GHG emissions (UNDP, 2011).

4.6. Decoupled environment degradation and GDP growth

The most important measure of the economy in terms of increase in its national output is the Gross Domestic Product (GDP) or including population growth, the per capita GDP. In general, an increase in per capita GDP is related to an increase in production and consumption, but this is not always the case.

Figure 8.3 shows for example, per capita GDP versus Per capita energy-related CO₂ emissions for year 2008 (each point is a country). A linear relationship between these variables could be expected since higher income means more appliance, automobiles, etc. Although it is possible to trace a line, it is also possible to find that many countries have similar CO₂/cap and very different GDP/cap. This difference might reflect the participation of fossil fuels in the energy matrix, but also how efficiently is the energy used by unit of GDP/cap. In fact energy efficiency technologies make possible the reduction per capita energy use while per capita GDP is increasing. This is exactly what happened in OECD countries as a response to the increase in oil prices in the 1970s. Between 1973 and 1985 total energy use per capita in OECD countries fell 6 percent while

Figure 8.3 Per capita energy-related CO₂ emissions and per capita GDP for 160 countries (2008)

Source: UNDP data.

per capita GDP increased 21 percent, a clear dissociation between energy and economic growth (Goldemberg et al., 2004).

4.7. The importance and limits of technology

In general, it is possible to affirm that technology has enabled growing efficiency of resource use. The main criticism to the Meadows et al. (1972) limits of growth is that technology has enabled to extract more and more economic activity for a given unit of natural resource.

But technology efficiency has physical limits ruled by the second law of thermodynamics. At some point, the following question arises; is technology efficiency enough to meet the very ambitious emission reduction targets proposed by climate scientists? According to Allwood et al. (2013), in the case of industrial energy, within the present conditions of material substitution and technology efficiency it is simply not possible. According to these authors, the world is reaching the efficiency limits for certain industrial technological processes, and the ambition to reduce industrial emissions can only be attained through an increase of material efficiency which includes recycling and reusing components, but also reduction of overall material demand by promoting longer life of products as well as intensifying its use.

5. Drivers and indicators for global environmental policies

While many of the critics on the original limits of growth publication (Meadows et al., 1972) were justified, as Turner et al. (1994) pointed out it does not follow that there are no ecological limits on growth. Even in this case the precautionary principle is valid in the sense that even if it is not certain that there are limits to growth it would be prudent to behave as if they were in order to prevent or at least reduce major environmental damages that could seriously affect human well-being (Turner et al., 1994). Of course in the logic of the ecological limits of growth and a better environment, human well-being, poverty eradication, and inequalities have to be also at the center of the equation.

5.1. Better indicators for development besides GDP

GDP growth as a symbol of progress is an index that is constructed on the basis of the twentieth-century human development, grounded on modern agriculture,

extractive industries, intensive use of fossil fuels and materials, intensive industrialization and growth of production and consumption regardless of what is produced and consumed and at what costs for natural resources.

There has been an important debate on the limits of GDP as a measure for human well-being. In the particular case of the environment, one of the most common indicators as an adjustment to GDP is the so-called Green GDP that takes into account the consumption of natural capital as depletion or damage. The main limitation of this index is that it will only measure what can be quantified as a product that is sold in the market place.

The Stiglitz, Sen, and Fitoussi (2010) report reviews different exercises of indicators that have the objective of measuring sustainability, from dashboards to the ecological and carbon footprints, to adjusted net savings (ANS). They suggest that it is difficult to establish one indicator for human well-being and environment and that it is better to develop a dashboard of indicators where the environment has its own well-identified sub-dashboard that affords access to the signs of change, preservation, or increase in several “stocks” to make long-term considerations for future generations (monetary and physical indicators). The report also argues in favor of the Carbon Footprint index being used for climate change.

5.2. Equity

If unequal distribution of income is maintained, a greater increase in GDP is needed to get the poor to access better incomes, this because the economy has to fulfill the requirements of the highest income groups (ECLAC, 2002; Rosas et al., 2010). A study for Latin America shows that even very small reductions in inequality can have very large positive impacts in terms of poverty reduction (ECLAC, 2002). In the horizon of the ecological limits of growth, equity acquires an additional value for the environment. Boyse (2007) goes even further when he proposed that wider political and economic inequalities tend to result in higher levels of environmental harm. If policies to redistribute income inequalities are not applied, more GDP will be needed to reduce poverty, meaning more production and consumption, and more impacts to the environment.

