

**The Transition to a Green Economy: Benefits, Challenges
and Risks from a Sustainable Development Perspective**

Report by a Panel of Experts*
to
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*The views expressed in this report are solely those of the authors and do not necessarily reflect those of the sponsoring UN organizations.

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The Transition to a Green Economy: Benefits, Challenges and Risks from a Sustainable Development Perspective

Summary of Background Papers

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The concept of a green economy has become a center of policy debates in recent years. During the recent global financial crisis, the United Nations General Assembly and several UN agencies underscored that the crisis represented an opportunity to promote green economy initiatives as part of the stimulus packages being put in place to support the recovery. Furthermore, when the GA decided to call a UN Conference on Sustainable Development (UNCSD), to be held in June 2012 in Rio de Janeiro, it chose as one of its major themes “a green economy in the context of sustainable development and poverty eradication”.

The concept carries the promise of a new economic growth paradigm that is friendly to the earth’s ecosystems and can also contribute to poverty alleviation. Viewed in this framework, it is compatible with the older concept of sustainable development that has been mainstreamed into the United Nations’ work for decades. But it also entails risks and challenges, particularly for developing countries, for whom economic development becomes more demanding and the fear arises that the new concept could be used to reinforce protectionist trends, enhance the conditionality associated with international financial cooperation, and unleash new forces that would reinforce international inequalities.

At the UNCSD’s first Preparatory Committee in May 2009, several delegations therefore requested that the United Nations Department of Economic and Social Affairs, the United Nations Environment Programme, the United Nations Conference on Trade and Development and other relevant organizations cooperate to prepare a study to be available for the second Preparatory Committee which would assess both the benefits and the challenges and risks associated with a transition to a green economy.

This document responds to this mandate. It contains three papers. The first one, by José Antonio Ocampo, looks at the macroeconomic policy implications of the transition to the green economy. The second, by Aaron Cosbey, focuses on the interlinked issues of trade, investment and technology. The third, by Martin Khor, considers the risks that this concept generates for developing countries and the domestic and international policies necessary to promote the green economy in these countries according to the principles of sustainable development. This summary presents the major policy conclusions that emanate from these contributions.

They are summarized around six major topics: (i) the advantages as well as the risks that the concept entails; (ii) the macroeconomic dimensions of green economic growth; (iii) the domestic strategies that developing countries need to put in place to meet the challenges of the transition to the green economy; (iv) the specific domestic and

international technological issues that this transition raises; (v) international trade issues; and (vi) financial support for developing countries. By the nature of the linkages among these issues, some are dealt with by two or even all three authors. For these reasons, it is better to summarize the papers by issue rather than in a sequential way. Also, although there is a high level of convergence of opinions among them, there are also a few disagreements.

THE CONCEPT OF A GREEN ECONOMY

The concept of the green economy has gained currency to a large extent because it provides a response to the multiple crises that the world has been facing in recent years – the climate, food and economic crises – with an alternative paradigm that offers the promise of growth while protecting the earth’s ecosystems and, in turn, contributing to poverty alleviation. In this sense, the transition to a green economy will entail moving away from the system that allowed, and at times generated, these crises to a system that proactively addresses and prevents them.

There is no unique definition of the green economy, but the term itself underscores the *economic* dimensions of sustainability or, in terms of the recent UNEP report on the Green Economy, it responds to the “growing recognition that achieving sustainability rests almost entirely on getting the economy right”. It also emphasizes the crucial point that economic growth and environmental stewardship can be complementary strategies, challenging the still common view that there are significant tradeoffs between these two objectives – in other words, that the synergies prevail over the tradeoffs.

Responding to concerns of many countries, the three papers underscore that the concept of green economy should be seen as consistent with the broader and older concept of sustainable development. The specificities of the broader concept are its *holistic* character, as it encompasses the three pillars of development – economic, social and environmental – and its particular focus on *inter-generational* equity. This is reflected in UNEP’s definition of a green economy as “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities”.

In his contribution, Khor raises several concerns and risks in the use of this concept from the perspective of developing countries. In particular, he underscores the need to identify and deal with the tradeoffs that may be involved at different stages of development and with different environment endowments and challenges. Furthermore, in linking the concepts of the green economy and sustainable development, he underscores the need to respect fully the principles agreed upon at the 1992 United Nations Conference on Environment and Development (UNCED) and, particularly, the principle of common but differentiated responsibilities. This requires, in his view, a three-pronged approach in which: the developed countries have to take the lead in changing their production and consumption patterns; developing countries maintain their development goals but do so while adopting sustainable practices; and developed countries commit to enable and

support the developing countries' sustainable development through finance, technology transfer and appropriate reforms to the global economic and financial structures.

Khor also presents several risks that may be associated with the misuse of the concept of the green economy. The first risk is that it could be defined or operationalized in a one-dimensional manner, as purely "environmental". The second risk is that of a "one size fits all" approach, in which all countries are treated in the same manner. There are also a series of risks related to the trade regime, to which we will return below: of using environment for trade protection; of gaining market access through the guise of environment; of developing countries' facing production that is subsidized in the industrial world without being able to impose corrective measures; of limiting the policy space that developing countries have to promote their own green economy sectors; and of facing technical standards that their exporters cannot meet. And finally, he also underscores that the concept of the green economy should not be used to impose new conditionality on developing countries for aid, loans, and debt rescheduling or debt relief.

Therefore, as the concept of the green economy is mainstreamed into the work of the United Nations, the three authors agree that it should be seen in the context of the now familiar concept of sustainable development and placed integrally within this holistic framework of UNCED, the Rio Principles and Agenda 21. This means that, while underscoring the links between the economy and the environment, it should not lose sight of the equity dimensions, including the needs of the poorer members of society throughout the world, the specific needs of developing countries (and of different groups of developing countries) and, of course, of future generations.

THE MACROECONOMIC DIMENSIONS OF GREEN ECONOMIC GROWTH

Ocampo highlights four different macroeconomic issues that must be taken into account in the analysis of the green economy. The first one relates to issues of inter-temporal welfare: how the welfare of future generations is taken into account in current economic decisions, an issue that is relevant for savings and investment decisions today, but has broader implications, as the social discount rate chosen should be used in cost-benefit analysis at the microeconomic and sectoral levels. The second refers to the effects that the degradation of the environment has on aggregate supply, as well as the effects of environmental spending and protection policies on both aggregate supply and demand. The third is the fact that economic growth is always a process of structural change, a fact that is highlighted by the significant changes in the patterns of production and consumption that must be put in place in the transition to the green economy, which in this regard can be characterized as no less than a new technological or industrial revolution. The final one relates to how global initiatives in this area are going to be financed. The first two of these issues are dealt in this section, the third in the next one, while later sections contain the analysis of technology and finance.

The first of these issues relates to the discount rate that is used to value in current economic decisions the consumption (welfare) of future generations and the environmental damages that are being created today but which will fully affect economic

activity only in the future – the damages generated by climate change, the loss of biodiversity or the deterioration of water systems, to name a few. The importance of this issue can be best understood in terms of the debates surrounding the Stern Review on the economics of climate change. For example, environmental damage worth \$100 half a century from now would be valued at \$49.90 today using the Stern Review's discount rate of 1.4% a year but only \$5.43 or \$6.88 using the alternative rates preferred by its critics (6 and 5.5%, respectively). Therefore, using a high discount rate significantly reduces the social profitability of taking mitigation actions today, favoring delayed action or even no action at all. For this reason, a high rate of discount reduces the attractiveness of savings and investing today to benefit the welfare of future generations.

This implies that social discount rates used for the analysis of optimal economic growth paths and associated savings and investment decisions are inherently linked to ethical debates on inter-generational equity. On these grounds, Ocampo justifies the use, by Stern and supporters of strong environmental action, of social discount rates that are below (in fact well below) market rates. Indeed, he argues that full inter-generational equity calls for the use of a discount rate equivalent to the expected rate of technical change (say on the order of 1.5 to 2%). This also implies that savings and investment today to reduce environmental damages must be increased to benefit future generations. A complementary argument is that strong action today insures future generations against the asymmetric and non-linear effects that certain developments can have on the ecosystem (i.e., the fact that the risk of losses associated with climate change or the extinction of species, among others, is higher than the probability of a more favorable outcome than those being projected), including the rising likelihood of extreme events (catastrophes). As indicated, this implies that microeconomic and sectoral cost-benefit analysis of relevant environmental investments should be evaluated using low social discount rates.

Macroeconomic considerations also indicate that green investments have a dual positive economic effect, on aggregate supply and demand. In the first case, the recent Green Economic report by UNEP shows that a strategy of reallocating investments towards the green economy may lead to slower potential economic growth for a few years, as renewable natural resources are replenished (an effect that can be strong in some sectors, such as fisheries), but will result in the long run in faster economic growth. Furthermore, investments in the green economy also reduce downside risks of adverse events associated with climate change, energy shocks, water scarcity and loss of ecosystem services. They will also result in the long term in increased employment, as green investments are generally more employment intensive, and have direct benefits in terms of poverty reduction. The latter is particularly true in the case of agriculture, where green technologies will tend to improve the agricultural productivity of rural smallholders.

A full consideration of the fact that green investments today will also increase aggregate demand gives an even more positive macroeconomic picture. Indeed, such investments can help increase economic activity and employment in the short-run, a much needed action for industrial economies that are still characterized by high levels of unemployment. This positive effect may even counteract whatever adverse aggregate

supply effects those investments can have in the short term. In turn, to the extent that investment is embodied in new equipment or leads to learning-by-doing, higher investment induces productivity growth, reinforcing long-term growth. Obviously, the composition of the demand stimulus must be carefully chosen to reinforce sustainable development: certain types of consumption and investment must be restricted to avoid excessive resource depletion and waste, whereas environmentally-friendly investment and consumption should expand.

DEVELOPING COUNTRIES' GREEN DEVELOPMENT STRATEGIES

The third macroeconomic dimension highlighted by Ocampo comes from recognizing that economic growth is nothing else but a process of structural change: one in which some activities expand, based on new technological knowledge, while others contract. In this “structuralist” view, those changes are not just a byproduct of growth but their prime mover: development is nothing other than the capacity of an economy constantly to generate new dynamic activities. This view is essential because the transition to the green economy involves no less than a technological revolution, and will have deep impacts on production structures as well as on consumption patterns.

These structural transformations have two types of implications. Since new technologies are largely going to originate in the industrial countries, there are a series of international issues related to how these technologies are disseminated, what changes in trade patterns they will generate and what mechanisms will be put in place by the international community to guarantee that this process will benefit all countries. These issues are dealt with in later sections. Here we will concentrate on a second set of issues that relate to the domestic policy response by developing countries.

The major implication in this regard, which is underscored by the three authors, is that active development strategies must be put in place to drive the transformation towards new dynamic green activities. This strategy can be called as an investment-led strategy, or an active industrial and technology policy. In the latter case, it must be emphasized, however, that it involves not only manufacturing or industry but the whole range of economic activities (agricultural transformations, for example, are critical). For this reason, “production sector policies” could be a better term than industrial policies. Developmental states must be at the center of these strategies, but they must be designed to encourage strong private-sector responses. In Khor’s terms, the state has traditionally had a strong developmental role in developing countries: it now has to take on a *sustainable* development role.

In the view of the three authors, the core of this strategy should be a strong technology policy with a focus on adaptation and dissemination of green technologies (an issue that will be dealt with more extensively below) and the treatment of green economic activities as “infant industries” that require appropriate support (subsidies, preferably time-bound, access to credit and perhaps some level of protection). In Cosbey’s view, a wise industrial policy requires giving preference to new public and private investment that contribute to sustainable development: investment with good prospects for generating backward and

forward linkages in the economy, and which aligns with countries' development priorities. In the end, he argues, governments looking to support domestic green sectors will inevitably pick losers as well as winners, but this should not be a blanket admonition against trying, as we have a rich history on which to draw in judging what works and what does not. These actions should be supported by public sector investments that develop the necessary infrastructure and provide access to basic energy and water and sanitation for the poor.

Needless to say, besides encouraging faster economic growth, the strategy must also incorporate sustainable development principles and practices. The set of related issues is extensively analyzed in Khor's contribution. It includes regulation, pricing policies, taxes and subsidies to limit pollution and emissions and to control over-exploitation of natural resources and making prices better reflect environmental values, as well as mainstreaming environmental criteria in government procurement policies. In his view, this principle should also be incorporated in the pricing of public services, but in such a way as not to penalize the poor, especially when the products or services concerned are essentials. Thus, if water is generally underpriced, when revaluing its price a system of differential pricing should be put in place that ensures access for the poor. Public expenditure on restoring damaged ecosystems (such as forests, hillsides, water catchment areas and mangroves) is also important.

One of the crucial issues is the right of rural communities to a clean environment that enables them to have a sound basis for their livelihoods and their living conditions. One of the most serious potential effects of global warming will be the lower productivity of agriculture in developing countries. For the same reason, however, poor rural communities are also among the main beneficiaries of the green economy. Sustainable agricultural production methods have great mitigation and adaptation potential, particularly with regard to topsoil organic matter fixation, soil fertility and water-holding capacity, and increasing yields in areas with medium to low-input agriculture and in agro-forestry. In this context, paying farmers for carbon sequestration may be considered a "triple dividend" policy, as carbon dioxide is removed from the atmosphere (mitigation), higher organic matter levels and moisture retention in soils enhance their resilience (adaptation), and improved soil organic matter levels lead to better crop yields (production).

This issue is also related to "food security", a term that has shifted back to the traditional concept of greater self-sufficiency and increased local food production. This may require, in Khor's view, putting back many institutions that were dismantled in developing countries due to structural adjustment policies: those that assisted farmers in marketing, credit, subsidies, infrastructure, and protection. It should also include international trade reform that sufficiently reduces or removes harmful agricultural subsidies in the developed countries, while enabling developing countries to have special treatment and safeguard mechanisms to promote their small farmers' livelihoods.

DOMESTIC AND INTERNATIONAL TECHNOLOGY ISSUES

Ocampo points out that the technological revolution surrounding the green economy is likely to differ from previous processes of this sort in at least three major ways. First of all, government policy is going to play a more central role than in past industrial revolutions. Secondly, given the level of integration of the world economy today and the fact that it is responding to veritable global challenges, the associated technological change is going to be essentially a global process, with specific international institutions playing a fundamental role in coordinating international cooperation. Thirdly, it will take place under the prevalence of intellectual property rights which are stronger and enjoy global protection under the TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights) of the World Trade Organization (WTO).

This raises essential issues as to who will benefit from technological change, in terms of being at the center of research and development efforts, and generating new economic activities and linkages with the rest of their economies. The available evidence indicates that most innovation in climate mitigating technology does take place in industrial countries and that, therefore, firms from those countries are the main holders of intellectual property rights, but a number of major developing country firms (from Brazil, China and India, in particular) have already gained some market share in new technologies. Given the center-periphery character of the process of technology generation, an important concern relates to whether this process will generate new forces for international inequality associated with the uneven technological capacities that already exist, both between industrial and developing countries but now also among developing countries.

A critical issue here, underscored by both Cosbey and Ocampo, is that, aside from the very large disparities in capacities to generate technology, technological absorption on the recipient side is always an active learning process. So, a central aspect of technology development and transfer is building local capacity so that developing countries can absorb, adapt, diffuse into the domestic economy and eventually design new technologies. Government support is thus essential to create national systems of innovation. This requires mechanisms to disseminate the technology, such as agricultural extension services for green agricultural technologies and similar mechanisms to spread knowledge about better building practices to household and construction firms, and about energy-saving technologies to small and medium-sized manufacturing firms, to mention a few. It also requires growing public, academic and private research and development (R&D) and engineering teams that adapt imported technology and eventually contribute to generate new technology.

In any case, given the fact that most developing countries will be technology followers, there is a need to develop global institutional arrangements that increase international cooperation and collaboration on research and development in all areas relevant for green growth, and accelerate the spread of those technologies to developing countries. According to all three papers, an important measure to promote sustainable development is to expand the space for technologies in the public domain, and to stimulate the transfer

to developing countries of publicly-funded technologies. Industrial countries should influence the flow of such technologies directly, or through requiring the private sector and public institutes that receive R&D funding from government to be more active in transferring technologies to developing countries. At the international level, there can also be public funding and joint planning of R&D programs, following for example the model of the Consultative Group on International Agricultural Research (CGIAR). Products and technologies emerging from such publicly funded programs should be placed in the public domain. A network of technology experts in various areas should be made available to advise developing countries, as well as designing a model R&D cooperation agreement, global demonstration programs, knowledge-sharing platforms, and a global database on freely available technologies and best practices in licensing.

The three authors also share a common view about the implications that this has for intellectual property rights (IPRs) and, particularly, the extent to which they clash with the public good character of knowledge. In Cosbey's formulation, there has always been a moral argument for developed countries to engage in technology cooperation, to help developing countries access and assimilate the technologies they need for development, but the arguments become even more compelling in the context of technologies that are urgently needed to avoid environmental problems that have a global scope, such as climate change and biodiversity loss. Furthermore, as he argues, it is impossible to describe a single IPR regime that suits all countries at all stages of development.

In the interests of building a global green economy, IPR regimes should be tailored to countries' development status. In Cosbey's view, even at low levels of development IPRs play an important role. They may result in more imports of high-tech goods that, in themselves, represent technology transfer – goods that exporters would be reluctant to export to countries with weak protection. Similarly, they might result in increased incidence of firm-to-firm licensing of technologies, which in its own way results in increased domestic technological capacity.

However, a delicate balance must be struck between these advantages and the costs that IPRs have for technologically-dependent countries. For this reason, the three contributions call for reforms of the global intellectual property regime that would: include broader room for compulsory licensing (replicating this and other aspects of the WTO Doha 2001 agreement on IPRs and public health), strengthen patenting standards (particularly standards of breadth and novelty), limit the length of patent protection, and allow innovators to use existing patented knowledge to generate new innovations.

INTERNATIONAL TRADE AND INVESTMENT RULES

Changing trade patterns will be an essential part of the structural change surrounding the transition to the green economy. This restructuring brings potential economic benefits to developing countries by opening up new export opportunities. Indeed, as Cosbey points out, the growth in environmental goods and services (variously defined) has tended to exceed growth of merchandise exports since at least the mid-1990s as well as growth of GDP. However, there are also risks. Although, some developing countries – notably

China, but also India and Brazil – are participating dynamically in these markets, most environmental goods are produced in industrial countries. Also, as already pointed out, new trends also pose risks associated with using environment for protectionist purposes, including the undue use of subsidies and technical standards, and limiting the policy space that developing countries have to promote their own green economies.

As Cosbey argues, one obvious way trade policy might help in the greening of economies is by lowering tariff and non-tariff barriers to goods such as wind turbines and efficient light bulbs, and services such as environmental engineering. However, Khor claims that some developed countries may be attempting, through the categorization of certain goods and services as "environmental", to eliminate the tariffs of unrelated goods in WTO negotiations. In turn, he argues in favor of developing countries retaining some room for protection to develop their own environmental goods and services and support their diversification efforts.

Both Cosbey and Khor also cautioned against the use of environmental standards as a new form of protectionism. The clearest case is that of border carbon adjustments, which would operate in practice as additional import tariffs and should thus be rejected. In addition, Cosbey argues that regulations, standards and prohibitions based on production and processing methods (PPMs), which are not necessarily protectionist, may be easily specified in ways that provide undue advantage to domestic producers. They include carbon footprint labels, or labels that display the amount of greenhouse gases a product emits over its life cycle. More generally, environment-related product and process standards, regulatory regimes and restrictions are steadily ratcheting up in industrial economies, and private buyers in these countries are also developing a parallel set of related standards and codes.

The rise of these standards has major implications for developing country exporters. Governments should thus focus on enabling exporters to meet such standards, working with the private sector to communicate the content of the regulations and to help firms identify, acquire and assimilate the technologies needed to meet them. Governments can also help build accredited national or regional capacity to test and certify goods as compliant; this includes building laboratories, working with foreign accreditation bodies, supporting technical training, etc. They can also design domestic standards that are not too far from those required internationally, which would help build up private sector capacity to export successfully to demanding key markets and result in less local pollution, resource use and waste. At the international level, however, the plethora of product energy performance standards, testing procedures and labeling requirements used in different markets creates a barrier to export. Harmonizing these standards would thus be a huge boon, in particular for small and medium sized exporters.

The support given by industrial countries to green industries, including for R&D, though essential for the transition to the green economy, also raise some concerns. In Cosbey's terms, there is nothing close to international agreement on the propriety and ideal character of such support, which is thus liberally granted by developed and developing countries alike. Furthermore, while there are rules in this area, there is a divergence of

opinion among the three authors about what WTO rules say, which reflects a broader policy debate. Although we could wait for clarity from the WTO dispute settlement process, this would not give policy makers certainty about what they can and cannot do. Furthermore, Cosbey argues that when rule-breaking is a widespread practice, as he thinks it is in this area, it seems unwise to use this mechanism, as any WTO dispute settlement decision risks looking anti-environment, anti-development, or both. Far better would be to hammer out some agreement (whether inside or outside of the WTO) that would identify best practice in the application of such support that is consistent with fair international trade.

Overall, there is broad agreement that technical standards and subsidies are essential for the transition to the green economy, but there is the possibility, as Khor argues that, through particular and narrow definitions of the trade-environment link, powerful nations could try to shift the economic burden of ecological adjustment to the weaker parties. A particular challenge in this regard is the interpretation of GATT Article XX, which allows countries to take measures contrary to the GATT rules on certain grounds, including measures “necessary to protect human, animal or plant life or health” and measures relating to the conservation of exhaustible natural resources.

Aside from these considerations, some countries will lose markets and/or suffer worsening terms of trade under a green economy. Any policies that help them successfully diversify away from known long-run losers would be essential for their success in a global green economy. A major concern here is obviously the commodity dependence of a large number of developing countries, particularly in Africa, the Middle East and Latin America. However, the best way to face the structural diversification efforts is to start by relying on capabilities and assets they already possess. Thus, Cosbey argues, for economies that rely heavily on extractives, the most feasible near-term course is to focus first on process improvements to existing activities, though clearly understood as a step in building up different classes of activities.

Finally, for Cosbey, the existing international investment “regime” – a web of over 2,700 bilateral investment treaties, investment provisions in a growing number of free trade agreements, and a host of firm/project-specific host government agreements – poses additional challenges. The first is that the plethora of agreements does not help states discriminate between desirable and undesirable forms of investment; in fact, some provisions in these agreements may actually act as obstacles to that sort of discrimination. Even more troublesome is the fact that, over the past decade, private sector actors have increasingly used dispute settlement provisions under these agreements to compel states into binding arbitration, arguing that new environmental regulations amount to an expropriation of their investments, or that they violate provisions on fair and equitable treatment by changing the rules of the game. This inappropriate interpretation of investment protection regulations must be unmistakably corrected. Furthermore, the Agreement on Trade-Related Investment Measures (TRIMS) under WTO, and most investment agreements, also prohibit the use of performance requirements. Cosbey argues that, where such measures can be shown to work in fostering new innovative global players, prohibiting them could constitute an obstacle to achieving a green economy. So,

as in the area of subsidies, it may be better to reach fresh international agreement as to what should be acceptable (and/or best) practice in this area in the pursuit of the green economy.

