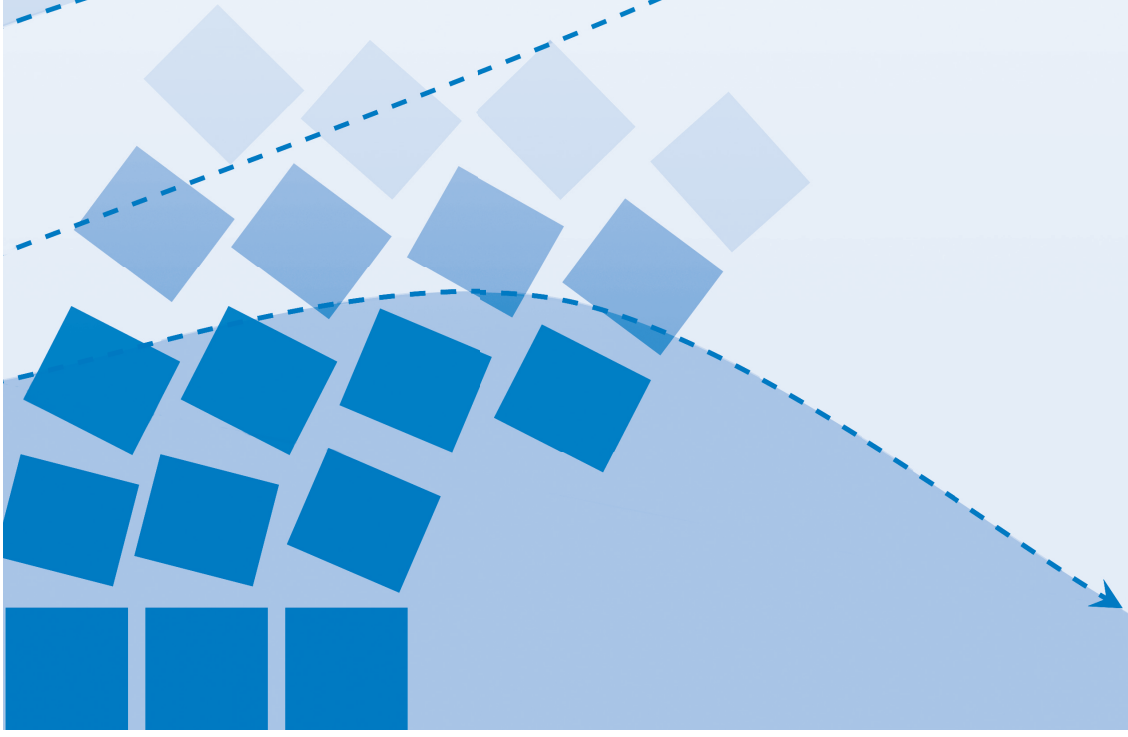
CHAPTER 3

A STRATEGIC FRAMEWORK FOR SUSTAINABLE STRUCTURAL TRANSFORMATION



It is a major challenge for Africa to achieve a development path that can reduce poverty and improve the living standards of its population while ensuring environmental sustainability. The basic argument of this *Report* is that there is a need for a strategy of sustainable structural transformation (SST). This involves the adoption of deliberate, concerted and proactive policies to promote structural transformation and the relative decoupling of natural resource use and environmental impacts from the economic growth process. However, putting this into practice is not easy. The specification of the policy framework and required instruments for decoupling are still at early stages both in international policy debates (see United Nations Environment Programme (UNEP, 2011a) and in Africa (see box 3).

In this context, this chapter puts forward a strategic framework for thinking about SST as a central thrust for African development strategies. The chapter is organized into four sections. Section A discusses why African countries should adopt a sustainable structural transformation strategy, rather than a "grow now, clean up later" approach. Section B discusses strategic priorities for increasing resource efficiency and mitigating environmental impacts and strategic issues related to investment and technological development as the key drivers of decoupling. Section C focuses on the role of the State, while section D identifies key areas in which the international community could support African policy makers to promote SST. The next chapter completes the analysis by discussing specific policies to promote SST, focusing on national policies that will develop productive capacities and relative decoupling in the key sectors of energy, industry and agriculture.

A. WHY SHOULD AFRICA PROMOTE SUSTAINABLE STRUCTURAL TRANSFORMATION?

1. The imperative of decoupling

While there are now many studies that make projections of climate change associated with CO_2 emissions and other sources of global warming, assessments of global levels of resource use and material throughput and their implications are only now being made (UNEP, 2011a; Dittrich *et al*., 2012). The work of the Working Group of the International Resource Panel is particularly useful from a policy standpoint, as it sets out scenarios of future material resource use based on different assumptions and considers their implications. Its three scenarios are as follows:

(a) *Scenario 1:* Freeze (industrial countries) and catching up (rest of the world). In this scenario, per capita levels of material resource use in industrial countries remain stable at year 2000 levels, while developing countries gradually build up the same per capita level by 2050;

(b) *Scenario 2:* Reduction by a factor of 2 (industrial countries) and catching up (rest of the world). In this scenario, industrial countries commit to an absolute reduction of per capita levels of resource use by a factor of 2, while developing countries catch up to these reduced levels of material resource use by 2050;

(c) *Scenario 3:* Freeze global consumption at 2000 level and converge (industrial countries and developing countries). In this scenario, there is no increase in total global material resource use, and there is also convergence in per capita levels of resource use between industrial countries and developing countries. This would be achieved by the reduction of per capita levels of resource use in industrialized countries by a factor of 3 to 5, and developing countries catching up to these levels by 2050, which would imply an even slower rate of increase of material resource use in developing countries and even a 10–20 per cent absolute reduction in resource use in some developing countries (UNEP, 2011a).