Moreover, Figure 8.4 presents a plot of per capita CO₂ emissions versus the education and health parts of the HDI for 2008. Putting together this figure with the above reasoning it is possible to assert that a more equal distribution of income and investment in those public services can have greater welfare effects than generalized growth and at the same time less environmental impacts.¹⁰ The same is true for a broader concept of inequality, especially regarding gender.

Figure 8.4 Per capita energy-related CO₂ emissions and HDI education and health for 160 countries

Source: UNDP data.

Also, this reasoning can also be applied at the international level. A new pathway for sustainable development implied a more equal distribution of wealth among countries.

5.3. Population growth

Population growth continues to be an important driver in global production and consumption growth and it will continue to represent a huge pressure on the environment. The dilemma of how to bring employment to new generations

when the population is growing in an economy that does not grow is of increasing importance. Decent work opportunity is crucial to human well-being and it needs to drive a transformation of the economic system that recognizes the physical limits of growth. In this arena the limits on population growth are also vital. There are a lot of studies and discussions on policies to reduce population growth as well as its linkages to the universal access to reproductive health care and family planning, gender equity, reproductive choice and investments in education, especially for girls and women, who are too often left behind. It is not the goal of this chapter to discuss population policies but to highlight its importance in the overall approach of the limits of growth.

5.4. The limits of multinational corporations

Multinational corporations (MNCs) are the main actors of globalization. Between 1990 and 2010, the world's outflow of Foreign Direct Investment increased by 450 percent, while world's GDP increased by 63 percent (World Investment Report cited by Forsgren, 2013). Although the total number of MCs is very high (around 70,000), the global scene is dominated by some few (Forsgren, 2013). MNCs dominate a very important part of the activities and markets that have the larger impacts on the environment (mining, agriculture, fishing, energy, food, automobiles, chemical, etc.; PWC, 2013).

Most of these companies have higher revenues than the GDPs of developing countries (Stiglitz, 2006; Hertz, 2004), and because of this, they have large political power (Stiglitz, 2006). According to several authors, MNCs have brought several benefits of globalization to developing countries such as technology transfer, training human resources, job creation, access to international markets, technology developments, etc. (Prahalad and Doz, 1987). According to others, they have brought more poverty than they alleviate (van Tulder and van der Zwart, 2006).

Businesses pursue profits and therefore MNCs have goals that are directed to the maximization of profits (Forsgren, 2013; Stiglitz, 2006, 2007a, 2007b). In the neoclassical theory, companies respond to the market. If consumers buy, producers provide. However, it must be admitted that MNCs act to shape consumer desires in ways that enhance their own profits and consumer consumption (Stiglitz, 2006). For this reason, in general, MNCs are against the concept of the limits of growth, because it goes against the principal goal of increasing profits by increasing consumption at no limit. It is well documented

that many oil and gas companies have lobbied against every international agreement to reduce GHG emissions (Sæverud and Skjærseth, 2007).

In the global arena, a less regulated country in terms of taxes, environment, labor, etc., is in principle, much more attractive to FDI than the more regulated ones (Stiglitz, 2006, 2009). Although the discourse of CSR (self-regulation of corporations toward social and environmental goals) has increased in several companies, in general, MNCs act differently depending on national regulations. There is evidence, for example, that extractive companies act differently depending on environmental regulation and government institutional capacities (Kallis et al., 2012; Bebbington et al., 2008; Urquidi and Walter, 2011; Fanthorpe and Maconachie, 2010).

Under this panorama, it is not only important to raise the right of domestic strategies for developing countries (Khor, 2009), but also imperative to develop a system of international environmental standards, regulations, and institutions for environmental justice that generate international rules in favor of sustainable development. Some have argued that environmental international regulation might act against local companies and its insertion in international trade (Khor, 2011). Proper financial and capacity building mechanisms may solve this. However, the worst panorama remains to continue down the same path.