FINANCING DEVELOPING COUNTRIES' GREEN ECONOMIES

There are diverging estimates of the resources needed for the transition to the green economy, which Ocampo and Khor summarize in their contributions. Based on these estimates, the recent Green Economy report by UNEP proposes a \$1.3 trillion (2% of world GDP) target for green (public plus private) investments. Close to three-fifths of this sum would be invested in energy efficiency – particularly in buildings, industry and transport – and renewables; the remainder would be invested in tourism, water, agriculture, fisheries, waste management and a small amount in forestry. The resources allocated to energy, of slightly over 1% of GDP, are broadly consistent with estimates by Stern for a scenario for emissions of 450 ppm CO₂ by 2050. Over half of the estimated needs will come from developing countries, particularly in the area of energy, where the greatest expansion of demand is projected. Compared with these needs, UNFCCC calculations of financial needs for adaptation are of a much smaller order of magnitude: 0.04-0.15% of world GDP by 2030, but there are larger estimates.

In this context, the commitment reached in the recent UNFCCC conferences of the parties of mobilizing \$100 billion a year by 2020 to address the needs of developing countries (which could include some private funds) is characterized by Ocampo as encouraging though at the low end of existing estimates, whereas Khor considers it far from adequate. In Ocampo's view, these resources should be additional to those that should be designed to pay for environmental services, including in particular those provided by natural forests – a mechanism that is being discussed through the initiative to reduce emissions from deforestation and forest degradation (REDD).

Khor and Ocampo argue, along with several developing countries and many civil society groups, that carbon offsets that enable developed countries to pay for pollution rights and escape from having to reduce their own emissions should not be counted towards the contributions to the global climate fund. Khor adds, in this regard, that the system is open to fraudulent practices, generates the danger of creating new financial speculative instruments and raises concerns about the unethical and social implications of transforming nature into a commodity. He also argues in favor of the use of Special Drawing Rights (SDRs) for purposes of supporting developing countries for sustainable development activities which, in his view, is an attractive alternative in a period when government budgets in developed countries are coming under stress.

Developing countries have insisted in various fora on the principle of “adequate, new and additional” international financial resources for sustainable development, including environmental activities, to which the concept of predictability should be added. Since the monitoring and implementation of international financial obligations have been extremely weak in the past (in relation to Official Development Assistance, ODA, in particular), clear mechanisms in both areas should be designed. No unrelated and

unnecessary conditionalities should be attached to the use of these funds, nor should the environment serve as an excuse to add additional conditions for ODA aid, loans, debt rescheduling or debt relief.

According to Ocampo, the priority in the allocation among developing countries should obviously be given to the poorest countries, as well as those more likely to be affected by climate change (which may be the same). Given the large synergies between poverty alleviation and the green economy (most particularly in sustainable agriculture, water and sanitation), there may be “double” and even “triple dividends” in funds allocated for development purposes to the poorest countries (social and environmental, but also possibly economic). However, beyond these allocations to the poorest countries and those most likely to suffer major environmental disruptions, a strong case can also be made for transfer-like resources for middle-income countries to help them contribute to the provision of global public environmental goods. Similarly, the financing of access to basic services for the poor represents a limited amount of resources and should thus be included as part of a “no excuses” global financial scenario. In the allocation of funds across different economic agents in recipient countries, priority should be given to public sector infrastructure investments that are critical to the transition to the green economy. Households should also be a major target of financing, particularly to support energy-efficient housing and appliances, including subsidies that could be financed with taxes on energy use.

In macroeconomic terms, an effective international transfer of resources implies that recipient countries should be running current account deficits, but they may not be willing to do so for strict macroeconomic reasons (avoiding exchange rate overvaluation and preventing crises). This has major implications for the design of financing facilities to support developing countries’ efforts to build a green economy. The major implication is that priority should be given to financing programs that generate strong synergies with domestic efforts and avoid raising costs associated with the new strategy. Perhaps the most important are global financial efforts that facilitate the free or low cost access to technology: global financial technology funds that create knowledge that is made available as a public good, public sector purchase of relevant technology that is also made freely available, technical assistance in building technology capabilities, and human capital formation. A second area may be mechanisms that facilitate long-term domestic financing in developing countries, thus overcoming its short-term bias. One possible way would be to use the capitalization of multilateral development banks to expand considerably their bond issuance and lending in the domestic currencies of the developing countries, and to support activities that contribute to domestic financial development in these countries, particularly domestic development banks’ capacity to extend the maturities of available domestic financing.

Those developing countries that run current account deficits will, of course, be ready to absorb the additional financing. But in this case, the major implication is that financing of external deficits should not increase the risk of financial crises, which should be reflected in the provision of transfers rather than loans, or of loans with a grant component. This is particularly crucial for low-income countries. An additional area that becomes very

attractive is the design of global disaster relief and disaster insurance facilities to manage climate disasters. Such facilities could include insurance premiums but with a grant component that could vary according to the level of development of countries.

The macroeconomics of the green economy

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INTRODUCTION

Under the influence of the United Nations, particularly the United Nations Environmental Programme (UNEP), the concepts of “green economy”, “green growth” and “global green new deal” have emerged into the global policy debate (UNEP 2011a, 2011b; Barbier 2010).¹ There is no unique definition of the concept “green economy”, but the term itself underscores the *economic* dimensions of sustainability. Thus, the Secretary-General’s report to the second Preparatory Committee of the United Nations Conference on Sustainable Development (UNCSD) states that “The concept of green economy focuses primarily on the intersection between environment and economy” (United Nations 2010b: par. 5), and the recent report by UNEP on the green economy makes it clear that the concept responds to the “growing recognition that achieving sustainability rests almost entirely on getting the economy right” (UNEP 2011a). It also emphasizes the crucial point that economic growth and environmental stewardship can be complementary strategies, thus countering the view that still holds a strong influence that there are significant tradeoffs between these two objectives.

Responding to concerns by many countries and analysts (see, for example, Khor 2010), it has been made clear that the concept should be seen as consistent with the broader and older concept of sustainable development, which has been mainstreamed into the work of the United Nations. The specificity of the broader concept is associated with its both its *holistic* character, as it encompasses the three pillars of development –economic, social and environmental—, and its particular focus on *inter*-generational equity, which derives from its original formulation under the Brundtland Commission as development “that meets the need of the present without compromising the ability of future generation to meet their own needs” (World Commission on the Environment and Development 1987: 8). It must be pointed out, however, that some analysts have criticized these definitions for the lack of an explicit reference to the ecological dimensions, understood as the biophysical limits within which society necessarily operates. The environmental dimension of sustainable development should thus be understood in that way.

To achieve the consistency between the two concepts, UNEP has defined the green economy as “an economy that not only improves human well-being and lessens inequality but also reduces environmental risks and ecological scarcities”, and as “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” –i.e. an economy that is “low-carbon, resource efficient and socially inclusive”. Also, to make the two concepts consistent, UNCSD has chosen as one of its themes the “green economy in the context of sustainable development and poverty eradication”.

¹ See also OECD (2010) and, for the origins of the term, Pearce *et al.* (1989).

To contribute to the preparatory process of UNCSD, this paper focuses on one particular aspect of the green economy: its *macroeconomic* dimensions –i.e., on issues that concern the effects of sustainability on economies as a whole. This is not an easy task. Most of the massive literature on the links between the economy and the environment focuses on what we could describe as its *microeconomic* dimensions and, in particular, on the role of externalities and different options to correct them (regulations, taxes and/or emissions trading, and subsidies). There is also an equally massive literature on the sectoral dimensions (which can perhaps be termed the *mesoeconomic* dimensions), particularly on the economic implications of the energy system in the face of climate change, but also on forests, water systems, agriculture, fisheries, mining and waste management, as well as the specific urban and rural dimensions of the associated challenges. But there is a less abundant literature on macroeconomic issues.

One way to divide the set of the specific macroeconomic and associated policy issues is to classify them under four different headings. The *first* one relates to how the welfare of future generations is taken into account in current economic decisions, affecting savings and investment decisions today and, more broadly, the social discount rate that should be applied in cost-benefit analyses of investments in environmental sustainability. The *second* refers to aggregate supply and (the much less common) aggregate demand analysis that incorporates environmental investments and constraints. The *third* is the analysis of economic growth as a process of structural change –i.e., as a process that involves significant changes in the structure of production and consumption, which is largely driven by technological change. The *fourth* one relates to the debates on financing the green economy, particularly of developing countries participation in global initiatives in this area. As we shall see, these four approaches are interlinked. They also necessarily interact with the micro and mesoeconomic dimensions of the green economy. This is particularly true of the third approach, but also of the priorities for allocation of funds under the fourth.

It is also important to emphasize that macroeconomic analysis, as outlined, is deeply embedded in distributional debates. They relate, first and foremost, to the inter-generational character of sustainable development. A second set of distributive issues, which are a major concern of this paper, relates to how the opportunities and costs are shared between developed and developing countries –i.e., to distributional issues of an international character. The discussion could be broadened to discuss different categories of countries in both groups but, for reasons of space, there will only be a few references to them. There are also many other subordinate distributional issues associated with the micro and sectoral dimensions, such as who is affected by carbon taxation or high hydrocarbon prices, by the composition of spending, by policies aimed at administering different sectoral policies, etc. Again, for reasons of space, this paper will only make passing reference to them.

The international equity dimensions have been made more difficult by of the overexploitation of ecosystems by industrial countries in the past. This is particularly evident in relation to climate change, where the *accumulated* emissions of greenhouse

gases, largely generated by industrial countries in the past, imply that there is no solution that is viable today that does not involve the active participation of developing countries. In the words of the proponents of the Greenhouse Development Rights Framework, “it is too late to talk of emissions reductions of Annex I countries alone. It is now necessary to secure significant cuts in emissions in the growing nations of the developing world” (Baer *et al.* 2008: 5) –where, they add, there are still high levels of poverty.

This makes it more difficult to achieve climate objectives while explicitly safeguarding the right to development. It implies in fact that we face not only the challenging task of reducing massive climate risks and other major environmental disruptions, but of doing so while reducing the accumulated international inequities that have accumulated. This is the particular challenge that is derived from the principle of “common but differentiated responsibilities”. It implies, in particular, as the United Nations Department of Economic and Social Affairs has put it, that: “The active participation of developing countries is now required and such participation can occur only if it allows economic growth and development to proceed in a rapid and sustainable manner” (United Nations 2009: v).

The “common” part of the responsibilities is also derived from the growth patterns that most developing countries have been following. This applies, for example, to greenhouse gas emissions where, despite the fact that per capita emissions continue to be much lower than those of industrial countries, developing countries contributed to 78.5% of the growth of CO₂ emissions between 1973 and 2008 and represented in the latter year 44.3% of the total.²

In relation to biodiversity and natural forests, a similar process to that of climate change has taken place, with industrial countries having affected their ecosystems much earlier in their development process. However, here the responsibility of developing countries is in fact much larger, as they hold in their territories the most mega-diverse ecosystems and the largest remaining natural forests. This also implies that the global community has to compensate them with adequate payment for the global environmental services they provide.

In other areas, the links are more local or regional, as in the case of the quantity and quality of water resources, the fertility of land or the access to clean air in the cities, among others. Here the responsibility of the developing countries is clearly to their own populations, recognizing also that there are close links between poverty and the degradation of ecosystems. The major responsibility of industrial relates to supporting the associated poverty eradication efforts.

As has already been noted, what is essential to the concepts of green economy and green growth is the understanding that the benefits of environmental sustainability outweigh the costs of investing in and protecting the ecosystems, so that it is possible to have a win-win or “double dividend” strategy of growth with environmental sustainability, and even win-win-win or “triple dividend” strategy that also includes poverty eradication and

² Estimated from data from IEA (2010), p. 45. Out of the total, China represents about half of the emissions from developing countries in 2008 and slightly over half of the increase in 1973-2008.

broader improvements in social equity. This can be understood in a negative sense that “The destruction of nature has now reached levels where serious social and economic costs are being felt and will be felt at an accelerating pace if we continue with ‘business as usual’”, to use the words of the TEEB Project (The Economics of Ecosystems and Biodiversity) (TEEB 2010a: 25). But, even more importantly, it should be understood in the positive sense that the concept of the “green economy” has proposed: a strategy of investing in environmental sustainability can actually improve growth prospects.

This paper analyzes from a macroeconomic perspective whether this is possible, and what policy instruments can be used to support these synergies. The following four sections survey the existing literature along the four perspectives that have been mentioned. The last draws some policy conclusions.

VALUING THE WELFARE OF FUTURE GENERATIONS

The first approach can be best discussed in terms of the debate surrounding the Stern Review on the economics of climate change (Stern 2007, 2008, 2009; Nordhaus 2007; Weitzman 2007), but it has precedents in similar debates in the past.³ The fundamental question is how the welfare of future generations is taken into account in current economic decisions, which also affects the choice between consuming today or saving and investing to increase the consumption of future generations.

The debate is based on the common sense view that a benefit today is worth more than a benefit tomorrow and thus that any future revenue or cost should be estimated with a discount when making decisions today. However, the importance of this issue in the current context is derived from the fact that discount rates have enormous implications when they involve very long time periods. For example, an adverse effect of climate change (or any other environmental damage) of \$100 half a century from now is worth \$49.90 today using the Stern Review’s discount rate of 1.4% but only \$5.43 to \$6.88 using the alternative rates preferred by its critics (6 and 5.5%, respectively). So, the use of high discount rates significantly reduces the social profitability of action today.

The major policy implication for the debate surrounding the Stern Review is whether the strategy to combat climate change requires a gradual tightening strategy by which investment in mitigation and the carbon prices that generate incentives to invest are progressively increased (a “climate policy ramp”, to use Nordhaus’ terminology), or strong action today to avoid future climate-related damages and/or to provide insurance against extreme events (climate catastrophes).

A central issue here is that “selecting an appropriate discount rate [...] is the outcome of implicit or explicit ethical choices” (TEEB 2008: 28), an issue that has also been extensively discussed by Stern (2008, 2009 chapter 5). For the reasons that are put forward in a Technical Appendix to this paper, the strict application of a principle of inter-generational equity implies that the discount rate should be low, and well below market interest rates, which aside from not considering equity dimensions do not take

³ See, for example, the debate on global warming in the 1990s between Cline (1992) and Nordhaus (1994).

into account environmental externalities either. Indeed, the Appendix argues that the appropriate discount rate should be the expected rate of productivity growth (which could eventually be negative if significant environmental damages are expected). The social discount rate should be used in microeconomic and sectoral analysis and can have major implications also in this area. In particular, investment decisions involve very different time horizons in different sectors, and the likely negative effects of environmental problems also play unevenly through time in different sectors.

Aside from the issues regarding the choice of a social discount rate, there are others associated with *risk* and *uncertainty*. The difference between these two phenomena is crucial here. The first refers to choices that we can make based on known parameters – or, to be precise, on parameters that can be inferred from past behavior of the economy and the ecosystem. The second refers to decisions that have to be made with imprecise or even lack of information (“known unknowns”), and thus without knowledge of what adequate parameters would be. It is here that the “precautionary principle” of Rio Earth Summit (UNCED) fully applies.

The most important cases are catastrophic events that could lead to irreversible processes beyond certain thresholds, which may also be known only with high levels of imprecision or even belong to the “known unknowns”. Such catastrophic events are present in some of the future climate change scenarios, but are already happening in the area of biodiversity (rapid extinction of species) and may be close to happening with fisheries or some water systems. Another and, in a sense, closely interlinked case refers to the fact that the probability of very adverse environmental events is higher than that of pleasant surprises.⁴ This is what most climate change scenarios project and it is certainly true of biodiversity. It is also a well known and, in fact, recurrent historical pattern in financial markets, where the extreme events are, of course, financial crises.

Risk should by itself lead to precaution. As argued in the Appendix, taking into account inter-generational equity implies that society should be highly risk-averse, resulting in low social discount rates. The phenomenon of *uncertainty* is particularly important in the analysis of the links between the economy and the ecosystem. This includes uncertainty about the benefits and costs of future events and even our incomplete knowledge of ecosystems (as reflected, for example, in the multitude of climate change scenarios) and of the effects that environmental damage can inflict on the economy. In economic terms, the precautionary principle should lead to strong insurance against extreme events. For Martin Weitzman, this is the best defense of action in the area of climate change: “spending money now to stop global warming should not be conceptualized primarily as being about optimal consumption smoothing so much as an issue about how much insurance to buy to offset the small chance of a ruinous catastrophe that is difficult to offset by ordinary savings” (Weitzman 2007: 704-705; see also Weitzman 2010).

Finally, although the policies adopted to correct the negative externalities and to promote activities with positive externalities have a rationale of their own, they may also have

⁴ This is what is known as “fat tails” in statistical terms. So, the asymmetry underscored in the text indicates that negative fat tails tend to be more important than positive ones.

macroeconomic effects. They imply that state intervention has to increase, which aside from active regulation may also (though not necessarily) mean that a larger fraction of world GDP may end up going through state budgets, as both revenue and spending. Some may fear that larger states could have negative effects on aggregate supply, though there is conflicting evidence on this subject that will not be reviewed here. The new revenues, particularly those from higher direct or indirect taxation on carbon, also provide opportunities for changing the structure of governments' revenues, reducing or eliminating taxes that may generate distortions or be regressive in their impact.

AGGREGATE SUPPLY AND DEMAND ANALYSIS

A second family of macroeconomic effects is those that green economy policies have on aggregate supply and demand. Those that work through aggregate supply have been explored abundantly in the existing literature, particularly in relation to climate change. Aggregate demand effects are less commonly explored but occupy a central place in stimulus packages and in demand-driven growth models in the Keynesian tradition.

The supply effects can be conceptualized in two different but complementary ways. The first one is to include a stock of natural capital that affects aggregate production together with other capital stocks –physical and human, as well as more intangible ones like institutional and social capital. A problem with this approach is that measurement problems are monumental, even more critical than those associated with measuring other forms of capital. The second is to view the damage to the ecosystems as a constraint on aggregate supply, or eventually as a productivity loss or a rising aggregate cost curve.

The contrast between these approaches is useful to differentiate two basic ways of understanding the relations between the macro-economy and the ecosystems. The first, which has been suggested by the World Bank (2006), considers development as a “process of portfolio management”, in which the resource rents from exhaustible natural resources can be transformed into other assets through the investment. From here the Bank derives a measure of “adjusted net savings”, which takes into account investments in all forms of capital as well as depreciation of physical capital and depletion of natural capital. This analysis carries the correct message that countries –developing countries, in particular— should fully save the rents from natural resources. But it also incorrectly implies that the scarcity of resources cannot be regarded as a bottleneck, as investments in physical and human capital can compensate for depletion of natural resources –a concept that has come to be called “weak sustainability”. So, this concept is only useful in a limited sense to understand the macroeconomics of the green economy.

The alternative approach, which comes from ecological economics, views the macro-economy rather as an open subsystem within the finite natural ecosystem. Its major conclusion is that capital cannot substitute for resources, as they perform different functions, and at least some of those functions cannot be duplicated by humans. This leads to the concept of “strong sustainability”, which posits that there are ecological limits that can constrain economic growth.

While the first of these approaches can be useful for some purposes –such as the transition away from natural-resource dependence of developing countries— the second is better to understand the physical and environmental limits to growth if green strategies are not followed to generate a consistency between economic growth and environmental sustainability.

A recent survey of macroeconomic models that analyze the links between the macro-economy and environmental sustainability indicate that the dominant link analyzed is the one that goes from the economy to energy, and then to climate change (or the environment in general), with few feedbacks, the main one being taxation. Stocks and maximum carrying capacities are not usually covered. It also concludes that the linear (or log-linear) relations that those models use are appropriate for the analysis of marginal changes, but not to events that are non-linear, such as thresholds generated by deep depletion of resources or the rising probability of extreme events (catastrophes). The models also generally assume, in a way that is consistent with the concept of “adjusted net savings”, that the depletion of natural capital can be substituted for physical capital. Technology is generally treated as an exogenous variable, and uncertainty is almost always left aside (Cambridge Econometrics and Sustainable Europe Research Institute 2010).

One common use of these models is the analysis of policies to confront climate change – which can be termed the “costs of action”. More stringent action to mitigate climate change will increase the costs of energy, which will then have adverse effects on global output. According to the survey by the Intergovernmental Panel on Climate Change (IPCC 2007a and 2007b, chapter 3), costs in 2030 consistent with emissions trajectories towards stabilization between 445 and 535 ppm CO₂ equivalent represent a maximum loss of 3% in global GDP (a loss in the growth rate of 0.12% a year). Costs are higher the more stringent the objective and differ by region. Most importantly, perhaps, costs can be reduced substantially through the adoption of an efficient portfolio of interventions is adopted and if revenues are used to promote low-carbon technologies or reform existing taxes. Models that assume induced technological change also give lower costs but require larger upfront investments. Aggregate costs under this trajectory reach a maximum of 5.5% of GDP in 2050 (equivalent again to a reduction in growth rates by 0.12% a year) based on a portfolio of existing technologies and those that are expected to become profitable. There are, however, large uncertainties about both cost estimates far into the future and the optimal path to achieve the required level of mitigation.

These costs of action obviously have to be confronted with the “costs of inaction”: the disruptions generated by environmental damages, which in this context can also be interpreted as a reduction in the aggregate productivity of the economy. The IPCC reports the large divergence of views on these damages as well as the difficulty in costing non-market damages in economic terms. A cost-benefit analysis should then evaluate these costs with those of taking action. It is here that the discount rate plays a critical role. The Stern Review comes to the conclusion that that mitigation costs of around 1% per of GDP are highly worthwhile to limit damage costs of around 5% of world GDP by 2050 (which could be significantly higher). However, costs can be higher if they rise rapidly after

some point, include thresholds and even low probability of extreme events. In this case, as we have seen in the previous section, cost-benefit analysis must be done using a low discount rates or as insurance against extreme events.

A broader analysis of the macroeconomic implications of environmental protection is that provided by UNEP's recent Green Economy Report (UNEP, 2011b, chapter 13). According to the simulations provided, investing in the green economy \$1.3 trillion, equivalent to 2% of world GDP or one-tenth of global investment, may lead to slower growth for a few years (relative to the scenario in which those resources are invested according to past patterns), as renewable natural resources are replenished, but will result in faster growth after 5-10 years. Aside from the fact that the green economy can deliver in the long-term more growth, it also reduces downside risks associated with climate change, energy shocks, water scarcity and loss of ecosystem services, increases employment (as green investments are generally more employment intensive) and have direct benefits in terms of poverty reduction (particularly through improvements of agricultural productivity of rural smallholders). Relative to business-as-usual, this scenario reduces energy demand by 40% by 2050 (largely through reduced power, and transport efficiency), which is increasing supplied by renewables production, and also decreases water demand by 22% and the ecological footprint by 48%.

These simulations as well as those of all supply-driven models may underestimate the potential short-term as well as long-run benefits from an ambitious investment drive in this area, particularly in industrial countries that require new demand impulses given the high levels of unemployment that have prevailed since the 2007-08 global financial crisis. This idea was behind some of the stimulus packages approved during the crisis. The share of green investments in the packages was particularly high in Korea, some European countries and China, but only 15% of global stimulus spending (Barbier 2010). There has been a weakening of the commitment of most countries to this strategy since 2010, but it should remain in the agenda.

If this strategy is successful in igniting a new wave of investments and thus increasing aggregate demand, it also has the long-term effects suggested by Keynesian growth models in which investment plays the leading role in the growth process.⁵ In this framework, therefore, investment plays the dual role of increasing domestic demand in the short-run and of accumulating assets that are essential for long-term growth. To the extent that investment is embodied in new equipment or leads to learning-by-doing, higher investment induces in turn technological change, further reinforcing long-term growth. Indeed, some of the positive effects of the structural dynamics that we will consider in the next section work through the induced demand effects of technological change.