The important point about the first scenario, in which developed countries make no effort to reduce their level of resource use in absolute terms and developing countries catch up to that level, is that if this were to occur, there would be a more than tripling of annual global resource extraction and the globalization of developed countries' levels of material resource use per capita. According to the UNEP report, *Decoupling Natural Resource Use and Environmental Impacts from Economic Growth* (UNEP, 2011a), this "represents an unsustainable future in terms of both resource use and emissions, probably exceeding all possible measures of available resources and assessment of limits to the capacity to absorb impacts" (p. 29). By 2050, there would be a doubling of biomass use, a quadrupling of fossil fuel use and a tripling annual use of metals (ores) and construction materials. Essentially "this scenario would place an equivalent burden on the planet as if the human population tripled by the year 2050 to 18 billion people, while maintaining the resource consumption patterns of the year 2000" (pp. 30–31).

It is against this background that the UNEP Report identifies decoupling natural resource use and environmental impacts from economic growth as a global

Box 3. Some African initiatives relating to decoupling

In Africa, there are a number of initiatives relevant to the promotion of decoupling with structural transformation. An important one is the African 10-year Framework of Programmes on Sustainable Consumption and Production (UNEP, 2005). This framework is part of the Marrakech Process, a global effort to support the development of a 10-year framework of programmes on sustainable consumption and production, as called for by the Johannesburg World Summit on Sustainable Development Plan of Implementation. The Sixth African Roundtable on Sustainable Consumption and Production (ARSCP) was held in 2010 in Cairo, and its main objective was to promote structural transformation and green development in Africa through the integrated implementation of cleaner and more efficient industrial practices, as well as through the promotion of sustainable lifestyles (ARSCP, 2010). Their members have agreed to implement several sustainable consumption and production initiatives that can promote resource and impact decoupling.

As part of the Marrakech Process, and with the support of the United Nations Industrial Development Organization (UNIDO) and UNEP, national cleaner production centres have been established in Egypt, Ethiopia, Kenya, Morocco, Mozambique, Rwanda (under establishment), South Africa, the United Republic of Tanzania, Tunisia, Uganda and Zimbabwe.[a] Among their objectives, these centres help developing countries in the region to increase their efficient use of water, energy and raw materials, improving the competitiveness of African industries and opening new access routes to the global market. Additionally, they stimulate the creation of public and private partnerships and promote the development and transfer of novel technologies. They can provide an important impetus to decoupling efforts.

Another key activity recognized by the African 10-year Framework of Programmes on Sustainable Consumption and Production is the creation of regional ecolabelling mechanisms to enhance the marketability of African products and ensure a lower environmental impact throughout their production process. As a market instrument, the main aim of an ecolabel is to increase consumer awareness and ensure that the design and production of products meets appropriate environmental standards. In this sense, these instruments encourage producers to adopt more resource-efficient and sustainability-friendly production processes, which can lead to some degree of decoupling. Currently, there are a number of existing ecolabelling initiatives in the region, and most of them apply to specific sectors, such as organic agriculture, fisheries, forestry and energy. In addition, the majority are international schemes. The East African organic products standard and the West African organic cotton ecolabels, however, are examples of initiatives operating on a regional scale.

Despite some progress, efforts to promote sustainable production and consumption are limited in most countries. The United Nations Economic Commission for Africa (ECA, 2009a) states that “sustainable production in Africa may be described as a ‘work in progress’ that has a long way to go before becoming widely adopted and fully integrated as an everyday practice” and “the regional capacity for promoting sustainable consumption is far less developed than for sustainable production” (p.13).

Box 3 (contd.)