6. Toward an economy for sustainable development and global environmental agenda

6.1. Green economy, steady state economy, and de-growth economy

UNEP defines green economy as one that results in “improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP, 2011). Before green economics, many authors have sustained alternative theories and pathways to human well-being and environment such as the steady state economy, the new economics of prosperity, or even economy of degrowth (Daly, 1973, 1996, 2010; Jackson, 2009; NEF, 2009; Schor, 2011; Nørgaard, 1994; Nørgaard et al., 2010; Odum and Odum, 2001; Reese, 2006; Victor, 2010; Kallis et al., 2012; Martínez-Alier, 2009, 2012; Martínez-Alier et al., 2010; Cato, 2009). The underlying debate is referred in Section 3.1 of this chapter on weak and strong sustainability.

It is not the goal of this chapter to discuss the difference of these approaches, but to recognize that there is a very important international dialogue and debate on how to transform global and national economic systems in a pathway that recognizes the importance of poverty eradication, social equity, and the environment for present and future generations. It should be highlighted however, that from our perspective, there are views that misuse the concept of the “green economy” to “green wash” conventional approaches that do not question the actual patterns of intensive use of natural resources and the inequity in consumption patterns.

The underlying question of the decoupled between resource consumption and development, is how to promote social welfare with less resources; how to provide well-remunerated employment to young population without intensive industrialization that leads to environmental decay; how to enhance human development and reduce environmental degradation. This is of course the core of the international debate on sustainable development and it is only not solved, but there are different answers for different regions and countries. We bring some examples delineated by different authors of new pathways of productive activities for sustainable development, understanding production not as an end in itself but as a mean to fulfill social needs.

6.2. Food availability

To meet the world's future, food availability must grow substantially while, at the same time, activities that provide it, shrink their environmental footprints considerably and adapt to climate change. At least six transformations in agriculture, livestock, and fisheries production are desirable to reach food availability: (a) Change production technologies and methods toward halting agricultural expansion, closing ‘yield gaps’ on underperforming lands, increasing cropping efficiency, shift from heavy mechanized with intense use of water, inorganic pesticides and fertilizers to organic systems and precision agriculture; and improvements in livestock management in order to reduce pasture area (Foley et al., 2005; UNDESA, 2013); (b) Recognize the complexity of production systems within diverse social and ecological contexts; (c) Shift from high-input industrial farming and large vessels to traditional systems run by small farmers and fishers to produce the majority of staple crops and animal protein needed to feed the world population. This will require secure land rights, good governance, greater commercialization and integration of small farmers and fishers into supply chains with infrastructure development (UNEP, 2011);

(d) Adoption of more sustainable diets. On average, the number of kilograms of cereal needed to produce 1 kilogram of meat ranges from 2 to 1 for poultry and from 7 to 1 for beef (UNCCD, 2012); and (e) Reduce waste. Approximately one-third of the total food produced for consumption, amounting to 1.3 billion tons per year, is lost or wasted (FAO, 2012), and about 30 percent of total harvested food does not reach the marketplace as a result of quality selection and cosmetic considerations (UN, 2013; IME, 2013). Policies to amend this nonsense have to be one of the main objectives of a new food and agricultural model.

6.3. Sustainable water and forest management

Water demand is expected to exceed supply at present rates of use. Proper investment in ecosystems services and restoration, as well as efficiency management and use particularly in agriculture, could achieve greater water and sanitation access and meet agriculture and industrial demands under a sustainable scenario. This would require investment as well as improvements in institutional arrangements and again, recognition of local communities (UNEP, 2011).

Forests are a fundamental part of the earth's ecological richness, providing many sorts of goods and services. Reduced deforestation and increased forest ecosystem services and goods is possible through the promotion of long-term financial, technological, and training supports and policies for sustainable management that value forest goods in contrast to agriculture and livestock for landowners, promoting other activities with lesser impacts such as ecotourism and agroforestry, and valuing ecosystem services (Merino-Pérez and Barry, 2005; Fisher et al., 2009; FAO, 2010; Toledo-Aceves et al., 2011). Sustainable water and forest management are the first steps in adaptation strategies to climate change.