Whether an aggregate supply or demand framework is used, it is important to emphasize that the macroeconomic effects of green growth are closely linked with sectoral and microeconomic effects. This is behind the "expanded Keynesianism" suggested by Harris

⁵ This tradition is associated with the pioneering contributions of Michal Kalecki, Nicholas Kaldor and Joan Robinson, among others. See, for example, Kaldor (1978), chapters 1, 2 and 4.

(2009), as well as to the Green or Sustainable New Deal proposed by the United Nations (2009; see also Barbier 2010). What this approach implies is that the demand stimulus should be accompanied by changes in the composition of investment and consumption: certain types of consumption and investment must be restricted to avoid excessive resource depletion and waste, but environmentally-friendly investment and consumption can expand. Some of this additional spending should thus be aimed at environmental conservation, research and development in new technologies, creating the infrastructure necessary to increase energy efficiency (e.g., public transport, subsidizing new consumer spending on residential energy conservation, etc.) and, more broadly, at forms of public infrastructure investment that “lock in” patterns of private investments that are beneficial for environmental sustainability. To the extent that the strategy includes limits to population, it should take into account that the transition to a stable population is also to a transition to a graying population, which increases the demand for social security and medical expenses. In short, the strategy should mix Keynesian demand management with green taxes and redistribution of demand towards environmentally sounder areas of spending, thus combining macroeconomic policy with microeconomic incentives.

GREEN GROWTH AS A PROCESS OF STRUCTURAL CHANGE

A major weakness of the previous growth analysis, which looks only at the dynamics of macroeconomic aggregates –GDP, investment, labor force growth, productivity—is that it ignores that the growth process is always accompanied by major changes in production structures: variations in sectoral contributions to GDP, employment, investment, and patterns of international specialization. The implicit assumption is that these transformations are just a side effect of growth. But the alternative “structuralist” view is that these changes are not just a byproduct of growth but rather are among the prime movers: that development is nothing other than the capacity of an economy constantly to generate new dynamic activities (Ocampo 2005; Ocampo *et al.* 2009). New activities are generally accompanied by the decline of others, in the process that Schumpeter (1962) correctly characterized as “creative destruction”, and thus have major distributive implications.

For industrial countries, the main engine of this process is technological change. Since technology generation is a highly concentrated activity at the world level, it generates a global “center-periphery” pattern. In developing countries, the process leads to the lagged transfer from industrial countries of those activities that mature in technological terms and, more traditionally, and with a shorter lag, to the response to demands for natural-resource intensive goods by the leading economies. A handful of successful dynamic developing countries are now playing a more active, though still subsidiary, role in the generation of technology and new economic activities.

This structuralist view carries, of course, major policy implications. Because production structure must change if growth and development are to proceed, conscious choice of policies that will drive the transformation of the system towards new dynamic activities can play an essential role for long-term economic expansion.

The relevance of this issue for the subject of this paper is that the full development of the green economy involves no less than a technological revolution and major changes in production and consumption patterns. This technological revolution is likely to differ from previous processes of this sort in at least three major ways. First of all, government policy is going to play a more central role than in past industrial revolutions. Secondly, given the level of integration of the world economy today and the fact that the revolution is responding to veritable global challenges, it is going to be essentially global in character, with international institutions playing a fundamental role in coordinating international cooperation. The latter include those that are at the center of negotiations and enforcement of global environmental agreements, but also of trade rules and the financing facilities that developing countries are likely to require. Thirdly, it will take place under the prevalence of intellectual property rights which are stronger and enjoy global protection under the TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights) of the World Trade Organization (WTO).

The process of creative destruction can have distributive impacts, across and within countries. The essential issues here are who benefits from technological change, in terms of being at the center of research and development efforts, and generating new economic activities and demand effects (linkages) with the rest of their economies, and who will be negatively affected by the activities for which there will be reduced demand. Given the center-periphery character of the process of technological generation, a crucial question is whether this process will generate new forces for international inequality associated with the uneven technological capacities that already exist, both between industrial and developing countries but now also among developing countries (and perhaps also among industrial countries). Past industrial revolutions generated unequalizing trends, and the ongoing industrial revolution will be no different. However, the fact that this time international cooperation is at the center of this process creates the opportunity to reduce these unequalizing forces.

Issues associated with the nature of the new technologies, capacities to both generate and absorb technology and intellectual property rights are crucial in this regard. The first refers to how much technology is embodied in equipment or inputs, or in easily transferable blueprints vs. in tacit or informal knowledge that is much less readily transferable to other firms and for which such transfer tends to take place, if at all, via foreign direct investment. In relation to the second issue, we know that, aside from the very large disparities in capacities to generate technology, technological absorption on the recipient side is always an active learning process. It requires mechanisms to disseminate the technology, such as agricultural extension services for green agricultural technologies and similar mechanisms to disseminate to households and construction firms knowledge about better building practices, and energy-saving technologies to small and medium-sized manufacturing firms, to just mention a few. It also requires the development of public/private/academic research centers, as well as engineering teams in larger firms that buy equipment and/or technological packages.

In turn, intellectual property raises well-known questions about the conflict between the public good character of knowledge and the incentives that may be needed to induce

private investments in innovation and to transfer the technology to third parties, but which generate distortions of their own (creation of temporary private monopolies). These distortions would have limited effects if there is competition among firms generating new technology.

The evidence available indicates that most innovation in climate mitigating technology does take place in OECD countries and that, therefore, firms from those countries are the main holders of intellectual property rights. According to optimistic assessments, however, there is enough competition –though clearly of an oligopolistic character— within and across technologies to guarantee that developing countries should be able to obtain licenses on reasonable terms (Barton 2007; Copenhagen Economics and the IPR Company 2009; Lee *et al.* 2009). A few developing countries, notably China, hold a minority but growing proportion of patents, particularly in solar photovoltaic (PV) and wind technologies. Ethanol and biodiesel industries exist in several developing countries (e.g., China, India, Pakistan, Thailand, Malaysia), indicating that this sector is characterized by low barriers to entry.

In any case, given the fact that most developing countries will be technology followers, there is a need to generate global institutional arrangements that create incentives to increase international cooperation and collaboration on research and development in all areas relevant for green growth and accelerate the transfer of those technologies to developing countries. These should include a large component of open innovation systems and publically financed innovations and prizes. The model of the green revolution and the network of research institutions linked under the Consultative Group on International Agricultural Research (CGIAR) could be replicated. Technology initiatives should also include designing a “model” R&D cooperation agreement, global demonstration programs, knowledge-sharing platforms, and a global database on freely available technologies and best practices in licensing.

Reforms of the global regime of intellectual property regime are also necessary, including broader room for compulsory licensing (replicating this and other aspects of the WTO Doha 2001 agreement on intellectual property rights and public health) and strengthening patenting standards, particularly of breadth and novelty (Henry and Stiglitz 2010; Lee *et al.* 2009). They should also allow innovators to use existing patented knowledge to generate new innovations.

The nature of the intersectoral linkages generated by the new activities also plays a critical role in disseminating or not the benefits of the new technological revolution to developing countries. In this regard, trade rules must facilitate access of developing countries that are active in the production of green technologies to the markets of industrial countries. This should be reflected in low barriers for developing countries’ exports of PV cells, wind engines and biomass fuels, the latter being the area where more developing countries are active but where protectionism in some of the industrial countries is high. Protectionist policies should not be used with environmental objectives. Furthermore, aside from avoiding border carbon adjustments, which would operate in practice as an additional import tariff, any GHG emission targets set should be

consumption rather production-based, in order to avoid discriminating against production in developing countries (Dervis 2008).

The management of subsidies for green technologies and activities in the international trade regime also requires careful scrutiny and possibly new rules. In this regard, it is clear that subsidies should be allowed, but also that those regimes that do so (such as the WTO agricultural regime) tend to benefit industrial economies. This could be compensated in part by the ability of developing countries to access global funds to finance some of their subsidies in this area.

In turn, some natural-resource intensive exports from developing countries may be adversely affected. This “destructive” part of the technological revolution must therefore lead to support for these countries for the development of alternative dynamic activities as part of necessary adjustment in their production structures.

Finally, and perhaps most fundamentally, the speed required to put the technological revolution in place and to guarantee that its benefits are shared equitably requires a much larger role for state action than has been typical in recent decades, involving regulation, taxes and subsidies, and mixing both market and non-market measures. This is true even of industrial countries but even more so of developing countries.

For this reason, an investment-based strategy is essential to manage the transition to the green economy in the case of developing countries. The two keys to such a strategy are public investment and production sector (industrial) policies, aiming at encouraging in both cases a strong private-sector response. The latter should include a strong technology policy with a focus on adaptation and dissemination of green technologies, treatment of green economy activities as “infant industries” that requires appropriate support (time-bound subsidies and/or protection), and government procurement policies that mainstream environmental criteria. The former should include public sector investments that support these industrial policy efforts and build the necessary public sector infrastructure, as well as access targets for basic energy and water and sanitation services for the poor.

FINANCING DEVELOPING COUNTRIES’ GREEN ECONOMIES

The resources required to finance the transition to the green economy have been subject to widely diverging estimates.⁶ UNEP’s recent Green Economy Report summarizes estimates for investment needs (public and private) for the green economy, placing them in the range of \$1.05 to \$2.59 trillion per year (approximately 1.6 to 4% of estimated world GDP in 2011). It then builds its scenarios for the impact of these investments on the basis of a figure of \$1.3 trillion (2% of world GDP). Close to three-fifths of this sum would be invested in energy efficiency –particularly in buildings, industry and

⁶ We will concentrate here on the broader calculations on green investments by UNEP (2011) and the estimates on climate change mitigation by Stern (2009), McKinsey (Enkvist *et al.*, 2010) and the summary of different projections made by United Nations (2009, chapter VI). Alternative estimates are available from UNDP (2008, chapter 3), World Bank (2009) and Tirkpak and Parry (2009).

transport— and in renewables; the remainder would be invested in tourism, water, agriculture, fisheries, waste management and a small amount in forestry. The resources allocated to energy –slightly over 1% of GDP– are broadly consistent with Stern’s estimates of mitigation costs for a scenario for emissions of 450 ppm CO₂ by 2050, and with full abatement costs by McKinsey for 2030. Thus, although UNEP’s scenario lies in the lower range of its own summary of existing estimates, the fact that energy needs coincide with those of other studies makes it quite reasonable.

Over half of the estimated needs will come from developing countries, particularly in the area of energy, where the greatest expansion of energy demands is projected. Compared with these needs, those of adaptation are of a much smaller order of magnitude: 0.04-0.15% of world GDP in 2030 according to estimates by the United Nations Framework Convention on Climate Change (UNFCCC 2008, Table 5).⁷ Similarly, the financing of access to basic services for the poor represent very limited amounts.⁸ Meeting those needs over the next few years should therefore be seen as part of a “no excuses” global financing scenario.

In this context, the commitment reached in the 2009 UNFCCC Conference of the parties held in Copenhagen of mobilizing \$100 billion a year by 2020 for a global climate fund to address the needs of developing countries looks encouraging, though in the low end of existing estimates, whereas the target of \$30 billion as fast start in 2010-12 is clearly low, though it would take time to build up the projects. According to the Report of the Secretary-General’s High-Level Advisory Group on Climate Change Financing (United Nations 2010b), the \$100 billion target is “challenging but feasible”, using resources from a wide variety of sources, but mainly from carbon taxes: (i) \$30 billion from allocating 10% of carbon taxes raised in developed countries for transfers to developing countries, assuming a carbon price in the range of \$20-25 per ton of CO₂ by 2020; (ii) \$10 billion from carbon pricing on international transportation (aviation and shipping); (iii) \$10 billion from redeployment of fossil fuel subsidies and some form of financial transaction tax; (iv) \$10 billion in additional capital for multilateral development banks, which can generate \$40 billion in gross financing with a \$11 billion grant equivalent; (v) direct budget contributions; (vi) the said carbon price would generate \$100-200 billion a year in gross private capital flows, with an estimated \$10-20 billion in net transfers (assuming that expectations of returns are reduced by 2%). It could also generate \$30-50 billion in carbon market flows, but there was a debate in the Advisory Group as to whether these contributions should count to the \$100 billion objective as they are really substitute for the domestic mitigation commitments that firms have to meet in industrial countries. For this reason, they should be clearly excluded as contributions to the financing of the mitigation and adaptation needs of developing countries.

⁷ The magnitudes have been translated to proportions of world GDP in 2030 on the basis of world economic growth of around 3% per year.

⁸ UNEP uses as a reference estimates by Hutton and Bartram of \$18 billion to meet the MDG target of halving the number of people without access to water and sanitation by 2015 and a \$50 billion cost estimate by McKinsey of meeting the world’s water needs, which means that full access should lie somewhere in between. Furthermore, in contrast with other estimates (particularly those for combating climate change), these are not recurrent needs.

The criteria proposed by the Advisory Group to select the desired resources is worth mentioning by itself: revenue capacity, efficiency (whether a given instrument has a “double dividend” by also helping to correct externalities), equity, incidence on developed vs. developing countries (only net flows from the former to the latter are included), reliability (predictability of revenue stream), practicality (feasibility of implementation), political acceptability, and additionality. The latter criterion is, of course, critical in one significant sense: these resources should be clearly additional to development assistance as such, though in practice the two are mixed, as we will see.

Aside from the required scale of financing, which is the issue these estimates refer to, there are many additional questions regarding the financing strategy. I will classify them under four different headings: (i) priorities of allocation among developing countries; (ii) public/private sector allocation, and within the latter between firms and households; as we will see, these issues also raise questions about the time profile of the financing available to different countries; (iii) macroeconomic issues associated with the transfer of resources to developing countries and the external/domestic composition; and (iv) sectoral priorities.

On the first issue, the priority should be given first to the poorest countries, which according to most estimates are also those more likely to be affected by climate change. The latter criterion is, however, important by itself, particularly in relation to the allocation of adaptation funds and international support to countries that are affected by associated disasters (hurricanes, floods and desertification). Given the large synergies between poverty alleviation and the green economy (most particularly in sustainable agriculture, water and sanitation), there may be “double” and even “triple dividends” in funds allocated for development purposes to the poorest countries (social and environmental, but also possibly economic). However, this should not distract the basic commitment to additionality, in particular for the funds allocated to combat climate change.

However, beyond these allocations to the poorest countries and those most likely to suffer major environmental disruptions, a strong case can also be made for transfer-like resources for *middle-income* countries to help them contribute to the global public good of climate stability (Dervis 2008). Indeed, again, one possible criterion is to extend the Greenhouse Development Rights Framework to the allocation of climate change funds (see again Baer *et al.* 2008). To this we should add the protection of natural forests and biodiversity, as some of the remaining natural wealth in these two areas (which is, of course, interlinked) is located in middle-income countries. Indeed, the best solution in this case is clearly the payment for the full value of the associated environmental services.

On the second set of issues, it is essential that priority be given to public sector infrastructure investments that are critical to the transition to the green economy, notably public transportation systems, and efficient water and sewage systems and electricity grids. Several countries may prefer to keep the control of these sectors by the government rather than as public-private partnerships or full private property. International allocation

of funds should fully respect national decisions in this area. Infrastructure investments are, of course, critical for directing private sector investments in the desirable direction (“crowding-in” private investments and “locking” them in the direction of green investments). They may also demand a specific time profile, requiring in particular major upfront investments. If there is a decision to undertake these investments by the private sector, due account should be made of the allocation of risks. This includes different forms of “moral hazard” (excess risk taking by private agents under the expectation that they will be bailed out by the government), a phenomenon we have become too familiar with through the history of financial crises. It also includes guarantees issues by governments in public-private sector partnerships, which all too often results in public sector assuming risks that private agents normally should, furthermore with no control over the factors leading to such risks and generating again moral hazard problems.

There are also major issues in the allocation of funds among private agents between firms and households. This becomes most clearly when considering the well known GHG abatement cost curve from McKinsey’s studies (Enkvist *et al.* 2007), which shows that most of the cases with *negative* costs (i.e., where there are indeed net potential social savings) are associated with building standards: insulation, lighting systems, air conditioning and water heating. Although one part of this refers to commercial construction, a major share refers to household dwellings, which will be reflected, however, in higher costs of housing. This issue similarly comes in estimates of the International Energy Agency (IEA) of ways to reduce overall future energy investments in an efficient way. According to IEA, total investments in 2005-2030 from producers and consumers can be reduced by \$560 billion in relation to a business-as-usual case, but this savings result from consumers spending \$2.4 trillion *more* in using more energy-efficient technologies while reducing energy supply investment by \$3 trillion (IEA 2006, chapter 8). There is also a case where the time profile requires significant upfront investments. This creates a strong case for establishing a subsidy on energy-savings building standards and appliances financed by a tax on energy consumption.

The third set of macroeconomic issues brings a series of considerations that have been extensively discussed in the literature on macroeconomic adjustments and financial crises in developing countries. The first point that has to be recalled in this regard is that a net transfer or resources requires that the recipient country should be running a *current-account* deficit in its balance of payments.⁹ The second relates to the features of domestic vs. external financing, particularly the fact that in most countries domestic financing has a short-term bias, so that it may not be adequate to finance the long-term needs associated with the green economy.

The frequency of financial crises and the strong evidence that they are associated with overvalued exchange rates and current account deficits have led developing countries in recent years to take steps to avoid both of these (generally twin) macroeconomic

⁹ This point comes from the well-known macroeconomic identity according to which $I - S = M - X$, where I and S are domestic savings and investment, and M and X are imports and exports of goods and services. So, a transfer of resources that allows investment to exceed domestic savings requires that there should be a current account deficit (imports larger than exports).

phenomena. Under these conditions, additional *external* financing is not what these countries require, and would only lead to larger reserve accumulation without any effect on investment. Developing countries may be particularly reluctant if the additional financing comes in the form of lending, but they could respond in a similar way to additional transfers, as they may also generate appreciation pressures. They may be even more reluctant to receive the transfer in the form of subsidized imports if the imports of goods and services compete with domestic production and runs contrary to the industrial policy objective of strengthening domestic capacities to build a green economy.

This has major implications for the design of financing facilities to support developing countries' efforts to build a green economy. The major implication is that priority should be given to financing programs that generate strong synergies with domestic efforts and avoid rising costs associated with the new strategy. Perhaps the most important are global financial efforts that facilitate the free or low cost access to technology: global financial technology funds that create knowledge that is freely available, public sector purchase of relevant technology to also make it freely available, technical assistance in building technological capabilities, and human capital formation.

A second area may be mechanisms that facilitate the term transformation of *domestic* financing, thus overcoming its short-term bias. One possible way would be to use the capitalization of multilateral development banks to expand considerably their bond issuance and lending in the domestic currencies of the developing countries, and to support domestic financial development in these countries, particularly the efforts of domestic development banks to extend the maturities of available domestic financing.

Those developing countries that run current account deficits will, of course, be ready to absorb the additional external funds. But in this case, the major implication is that financing of external deficits should not increase the risk of financial crises, which should be reflected in the provision of transfers rather than loans, or of loans with a grant component. This is particularly crucial for low-income countries. An additional area that becomes very attractive is the design of global disaster relief and insurance facilities against climate-related disasters. Such facilities could include insurance premiums but with a grant component that could vary according to the level of development of countries.

This is not the place to analyze in the detail the final issue, on sectoral priorities, but it is important to recollect some that come from the foregoing analysis. It includes, first of all, access to basic services, which has a limited cost and should be part of a "no excuses" global financial package. The second are those investments with "double" or "triple dividends" in terms of poverty alleviation in the poorest countries of the world. The third are global disaster relief and disaster insurance facilities. The fourth, given again by their limited costs and large benefits in terms of both biodiversity and climate mitigation, are natural forest protection. But it is useful to add to this list at least two that could have large positive impacts on developing countries, given their resource endowments: research into tropical agriculture (a large under-researched area) and environmentally-friendly exploitation of coal reserves, particularly carbon storage and sequestration.

POLICY CONCLUSIONS

The analysis of the macroeconomics of the green economy involves four different issues. The first one relates to the inter-temporal welfare and, particularly, to the social discount rates that should be used in a cost-benefit analysis involving future generations. The second refers to the effects of the degradation of the environment on aggregate supply, and the effects of environmental spending and protection policies on both aggregate supply and demand. The third is the analysis of economic growth as a process of structural change, which would be driven in the next decades by a technological revolution to put in place the new patterns of production and consumption that are required by the green economy. The final one relates to the debates on financing the green economy, particularly financing of developing countries participation in global initiatives in this area. These four approaches are obviously interlinked, and also linked with the micro and sectoral dimensions of the green economy.

The major conclusion from the first of these approaches is that the analysis of inter-temporal welfare cannot be delinked from ethical debates on inter-generational equity. On these grounds, it may be justified to use social discount rates that are below (indeed well below) market rates, which also implies that savings and investment today must be increased to benefit future generations. This is particularly so of actions which may be interpreted as insuring against the asymmetric and non-linear effects that certain actions can have on the ecosystem, including the rising likelihood of extreme events (catastrophes). The analysis has broader implications for the analysis of the relations between the economy and the ecosystem, namely that cost-benefit analysis of environmental investments and outcomes should be evaluated using low social discount rates.

The aggregate supply and demand analysis indicates that green investments have a dual positive economic effect on aggregate supply and demand. In the first case, a strategy of reallocating investment towards the green economy may lead to slower potential economic growth (aggregate supply capacities) for a few years, as renewable natural resources are replenished, but will result in the long-run in faster growth. It will also reduce downside risks associated with climate change, energy shocks, water scarcity and loss of ecosystem services, increases employment and have direct benefits in terms of poverty reduction (particularly through improvements of agricultural productivity of rural smallholders). Such investments can also help increase aggregate demand in the short-run, a much needed action for industrial economies under the high unemployment that still prevails; this demand effect may prevail in the short-run over the adverse effects on aggregate supply. In turn, to the extent that investment is embodied in new equipment or leads to learning-by-doing, higher investment induces productivity growth, reinforcing again long-term growth. Demand stimulus must be accompanied, in any case, with changes in the composition of investment and consumption: certain types of consumption and investment must be restricted to avoid excessive resource depletion and waste, but environmentally-friendly investment and consumption can expand.

The transition to the green economy involves no less than a technological revolution, and will have deep impacts on production structures, as well as on consumption patterns. Since production structure must change if growth and development are to proceed, production sector strategies are called for to drive the transformation of the system towards new dynamic green activities. In developing countries, this requires an investment-led strategy with two essential elements: public investment and active production sector (industrial) policies, aiming to encourage in both cases a strong private-sector response. The production sector strategies must have at their center an ambitious technology policy with a focus on adaptation and dissemination of green technologies and the treatment of green economy activities as “infant industries” that require appropriate support (time-bound subsidies and/or protection). The investment strategy should include public sector investments that support industrial policy efforts and the necessary public sector infrastructure, as well as targets for the access of the poor to basic energy and water and sanitation services. The transformation can also generate losers, which implies the need to put in place appropriate support for those natural-resource intensive developing countries that may have to experience a significant transformation of their production structures.

The analysis of financial flows required to support developing countries’ green economies involves a cluster of issues. The first is the scale of financing, which at a global level involves at least 2% of world GDP (\$1.3 trillion at current prices and GDP levels) and at least the \$100 billion dollars for the proposed green climate fund, to which funds to help developing countries meet other environmental objectives should be added. The priority in the allocation among developing countries should obviously be given to the poorest countries and to those more likely to be affected by climate change (which may be the same countries). Given the large synergies between poverty alleviation and the green economy (most particularly in sustainable agriculture, water and sanitation), there may be “double” and even “triple dividends” in funds allocated for development purposes to the poorest countries. However, beyond these allocations, a strong case can also be made for transfer-like resources for middle-income countries to help them contribute to the provision of global public environmental goods. In the allocation of funds across different economic agents in recipient countries, priority should be given to public sector infrastructure investments that are critical to the transition to the green economy. Household should also be a major target of financing, particularly to support energy-efficient housing, including subsidies that could be financed with a tax on energy use.

In macroeconomic terms, an effective international transfer of resources implies that recipient countries should be running current account deficits, but they may not be willing to do so for strict macroeconomic reasons. The major implication of this is that priority should be given to financing programs that generate strong synergies with domestic efforts and avoid rising costs associated with green growth. This includes global financial efforts that facilitate the free or low cost access to technology. In addition, the global financing strategy should help improve the availability and term structure of domestic financing available for green economic activities in developing countries. Actions of multilateral development banks in support of domestic development banks can be critical in this regard.

A common theme of both the analysis of the structural transformations and financing is the central role of technology. It is essential in this regard to avoid new forces for international inequality that may be generated by uneven technological capacities that already exist. It is also crucial to take into account that technology absorption on the recipient side is always an active learning process. It requires mechanisms to disseminate, adapt and eventually generate new technology. Given the fact that most developing countries will be technology followers, there is a need to increase international cooperation and collaboration on research and development in all areas relevant for green growth, and accelerate the transfer of those technologies to developing countries through open innovation systems, publicly financed innovations, as well as global demonstration programs, knowledge-sharing platforms, and a global database on freely available technologies and best practices in licensing. The technological regime should also include reforms of the global regime of intellectual property regime, including broader room for compulsory licensing, strengthening patenting standards and allowing innovators to use existing patented knowledge to generate new innovations. On the financing side, this calls for a global technology fund to support the creation of knowledge that would be disseminated as a public good, public sector purchase of relevant technology to also make it freely available, technical assistance in building technology efforts, and human capital formation.

Technical Appendix

Optimal consumption paths and the social discount rate

In technical terms, the fundamental question about optimal consumption paths is how to maximize a social welfare function that is the discounted value of the utility of consumption of current and future generations in a growth process that takes into account the links between the economy and the ecosystem.

The analysis formally uses the Ramsey model (also called the Ramsey-Koopmans-Cass model) that indicates that the social discount rate that should be used to estimate the present value of future benefits and costs of climate change should take into account three factors: (i) the pure rate of time preference or, better, in this context, the inter-generational rate of time preference; (ii) the elasticity of substitution between consumption in different periods, which in inter-generational terms may be interpreted as the willingness of the current generation to substitute (sacrifice) its consumption today with the consumption of (i.e., to benefit) future generations; and (iii) the expected growth in per capita consumption, which in this model may be said to be basically dependent on productivity growth (certainly an appropriate assumption given the long-term horizon of analysis).¹⁰ The discount rate will therefore be higher if the rate of time preference and

¹⁰ Formally, the maximization leads to a discount rate which is expressed as $r = \delta + \eta g$, where δ is the inter-generational rate of time preference, η is the inverse of the elasticity of substitution between consumption in different time periods, and g is productivity growth, which determines the evolution of per capita consumption through time. The effects of δ and g in this equation are easy to understand, but that of η is more difficult. A higher η (a lower elasticity of substitution between consumption in different time periods)

productivity growth are higher, or if the elasticity of substitution is lower (i.e., if current generations are less willing to sacrifice their consumption for the benefit of future generations).

The equity issues raised in the main text have been recognized and have led to broad consensus in relation to the first of the factors determining the discount rate. So, it can be said that inter-generational equity requires a zero rate of time preference (i.e., total neutrality among generations). However, a similar equity principle should also be applied to the second factor, as the neutrality among generations could be said to imply that the rate of substitution between consumption today and that of future generations should be one (i.e., increasing or sacrificing a proportion of the consumption of the current generation should be equivalent to increasing or sacrificing the same proportion of the income of a future generation). There is less agreement on this interpretation of inter-generational equity. Interestingly, if we adopt both criteria, the inter-generationally equitable rate of discount is the expected rate of productivity growth.¹¹

The major criticism of this conclusion is that such a rate is inconsistent with market parameters (returns on risk-free financial instruments are closer to it but those on riskier assets are much higher) as well as with savings behavior. The first is not a relevant issue in this context, as market returns do not take into account externalities (the major issue with which we are concerned when analyzing environmental issues) and financial markets are full of other market imperfections. In relation to the latter, it implies that *all* capital income should be saved, a behavior that may arguably be desirable.¹² Another way of looking at this issue is that adopting market rates of returns on capital and savings behavior may bias decisions in favor of the current generation, which not only undervalues the consumption of future generations but, for the same reason, saves less than desirable for those generations to enjoy higher consumption levels.¹³

However, two caveats are in order. The first one is that using low discount rates for very long time horizons may give a weight to hypothetical events too far in the future (say two centuries from now), so perhaps a long but limited time horizon may be preferable. The second is that other ethical principles could be adopted aside from the inter-generational equity, particularly a principle that would aim at maximizing the welfare of the poorest generation (Nordhaus 2007). The latter may be interpreted also as an argument for

implies that people are less willing to accept variations in their consumption through time, which in inter-generational terms means that the current generation is less willing to sacrifice their consumption today to increase the consumption of future generations. A major implication of the Ramsey model is that the higher the time preference and the lower the elasticity of substitution, the lower the savings rate should be.

¹¹ Formally $\delta = 0$ and $\eta = 1$, so that $r = \delta + \eta g = g$.

¹² Indeed, an interesting implication of $\delta = 0$ and $\eta = 1$ is that all capital income should be saved (or that aggregate savings should be equivalent to capital income). This is, in fact, consistent with the “golden rule” in a Solow-Swan growth model –i.e., that which maximizes per capita consumption through time. In a macroeconomic model in the tradition of Michal Kalecki or Nicholas Kaldor, among others, if all savings come out of profits, this is also consistent with profits being entirely saved.

¹³ The “calibration” of parameters used in simulations can have this effect. So, for example, Nordhaus (2007) assumes $\delta = 0$ but then calibrates the model according to market parameters and obtains $\eta = 3$, which implies a very low willingness by current generations to substitute their current consumption with that of future generations.

developing countries' using a higher social discount rate, which is consistent also with the fact that productivity growth has to be higher in those countries to guarantee convergence of income levels with those of industrial nations. However, this does not take into account the fact that ecosystem constraints associated with climate change are of a *global* character. So, a more appropriate approach would be exempting the poor from making commitments to achieve global climate change objectives. This is precisely the approach of the Greenhouse Development Rights Framework, which exempts individuals under a certain poverty line from making commitments in the area of climate change.¹⁴ This approach does not necessarily apply in relation to other environmental issues, such as biodiversity, land fertility or water management, as in those cases green policies will directly increase the income of the poor (TEEB 2010b; UNEP 2001b).

We can incorporate risk into this framework by using the case of two interest rates, one risk free and another that fully incorporates risks that can be inferred from past performance – say, the interest rate of a risk-free government bond and the average rate of return on equity over a long time horizon. Even a desirable private discount rate would be a weighted average of the two and will be lower the higher the level of risk aversion. But we can argue that inter-generational equity requires that society be highly risk-averse in relation to events that may have strong negative effects on future generations. If this is so, the social discount rate should again be low, close to that of a risk-free government bond.

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¹⁴ See again Baer *et al.* (2008). Please notice that the proposal refers to persons, but of course the proportion of poor persons is much larger in poor countries. They define a “development threshold” (poverty line) of \$20 per day (\$7500 year), which encompasses 70% of the world’s people, who account for only about 15% of cumulative emissions.

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Trade, Sustainable Development and a Green Economy: Benefits, Challenges and Risks

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INTRODUCTION

This paper explores potential trade opportunities and risks from a transition to a green economy, and examines trade policy options that are relevant for this transition. It is written in the lead up to the UN Conference on Sustainable Development (UNCSD), to be held in June 2012 in Rio de Janeiro, and is a complement to two other papers also focused on the green economy in the context of sustainable development and poverty eradication: one on the macroeconomic aspects of the green economy and the other on development, poverty and the green economy. A synthesis of the three papers is also being produced. In the section that follows this, it discusses the transition to a green economy, asking why it is desirable, and in what ways trade policy might help. The third section explores the impacts, both positive and negative, that might be expected by countries whose trading partners are pursuing a green economy. The fourth section asks what role there might be for the international community in ensuring that trade and investment policy and practice contribute to a widespread and equitable pursuit of the green economy, and last section offers some concluding thoughts.

TRANSITIONING TO A GREEN ECONOMY

The move to a green economy is a significant transition, on par with other grand transitions in human socio-economic history. If it can be carried off—and we have strong reasons to hope that it can—it will differ from previous waves of change in that it was at least in part intentional, and in that it paid more careful attention to the welfare of those that might otherwise be caught in the painful process of unplanned structural change. This section briefly reviews why the global community should have an interest in such a transition in the first place, surveying arguments from the perspective of development, environment and economic objectives. It then asks what role trade and investment policies might play.

Why move to a green economy?

The green economy is more than just environmental in scope; it is also about development and the economy. From a development perspective there are a number of ways in which a green economy might benefit both developed and developing countries. A green economy should not only maintain, but should enhance the value that the poor in developing countries derive from agriculture, fisheries and forest harvest – all activities that depend fundamentally on a sound environment. It should help reduce energy poverty through the provision of low-cost distributed renewable energy systems. And if successful it should help reduce the vulnerability of the poor to the impacts of unchecked climate change, desertification ocean degradation and loss of biodiversity, as well as the impacts of local air, soil and water pollution.

In developed and developing countries alike it should be the spur for new innovative activities – activities that create more jobs than traditional sectors, and increase energy security and industrial efficiency. There are growing opportunities for investment in the buildings, transport, energy and waste sectors in particular, as well as in manufacturing, agriculture and others. The services sector support that is needed in many of these sectors will also be an important part of the green economy.

A green economy also has environmental benefits, and these are obvious enough to need no lengthy enumeration. It should help address global challenges such as climate change, loss of biodiversity and desertification. It should also contribute to efforts at the national and regional levels to address local pollution of air, water and soil.

A shift to a green economy will also generate economic benefits (clearly, any such shift involves risks and costs as well, and some of these are considered later in this paper). One obvious potential advantage to a green economy is the opening up of new export markets. Some of these are explored in greater depth below, but well-known examples include significant new markets for biofuels, and for renewable energy technologies such as solar panels and wind turbines. Opportunities in these markets may be driven by demand in export markets alone, or by a combination of foreign demand and domestic capacity development in response to stringent domestic environmental standards.

As well as opening up new markets, a shift to a green economy may help to maintain existing market share. Environment-related product and process standards (technical regulations), regulatory regimes and restrictions in most OECD markets are steadily ratcheting up, with tough implications for developing country exporters.¹⁵ Even more significant for some exporters is the rise of sustainable development-related standards and codes employed by private buyers.¹⁶ And the ascendancy of climate change as an urgent policy problem threatens to give rise to new types of non-tariff barriers, such as border carbon adjustment.¹⁷

Maintaining market share in the face of steadily increasing stringency of specifications is not a straightforward matter, but it can be aided by two key aspects of a push to a green economy. First, governments can focus on enabling exporters to meet such standards, working with the private sector to communicate the content of the regulations and to help firms identify, acquire and assimilate the technologies needed. In the same vein, governments can help build accredited national or regional capacity to test and certify goods as compliant; this might involve building laboratories, working with foreign accreditation bodies, supporting technical training, etc.¹⁸ Second, governments can work on propounding and enforcing domestic standards that are not too far from those required internationally. Such standards are important in building up private sector capacity to

¹⁵ UNCTAD (2006). In the last five years in the EU alone has promulgated three pieces of far-reaching legislation: the Restriction of Hazardous Substances Directive (ROHS), the Registration, Evaluation and Authorization of Chemicals (REACH) programme and the Directive on Waste Electronics and Electrical Equipment (WEEE).

¹⁶ Potts *et al.* (2010).

¹⁷ Cosby (2009).

¹⁸ Aldaz-Carroll (2006); UNCTAD (2006); Cosby (2004); Hufbauer *et al.* (2001).

successfully export to demanding key markets.¹⁹ They also incidentally result in less local pollution, resource use and waste. Domestic standards regimes have an important role in helping firms adapt to any such new standards.

Can trade and investment policies help in the transition?

A green economy has several important international dimensions. First, international trade is a powerful driver of growth, and so it is imperative to direct that potential in ways that contribute, rather than detract, from progress toward a green economy. This section explores the potential benefits of liberalizing trade in environmental goods and services, and of reducing fossil fuel subsidies, and asks how trade's contribution might be helpful in diversifying away from resource-intensive export-led growth paths. Second, trade law is important in shaping the bounds of possible government actions in pursuit of a green economy. This section explores the ways in which investment agreements and trade-related intellectual property rights might foster or frustrate that pursuit.

Liberalizing trade in environmental goods and services

One obvious way that trade policy might help in the greening of economies is by lowering tariff and non-tariff barriers to goods such as wind turbines and efficient lightbulbs, and services such as environmental engineering. There is a mandate in the WTO's Doha Round to liberalize trade in so-called environmental goods and services (EGS),²⁰ though environmental goods in particular have yet to be definitively defined in those talks.²¹ EGS offer tangible environmental benefits to importers, particularly in developing countries where access to distributed renewable energy can be a key plank in addressing poverty, and where many governments are now beginning to grapple in earnest with urban environmental issues such as water treatment, sanitation and local air pollution.²² Moreover, to the extent that EGS can address global concerns such as climate change and biodiversity, *all* countries have an interest in their rapid and widespread uptake – a process in which trade and investment would play a key role.

One of the tensions that have plagued the WTO negotiations is the fact that many countries pursuing a green economy are looking to foster domestic competitive sectors to produce and export EGS, and are reluctant to relinquish tariff protection as an instrument by which they might do so. This is not, however, a tension between environment and economy; both objectives depend alike on the success of the policies employed. If such policies are successful in producing globally competitive innovating firms, then they will compensate for the initial environmental and economic costs of sheltering inefficient green infants; more innovation and competition is clearly better. If they are not, then the supporting country (and the world) is worse off both economically and environmentally, having achieved less environmental improvement than was possible for the resources spent; it would have been better simply to rely on foreign producers and investors.²³

¹⁹ Yu *et al.* (2010).

²⁰ WTO (2001a); Paragraph 31(iii).

²¹ Cosbey *et al.* (2010) offer a discussion of the issues of definition, and a suggested taxonomy. See also Jha (2008). Stillwell (2007) also discusses definitions, and offers a history of the negotiations.

²² Vickleaev (2003); Steenblik (2006).

²³ Point Carbon (2008) offers the sobering example of the pursuit of national excellence in wind energy by the Ukraine, the result of which was that as of 2007 average cost of installed capacity in wind power was 2-3 times higher than average global costs.

As such, the question of whether developing countries should be allowed to shelter EGS infants should hinge on whether it can or cannot be done effectively. In the end, governments looking to support domestic green sectors will inevitably pick losers as well as winners. But this is not a blanket admonition against trying. Decades of experience with traditional government efforts in this area show us that there are ways to limit the chances of wasted support—such as providing help only to activities that are new to the domestic economy, and those that have good potential for spillover effects—and ways to limit the damage when losers are picked—such as making continued support time-limited and conditional on explicit criteria for success.²⁴ These sorts of conditions might be the *quid pro quo* for special and differential treatment in the EGS negotiations.

The stakes are high for those that succeed. Growth in environmental goods and services (variously defined) has tended to exceed growth of merchandise exports since at least the mid-1990s²⁵ as well as growth of GDP (see table 1). DIW (2009) estimates that the global market will grow to between USD 1.2 and 1.9 trillion by 2020. Sharp (2009) reaches a far higher estimate even of the current market using a rigorous bottom-up compilation of the sector, estimating its size in 2007/2008 to be £3 trillion, or roughly 6 trillion USD, and noting major growth in the area of low-carbon goods and services and renewables.²⁶

Table 1: World Market for Environmental Goods and Services
Average annual rate of growth 2004-2010: High and low growth estimates

	GDP Growth	Environmental Expenditures		Environmental Imports (import region)	
		High	Low	High	Low
Europe	2.5	5.4	2.1	6.5	3.0
North America	3.3	9.9	6.3	11.5	8.0
Asia	4.8	8.3	6.0	12.2	9.7
Rest of world	3.8	9.0	7.0	10.7	8.7
World as a whole	3.5	7.7	4.7	9.4	6.4

Source: DIW (2009)

It is important to note that while most environmental goods are produced in OECD countries, the tensions over liberalization are not a clear cut North-South divide; developing countries are increasingly important producers and consumers of EGS. Figure 1 shows China's phenomenal rise from 2005 to 2009 as an exporter. Vossenaar (2010) notes that many developing countries are now adopting renewable energy targets, and need technologies that may not be locally available. He observes that developing countries have become the world's largest and fastest growing markets for environmental goods, the markets in developed countries being mature by comparison.

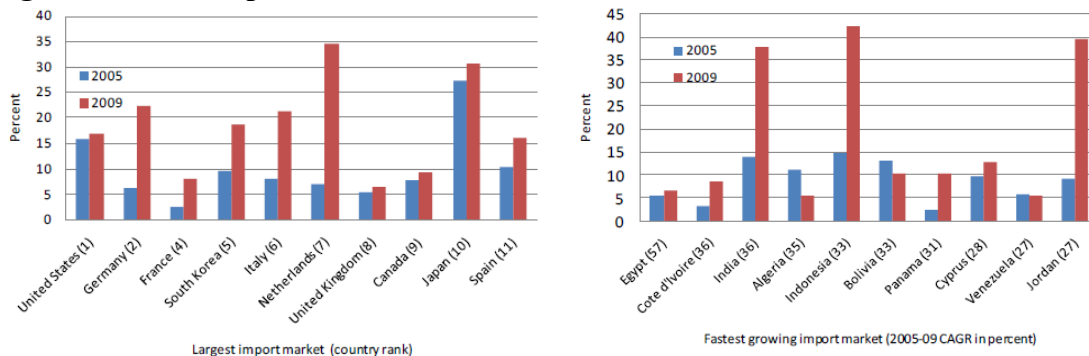
²⁴ Rodrik (2004).

²⁵ Bijit and The (2004).

²⁶ It should be noted that this analysis includes, as a large and unspecified portion of the estimate, nuclear energy under the heading alternative fuels.

Even where countries choose to rely on foreign expertise in certain EGS, trade policy's contribution to their rapid uptake needs to be put in perspective. Most analysts find that non-tariff barriers such as subsidies to traditional energy sources, regulatory and legal barriers, lack of infrastructure, traditional investment risk and other factors figure much more prominently as obstacles to dissemination than do tariffs.²⁷ Many of those barriers are not subject to trade policy remedies. As such, while trade policy may be necessary to the spread of EGS as part of a drive to green economy, it will probably not be sufficient.

Figure 1: China export market shares, 2005 and 2009



Source: Wyden (2010); Figure 4.

Reducing fossil fuel subsidies

IEA (2010a) estimates that subsidies for the consumption of fossil fuels in 2009 reached at least \$312 billion.²⁸ Almost all of those were administered in developing countries rich in fossil fuel resources. On the production side, subsidies to the production of fossil fuels (most often used in OECD countries) have been estimated at another \$100 billion per year.²⁹

This is a formidable sum spent in furtherance of critical environmental damage. IEA (2010a) estimates that completely removing consumption subsidies would lower demand and result in a 6% reduction in energy-related CO₂ emissions by 2020 – equivalent to the combined current emissions of Germany, France, United Kingdom and Italy. As well, subsidies to traditional fuels are a formidable obstacle to the uptake of renewable energy, and the implementation of energy conservation and energy efficiency measures.³⁰

Fossil fuel subsidies also present economic challenges. While most consumption subsidies do not involve actual cash outlays, they do involve opportunity costs, since excess cheap fuel consumed at home cannot then be exported. The sums involved are staggering; Iran's subsidies in 2009 amounted to almost 35% of GDP,³¹ and Indonesia's direct subsidy payments in 2007 were close to 25% of its budget.³² This is money that

²⁷ Jha (2008), Vickleaev (2003); Vossenaar (2010), Wooders (2010).

²⁸ The analysis used the price gap method (difference between world reference price and domestic prices) for a survey of 37 countries.

²⁹ GSI (2010).

³⁰ Wooders *et al.* (2010).

³¹ IEA (2010a).

³² Asian Development Bank, cited in UNEP (2008).

cannot then be directed to important public policy goals. And low domestic prices are a disincentive to investment in domestic refining capacity, so much so that major exporters such as Nigeria, Iran and Kazakhstan are actually forced to import refined fuel.³³

Fossil fuel subsidies are often defended as pro-poor, particularly in energy-poor countries such as India. But IEA analysis indicates that only 15% of consumption subsidies actually reaches the poor; the rest is consumed by the middle class, who own automobiles and air conditioners.³⁴

It has been proposed that, just as the WTO is now negotiating ways to reduce or eliminate environmentally perverse fisheries subsidies, it should also work to forge similar agreement on fossil fuel subsidies.³⁵ This would represent a significant contribution of trade policy to achieving a green economy.

Intellectual property rights

Many of the green economy's challenges are issues with considerable history. Of none is this more true than the role of intellectual property rights (IPRs) and specifically patents—a policy tool that has been hotly debated for over a hundred years. While there has been ample (but inconclusive) analysis of whether strong IPRs foster trade and investment, and of their international distributional impacts, the key question with respect to the green economy is how they might help or hinder countries to gain access to cleaner technologies.³⁶

One of the basic tensions is this: the willingness to invest in innovation depends to some degree on the products of that innovation being protected from low-cost imitation. This is particularly true for technologies where the costs of research and development are high and the cost of imitation is low. But the very fact of protecting innovation also raises the cost of its products for many years, and may frustrate derivative innovation that builds on the original work, the final result hampering dissemination. So the key goal is balance – finding the point at which protection manages to provide incentives to innovate, but does not overly restrict dissemination and further innovation.

There are other well-known tensions. At early stages of development, countries throughout history have used weak IPR regimes to foster domestic capacity to innovate.³⁷ Under such regimes innovation begins with imitation and reverse engineering, and ideally over time evolves to the point where domestic firms are creating intellectual property that needs strong IP protection.³⁸ As such, from a development perspective it is impossible to

³³ *Ibid.*

³⁴ *Ibid.* See also Shenoy (2010), UNEP (2008).

³⁵ Lang, Wooders and Kulovesi (2010).

³⁶ This paraphrases Barton *et al.* (2002:24), who were concerned with the impact of IPRs on development, and who conducted a thorough survey of the existing literature on trade, investment and technology transfer impacts.

³⁷ This is true of the United States, Japan, Korea and Taiwan, among others, all of which were racing to catch up to trading partners that were much more advanced as fonts of innovation. See Chang (2002), Barton *et al.* (2002).

³⁸ Kim and Dahlman (1992).

describe a single IPR regime that suits all countries at all stages of development. In the interests of growing national innovative cultures that help push the global community toward a green economy, IPR regimes should be tailored to countries' development status.³⁹

It can be argued, though, that even at low levels of development IPRs play an important role. They may result in more imports of high-tech goods that, in themselves, represent technology transfer – goods that exporters would be reluctant to export to countries with weak IP protection. Similarly, they might result in increased incidence of firm-to-firm licensing of technologies, which in its own way results in increased domestic technological capacity. The downside is that strong IPRs at the same time will tend to wipe out low-tech innovators that rely on imitation. Again a delicate balance must be struck.⁴⁰

Domestic capacity to innovate is key to translating technology into real development and lasting environmental gain.⁴¹ It allows firms to effectively assimilate new technology from abroad, to adapt foreign innovations to local circumstances, and to spawn innovations of their own. Government support is critical to creating national systems of innovation, among other things through investment in education, support of research and development, linking public research and private sector users, and the promulgation of facilitative IP law. There is a clear role for international support to developing countries in carrying out these functions.⁴²

The details of IP law and practice matter a great deal to their final impact. It was noted above that balance was important, so the length of patent protection is obviously a key issue. Many IP provisions in modern free trade agreements go beyond WTO provisions to provide for longer protection periods.⁴³ Scope is also important – some national patent regimes allow firms to use broad “gateway” patents that can strategically block competitors from lucrative (and publicly valuable) lines of innovation.⁴⁴ “Stacking” multiple patents around various aspects of a single innovation has the same prohibitive effect.