6.4. Sustainable energy production and consumption

Energy transition to a less environmental impact activity in its production, transformation, and use, meanwhile gaining access to electrification and sustainable use of biomass as well as other fuels is only achievable by huge increases in renewable energy sources, energy efficient technologies, and a structural change to lesser energy consumption patterns.¹¹ There are several studies that show the possibilities of energy transition toward low carbon pathway (IEA, 2012; IEA, 2013; WEAR, 2013; EU, 2013; IPCC, 2014). However, the increase in energy consumption is related to the patterns of growth discussed

earlier. Therefore, sustainable energy has to be linked to material efficiency, equity, and even demand reduction for the higher consumers. There are several economic instruments such as taxes that help orienting sustainable patterns of consumption and production.

6.5. From energy efficiency to resource efficiency

One of the strategies to reduce environmental impacts is increasing resource efficiency of which material efficiency is crucial. According to Allwood et al. (2013), material efficiency includes the following options: (a) Light-weight design; (b) Reducing yield losses; (c) Diverting manufacturing scrap; (d) Reusing components; (e) Longer life of products, and (f) More intense use of products. Other strategies are the shifting from certain products to others such as e-books rather than paper ones (UNDESA, 2013).

6.6. Sustainable cities

On the other hand, the percentage of global population living in urban areas has reached 50 percent at the beginning of the twenty-first century and is expected to reach 60 percent by 2030; the fastest rates of urbanization are found in the developing world (UNHabitat, 2013). It has been calculated that urban areas consume more than 65 percent of the world's energy and emit 70 percent of global greenhouse gas (GHG) emissions (Solecki et al., 2013). Vehicles are the largest source of GHG emissions in most urban areas; for this reason sustainable transportation is central to reduce energy consumption (UNHabitat, 2013). The Avoid-Shift-Improve-Finance (ASIF2) framework (Dalkmann and Brannigan, 2007; Mani et al., 2012; Schipper et al., 2000; and Tiwari et al., 2011) helps in understanding different strategies toward sustainable transportation: (1) avoid unnecessary trips, for example through information technologies; (2) shift to more sustainable transport modes, for example public transport and rail for freight; (3) improve performance in all modes; and (4) finance investment in urban development and transport to achieve reduced CO₂ levels and sustainability.¹²

6.7. Science, technology, and innovation

Technology is not all in pursuing sustainable development but it does not mean that it is highly important to reduce resource consumption. To make a

serious attempt to face the social, economic, and environmental challenges of sustainable development, STI must strive to understand both, the natural and the cultural worlds and the way they interact. Taking into account this approach, it is still important for the need to fastest the process of certain technologies introduction to the market, as well as increase technology transfer. For this reason, and important to put in place international efforts to set up (a) national systems of science, technology, and innovation and (b) policies for technology transfer and dissemination for the benefits of all countries, especially patents and trade policies; and (c) social discount rates that are well below market rates in order to accelerate technological change and promote intergenerational equity (Stern, 2007; Ocampo et al., 2011).

7. Lines for an environmental agenda in the context of the global governance and rules for the post-2015 era

Under the panorama explained above, an environmental agenda for the post-2015 era needs to consider the following elements:

7.1. Build consensus of a new economy for sustainable development

The formulation of a global development agenda post-2015 requires a new international consensus to build environmental sustainability as an integral part of the development process. The concept of green economy and sustainable development that is emerging from the follow-up of the Rio+20 Conference seems to go in this direction. However, further efforts are needed in order to fully modify the economic model of development that wrongly assumes no ecological limits of growth. Under this background some suggestions are:

Moving from per capita GDP to sustainable development indicators: So long as per capita GDP remains as the dominant measure of development for the eradication of poverty, the promotion of equity and addressing the physical limits of growth will continue being of secondary importance. Development goals must include environmental sustainability, poverty eradication, and equity as the focus of policy attention and established targets in these fields must guide the actions of international development institutions, especially international financial institutions.

Promoting public, social, and private investments for sustainable development: Markets, left to their own logic, will not reorient economies to a more sustainable path. The global governance has a role to play in promoting the need for public policies in the strategic transition toward more sustainable economic trajectories that reorient production activities in accordance to the local population and environmental features needs of each country. Public policies are needed to stimulate public, social, and private investments in the path to reduce GHG emissions and pollution, enhance energy, material and resource efficiency, prevent the loss of biodiversity, and restore ecosystem services. These environmental objectives need to be consistent with job creation, poverty eradication, improved equity, and the recognition of the strategic role of local producers and communities in sustainable agriculture, fisheries and resource management, sustainable energy and cities, water management and forest, and resource efficiency. The economic transition also requires different methodologies for the estimation of costs that contribute to place social benefits ahead of private profits.