³⁹ Correa (2000).

⁴⁰ Policy makers will face difficult challenges in finding that balance; different sectors will evolve at different rates, and most countries will find that as leading sectors clamour for stronger IPR protection many other sectors lobby to maintain the protection *they* are offered by weak IP laws.

⁴¹ Cannady (2009).

⁴² The WTO's TRIPS Agreement commits to some limited support of this type. Article 66.2 commits developed countries to provide incentives to their firms for technology transfer to LDCs. More broadly, Article 7 declares that the purpose of IPRs should be the promotion of innovation and technology transfer.

⁴³ Gervais (2007). Many such agreements also allow for protection of testing data and the re-registering of patents if new uses are found for an existing innovation. More important in the area of pharmaceuticals than industrial patents, these allow for much longer periods of effective protection.

⁴⁴ For example, the US Patent Office in 1986 and 1988 granted patents for sunflower seed with high oleic acid content, *regardless of how it was derived* (U.S. Patent nos. 4,627,192 and 4,743,402). Heller and Eisenberg (1998) called this *the tragedy of the anti-commons* – wherein not enough people access scarce resources (innovations) because they are blocked by strategic patents.

All of this is well understood in the context of pharmaceutical patents, which have been the subject of a great deal of analytical work, and for which WTO members have gone so far as to explicitly confirm the TRIPS Agreement's flexibilities.⁴⁵ But it is important to note the differences between pharmaceuticals and industrial patents in environmentally sound technologies. Barton (2009) argues that while IPRs offer developers of particular medicines a solid monopoly on their products, innovators in the area of wind power, biofuels and solar PV have many competitors to whom buyers can go for similar products, decreasing the power of patents to block affordable access.⁴⁶ This assumes, of course, that innovators will actually license their technologies. What limited evidence we have from clean energy technologies seems to indicate a willingness to licence more or less in line with that found in other sectors.⁴⁷

To the extent that current IP law and practice suffers from the problems described above, it means that the world is not reaping the potential benefits that innovation might bring. In the context of a green economy, this is a critical global problem. Lee *et al.* (2009) calculate, for example, that in order to achieve the minimum required climate change mitigation as estimated by the IPCC, we will need to *double* our rate of clean energy technology diffusion by 2025. They make a number of recommendations designed to help that happen, including open innovation mechanisms such as technology prizes, boosting technology standards, and other forms of international cooperation on developing, demonstrating and diffusing new technologies.

Is there anything new about the issues surrounding IPRs when we consider their impact in the context of the green economy? Arguably there is. There has always been a moral argument for developed countries to engage in technology cooperation, capacity building and other efforts to help developing countries access and assimilate the technologies they need for development. But the arguments become even more compelling in the context of technologies that are urgently needed to avoid environmental problems that have a global scope, such as climate change, and biodiversity loss.⁴⁸

Investment law and policy

Investment is fundamental for the green economy, and for sustainable development more broadly. It is the vehicle by which old infrastructure and productive capacity are transformed into new and greener stock. And it is needed in abundance. The IEA estimates that, just in the area of energy, an average incremental investment—that is, over the baseline case—of more than a trillion dollars per year is needed between now and 2050 to achieve even the minimum required mitigation as described by the Intergovernmental Panel on Climate Change (with some two thirds of that investment needed in developing countries).⁴⁹

⁴⁵ WTO (2001b).

⁴⁶ Lee *et al.* (2009) find low-carbon sectors to be heterogeneous, with many but not all of them characterized by highly concentrated patent ownership.

⁴⁷ UNEP/EPO/ICTSD (2010).

⁴⁸ Tomlinson, Zorlu and Langley (2008).

⁴⁹ IEA (2010b) forecasts the need for \$46 trillion incremental investment between 2007 and 2050 to halve global energy-related carbon emissions. Achieving the IPCC 50% minimum target by 2050 *also* depends on reductions in non-carbon greenhouse gas emissions.

But while the need for torrents of new investment is indisputable, not all investment is helpful in promoting a green economy. Industrialized countries have over the years developed strong domestic regulatory regimes to help ensure that investment does not result in over-exploitation of renewable resources, or damage to the environment or human health. Many developing countries, faced with the environmental and health impacts of the development process, are now experimenting with the same sorts of regulatory innovations. Moreover, states may seek to give preference to new investment that contributes to sustainable development – investment with good prospects for generating backward and forward linkages in the economy, and which aligns with their development priorities.

The existing international investment “regime”—a web of over 2,700 bilateral investment treaties, investment provisions in a growing number of free trade agreements, and a host of firm/project specific host government agreements—is not particularly good at helping states discriminate between the desired and the undesirable forms of investment. In fact, provisions in many of those international investment agreements (IIAs) may actually act as obstacles to that sort of discrimination.⁵⁰

In the last decade private sector actors have increasingly used investment dispute settlement provisions in BITs and FTAs to compel states into binding arbitration, arguing that new environmental regulations amount to an expropriation of their investments, or that they violate provisions on fair and equitable treatment by changing the rules of the game.⁵¹ The arbitral panels hearing such cases are not bound by precedent and have delivered contradictory rulings, meaning that states aiming to tighten up existing environmental regulations face considerable legal uncertainty.⁵² A number of countries have moved to amend their treaty texts to prevent such cases, but these represent a drop in the proverbial bucket.⁵³

Host government agreements are contracts between governments and firms governing the conditions under which the firm’s investment takes place. Often these contain particularly restrictive language—the product of disparate negotiating capacity between smaller host states and multinationals—in so-called stabilization clauses. Most often used for large capital-intensive investments in the extractives sectors, many of them guarantee regulatory certainty for time periods of up to 99 years, with compensation promised for breaches.⁵⁴

Many “new generation” IIAs, and the WTO TRIMS Agreement, also prohibit the use of so-called performance requirements.⁵⁵ These are conditions of establishing an investment, or conditions for preferential treatment, that are linked to the use of domestic

⁵⁰ Cosbey *et al.* (2004).

⁵¹ See Been and Beauvais (2003); Tollefson (2003); Mann and Soloway (2002).

⁵² Cosbey *et al.* (2004).

⁵³ New model IIA text that addresses these problems is now used by Canada, Columbia, Norway and the United States, but these have no effect on treaties already in place.

⁵⁴ Shemberg (2008).

⁵⁵ UNCTAD (2006b).

resources, to export performance, to technology transfer, and so on. The key question here is whether these sorts of policies are effective or ineffective at fostering economic development (in the present case we are concerned specifically about green development). If effective—and while there is no consensus, there is evidence that at least some sorts of performance requirements have worked⁵⁶—then these prohibitions are another way that investment law can constitute an obstacle to achieving a green economy.

Investment law is a valuable governing influence, allowing for greater investor certainty and potentially fostering more robust flows of investment to developing countries.⁵⁷ But certain aspects of many of the agreements in force today may be problematic from the green economy perspective.

Shifting away from commodity-dependence in export-led growth

The green economy being a sub-set of sustainable development, it bears asking if and how it might help move economies away from current modes of *unsustainability*. One such mode is over-dependence on natural resource-intensive exports – a state that engenders both economic and environmental problems. Environmentally, economies that rely on such growth may suffer significant environmental damage in terms of land degradation and pollution.⁵⁸ The economic problems associated with commodity dependence are usually discussed as three separate but related challenges:⁵⁹

- Terms of trade impacts – the long run deterioration of commodity prices vis-à-vis prices of manufactured goods;
- The high volatility of prices in commodity markets, which accentuate economic cycles and thus lead to lower levels of growth in the long term; and
- The relatively small share of the value chain appropriated by producers of commodities – a problem associated most acutely with low-income countries.

Dependence on *high-rent* commodities has its own set of particular problems, often discussed in the literature on the *resource curse*.⁶⁰

- So-called “Dutch disease”: the appreciation of exchange rates arising from resource booms, and the subsequent crowding out of other tradable sectors; and
- Institutional impacts: the damaging effects of rent-seeking that can be spawned by the presence of high resource rents.

⁵⁶ Moran (1999, 2001); UNCTAD (2003) find that export-related performance requirements are effective at creating linkages and spillover effects within the host economy, while those related to technology sharing and joint ventures are on the whole ineffective. See also Kumar (2005).

⁵⁷ For a survey of the evidence on IIAs’ impacts on FDI see Mann and Cosbey 2004.

⁵⁸ Schaper (1999) describes the structural change toward such growth in nine Latin American and Caribbean economies in the ‘80s and early 90’s, and the attendant environmental impacts.

⁵⁹ UNCTAD (2008).

⁶⁰ See Sachs and Werner (1995), Auty (2004), Ross (2001). For a good survey of the resource curse literature, see Stevens (2003). Rudiger (2006) is an excellent analysis of the available strategies for addressing the problem.

Commodity dependence is a concern for a large number of developing countries, particularly in Africa, the Middle East and Latin America. Figure 2 shows that the concentration index for developing countries in the last 15 years has been more or less double that of developed countries, and has been slowly but steadily rising over that time. LDCs are particularly badly afflicted; of the 33 African LDCs 12 of them have extractives as more than 50% of their export streams, and another 7 are similarly dependent on agricultural exports.⁶¹

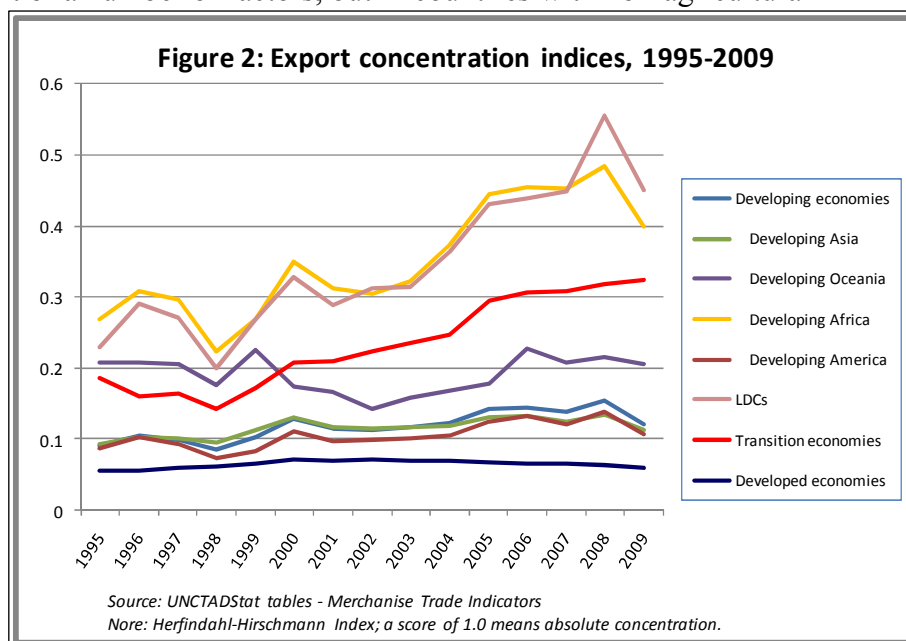
Figure 2 shows a drop in concentration for some countries in 2009. Over the period of 2003 to 2008 – the longest and strongest commodity boom of the past century – the prices of metals and minerals rose by almost 300%.⁶² But in 2009 commodity prices plummeted, responding to the global financial crisis and reducing the extent to which many economies were dominated by the value of key commodity exports. As of this writing many commodities’ prices are again reaching the peaks seen in 2008.

The commodities boom (centred mostly on metals and minerals rather than agricultural commodities) was the result of a number of factors, but in countries with non-agricultural commodity dependence one of the impacts was a crowding out of the manufacturing sector, reversing gains in diversification that had been previously made.⁶³

Can a transition to a green economy offer anything of value to economies facing these challenges?

Arguably it can. For one thing, the move to a green economy for many countries will mean a structural shift to new forms of economic activity. For those countries that are currently heavily reliant on commodity exports—particularly those dependent on the energy- and resource-intensive mining and minerals sectors—this will probably mean a shift to a more diversified economy as a whole.

It should be noted, however, that the hard realities of structural transformation dictate that countries will be most successful if they start to build on assets they already possess. Moving into new sectors of activity will demand a constellation of inputs – services,



⁶¹ Cosby (*forthcoming*).

⁶² World Bank (2009).

⁶³ Gallagher and Porzecanski (2010) document this dynamic in Latin America.

expertise, technologies, legal and regulatory regimes—that may or may not already exist to serve existing sectors.⁶⁴ The most obvious starting points in diversification are those that draw most heavily on the inputs already present in the economy, exploiting existing capabilities.⁶⁵ For economies that rely heavily on extractives, for example, the most feasible near-term course is to focus first on process improvements to existing activities. Expertise developed in reducing energy and resource inputs, and reducing or reusing wastes, not only makes the sector more competitive and less environmentally damaging (which does nothing to address commodity dependence), but can also eventually form the basis for exportable new business services and technologies (which *does* help). A second focus would involve different classes of activity, but which draw on some of the same sorts of inputs needed for exiting activities. Depending on the sector involved, this might involve moving up the value chain from extraction to processing to light manufacturing, for example, or building from agricultural production to pursue agricultural biotechnology. The boom years for commodity producers offer the fiscal “space” in which to pursue these sorts of initiatives.

Obviously, not every country can build up competitive sectors in every aspect of the green economy. Given their respective starting points there may be some economies that will find very few, if any, appropriate sectors; the green economy does not transcend the realities of global competition. That said, the opportunities are real; competitiveness is a dynamic state, and has through history been subject to significant influence by policy making (though not always successfully).⁶⁶

A move to a green economy can also be helpful if it involves institutional improvements. UNEP (*forthcoming*) argues that in some countries the shift to a green economy will involve improved governance as one of many enabling conditions, and discusses how transparency and accountability contribute to that end. To the extent that countries follow this guidance, they are decreasing the probability that high resource rents will give rise to rent-seeking behaviour and the resulting misallocation of resources.

There are ways in which a green economy can help move states away from resource-based export-led models and the commodity dependence that they often spawn. Ultimately, one of the many faces of the green economy is wise industrial policy.⁶⁷ To the extent that a commodity dependent export model is both economically and environmentally undesirable, the strategies employed to reach a green economy may provide some helpful antidotes.

⁶⁴ Hausmann and Rodrik (2003).

⁶⁵ Hausmann and Rodrik (2006).

⁶⁶ Amsden (2001).

⁶⁷ Industrial policy here is used in the broad sense employed by Cimoli, Dosi and Stiglitz (2009) to mean not only infant industry support, but also science and technology policies, government procurement, and policies on investment, IPRs and allocation of financial resources.

IMPACTS OF THE TRANSITION IN MAJOR TRADING PARTNERS

The previous section analyzed the possible reasons for, and impacts of, a shift to the green economy at the country level, also asking how trade and investment law and policy might help or hinder the transition. This section focuses more on trade and investment as vehicles rather than tools; the question is what impacts there might be for the trading partners of countries that are moving toward a green economy.

Opportunity in structural change

As countries undergo the structural change inherent in the move toward a green economy, new export opportunities may open up. A host of national-level studies have found strong potential in future markets for environmental goods and services variously defined.⁶⁸ The strongest growth seems to be not in the traditional environmental sector, dominated by environmental management technologies such as remediation and management of pollution, but rather in low-carbon technologies and renewable energy technologies and services.⁶⁹

Much of this market is pushed by regulatory demands in OECD countries. The EU Biofuels Directive, for example, mandates a 10% minimum share of transport fuels to be “sustainably derived” biofuels by 2020.⁷⁰ That mandate is estimated to significantly raise the demand for imports of biofuels to the EU market, with imports of some 9 Mt by 2020 of bioethanol and 1.6 Mt of biodiesel.⁷¹ Similarly, The EU’s 2007 Energy Directive mandates a 20% share for renewables in the overall energy mix by 2020 – a goal which has spawned, among other things, a move to construct a highly ambitious network of concentrated solar and wind-powered generation facilities in Northern Africa, with transmission capability to Europe. If it materializes as planned, “Desertec” could provide up to 15% of Europe’s electricity needs by 2050, and represent a 100% increase in solar capacity worldwide – a significant export opportunity.⁷²

A number of developing country firms have already gained significant market share in new technologies. China in 2009 exported over \$10 billion worth of solar panels and cells, more than twice as much as the second biggest exporter and almost 80 times the value exported only ten years earlier, when it was not even among the top 5 world exporters.⁷³ India’s Suzlon Energy is now a global power in supplying wind turbines, with a 6.4% share of the global market.⁷⁴ Three Chinese companies now rank in the top ten for market share in wind power as well, though they are almost exclusively focused on meeting domestic demand.⁷⁵ Both China and India’s sizable domestic markets have

⁶⁸ Eco-Canada (2010); Wyden (2010); Sharp (2009); DIW (2004).

⁶⁹ Sharp (2010).

⁷⁰ European Commission (2008).

⁷¹ Banse and Grethe (2008).

⁷² Pfeffer (2009); Desertec Foundation (n.d).

⁷³ UN Comtrade database. (HS 854140: Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes).

⁷⁴ BTM Consult (2009).

⁷⁵ *Ibid.*

been springboards for export success, driven as in the OECD countries by ambitious domestic targets for renewable energy generation.

The obvious question is whether these are special cases; China and India in many ways are not representative of other developing countries. Does their success have relevance for the rest and, in particular, for least developed economies? It is true that much of the green economy will be based on goods and services that require a workforce with advanced technical training, supporting industries and services in the high tech area, access to finance and ample government assistance, and that domestic market size is important, all of which would seem to favour larger emerging developing countries over smaller economies. That said, however, green goods and services are a heterogeneous group, and not all have the same demanding character. For example Steenblik (2006) argues that biofuels, solar thermal and geothermal are all lower-tech technologies in which less developed countries have either existing expertise, or good chances of developing competitive exports streams. The most relevant lesson from both China and India is the importance of concerted support by governments in the drive to succeed in the green economy, though the characteristics of that success will vary from country to country. Both countries used a judicious mix of government support and domestic targets to stimulate their respective green sectors.

There will probably be economic opportunities for some developing countries as the international climate change regime converges on consensus for a post-2012 architecture. Whatever regime follows on from the Kyoto Protocol's first commitment period will probably contain a market mechanism similar to the Clean Development Mechanism (but likely available only to the poorest developing countries). There will probably also be mechanisms for sizable transfer payments to cover reduced emissions from deforestation and forest degradation (REDD) and to reward nationally appropriate mitigation actions (NAMAs). It remains to be seen how broad a scope there will be for any of these mechanisms, and what levels of funding, but it is worth noting that NAMAs and REDD are essentially transfer payments to governments for taking certain policy actions. While this sort of revenue stream is fiscally (and environmentally) very helpful, it is not strictly speaking trade, and may have enclave development characteristics with few domestic linkages. CDM, by creating incentives for private sector actions, may suffer less from that shortcoming, but is likely to be rather limited in scope, both because of its project-by-project characteristics⁷⁶ and because major drivers of demand such as the EU's ETS will probably limit purchases to LDC-generated credits only. While this is good news for LDCs, there are ultimately few CDM candidate mitigation projects available in those countries, emissions being very low.

One of the classic barriers to increased trade opportunities, particularly for developing countries, is the plethora of different export market product energy performance standards, testing procedures and labelling requirements. Harmonizing these standards at a high level would be a huge boon for small and medium sized exporters in particular, for whom meeting different requirements in every country of export is disproportionately

⁷⁶ To the extent the CDM can manage to ramp up approval of programmes of activities, which it has not managed to do to date, this shortcoming could be overcome. See Beaurain and Schmidt-Traub (2010).

difficult. And it could have enormous environmental benefits as well, more quickly disseminating energy efficient products at lower cost.

The risks of structural change

The opportunities described above are the product of structural change in countries driving to a green economy. Not all impacts will be positive, however; as the world moves toward a green economy and demand for environmentally preferable goods increases, the demand for environmentally damaging goods will of course drop. Whatever the overall global balance of impacts, some countries will suffer worsening terms of trade under a green economy, and some firms suffer a loss of markets. Perhaps the best studied case is the impact of climate change response measures on oil producing states. Müller (2005) surveys the literature to find a range of predicted results from implementing the Kyoto Protocol, all negative, ranging from the minor (0.2% decline in real GDP by 2010) to the significant (13% drop in oil revenues, or a 5.5% drop in GDP assuming the 2004 ratio of oil exports/GDP).⁷⁷

But the magnitude and character of impacts are not determined by a country's economic structure alone. They also depend in large part on that country's policy choices. Any policies that successfully diversify away from known long-run losers will blunt the negative impacts of a green economy. Social policies can help cushion the blow and facilitate adjustment for those who lose jobs and income. And industrial policy aimed at fostering competitiveness in sectors important to the green economy can help tilt the balance of impacts from negative to positive.

While the individual losers are clearly important, it is also important to put the pain of adjustment into perspective. To take the example of climate change again, it has been well documented that the costs of action are far less than the costs of inaction.⁷⁸ In the long run, perpetuating unsustainable livelihoods is not in anyone's interest.

Managing the adjustment is not an easy task even for countries with well developed social safety nets and ample fiscal capacity. In developing and least developed countries international assistance will be needed. The purveyors of official development assistance have increasingly become cognizant of the need for development to be sustainable, and will need to understand in each partner country's case how a shift to a green economy might change the nature of the challenges and opportunities they face.

The risks of protectionism⁷⁹

New market opportunities may, as noted above, be a positive spin-off from the pursuit of green development by a country's trading partners. Those benefits, however, are dependent on market access. At the First Preparatory Committee for the UNCSA in May 2010, there was cautious praise for the idea of a green economy and its potential

⁷⁷ Note that in all these results there is still an increase in total revenues, but there is a widening gap between those revenues and revenues derived in the baseline case.

⁷⁸ Stern (2007) contrasts the costs of action, at around 1% of global GDP, with the costs of inaction, at 5 – 20% of GDP annually.

⁷⁹ This section draws heavily on Cosby (2011).

contribution to sustainable development.⁸⁰ But several countries also cautioned that the green economy as a paradigm should not provide cover for, or legitimize, protectionism that in the end works against sustainable development and harms the poor and marginalized.

Cosbey (2011) analyzes a comprehensive range of policy measures that governments might take in pursuit of a green economy, to parse out those most relevant to these concerns. The large majority of potential measures are domestically focused and have few or no trade or investment implications. They include environmental regulations focused on non-tradable sectors such as buildings and transportation, public education, strengthening integrated planning, improved transparency and accountability, effective enforcement of laws, reform of environmental laws, and better measurement and use of indicators to monitor trends of interest.

Another tranche of measures does have trade and investment implications, but these arise from the impacts, both positive and negative, of structural change—the risks and opportunities discussed above.

A final category of measures may in fact be problematic, in that they might be used to deliberately protect and promote domestic green industries at the expense of foreign competitors. There are relatively few such measures:

- Conditioned support for green sectors, designed to foster green infant industries
- RD&D support to domestic green sectors
- Regulations, standards and prohibitions based on production and processing methods
- Environmental levies and taxes on transport

Support for green sectors comes in the form of investment incentives or operational support, as low-interest loans, outright grants, export credit financing, tax breaks, below-market-value land grants and other forms of benefit. Often that support is conditional on the use of domestic inputs, on export performance, on some percentage of domestic ownership or on technology transfer – all measures that aim to foster domestic capacity in the area.

To the extent that such measures are successful, they may indeed have adverse impacts on foreign competitors – particularly those whose governments are unable to match such spending. Some varieties of conditioned support are prohibited under the WTO's Agreement on Subsidies and Countervailing Measures.⁸¹ On the other hand, it was noted above that some conditioned support might be effective in fostering domestic capacity. As well, if it results in capable new global innovators and competitors in those sectors, conditioned support may create global environmental benefits. As such, a number of

⁸⁰ Spence and Vavilov (2010).

⁸¹ Article 3 deems subsidies conditioned on use of local inputs, or on export performance, prohibited. Depending on the nature of the measures, conditioned support may also breach commitments made under The Agreement on Trade-Related Investment Measures and the General Agreement on Trade in Services.

countries do engage in support of this type aimed precisely at fostering green infant industries. Ignoring for the moment the strictures of WTO law (something often done, in this context), there is nothing close to international agreement on the propriety and ideal character of such support, which is liberally granted by developed and developing countries alike.⁸²

Support for research, development and dissemination of new environmental technologies is also a widespread practice. If successful it is also destined to alter the terms of competition between countries. That said, it is more or less recognized that support at this part of the innovation chain is within the bounds of acceptable sovereign practice. This kind of support is widely spread across developed and developing economies. Support for *mature* industries, however, may raise more acute trade and competitiveness issues, and has been taken to WTO dispute settlement on several occasions.⁸³

Regulations, standards and prohibitions based on production and processing methods (PPMs) are troubling because they are easy to specify in ways that advantage domestic producers. An infamous 1902 German measure gave special tariff treatment to “large dappled mountain cattle or brown cattle reared at a spot at least 300 metres above sea level and which have at least one month’s grazing each year at a spot at least 800 metres above sea level.”⁸⁴

The potential for protectionism in PPM-based measures is legitimate, but not all such measures are protectionist. From an environmental perspective a PPM-based approach is indispensable; how a product is made is one of the most important determinants of its final environmental impact. This leaves us with a pressing need for agreed rules governing how and when such measures can be employed.

The types of measures in question include border carbon adjustment: levies on imported goods that attempt to “level the playing field” between domestic (carbon constrained) firms and foreign (presumably unregulated) firms, with charges based in some fashion on the embodied carbon in the imported goods. Even if they can be supported in theory, on the grounds that they are aimed at preventing leakage, these measures may be so administratively complex that they leave significant room for protectionist influence.⁸⁵ Trade lawyers seem split on the question of whether BCA can be designed so as to

⁸² As of this writing, there are two ongoing WTO disputes alleging such support: DS 412 - *Canada — Certain Measures Affecting the Renewable Energy Generation Sector* (Complainant: Japan); and DS 419 - *China — Measures concerning wind power equipment* (Complainant: United States of America).

⁸³ See in particular DS 316 - *European Communities and Certain Member States – Measures Affecting Trade in Large Civil Aircraft*, Panel Report, June 30, 2010; and the ongoing DS 353 - *United States of America — Measures Affecting Trade in Large Civil Aircraft — Second Complaint* (Complainant: European Communities).

⁸⁴ Cited in Charnovitz (2001). While this is an example of using PPM-based standards to circumvent most-favoured-nation treatment (in favour of Switzerland and Austria, in this case), it illustrates more generally how the right specifications can be used to create *de facto* discrimination.

⁸⁵ Moore (2010).

conform to WTO law (and still be feasible).⁸⁶ And developing countries argue that a level playing field violates the UNFCCC principle of common but differentiated responsibility.

Also noteworthy among PPM-based measures are carbon footprint labels, or labels that display the amount of greenhouse gases a product emits over its life cycle. At present these are mostly propounded by private sector, but are becoming of increasing interest to governments.⁸⁷ As with BCA, the design of these instruments is key to their final impact; differing assumptions about scope (e.g., do we consider emissions from land use change? How many years back do we go?) mean that different labels arrive at impact figures that differ by orders of magnitude.⁸⁸ Considering just the transport segment of the life cycle—as do food miles labels—can lead to results that favour local producers – unfairly so, since the method of production may make a far bigger difference to final impact than transport.⁸⁹ And as with BCA, while there is applicable WTO law (the TBT Agreement, in this case), the law says nothing particularly helpful about best practice. Where private-sector labels are concerned, there is no consensus on whether WTO law is even applicable.⁹⁰

PPM-based standards, like conditioned subsidies, are covered by WTO law—in this case the GATT or TBT. But there is considerable uncertainty about what can and cannot be done under those strictures. It is a good bet that any BCA regime that comes into force will be challenged in the WTO's dispute settlement system. PPM-based standards, such as those for sustainable biofuels or carbon footprint labels, are also likely to face challenges. So while there are existing rules to guide practice in this area, there are two problems. First, in many cases it's not clear *ex ante* what that law says. We could simply wait for clarity from a WTO dispute settlement process, but that gives policy makers no certainty about what they can and cannot do. Second, it unwisely burdens the WTO dispute settlement mechanism with issues that are caustic to the regime, since the dispute is not a case of interpreting rules that reflect agreed principles, but rather of contesting fundamental disagreements. Far better would be to hammer out some agreement (whether inside or outside of the WTO) that would identify best practice in the application of BCA, of labelling, or even of conditioned support – the design of the instrument being the key that determines its good or bad character in the end.⁹¹

Environmental levies and taxes on transport are being considered by UNFCCC negotiators (and in the respective trade associations) as a way to address maritime transport and air transport's contributions to climate change. These would be inherently

⁸⁶ Gros and Egenhofer (2010), Ismer and Neuhoff (2007), and Paewelen (2007) argue that BCA can be compatible with WTO law. McLure (forthcoming), Bordoff (2009) and Cosbey (2009) are more sceptical.

⁸⁷ Bolwig and Gibbon (2009) estimate 20 labels in use as of that time, all private. France has introduced product carbon footprint labelling as of 2011 for some goods, and the EU is conducting studies to explore the feasibility of PCF schemes – a possible precursor to an EU-wide voluntary scheme (Kommerskollegium 2010a; 2010b).

⁸⁸ Cornellsen and Dehue (2009); Zah (2009).

⁸⁹ DEFRA (2005); Sim *et al.* (2007).

⁹⁰ Joshi (2004); Vranes (2011).

⁹¹ Agreement within the WTO would be the first best solution, but such matters are not likely to be taken up until at least the conclusion of the Doha Round.

punishing for traded goods vis-à-vis locally produced goods. One of the key negotiating issues is how to build special and differential treatment into such a scheme so that small and vulnerable economies are not harmed. Small island states dependent on tourism trade, for example, would face potential reduced demand from an undifferentiated scheme, and depending on the scheme design those exporters relying on air freight might face significant impacts. The final result is not protectionism *per se*, but the design of the scheme might be subject to protectionist influences.

WHAT ROLE FOR THE INTERNATIONAL COMMUNITY?

The analysis in this paper has highlighted a number of ways in which the international community might collaborate in fostering a green economy through trade and trade-related policies. These can be broken down into: first, the ways that developed countries can support developing countries in their efforts to create a domestic green economy and cope with the impacts of global green economic pursuit, and; second, the ways that the community of nations can come together to find agreement on a way forward.

Support for developing countries

Much of the move toward a green economy will necessarily take place at the national, sub-national and local levels. For countries with low financial, technical and managerial capacity there will be elements of the effort that need support from the international community. The domestic efforts that this paper has highlighted as necessary, where international support could be critically important, are:

- Help exporters meet stringent international environmental and social standards, both private and public. This means, among other things, information brokering to the private sector, building technical capacity nationally or regionally for accredited testing and certification, and creating/maintaining a strong domestic standards regime.
- Set nationally appropriate and ambitious targets for clean energy provision, accompanied by incentives such as feed-in tariffs or quotas, and by removal of obstacles such as subsidies for polluting energy sources and technologies.
- Engage in “smart” industrial policy geared toward the green economy of the future, aimed at diversifying the economy and protecting it from the shocks of the coming global structural changes. Ensure that priority is given to the many areas of positive potential for the poorest.
- Strengthen social systems to help cushion and facilitate the transition with minimal negative social impacts.
- Work to create vibrant national systems of innovation, among other things through investment in education and training, support for research and development, linking public research and private sector users, financing for demonstration projects, and promulgating facilitative IP law.
- Identify and dismantle non-tariff barriers to imports of environmental goods and services, particularly in those sectors where it is unrealistic to expect domestic champions to arise.

There are a number of vehicles through which such support could appropriately flow, depending on the nature of the challenge: bilateral aid (focused on aid for trade, environmental cooperation or traditional development aims), multilateral development banks, other multilateral institutions (e.g., the Global Environment Facility, funding arms of multilateral environmental agreements), or *ad hoc* bodies charged with fostering a green economy that works for developing countries.

International collaboration

Beyond support to developing countries in meeting the challenges of a green economy, there are ways in which international cooperation or agreement is needed to allow the global community to move toward green economic growth:

- Agreement at the WTO on reduction or elimination of tariffs and non-tariff barriers to trade in environmental goods and services. There should be some constrained flexibility for developing countries intent on fostering national champions in particular sectors, but the concerns over liberalizing dual-use goods should take a back seat to the urgency of need for new technologies.
- Agreement on a concerted effort to “oil the innovation chain” – to get new technologies more quickly to market. This might include global demonstration programs; support for open innovation programs and national commitments to make public research common intellectual property; international R&D cooperation; publicly backed patent pools; support for financing, etc.
- Agreement that IPR regimes, including TRIPS, should be sensitive to the country’s level of development, respecting the reality that strong national-level innovative capacity is in the global interest.
- Agreement, based on economic evidence, that some specific forms of performance requirements are acceptable practice (particularly in developing countries) since they can be (have been) effectively used to foster globally competitive firms that can positively contribute to a green economy.
- Agreement on what should be acceptable (and/or best) practice in the pursuit of the green economy with respect to PPM-based measures such as BCA and carbon footprint labelling, and with respect to subsidies designed to foster national champions. At the end of the day in some cases this might simply re-affirm the current WTO rules, but widespread “stretching” of those rules suggests the need for a dedicated dialogue. In the case of subsidies, for example, we might think about the careful revival of non-actionable subsidies as a category in the WTO SCM Agreement.

These efforts might be part of a grand concerted push to foster a green economy globally. Or, more likely, they could be tackled separately in the fora most appropriate to each, but under the loose framework of such a concerted effort.

CONCLUSIONS

Most of the issues treated in this paper are not new. The global community has for years been debating the (often illusory) tensions between trade and environment, development

and environment, and arguing about the advisability of industrial policy. The need for policy space, the role of intellectual property rights and international investment agreements, subsidies, investment incentives – these are all well-trodden roads of discourse. Indeed, even the policies and practices necessary to get us to a green economy are not entirely new; many are even now in wide use,⁹² though as yet not wide enough.

What is new in the present context is the heightened urgency for international cooperation, and the stronger argument for assistance to developing countries, particularly the least developed among them. Given the urgency of the multiple global environmental crises facing us⁹³—climate change, loss of biodiversity, desertification, ocean degradation—, the urgency of the need to narrow the gap between rich and poor globally and at the national level,⁹⁴ and the security that development and environmental health bring to the global community,⁹⁵ it is in the common interest that the green economy be widely achieved. That urgency should trump many concerns about competitiveness in both the developed and developing countries. It is urgent, for example, that developing countries become incubators for globally competitive innovative green firms, and capable adopters of new technologies, and trade rules need to find room for that to occur. It is also urgent that there be lower barriers to trade in environmental goods and services, even if that means also liberalizing trade in dual use goods. And it is urgent that standards be used—fairly, but effectively—to force needed environmental improvement.

An open rules-based system of trade is a global good, even though there are superficially appealing arguments for national-level mercantilism. It is valuable enough that nations have committed to making it happen, through mutually beneficial actions that often appear to be sacrifices at the national level. In the same way the green economy, adopted and promoted in all countries, is a global good valuable enough that it should outweigh narrow national competitiveness concerns.

Not all countries will be clear winners in the coming transition, and some will do better than others. It would be misleading to suggest that least developed countries will soon be developing export streams in high tech capital-intensive sectors such as solar PV and carbon capture and storage. But as argued above the green economy is also based on relatively low tech activities, in which developing countries have already been successful, such as biofuels, solar thermal and geothermal energy. Many of the action items for international cooperation are aimed at equitably spreading the benefits of the green economy, and at supporting governments in their drive to make their economies capture the full potential, and avoid the risks, of green structural change.

⁹² OECD (2009); UNEP (2011).

⁹³ Rockström *et al.* (2009) offer a disturbing survey of the various planetary boundaries that we have already crossed or are soon to cross.

⁹⁴ There is some significance to the fact that eradicating poverty and hunger is the first of the Millennium Development Goals, adopted in the Millennium Declaration by all 192 UN member countries and at least 25 international organizations. (UNGA, 2000).

⁹⁵ Kaplan (2000); Mathews (1989).

Some sectors will feel the pain of transition, and countries that specialize in those sectors will be challenged accordingly. But while the individual losers are clearly important, it is also important to put the pain of adjustment into perspective. As noted above, it has been well documented that the costs of action are far less than the costs of inaction. In the long run, perpetuating unsustainable livelihoods is not in anyone's interest.

This paper finds that there is a role for trade policy in the pursuit of a green economy; trade and investment are critically important drivers of growth and structural change. The challenge—and it is an *achievable* challenge—is to ensure that all countries grow and change in ways that have benefits both nationally and globally.

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Challenges of the Green Economy Concept and Policies in the Context of Sustainable Development, Poverty and Equity

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THE CONTEXT OF SUSTAINABLE DEVELOPMENT AND GREEN ECONOMY

The “green economy” has become a topic of growing discussion in light of the environmental crisis. It is for example the subject of a major initiative by UNEP, which launched its Green Economy report in February. It has also become a rather controversial term, perhaps because it has become the subject of a multilateral negotiating process, within the Rio-Plus-20 framework. The “green economy” is not a concept that has yet to enjoy widespread agreement (among economists or environmentalists) or an international consensus. It is an extremely complex concept and it is unlikely there can be a consensus on its meaning, use and usefulness and policy implications, in the short term. A “green economy” gives the impression of an economy that is environmentally-friendly, sensitive to the need to conserve natural resources, minimise pollution and emissions that damage the environment in the production process, and produces products and services the existence and consumption of which do not harm the environment.

Among the difficult questions are whether the attainment of such an economy constrains other aspects (including economic growth of poor countries, and social development goals such as poverty eradication and job creation); how to identify and deal with the trade-offs; what are the appropriate combinations between these aspects and at different stages of development as well as stages in the state of the environment; what is the role of the state in regulation and investments and defining frameworks; how compatible is a green economy with the free market and what is the appropriate way to address the role of the private sector; how to build an economy that is more environmentally-friendly, and how to handle the transition from the present to the greener economy?

The Green Economy issue being discussed in the Rio Plus 20 process must also be context specific, or specific to the framework in which it is being discussed. This context is the Rio Plus 20 conference, which is a follow up to Rio 1992. This is explicit in the mandate of the 2012 Conference that refers to “a green economy in the context of sustainable development and poverty eradication”. For this purpose, the green economy is thus not an academic idea for free brainstorming. It must be derived from and rooted in the spirit, objectives, principles and operationalising of UNCED 1992, and especially the Rio Principles and Agenda 21. This should be supplemented by the Rio Plus 10 conference outcomes and commitments.

The main framework of UNCED 1992, its related agreements (UN Framework Convention on Climate Change, UN Convention on Biological Diversity and UN Convention to Combat Desertification) and its follow-up processes is to place the environment together with development in a single context. This is a unique achievement which has to be preserved and advanced, and not detracted from or diverted from.

UNCED was a watershed event that raised hopes a new global partnership to tackle the growing global environment crisis and simultaneously strive for more equitable international economic relations that would be the basis for promoting sustainable development globally and nationally. The unique achievement of UNCED was its generation of awareness and commitments to recognise not only the environment crisis in its many facets, but how this was embedded in economic and social systems, and that a realistic and long-term solution lay in dealing with both the environment and the development crises simultaneously and in an integrated fashion, entailing both international cooperation and national actions. The following are elements of the integrated UNCED framework:

- It recognised the environmental crisis and the need for deep reform of production and consumption patterns. It recognised the sustainability principle, that present production should not compromise meeting the needs of the future. It recognised the precautionary principle.
- It also recognised the “right to development” and the development needs and priorities of economic growth in developing countries plus social development goals including poverty eradication, jobs creation, food, health, education, etc.
- From the recognition of the above, the three pillars of “sustainable development” were accepted as environmental protection, economic development and social development.
- It recognised the need not only for national action but also international policies and actions in understanding and addressing the issues, and that for developing countries national action must be supported by international policies and actions to enable implementation of sustainable development.
- In this context it recognised that countries played different roles in contributing to the environmental crisis, that countries are at different stages of development, and that these must lead to key principles and have important implications for actions and for the international cooperation framework.
- Out of this arose the equity principle of common but differentiated responsibilities. It recognised that the major contribution to pollution (including Greenhouse Gas emissions) and resource depletion was by developed countries, and that developing countries are now disadvantaged because there is little “environmental space” left, which has implications for their future development. In practical terms, there should be a three-prong approach to achieving sustainable development: (1) The developed countries have to take the lead in changing production and consumption patterns (their economic model); (2) Developing countries would maintain their development goals but take on sustainable development methods and paths; (3) Developed countries commit to enable and support the developing countries' sustainable development through finance, technology transfer and appropriate reforms to the global economic and financial

structures or practices (this is why there were chapters on finance, technology, trade, commodities etc in Agenda 21).

- Issues requiring an integration of economic and environmental concerns (such as the interaction of trade and environment; and the relation between intellectual property rights and environmental technology and indigenous knowledge) should be resolved through international cooperation, in which the development needs of the South would be adequately recognised.

If the above principles are to be followed, then the concept of sustainable development would have at least two major components, each balancing the other: environmental protection and meeting the basic and human needs of present and future generations. Thus, sustainable development would not only involve ecological practices that enable meeting the needs of future generations, but a change in production and consumption patterns in an equitable manner whereby resources which are currently being wasted are saved and rechannelled to meeting the needs of everyone today as well as the needs of future generations. Equity among and within countries in the control and use of resources in ecologically prudent ways is a most critical factor.

The centre of the North-South debate and negotiations was conducted in the negotiations on the Rio Declaration on Environment and Development and on the Agenda 21 chapters on financial resources and on technology transfer. The developing countries insisted that the rich and poor countries should not be viewed on similar terms in relation to the causes and burden of resolving environmental problems, but that the North should bear a larger burden of costs and responsibilities due to their larger share in causing the problems and their relatively larger capacity to meet the costs. Eventually, much of the South's arguments and perspectives prevailed, as manifested in several of the Rio Declaration principles, especially Principle 3 that "the right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations", and Principle 7 that "in view of the different contributions to global environmental degradation, States have common but differentiated responsibilities" and that "developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command."

The conference in 2012 to mark the 20th anniversary of the Rio Summit is meant to review the implementation of the Rio outcomes. The review would be on the extent to which the sustainable development objectives have been met, identify the implementation gaps and propose measures for the way forward. As the "green economy" concept is being discussed as part of this process, it must thus be placed integrally within this holistic framework of UNCED, the Rio Principles and Agenda 21. The green economy should have as its basis the environmental imperative, the development (economic and social) imperative and the equity principle that links the environment and development dimensions. The green economy should thus be defined and operationalised in this EDE (environment, development, equity) framework, which must also incorporate both the

national and international dimensions. Objectives, principles, policies, proposals, initiatives, on the green economy should be within this EDE framework.

RISKS OF MISUSE OF THE GREEN ECONOMY CONCEPT

Concerns have been raised by developing countries' delegations that the “green economy” concept may be misused or taken out of context, and that the promotion of the “green economy” concept may give rise of unhelpful or negative developments, and these must be avoided.⁹⁶

One dimensional approach

The first risk is that the “green economy” is defined or operationalised in a one-dimensional manner, taken out of its being embedded in the sustainable development framework, and promoted in a purely “environmental” manner (without considering fully the development and equity dimensions) and without consideration of the international dimension, especially its negative effects on developing countries. In such a situation, if the green economy concept gains prominence, while the sustainable development concept recedes, there may be a loss of the use of the holistic sustainable development approach, with imbalances between the three pillars.

“One size fits all” approach

The second risk is that a “one size fits all” approach is taken, in which all countries are treated in the same manner. This would lead to failures either for environment, development or both. The levels and stages of development of countries must be fully considered, and the priorities and conditions of developing countries taken into account. The principle of common but differentiated responsibility should be respected and operationalised. Thus, in considering various principles, policies and targets, adequate flexibilities and special treatment should be provided for developing countries, such as exemptions, allowance for more lenient obligations, and the provision of finance, technology and capacity building.

Risk of using environment for trade protection

There is a risk that the environment, and by implication the “green economy”, can be inappropriately made use of by countries for trade protectionist purposes, and that in particular developed countries may use this as a principle or concept to justify unilateral trade measures against the products of developing countries. One example are the proposals or plans to impose a “carbon tariff” or “border adjustment tax” on products on the ground that these generated emissions of carbon dioxide during the production process above a certain level, or that the exporting country does not have emission controls of a standard deemed adequate by the importing country. Developing countries are strongly opposed to such trade measures, which is seen as protectionist. This would penalise developing countries that do not have financial resources or access to low-emission technologies, and thus violate the principle of common but differentiated responsibilities.

⁹⁶ These concerns were raised for example at the first preparatory meeting of the Rio Plus 20 process held in May 2010 and at the UNCTAD meeting on the green economy: trade and sustainable development implications in October 2010.

Just prior to the establishment of the WTO and in the few years after its establishment, there was a major debate inside and outside the WTO on the possible role of trade-related environment measures and in particular about the possible use of the concept of “processes and production methods (PPMs).” The PPM concept had been introduced as a means of distinguishing between products by the manner in which the products are made and the environmental effects (for example, the volume of pollution) arising from the production.

The WTO’s non-discrimination principle states that a member shall not discriminate between “like products” from different trading partners, and between its own and like foreign products, thus giving them national treatment. Thus the amount or rate of any taxes or charges on imports cannot be more than what is charged on “like” local products. This raises the issue of what is a “like product” and the related issue of PPMs. Many developing countries are of the view that if two products are “like” because their physical characteristics are similar, they should be treated in a similar way, and that differences in the production processes or methods and the manner in which the production takes place (including the environmental aspects) would not make these products “unlike.” Thus, it would be against the GATT rules to take a trade measure (such as an extra import duty) on a foreign-made product on the grounds that the production method is less environmentally sound.

In 1994, some international environment NGOs proposed to amend GATT rules to enable WTO Members to use trade-related environmental measures (TREM) to enable import restrictions based on PPMs, and advocated TREMs to promote internalizing the environmental costs of traded goods and setting a “fair price” for a traded product. (Raghavan, 1994a). In contrast, the Third World Network argued that the proposals to legitimize TREMs would add another burden of adjustment to the already-burdened South, and could change the non-discrimination principles of the multilateral trading system and change the basic rules of the game and the conditions of competition under the guise of protecting the environment. (TWN, 1994). The paper described several examples of how these concepts would be difficult or impossible to be implemented and how they would unfairly be biased against the developing countries. It suggested that the initiatives to introduce TREMs and legitimize PPMs in the WTO be abandoned. It proposed instead that any trade measures linked to the environment should be addressed by negotiations for an international treaty and any treaty containing obligations on developing countries must have provisions for technology transfer and financial resources as an integrated contractual obligation (TWN, 1994).