Changing consumption patterns. According to the ecological footprint it would take three to four Earths to meet the consumption demands of the current human population, if every human consumes at the level of the average US inhabitant (Wackernagel and Reese, 1996; Wilson, 2002); and GHG emission will reach 3.8 times actual emissions if population in developing countries uses the same amount of fossil fuels per capita that developed countries use (IPCC, 2007). Technology has enabled growing efficiency of resource use, but it has its limits and unsustainable lifestyles with excessive consumption of energy, materials, and goods among the richer segments, place enormous pressure on the environment (Allwood et al., 2013). The poorer segments, meanwhile, are unable to meet food, health care, shelter, and educational needs. Changing consumption patterns will require focusing on demand, meeting the needs of the poorest, and changing lifestyles and excessive material and energy demands of the richest. This requires building a new paradigm of success that is not based on increasing consumption. In the case of energy, carbon taxes have been discussed widely as an economic instrument to accelerate energy transition toward a low carbon economy (Parry et al., 1999; Shah and Larsen, 2014). Application of this instrument might be different depending on the country, especially in developing countries.

Recognize the importance of equality for the environment: Through various channels, policies to improve the distribution of wealth act in favor of the environment. Persisting unequal distribution of income imply that a greater

increase in GDP is needed to get the poor to access better incomes (ECLAC, 2002; Rosas et al., 2010), with deleterious consequences to the environment if current consumption and production patterns are maintained. This is true at the National level but also among countries. Gender equality is also catalytic to social, economic, and environmental progress, and therefore it should be well integrated into sustainable development policies, strategies, and action plans (UNDP, 2013c). Investments in education, especially for girls and women and universal access to reproductive health care and family planning must be high in an agenda for sustainable development. This is the best approach to reduce population growth that will make an important contribution to sustainable development. Improved access to education and health enhances human development, creates informed citizens, and represents a critical investment in human capital that is essential for a more demanding development path. Moreover, in the context of pluricultural and multicultural societies, a strategy for sustainable development needs to recognize the rights of indigenous communities to the land, natural resources, ethnic identity, and cultural heritage; as well as their right to participate in the decisions that affect them.

7.2. International environmental regulations and standards

Environmental problems do not have frontiers, especially when looking at the global environmental problems. It is absurd that countries compete for Foreign Direct Investment (FDI) or that Multi-National Corporations (MNCs) look for countries to develop their investments, based on less environmental regulation. The IEG needs to develop a system that promotes international standards and regulations, not only for products but also for production processes that limit the FDI based on no regulation to protect the environment. This is especially important for extraction activities. Conventions need to start developing protocols on this matter and WTO and PTAs require recognizing them. The best technologies and practices need to be available for all, and limits to the maximization of profits on behalf of the environment need to be set.

7.3. Strengthen global environmental justice

In the broadest perspective, the recognition of the linkages between environment and human well-being leads to acknowledge the fundamental right to the protection of a healthy environment as a human right. Environmental law, jurisprudence, and environmental governance are central to resolving problems

of environmental justice. The recognition of environmental problems in current international justice institutions and even the possibility of an International Environmental Court is a central issue to strengthen global environmental governance (UNEP, 2013b). Today there is no international body with delegated authority to enforce international environmental regulations. The protection of fragile ecosystems, the sustainable use of natural resources in the global commons, and the improved management of trans-boundary resources are areas of special concern in the development of a global mechanism for environmental governance.

7.4. Strengthen global institutional framework

The need to strengthen the global institutional framework for sustainable development was addressed in the Resolution of the Rio+20 United Nations Conference on Sustainable Development. This brought out the strength of the UNEP, and the creation of a universal, intergovernmental high-level political forum. This reform goes in the direction to highlight the environmental view, strengthen institutions, and avoid overlap with existing structures, bodies, and entities and in the move to a more coherent international framework. Global efforts to strengthen these international bodies and initiatives such as sustainable development objectives post-2015 are highly important to enhance global environmental governance. How these bodies will support environmental conventions is something that needs to be developed. Also, the relation between environmental governance and the multilateral trading system needs more covenant efforts. There is still much more way to go in order to clarify trade limits and their implementation, and to solve disputes in the benefit of the environment.