Another method to justify the use of unilateral trade measures is to make use of GATT Article XX, the general exception to the normal GATT rules. Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade, countries can take measures contrary to the GATT rules on certain grounds, including measures “necessary to protect human, animal or plant life or health” and measures relating to the conservation of exhaustible natural resources. In Europe, a few political

leaders have made bold statements, proposing the use of sanctions on imports, on climate grounds. In October 2007, the French President Nicolas Sarkozy said that the EU must examine the possibility of “taxing products imported from countries that do not comply with the Kyoto protocol. We have imposed environmental standards on our producers. It is not normal that their competitors should be completely exempted...Environmental dumping is not fair. It is a European issue that we must raise” (Sarkozy, 2007).

In the United States, a common feature of several climate-related bills introduced in the Congress is the inclusion of a border adjustment mechanism, in which importers will have to purchase “international reserve allowances” to cover the cost of emissions in the imported products. In June 2009, the House of Representatives passed the American Clean Energy and Security Act (also known as the Waxman-Markey bill⁹⁷). The bill obliges the US President to place a charge on importers of certain products that come from many developing countries by 2020. The importers will have to buy “allowances” for the emissions of the products they bring into the country. Several developing countries have voiced their opposition to these proposed trade measures as being protectionist. Although it appears unlikely that a joint House-Senate climate bill will be passed in the near future, it is also most likely that any future bill would contain a border tax adjustment clause.

The use of trade measures with the effect of blocking developing countries’ goods on climate grounds has the potential to deal a severe blow to the multilateral trading system, as well as adversely affect the climate negotiations under the UN Framework Convention on Climate Change (UNFCCC). Many developing countries would consider this as an attempt by developed countries to evade their commitment to assist developing countries, and instead shift the burden of adjustment onto these developing countries.

Attempting to gain market access through the guise of environment

Another risk is that the environment is misused as a disguised method by countries to promote the access of their goods and services into markets of other countries. There is a fear that the Green Economy concept could be used as a front for mercantilist interests. For example, concerns have been expressed by developing countries in the WTO that some developed countries have been attempting to get them to eliminate the tariffs of many of their goods that the proponents claim are “environmental goods.” This follows a mandate in the Doha negotiations to reduce or eliminate barriers to environmental goods and services. The negotiations have been bogged down by the definition of environmental goods, with claims that the list of goods proposed for tariff liberalisation reflects products of export interest to developed countries, whereas developing countries’ products are absent. On environmental services, the list in the proposal covered a wide range, including sensitive sectors, since many of them are public utilities.

The argument that the tariff elimination would benefit developing countries as they can import the products cheaply runs into the same type of criticism regarding proposals for import liberalization in food products. Just as most developing countries promote local food production and thus are against large cuts to their food tariffs, they are against tariff

⁹⁷ See Yu (2009a and 2009b) and Khor (2010b) for details and analyses of the Waxman-Markey Bill.

elimination on environmental goods as they wish to preserve policy space to be able produce these goods and their infant industries would need protection at least initially.

The treatment of subsidies

Another concern of many developing countries is that some developed countries have been providing their companies with major subsidies for the research and development (R&D) of environmentally sound technologies. This puts developing countries at a disadvantage, especially since they lack the financial resources to match the developed countries' subsidies. Given this unfair imbalance in subsidies, the developing countries and their firms would be in an even worse competitive situation if they have to lower their tariffs on environmental products.

Developing countries have also been concerned that government subsidies for research and development had been designated as “non-actionable subsidies” (meaning they are permitted) in the WTO's subsidies agreement, thus enabling countries with the resources to provide enormous subsidies to their enterprises and to give them a competitive advantage, while most developing countries do not have the resources to provide research R&D in significant amounts. This designation expired in 2000. However, while R&D subsidies are no longer allowed when limited to specific enterprises, they are allowed if given to industries across the board. Developing countries have been unable to compete with regard to R&D grants because of their lack of funds, and are also constrained due to the WTO rules from using many other types of subsidies that were used by developed countries when they were in their development phase. An even bigger imbalance is that agricultural subsidies are exempted from the strict rules of the subsidies agreement, and much more lenient treatment is provided to this sector, allowing developed countries to continue to maintain hundreds of billions of dollars of agricultural subsidies each year. The developing countries have proposed as part of the Doha negotiations that the subsidies they provide be considered “non actionable” (i.e. that they be permitted) for certain purposes, including for environmental protection. WTO members were urged to refrain from taking complaints against developing countries while the negotiations on the proposal are taking place.⁹⁸ Amending the WTO rules in this direction would be helpful. However a complaint has been taken against a developing country for subsidies provided to resident companies producing renewable energy

Environmental standards

Another potential problem is the adoption of environmental standards for products; developing countries that are unable to meet the standards face the prospect of losing their exports. The approach towards developing countries should be to provide resources and technology for upgrading their environmental technology and standards, and not to penalise them. The full and effective participation of developing countries in setting international standards is also needed as many important standards are currently “globalised” from those of developed countries without the concomitant support to developing countries to assist them to comply with such standards.

⁹⁸ WTO 2010, para 10.2. See also the discussion on this issue in Section D.

New conditionality

Another risk is that the “green economy” may be used as new conditionality on developing countries for aid, loans, and debt rescheduling or debt relief. This may pressurise affected developing countries to take on one-dimensional environmental measures rather than sustainable development policies that take economic and social development and equity goals into account.

POLICIES AND MEASURES FOR PROMOTING SUSTAINABLE DEVELOPMENT AND GREEN ECONOMY

In operationalising the Green Economy concept, the three aspects of sustainable development (environmental, economic and social) should be incorporated, to obtain a multi-dimensional outcome. The following are some measures and policies that can be taken to promote a more environmentally-sound economy in the context of sustainable development.

Recognising the economic and social value of environmental resources

It is crucial for policy makers and the public to recognise the economic and social value of the environment, that conserving resources such as clean air, water, forests, mangroves etc have positive externalities which are valuable for meeting basic and human needs besides having their intrinsic environmental worth. Conservation should thus be promoted, and there should be investments on rehabilitation of damaged natural resources. Recent studies have compared the benefits of conserving or sustainably using natural resources, with the benefits such as revenues from using or exploiting the resources in a way that maximises short-term profits at the expense of the environment. The recent reports on the economics of biodiversity have compiled many case studies estimating the economic value of mangrove swamps, forests and other natural resources and made the case that conserving the resources often yield more value than converting their use to commercial aquaculture and other activities.⁹⁹ For example, a 2007 study in Southern Thailand on conversion of mangrove into commercial shrimp farms showed net private economic returns of US\$1220 per hectare per year, while the cost of restoration after the pond is abandoned after 5 years of exploitation was \$9318 per hectare. But this was exceeded by the estimated benefits of retaining the mangroves (including for using forest products, providing nursery for fisheries and coastal protection against storms) which totalled US\$12,392/ha (UNEP, TEEB 2009).

Conserving resources and restoring damaged environments and eco-systems

While there are benefits in conserving natural resources, there should also be recognition of the opportunity cost of not “exploiting” or using up the resources. The short term usefulness of using Nature and the short and long term usefulness of conserving Nature (or making use of resources sustainably) should be both recognised and reconciled, and international support should be made available to developing countries in offsetting the opportunity costs.

⁹⁹ The reports give examples of the economic value of forests, mangrove swamps, conservation parks and sustainable fishery practices (UNEP, TEEB 2009).

One interesting proposal from a developing country for sharing the opportunity costs of conserving natural resources is the Yasuni Initiative of Ecuador, in which the country is willing to forgo the benefits of oil revenues in order to preserve a biodiversity-rich large tract of forest. (Khor 2010c). In the proposed scheme, the government would maintain the crude oil field located in the Yasuni National Park indefinitely underground. The international community would contribute half the revenue that the State would have received by extracting the oil, while the government would assume up to half of the opportunity cost of keeping the oil in the ground.

The fund's capital will be invested in renewable energy projects and the interest from the fund would be used to conserve forests, help small farmers reforest and promote energy efficiency and social development.

Public expenditure on restoring damaged ecosystems (such as forests, hillsides and water catchment areas, mangroves) is also important. Damage to the ecosystems has been significant and restoration would reduce the adverse effects and enable the resumption of the environmental functions. However, in many developing countries, there is a lack of financial resources to undertake ecological restoration on the scale needed, and thus international support is necessary.

Enabling prices to better reflect their environmental value, while ensuring access to basic goods and services.

A major challenge in sustainable development (and thus of any green economy initiative) is to reconcile the two principles of allowing prices to better reflect their environmental values, while ensuring access of the public (especially the poor) to basic amenities and basic livelihood opportunities. Thus both the environmental dimension and social dimension has to be incorporated.

The over-exploitation of natural resources, and related wastage, is promoted by the low prices of natural resource-based products such as water and wood. This under-pricing could be due to the prices not being able to incorporate or fully incorporating the cost of adverse side effects during production or because of subsidies, or other factors. The state has the key role to address the failure of market prices reflecting real environmental values. In general, prices should better reflect the environmental values, including the incorporation of the costs of adverse effects. Environmental taxes should be used, as well as pricing policy relating to public services.

However this should be done in a manner that does not penalise the poor and ordinary people, especially when the products or services concerned are essentials. Thus, if water is generally underpriced, then in a revaluing of the price of water provided by the state, a system of differential pricing that is sensitive to ensuring access for the poor could be instituted. The first block of water for households in a quantity essential for family use may be charged at an affordable rate, with higher rates at subsequent blocks; the water supplied to hotels and industries could be at higher rates; and in developing countries community water in poor areas may be provided free. Overall, the price of water should

better reflect their ecological values, while there can be subsidisation for the poor or for essential use.

The removal or reduction of subsidies for environmentally-damaging activities or products has also been strongly advocated. However, this should be undertaken with the principle that it should not affect affordable access of the poor to essentials such as energy or food, or affect their livelihoods adversely. For example, subsidies provided to the fishing industry have contributed to over-fishing and rapid depletion of fish stocks. In the WTO, negotiations are taking place to discipline fishery subsidies. However, many developing countries have argued for exemptions or more lenient treatment be given to them for subsidies that are provided for their fishing sector that is characterised by small-scale and artisanal fisherfolk. In another case, if subsidies for fossil fuels are reduced or eliminated (as being proposed in the G20 process) this should be done in a manner that does not adversely affect the access of the poor to energy.

On the other hand, incentives (subsidies, access to credit, tax breaks, etc) should be provided to producers and consumers to promote good production processes and products (renewable energy, sustainable agriculture, no-emissions cars). For developing countries, subsidies and other incentives are particularly important, since many new industries and practices have to be fostered. Such subsidies should of course be well designed and implemented properly to ensure they meet sustainable development goals.

A potential barrier for developing countries is the subsidies agreement in the WTO, which has considerably reduced the policy space of developing countries on the types of subsidies they are able to provide. The complaint taken against a developing country at the WTO regarding the legality of its subsidies provided for wind energy companies may create an atmosphere of uncertainty to developing countries seeking to promote climate-friendly industries and technologies. Meanwhile, many developed countries provide research and development grants to their companies, the total running into billions of dollars. It is not so clear to many developing countries what kinds of subsidies are permitted and what are prohibited and “actionable”. It appears that many types of subsidies used by developed countries during their development phase are now unable to be used by developing countries in the industrial sector. However, many subsidies are still allowed in agriculture, and these are used mainly by developed countries, which is another imbalance. In view of the imperative of having a transition to a green economy, it is important to review the subsidies rules in the WTO.

In fact, developing countries have proposed that they be given an exemption on some of the prohibited subsidies, including on environmental grounds. As part of the documents that launched the current Doha negotiations, the proposal of developing countries to expand the list of non-actionable subsidies for them was included for consideration.¹⁰⁰ The decision taken by the WTO's 2001 Doha Ministerial Conference was to “take note of the proposal to treat measures implemented by developing countries with a view to achieving legitimate development goals, such as regional growth, technology research and

¹⁰⁰ This decision is contained as para 10.2 in WTO (2001). This point on subsidies and developing countries' proposal is also mentioned in UNCTAD's paper on the Green Economy (UNCTAD 2010).

development funding, production diversification and development and implementation of environmentally sound methods of production as non-actionable subsidies.” It agreed that the issue be addressed as an outstanding implementation issue, and added: “During the course of the negotiations, Members are urged to exercise due restraint with respect to challenging such measures.” As the Doha negotiations are still proceeding, the “due restraint” clause is still in place. This proposal should be taken seriously.

The critical role of the public sector

Besides its regulatory function, the state has also an important role in strategic policy-making in re-orienting various economic and social sectors towards a sustainable development pathway. As argued by UNDESA (2009), developing countries face a vastly more daunting challenge than developed countries and in a far more constrained environment, since much of the atmospheric space has been used up already (and mostly by developed countries).

Can high growth in developing countries can be combined with lowering the emissions trajectory? UNDESA (2009) argues it is feasible because the technologies exist but such a switch entails unprecedented and potentially very costly socio-economic adjustments in developing countries. This switch will require a high level of international support to boost finance, technology and institutional capacity in developing countries, capable of raising investment levels and channelling resources towards lowering the carbon content of economic activity and building resilience to unavoidable climate changes. The mix of market and non-market measures may be different for developed countries (which may give a greater role to market mechanisms, taxes and regulations) and developing countries, which should emphasise public investment and industrial policies, managed by a developmental State.

The level and content of investments influences the rate and content (or composition) of economic growth. The UNDESA report strongly argues that large investments have to be made up-front in new carbon-saving technologies, with the public sector playing a leading role in triggering growth and crowding in private investment along a new development path. Reducing greenhouse gas emissions will require large and interconnected investments across several sectors. Most important is the energy sector: developing countries need to expand energy infrastructure and make energy services widely available at affordable prices especially to the 1.6 billion people (mainly the rural poor) without access to electricity and 2 billion without access to modern energy

Developing countries also need to adopt adaptation measures to avoid or cope with climatic and weather events, which can have devastating effects, as the recent floods in Pakistan, Sri Lanka and many South American countries have demonstrated. These have adverse effects especially on poor communities. Large-scale adaptation projects in both the rural and urban sectors, with significant support from international climate financing, can contribute to job creation and economic growth.

Besides investments, the switch to a sustainable pathway also requires governments to adopt an industrial policy which also incorporates sustainable development principles and

practices. The industrial policy includes selection of sectors to promote in industry (as well as agriculture and services), and includes measures such as subsidies and access to credit to producers, as well as trade and technology policies that are supportive of the production. One specific proposal in the DESA report is the establishment of a global feed-in tariff programme in the energy sector.¹⁰¹ In a feed-in tariff scheme, utility companies are obliged to pay agreed prices or tariffs to renewable energy suppliers and to “feed” the renewable energy into the national grid. This induces investments in renewable energy.

The role of government to address the climate change crisis as described above should also apply to other areas, such as public investment for promotion of biodiversity, conservation and sustainable use of natural resources, and the restoration of degraded resources and ecosystems.

Regulating the Market

Another major issue in considering the “green economy” is the need for regulating markets and corporations. Although the private sector has an important role to play in the shift to sustainable development and to a green economy, they should operate within the framework of government regulation and policies. Markets and companies left to themselves have been unable to take a sustainable development pathway. Indeed, much of the pollution, extraction and depletion of resources in the world have been the result of activities of companies, especially the big companies.¹⁰² Companies have to operate in an intensely competitive environment, with imperatives to minimise costs and maximise profits, with the short-term being the critical horizon. Governments have to establish the frameworks of regulation, incentives and disincentives, so that corporate practices are aligned to environmental, social and developmental objectives. The Stern Report (2006) termed the climate change crisis as “the greatest market failure the world has ever seen.”

Thus, regulation of the private sector, especially the large companies, is important. Regulatory mechanisms such as limits to pollution and emissions, pesticides in food, water contamination, and use of environmental taxes and fines, are thus seen as crucial policy instruments, that should be major or central components to promoting the “green economy”.

However, there is also an increasing trend instead of creating and relying on “markets” whereby companies (and countries) can pollute beyond their assigned limit by buying pollution or emission certificates from other companies or countries. Such markets for buying and selling “pollution rights” are increasingly seen as an alternative to companies or countries having to take their own adequate action, and to pass the action on to others. There is an increasing body of criticisms about this trend, including the avoidance by developed countries and their companies from environmental action, the problems including fraudulent practices in the workings of these markets, the dangers to both the environment and to social development of turning Nature and natural resources into commodities, and dangers of creating new financial speculative instruments. It should

¹⁰¹ Details on feed-in tariff scheme are in DESA 2009 and Hallstrom N. 2011.

¹⁰² See Khor (1995).

thus be recognised that while there is an interest in learning about the use of pricing mechanisms, taxes and payment for entrance of cars into urban centres, there is also a debate on the appropriateness and effects of the use of “markets” for pollution permits or for “offsetting” in the implementation of environmental commitments.

Addressing the link between livelihoods and living conditions of rural communities and the environment.

There is a particularly strong link between the rural poor and the environment. They live close to the natural environment and depend on land, water and forest and marine resources for their livelihoods. Their housing materials and utensils, and sources of water, food and energy, come directly from natural resources. Thus, the deterioration of the natural environment has an almost immediate and drastic impact on their living conditions and livelihoods. Conserving natural resources in places where poor communities live is thus an important component of sustainable development. This environment has been increasingly encroached upon, and the competing use of the resources by commercial interests has often left the poor communities at a disadvantage, with losses to their livelihoods and incomes, and deterioration of their water supply. Examples include indigenous people losing their forests to timber and mining companies undertaking extraction activities; fishing communities losing their mangrove forests due to commercial aquaculture or losing their fishery resources due to over-fishing by large trawling boats or huge fishing ships; and local communities suffering from contamination of their rivers and land by industrial wastes.

The concept of sustainable development and of green economy should incorporate the right of rural communities to a clean environment that enables them to have a sound basis for their livelihoods and their living conditions. A rights based approach is important, that can include the rights to work, to food and health and the new rights to water and sanitation, and the UN Declaration on the Rights of Indigenous Peoples.

Climate change and extreme weather events also affects the poor most severely. The recent series of floods caused by heavy rains in many countries mainly affects those living in rural areas. One of the most serious potential effects of global warming will be the lower productivity of agriculture in developing countries. Sea water rise will also have effects mainly on coastal populations

At the same time, poor rural communities should also be the main beneficiaries of sustainable development, and the green economy. About 1.6 billion people do not have access to electricity, and many rural dwellers do not have access to clean water and sanitation. The degraded resources have also caused a deterioration in their living conditions. Thus, sustainable development and green economy strategies should prioritise policies and projects that benefit them. These include prohibition of activities that damage the environment and livelihoods of the poor communities (unless they are provided with alternative land and housing of equally good quality); restoration of ecosystems; support for sustainable agriculture activities; large government investments in renewable energy, water and sanitation programmes as well as improved education and health services.

On the other hand the interests of poor rural communities should not be adversely affected in the name of the Green Economy. For example local communities should not be forced to leave their homes in the forests when such forests are declared conservation parks. In the building of big hydro-electric dams, now often done in the name of renewable energy, large numbers of forest dwellers have been relocated, often without being given equally good sources of livelihood and living conditions or adequate compensation. Also, biological resources of local communities have been misappropriated either through physical removal of plants, or through patenting of the resources and the traditional knowledge associated with their use; these resources are often converted into “natural” or “nature-based” products.

Addressing Unsustainable Consumption Patterns and the link to Environment, Poverty and Equity

UNCED acknowledged the need to reform existing patterns of consumption and production in order to meet sustainable development objectives, thus leading to the call for measures to lead to sustainable patterns of production and consumption. It recognised the link between poverty and unsustainable patterns of production and consumption. According to Agenda 21 (para 4.3), poverty and environmental degradation are closely interrelated; while poverty results in certain kinds of environmental stress, the major cause of the continued deterioration of the global environment is the unsustainable patterns of consumption and production, particularly in industrialised countries, which is a matter of grave concern, aggravating poverty and imbalances.”

However, while there has been much discussion on making production patterns and systems more environmentally efficient, there has been less focus on consumption patterns. This should be rectified as consumption patterns often drive the pace of production and greatly influence the composition of the good and services produced. A more rational pattern of consumption can result in a more rational pattern of production. Consumption patterns are in turn highly influenced by the distribution of incomes worldwide and within countries. Due to the unequal distribution of income in the world, a large share of goods and services produced are luxuries that the wealthy are able to pay for, while the poor who have needs but are unable to pay lack basic goods and services such as housing, clean water, sanitation, basic education and food.

Agenda 21 understood and acknowledged this point, stating that special attention should be paid to the demand for natural resources generated by unsustainable consumption, and that although consumption patterns are very high in certain parts of the world, the basic consumer needs of a large section of humanity are not being met. This results in excessive demands and unsustainable lifestyles among the richer segments, which place immense stress on the environment. The poorer segments, meanwhile, are unable to meet food, health care, shelter and educational needs. Changing consumption patterns will require a multi-prong strategy focusing on demand, meeting the basic needs of the poor, and reducing wastage and the use of finite resources in the production process. (para 4.5).

Since UNCED 1992, there has not been much progress in changing the unsustainable consumption patterns. In the past two decades, a large part of the world's resources have continued to be channeled towards luxury projects, goods and services, while there has been an alarming increase in the depletion and pollution of the world's natural resources. Much of the discussion on making consumption and production patterns more sustainable has been on reducing the energy and materials used per unit of production, minimising the generation of wastes, and making consumers aware of environmentally sound purchasing choices. These are laudable objectives; however the core problem of income inequality has not been resolved but in many countries it has become more acute, with a larger share of national income accruing to a small percentage of the population.

This has several implications. While there is more potential to increase the productivity per unit of natural resources used, this is done within the same or worse income distribution pattern; thus the rich may consume the same luxury products and services and in larger numbers though each unit may be more energy-efficient. Because of the same distribution pattern, the poor still do not have access to basics. Thus, an improvement in the pattern of income distribution is required if sustainable development objectives are to be met. The equitable distribution of income as a goal becomes more urgent as resources are being depleted to critical levels, and as the "atmospheric" space for Greenhouse Gases is fast vanishing. In this situation of environmental crisis, the irrationality of existing consumption patterns becomes even more evident.

Improving income distribution requires public policy and government intervention, as the market left to itself would continue to produce according to the pattern of demand which in turn is influenced by the pattern of income distribution. At the international level, measures are needed to develop a more balanced and equitable economic, trade and financial system. This has to be accompanied meanwhile by transfers of financial resources and technology, as well as redistributive methods such as ODA. At the national level, measures are needed to foster more equitable patterns of wealth and income distribution, including through land reform, better wages, and a budgetary system of taxes and expenditure oriented to improving the livelihoods and living conditions of rural communities and the urban poor, as well as pro-poor and pro-employment growth.

Food Security, Agricultural Trade, Rules, Rural Livelihoods and Sustainable Agriculture

The integral nature of sustainable development can be shown in addressing the inter-related issues of food, agriculture, livelihoods of the poor, trade policy and the environment. The Green Economy concept has also to address these issues in their complexity. The right to food is an essential human right, and developing countries place importance on food security. The present inflation of food prices to almost record high levels lends urgency to the issue. At the same time, billions of people depend on agriculture for their livelihoods and incomes, while agriculture also has to be environmentally sustainable. Under the advice that food security could be better obtained through importing cheaper food, many developing countries reduced food production. The rising world prices of many food products (and increasing cases of scarcity in world markets) have led to domestic food price inflation and social instability. There is a policy

shift to re-defining “food security” to the traditional concept of greater self-sufficiency and increased local food production. This raises the question of what constitute the barriers to local production and how to remove these barriers.