7.5. New common but differentiated responsibilities

Increasing differentiation among developing countries is part of the new international scene. Mechanisms of global governance for sustainable development especially to reach a new international consensus in the UNFCCC will have to give proper interpretation to the concept of common but differentiated responsibilities in recognition to the variety of development trajectories across countries and their responsibility based on historic emissions, current and projected total, and per capita emissions.

7.6. Science and technology for all

Developing the capacity to innovate and have access to technology are crucial for reducing the wide developmental gaps that exist between developing and developed countries. This requires strengthening the capacity of developing countries to develop, review, and implement education, science, technology, and innovation oriented toward nationally relevant responses to the challenges they face in relation to climate change, the preservation of biodiversity, and reducing and avoiding desertification. Under the barriers for technology transfer it is important to recognize the increasingly globalized protection of intellectual property rights on the ability of countries to provide their citizens with basic research, education, public health, and environmental protection (Maskus and Reichman, 2005). A new international system is needed in the recognition of the links between international public goods and transfer of technology. Keeping and strengthening the precautionary principle is also essential in MEAs.

7.7. Finance and support for sustainable development

Depending on the methodology used, the estimation of financing needs to support sustainable development strategies varies wildly but they all coincide to predict high financing costs. Several mechanisms of financing have been discussed in recent years but serious commitments are still to be made if environmental sustainability is to be effectively integrated into a new development paradigm. In the allocation of resources, clear priority should be given to the poorest countries, as well as those more likely to be affected by climate change. In the allocation of resources traditional development goals, such as access to water and sanitation, electrification, but also reduction of air and water pollution in cities of middle-income countries, should be made compatible with sustainable management of natural resources both as a policy to reduce poverty and as a strategy for adaptation to climate change. In fact, sustainable resource management is the first step to attend adaptation strategies for climate change.

Notes

- 1 In January 2013 governments took a major step forward to begin lifting the health and environmental impacts of mercury, including its most toxic forms, by agreeing a global Convention, Minamata Convention, covering emissions and releases.

- 2 The history of the Montreal protocol, background, importance and the role of scientists, negotiations, problems and success is brilliantly exposed in Andresen, Sarma and Sinclair, 2002.
- 3 The difference in the control of CFC used mainly as aerosol product and the more difficult control of methyl bromide used as a pesticide (both ODSs under control in the MP) is presented as an example (DuPuis and Gareau, 2008).
- 4 This in part explains the dissimilarity in the position of the US government in the MP and the Kyoto Protocol (Sunstein, 2007), and the role of US fossil fuel industry in Washington's rejection to any international agreement to reduce GHG emissions (Sæverud and Skjærseth, 2007).
- 5 Environmental externalities refer to the "uncompensated environmental effects of production and consumption that affect consumer utility and enterprise cost outside the market mechanism" (OECD, 2013). As a consequence of negative externalities, private costs of production tend to be lower than its "social" cost.
- 6 This school of thinking is known as the weak sustainability.
- 7 This is called the strong sustainability view (Heidiger, 1999).
- 8 A critique to this interpretation is that in general per capita GDP weights more for higher HDI countries where the health and education part of the index has been obtained. Despite this important point that questions the validity of the HDI itself, this suggests that there is not always a positive relation between fossil fuel consumption and human well-being.
- 9 These estimations are based on a minimum electricity consumption of 250 kWh/year in rural areas and 500 kWh/year in urban areas and 22 Kg of LPG per person per year (in comparison, average US consumption per household in 2011 was 11, 280 kWh of electricity/year and 900 kg of LPG/year).
- 10 Similar reasoning for happiness is considered in Kallis et al., 2012.
- 11 Biofuels production must grow in a sustainable way. There is no space in this chapter for this discussion but for more about this see
- 12 A very good example of the positive synergies that a consumption pattern brings in the energy sector is the shift from larger and heavier vehicles to smaller cars (Schipper and Lilliu, 1999; Cuenot, 2009; Meyer and Wessely, 2009; Sheinbaum-Pardo and Chávez-Baheza, 2012).

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