The decline of agriculture in many developing countries was due to structural adjustment policies, which dismantled institutions and policies that assisted farmers in marketing, credit, subsidies and infrastructure and which drastically reduced agricultural tariffs. Many countries that were net exporters or self-sufficient in many food crops became net importers when local production declined and imports (some of them heavily subsidised) rose. The effects on farm incomes and national food were severe. The high agricultural subsidies in developed countries affect developing countries by enabling cheap exports to penetrate the poorer countries' markets, disrupting local production; by preventing access to the rich countries' markets; and by out-competing developing countries' products in third markets. In 2009 the agricultural subsidies of OECD countries (measured by total support estimate, i.e. subsidies to farm producers, general services support and consumer support) totalled \$384 billion, compared to \$362 billion in 2007. (OECD 2009, 2010). The subsidies enable sale of products at below production cost, enabling exports to developing countries whose applied tariffs had been brought down. Between 1996 and 2002, EU frozen chicken exports to West Africa rose eight fold, due mainly to import liberalization. In Ghana, the half million chicken farmers have suffered from this situation. In 1992, domestic farmers supplied 95% of Ghana's market, but this share fell to 11% in 2001, as imported poultry sells cheaper. (Khor 2008c).

The plight of the small farmers in developing countries should be addressed through domestic policies supporting their agriculture and international trade reform that sufficiently disciplines subsidies in the developed countries, while providing developing countries with special treatment and safeguard mechanisms to promote their small farmers' livelihoods. The WTO rules and the proposed Doha framework, as well as the provisions in many bilateral trade agreements fall short of these goals.

Agricultural reform is also needed to take into account the environment, including climate change. On one hand, climate change is predicted to adversely affect agriculture productivity in developing countries. Countries such as Chad, Ethiopia, Nigeria, Somalia, Sudan and Zimbabwe could lose cereal-production potential by 2080; in Latin America there are generalised reductions in rice yields by 2020; and cereal yields could decrease by 30% by 2050 in South Asia. (Nyong 2009: p 47). According to the report of the IAASTD (Independent assessment of agricultural knowledge, science and technology for development), climate change can irreversibly damage the natural resource base, and increase water scarcity. Extreme climate events (floods and drought) are increasing and are likely to affect food and forestry production. (IAASTD 2008).

On the other hand, agriculture is a major contributor to climate change. Agriculture directly and indirectly contributes 17 to 32 percent of all global human-induced Greenhouse Gas emissions (Greenpeace 2008). Conventional and intensive agriculture characterized by mechanization and use of agro-chemicals and reliance on high external inputs have led to high environmental and social costs that may undermine future food

production capacity. Agriculture has great mitigation potential and is also important for adaptation action.

The IAASTD, an inter-governmental process co-sponsored by many international organisations with over 400 authors, conducted a three-year assessment on agricultural science and technology. It made a critique of conventional industrial farming and called for a fundamental change in farming practices. Its report concluded that the old paradigm of industrial energy-intensive and toxic agriculture is an outdated concept, while small-scale farmers and agro-ecological methods provide the way forward.

A report by the International Trade Centre and FIBL (Research Institute of Organic Agriculture, Switzerland) provides a detailed assessment of the benefits of organic farming regarding climate change. The study concludes that within agriculture, organic agriculture holds an especially favourable position, since it realizes mitigation and sequestration of carbon dioxide in an efficient way. Organic production has great mitigation and adaptation potential, particularly with regard topsoil organic matter fixation, soil fertility and water-holding capacity, increasing yields in areas with medium to low-input agriculture and in agro-forestry, and by enhancing farmers' adaptive capacity. Moreover in some areas, organic farming performs better, for example in conditions where there are water constraints. Yields from organic agriculture where water is limited during the growing period, and under subsistence farming, are equal or significantly higher than those from conventional agriculture. The ITC report cites a comparison of 133 studies from developing countries concluded that organic plant and livestock yields were 80% higher than their conventional counterparts, and for crops only the yield increase was 74%. (ITC/FIBL 2008).

Another review of sustainable agriculture practices, covering 208 projects in 52 countries, show that 9 million farmers have adopted sustainable agriculture practices on 29 million hectares in Africa, Asia and Latin America (Pretty and Hine 2001, cited in Lim 2003). Farmers have achieved substantial increases in food production per hectare: 50-150% for rain-fed crops; 5-10% for irrigated crops.

There should be greater priority to adaptation and mitigation measures in agriculture in developing countries. There should be bigger support from governments and international agencies for sustainable agriculture.

The sustainable development framework can usefully incorporate all the various key aspects of the food-agriculture-trade-environment nexus, as described above. It is a test for the Green Economy concept whether it also has the methodology and the conceptual base to encompass the same comprehensive approach.

Strengthening international policies and mechanisms to support developing countries' policies and efforts towards sustainable development.

At the international level, systems and mechanisms should be established or strengthened for developed countries to support and enable developing countries to move towards a sustainable development path. These would include the provision of adequate financing

and technology transfer which includes the promotion of endogenous environmentally-sound technology in developing countries.

Reforms and improvements are needed in the global economic frameworks, structures and processes with the view to enable and support developing countries in the transition to sustainable development processes and models. Reviews and reforms in trade rules (multilateral rules as well as regional and bilateral FTAs) are required, for example, in the areas of reducing developed countries' agricultural subsidies, reviewing industrial subsidies to enable developing countries to promote environmentally-sound practices or products such as renewable energy, establishing appropriate intellectual property rules that enable access to environmental technologies at affordable cost, etc. The issues of finance and technology are further discussed in the next two sections.

TECHNOLOGY DEVELOPMENT, TRANSFER AND COOPERATION

The central role of technology transfer was recognised in the 1992 Rio Summit and its related conventions. It was recognised that technology transfer is required beyond the commercial arena, and a pro-active role of national and international public policy is needed for developing countries to have access to technology. Chapter 34 of Agenda 21 defines environmentally sound technologies as not just individual technologies but total systems that include know-how, procedures, goods and services, equipment and organisational and managerial procedures. It states the principle of the need for favourable access to and transfer of environmentally sound technologies to developing countries through technology cooperation enabling transfer of technological know-how and building up of economic, technical and managerial capabilities for the efficient use and further development of transferred technology.

The UNFCCC also recognises technology development and transfer in several provisions. Despite this, there has been in fact little transfer of climate-friendly technology under the UNFCCC. This implementation gap is sought to be rectified. It was agreed under the Bali Action Plan (adopted in December 2007) that developed countries would provide technology support to developing countries in a measurable, reportable and verifiable manner. An executive committee on technology is in the process of being established under the UNFCCC to address technology transfer issues.

A central aspect of technology development and transfer is the building of local capacity to design and make technologies. Developing countries should be given the chance to climb the technological ladder from the initiation stage, where technology as capital goods are imported; to the internalisation stage, where local firms learn through imitation under a flexible intellectual property rights regime; and the final generation stage, where local firms and institutions innovate through their own research and development (UNCTAD 2007).

Whether IPRs constitute a barrier to technology transfer depends on factors such as whether or not the particular technology is patented, whether there are viable and cost-

effective substitutes or alternatives, the degree of competition, the prices at which it is sold, and the degree of reasonableness of terms for licensing.

According to Agenda 21 (para 34.9), a large body of technological knowledge lies in the public domain (as are not covered by patents) and there is a need for the access of developing countries to such technologies as well as the know how and expertise required to use them. Expanding the space for technologies in the public domain, and to expanding the transfer to developing countries of publicly-funded technologies are thus an important part of the solution. Governments in developed countries spend substantial amounts on R & D programmes, many of which are implemented by the private sector. In addition, governments sponsor a range of R & D that underpin private sector investments in developing environmentally sound technologies (IPCC 2000, page 95). A survey of government R & D funding of environmentally sound technologies in the US, Canada, UK and Korea found that in most countries, governments allocated their rights (patents, copyrights, trademarks etc.) to the recipient research institutions to a significant degree. As a result, the diffusion of climate-friendly technology would “typically be along a pathway of licensing or royalty payments rather than use without restriction in the public domain.” (Sathaye et al 2005).

The IPCC report (2000) calls on OECD countries to influence the flow of such technology directly through their influence on the private sector or public institutes that receive funding from government to be more active in transferring technologies to developing countries. It cites Agenda 21 (chapter 34, paragraph 34.18a) that “governments and international organisations should promote the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain.” Products that emerge from publicly funded R & D should be placed in the public domain. Those that are partially funded should be in the public domain to the extent to which it is publicly funded.

At the international level, there can also be public funding and joint planning of R & D programmes. Products and technologies emerging from such publicly funded programmes should be placed in the public domain.

For technologies that are patented, there should be an understanding that patents should not be an obstacle to developing countries' access. Agenda 21 (para 34.10) states that: “Consideration must be given to the role of patent protection and intellectual property rights along with an examination of their impact on the access to and transfer of environmentally sound technology, in particular to developing countries, as well as to further exploring efficiently the concept of assured access for developing countries to environmentally sound technology in its relation to proprietary rights with a view to developing effective responses to the needs of developing countries in this area.” Agenda 21 (para 34.18e) also agreed that in the case of privately owned technologies, measures would be adopted particularly for developing countries, including developed countries creating incentives to their companies to transfer technology; purchase of patents and licenses for their transfer to developing countries; prevention of the abuse of

IPRs including through compulsory licensing with compensation; providing funds for technology transfer; and developing mechanisms for technology access and transfer.

A study on transfer of technologies for substitutes for ozone-damaging chemicals under the Montreal Protocol has given details on how technology transfer to developing countries' firms was hindered by either high prices or other unacceptable conditions imposed by companies holding patents on the chemical substitutes onto companies in developing countries that wanted a license to manufacture the substitutes. (Anderson 2007). Examples include the case of HFC-134a, a chemical used to replace harmful CFC in refrigeration. When Indian companies requested a license from a US company owning the patent for HFC-134a, in order to manufacture the chemical, they were asked to pay a high sum which was far above the normal level, or to allow the US company to own a majority equity stake in a joint venture and with export restrictions on the chemical produced in India; both options were unacceptable to the Indian producers. Korean firms also faced difficulties when they wanted to replace CFCs with acceptable substitutes HFC-134a and HCFC-141b, which had been patented by foreign companies in Korea. "South Korean firms are of the opinion that the concession fees demanded by technology owners represent a lack of intention to transfer the alternative technology." (Anderson et al 2007, pages 262-265); Many of the technology agreements between Korean firms and their partners in Japan and the US contain restrictions such as they are not allowed to consign to a third party, to export and that the improved technologies should be shared.

Under the TRIPS Agreement, there is considerable flexibility provided to WTO member states to grant compulsory licenses, and the grounds to do so are not restricted. In developed countries, there have been many compulsory licenses granted by the government to facilitate cheaper products and technology in the industrial sector. In many developing countries, compulsory licenses have been issued for the import or local production of generic drugs. Thus, compulsory licensing is an option particularly when the patent-holder is unwilling to provide a voluntary license with reasonable conditions.

Some developing countries have previously proposed at the WTO that countries be allowed not to patent environmentally-sound technology so that its transferred and use can be facilitated. The relaxation of the TRIPS rules in the case of climate-related technologies has also been proposed by developing countries in the UNFCCC; however this was opposed by major developed countries. Governments can also facilitate easier access to voluntary licenses. Measures can also be taken to ensure that royalty and other conditions in voluntary licenses are fair and reasonable.

International cooperation is also needed to establish programmes that support developing countries to assess their technological needs in different sectors; to assess the appropriateness of various technologies, taking account of the environmental, safety, social and economic aspects; to identify the obstacles to the development or transfer of these technologies; and to devise policies and measures to overcome the obstacles. A network of technology experts in various areas should be made available to advise developing countries. Technology funds should be established, including under relevant

conventions such as the UNFCCC and CBD, as well as in the social and development areas, to finance technology development and transfer.

Agenda 21 also has many useful proposals and decisions, including establishment of a collaborative network of research centres, support for cooperation and assistance programmes, and building capacity for technology assessment, and collaborative arrangements. These should be revisited as part of the Rio Plus 20 process.

As discussed earlier, the development and deployment of environmentally-sound technologies requires a strong and dedicated programme at the national level, with significant public investments in developing countries, for projects such as feed-in tariffs to enable large-scale development and use of renewable energy. Due to the limited resources of developing countries, a significant part of the financing for such technology programmes should be from international funds.

FINANCING OF SUSTAINABLE DEVELOPMENT

The Rio Summit and its Agenda 21 gave a critical place to financing as one of the two key means of implementation of sustainable development objectives. The rationale for international financing was agreed to and clarified in Agenda 21. Economic growth, social development and poverty eradication are the first and overriding priority in developing countries and are themselves essential to meeting sustainability objectives. In light of the global benefits of implementing Agenda 21, providing finance and technology to developing countries will serve the common interests of developed and developing countries and humankind in general, including future generations. Without these means of implementation, it will be difficult for developing countries to fully implement their commitments. The cost of inaction could outweigh the financial costs of implementing Agenda 21 and inaction will narrow the choices of future generations. (UNCED para 33.3).

The UNCED Secretariat estimated the additional estimated average annual costs (in 1993-2000) of implementation in developing countries were over \$600 billion, and of this total the Secretariat estimated that \$125 billion would be from international cooperation in grant and concessional terms. (UNCED, para 33.18). The outcome, as reflected in Agenda 21, was that developed countries make financial commitments to give effect to the UNCED decisions, with developing countries drawing up national sustainable development plans, and a regular review and monitoring be conducted on the adequacy of funding and mechanisms, including efforts to reach the targets. (UNCED, para 33.21). UNCED agreed that substantial new and additional funding for sustainable development and implementing of Agenda 21 will be required. The key outcome was that developed countries reaffirmed their commitments to reach the UN target of 0.7 per cent of GNP for ODA as soon as possible, with some agreeing to a 2000 deadline. Those countries that have already reached the target were commended and urged to make additional contributions, while other developed countries agreed to make their best efforts to increase their ODA level. (UNCED, para 33.13).

The finance issue also figures prominently in other related processes. Under the UNFCCC developed countries committed to provide financial resources, including for technology transfer, needed by developing countries to meet the agreed full incremental costs of their mitigation measures (article 4.3) and to also meet the costs of adaptation (article 4.4). The extent to which developing countries will implement their commitments will depend on the effective implementation by developed countries of their finance and technology transfer commitments, and will take fully into account that economic and social development and poverty eradication are the developing countries' first and over-riding priorities. (Article 4.7)

Under the UN Convention on Biological Diversity (CBD) developed countries committed to provide new and additional financial resources to enable developing countries to meet the agreed full incremental costs to them of implementing measures to fulfill their CBD obligations. The implementation of the finance commitments shall take into account the need for adequacy, predictability and timely flow of funds and the importance of burden sharing among the contributing Parties. (Article 20.2) The extent to which developing countries will implement their CBD commitments will depend on the effective implementation by developed countries of their finance and technology transfer commitments and will take fully into account the fact that economic and social development and eradication of poverty are the first and overriding priorities of the developing countries (article 20.4).

The monitoring and implementation aspects of the finance obligations have been weak. The 1989 proposal in the UN General Assembly resolution mandating UNCED to consider a technology fund did not materialise. Most developed countries have not yet reached the 0.7% ODA target and funding for sustainable development activities remains far from adequate.

In recent years, negotiations at the UNFCCC have seen movement on the issue of financial resources for climate change. Decisions at the meeting of the Conference of Parties in Cancun in December 2010 included noting the developed countries' commitment to provide new and additional resources approaching \$30 billion in 2010-2012, and recognised that developed countries commit to a goal of mobilising \$100 billion a year by 2020 to address the needs of developing countries. A decision was taken to establish a Green Climate Fund under the UNFCCC; the Fund will be designed in 2011 by a transitional committee.

At the Nagoya meeting of the Conference of Parties to the CBD in November 2010, a Strategic Plan (2011-2020) was adopted. Many finance-related issues remain to be resolved, including the size of resources needed not only for climate-related activities but also those in other areas such as addressing biodiversity, toxic substances and wastes, water and energy, as well as social sectors. (Chee 2010).

The scale of financing required by developing countries for climate mitigation and adaptation activities has been estimated at several hundreds of billions of dollars a year, or even a trillion dollars and more. In a review of various estimates of mitigation costs,

UNDESA (2009: p154-155) found the range of over \$400 to \$1,200 billion annual additional cost of mitigation strategies for the world and over \$200 bil to almost \$1,000 billion for developing countries, for a scenario of limiting Greenhouse Gas concentration to 450 ppm. The World Bank (2010) estimated in developing countries mitigation would cost \$140-175 billion a year over the next 20 years, with associated financing needs of \$265-565 billion, with a 450ppm scenario. For adaptation, a World Bank adaptation report estimates the annual cost between 2010 and 2050 of \$75-100 billion a year. A more comprehensive study by scientists led by Martin Parry (2009) that includes the adaptation costs in more areas has far higher estimates (\$400-600 billion).¹⁰³ Given these estimates, the volume of funds mentioned for mobilization (\$100 billion annually by 2020) is far from adequate, especially when taking into account the finance-related commitments of developed countries in the Climate Convention, including payment for the agreed full incremental costs of mitigation measures.

There are also other costs required to be met besides that for climate change. At the Nagoya meeting of the Conference of Parties to the CBD in 2010, there was no agreement to establish specific targets for financial resources mobilisation, although the G77 and China proposed specific figures with time lines. It was agreed to develop and apply methodologies for assessing gaps and needs, as well as progress in the increase in and mobilisation of resources against several indicators that were adopted (including aggregated financial flows of biodiversity-related funding and flows from various sources to developing countries). (Chee 2010).

With the big gaps still between what is required and what has been committed, major efforts are needed to mobilise and channel the sufficient financial resources towards sustainable development activities.

The UNDESA report on climate and development (UNDESA 2009: p151-183) reviews methods to “crowd in” private sector financing (through cap and trade, carbon taxes, sources of green investment and consumer financing; and proposals for public sector international cooperation financing (including mandatory assessed contributions by developed countries into a fund; revenue from global auctioning of emission permits; a global carbon levy; and revenues from carbon offsetting schemes. The November 2010 report of the UN Secretary General's high-level advisory group on climate change financing concluded it is challenging but feasible to mobilise \$100 billion a year by 2020 to address the needs of developing countries (United Nations 2010). It examined many various sources of funds ranging from offset levies to direct budget contributions based on assessed contributions.

An important issue not in the list is the use of Special Drawing Rights (SDRs) for purposes of supporting developing countries for sustainable development activities. The G77 and China proposed that there be periodic issuance of SDRs, during the preparation for the UN Financial Crisis conference of 2009. This should be considered further, especially in a period when government budgets in developed countries are coming under stress, affecting the ability or will to increase budgetary support to developing countries.

¹⁰³ For details of these cost estimates for climate mitigation and adaptation , see Khor (2010a).

Developing countries in various fora, have insisted on the principle of “adequate, new and additional” international financial resources for environment activities, especially those with global benefits, or those activities that have to be undertaken although the environmental problem is mainly caused by factors external to the country, like adaptation to climate change. It is important that estimation be continuously be made and updated on the scale of funding that is required by developing countries for sustainable development activities, and that a proper system be established for the reporting of developed countries' implementation of committing “new and additional financial resources”. The funds should not be from existing resources earmarked for other activities, such as health-care or education, for this would deprive other worthy sectors of their funds. This is because development should not have to make way for the environment. The criteria for “new and additional” should be clarified and a system be set up for monitoring the flow of resources, to be measured against what is required and what has been pledged. The decision in the UN Framework Convention on Climate Change (UNFCCC) for the transfer of finance and technology to be subject to being “measurable, reportable and verifiable” should be followed up by establishing such a system of continuous monitoring, measurement, reporting and verification. This should be done in other areas of the environment, as well as development.

Developing countries also stress the importance of the predictability of funding, whose flows and volumes should not have to be dependent on variable or volatile factors. The funds should not be attached to unrelated and unnecessary conditionalities, nor tied to cumbersome and expensive bureaucracy which delays the disbursement, or go through agencies which adds to the costs and bureaucracy detracts from the amounts received from recipient countries. In the financial flows, and especially if there are new multilateral funds, the governance should be democratic, with developing countries having an equitable share in the decision-making bodies. There should be adequate safeguards and technical capacity to ensure the accountability and proper use of funds.

Developing countries generally also prefer funds sourced through the public sector, in a predictable manner, and that is non-debt creating. This is to avoid new indebtedness arising from environment or social sector activities, as it is difficult for such activities to earn net revenues that enable sustainable debt servicing. For example, in discussions on climate change, it is widely recognised that adaptation activities in general should be funded by grant-type payments rather than loans, as there is little or no commercial gain possible from most adaptation activities. There are concerns that if these non-commercial activities are financed through loans, they may add on to the countries debt burden and contribute to loan-related difficulties. Regarding financing through the carbon markets, several developing countries and many civil society groups have several concerns, including that this facilitates offsets that enable developed countries to pay for pollution rights and escape from having to reduce their own emissions; that the system is open to fraudulent activities; the creation of financial markets for carbon leads to new opportunities and manifestations of financial speculation in which the carbon price reflects the state of speculation and in which there is unpredictability and volatility not

only in the price but the activities being funded; and concerns about the unethical and social implications of the “commoditization of nature.”

The developing countries have often proposed in fora that discuss or negotiate on environmental and social issues that funding should mostly be from public sources, and in non-loan form, in which budgetary allocations could be supplemented by innovative taxes such as a financial transactions tax and a levy on airline tickets. If the financing is for activities that are commercial in nature, the non-loan component may be mixed with loans on a concessional basis, which could possibly leverage market loans.

The issue of financing sustainable development and the transition to a green economy is not restricted to ODA or the transfer of funds through various Conventions. It is also linked to other issues in the global economy which greatly influence the amount and volatility of the flow of financial resources to developing countries. These issues include external debt, the terms of trade, trade policies and performance, commodity prices, volatility in the international flows of funds, and reform of the international monetary and financial system. Many of these issues were dealt with in the 1992 Rio process, and are included in Agenda 21, because of the understanding that they are an integral part of the sustainable development framework. These issues also form Goal 8, a global partnership for development, of the Millennium Development Goals. Thus, issues in the global economic, trade and finance systems are an important and integral part of the sustainable development framework, and should similarly be an essential part of discussions on the green economy. In particular, greater financial resources can be made available to developing countries through better terms of trade, development-oriented trade policies, corrections to the imbalances in the multilateral trading system, debt relief to developing countries facing debt-related difficulties, a more development-oriented intellectual property system, and appropriate reforms to the international financial and monetary system.

CONCLUSIONS

There are many challenges and obstacles facing developing countries in moving their economies to more environmentally friendly paths. On one hand this should not prevent the attempt to urgently incorporate environmental elements into economic development. On the other hand, the various obstacles should be identified and recognised and international cooperation measures should be taken to enable and support the sustainable development efforts. The conditions must be established that make it possible for countries, especially developing countries, to move towards a “green economy.” The main conditions and dimensions have been recognised in the negotiations that led to Rio 1992, and are well established in the Rio Principles and in Agenda 21. The treatment of the “green economy” in Rio Plus 20 should be consistent with the sustainable development concept, principles and framework, and care should be taken that it does not detract or distract from “sustainable development”. Thus the “value added” to the Green Economy as contrasted to sustainable development should be identified. Care has to be taken to ensure that the “green economy” term and concept is also understood to include the social, equity and development dimensions, including the need for international

provision of finance and technology and accompanying global economic reforms and that the risks of the misuse of the term are adequately addressed.

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