Many African governments have prepared and implemented national strategies for sustainable development as a follow-up to the United Nations Conference on Environment and Development in 1992. Recently, ECA appraised the progress made during the last two decades in the African continent (ECA, 2011a). The review indicates that most ECA member States have developed and are implementing their national strategies for sustainable development. These national strategies differ according to the countries' specific understanding of the concept of sustainable development and their developmental stage. Some of them place a special emphasis on the economic dimension, while others focus more on environmental or poverty-reduction-related issues. However, in many cases, the strategies just include general directives and do not clearly consider decoupling measures focused on the efficient use of land and natural resources, the utilization of alternative sources of energy, pollution mitigation and waste/pollution management. The concept of decoupling has been recognized and proposed explicitly as a policy objective in only a few. Notably, South Africa's National Framework for Sustainable Development calls for resource and impact decoupling.

a For a list of national cleaner production centres in Africa, see http://esa.un.org/marrakechprocess/ncpcs.shtml.

imperative. Scenarios 2 and 3 suggest the parameters of different ways to do this. Scenario 2 ("moderate contraction and convergence") is a global strategy in which absolute decoupling takes place in industrialized countries, while developing countries pursue relative decoupling together with catch-up growth. This would require "substantial economic structural change and massive investments in innovations and resource decoupling" (p.31). Scenario 3 ("tough contraction and convergence") is a global strategy that would require even more investment and innovation, and absolute decoupling in some developing countries as well as in industrialized countries. The technological, social and political requirements for effective collective action to agree and implement this global strategy are hardest for this scenario. However, Scenario 3 is the scenario that "would be most compatible with the existing (if unknown) limits to the Earth's resource base" and also "more or less consistent with the assessments of the Intergovernmental Panel on Climate Change of what would be required to prevent global warming beyond 2 degrees" (p. 32).

2. Africa in the global context

Where should Africa fit into this global context? How should African policymakers position themselves in relation to negotiation of such a global consensus on material

resource use? What national policies should they adopt in relation to the decoupling of natural resource use and environmental impacts from economic growth?

From the outset, it must be stressed that given the current living standards of the majority of the population in Africa and also the urgency of creating jobs for its growing young labour force, it is critical that African countries seek to achieve accelerated economic growth and a type of economic growth that maximizes broad-based improvements in human well-being. Notions of no growth or degrowth, which are sometimes put forward in sustainability debates, are simply not relevant in Africa.

Given this development imperative, one option for African countries would be to prioritize economic growth, catching up and structural transformation, ignoring environmental constraints, a strategy some describe as "grow now, clean up later". Not only are the living standards of the majority of the population in Africa extremely low but, as shown in Chapter 2, levels of material consumption are too. It could be argued therefore that there is scope for Africa to go for economic growth without the continent impinging unfairly on global ecological sustainability. The evidence in this *Report* shows that DMC per capita has been falling in Africa and its share of global material consumption, around 7 per cent of globally consumed resources in 2008, is well below its share of the global population (around 15 per cent). Thus, Africa could aim for growth without impinging unfairly on the global ecological footprint.

Further, taking account of the environment now may be costly and thus could slow down economic growth and poverty reduction. This would occur, for example, if the adoption of decoupling policies forces producers to use more expensive or less productive technologies. It is difficult to make estimates of the additional costs associated with structural transformation with decoupling policies, compared with structural transformation with no decoupling. However, such costs are recognized as significant in the economic debate on climate change mitigation, which is conceptualized in terms of the additional short-term investment costs required to offset the long-term costs of different degrees of climate change. The United Nations Department of Economic and Social Affairs (DESA, 2009), for example, estimates that the additional upfront investment costs of promoting a low-carbon-energy transition in order to mitigate climate change are at least twice the current levels of investment.

African policymakers will have to consider the alternatives carefully. However, there are a number of valid reasons as to why they should promote SST now rather than follow a policy of "grow now, clean up later".

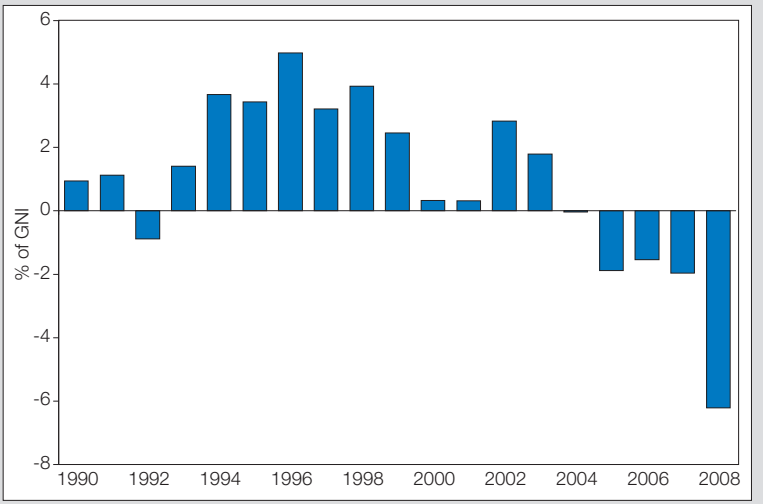
Firstly, it is clear that despite low levels of DMC per capita, there are already strong environmental pressures emerging in Africa. As discussed in the previous chapter, this is particularly evident in relation to land degradation, and there is also an ongoing shift in which the share of non-renewable resources in total resource use is increasing. However, the adverse economic effects of environmental degradation are also apparent in estimates of adjusted net savings (ANS). This indicator shows the rate of savings in an economy after adding to the gross national savings the expenditures on education (human capital) and subtracting the costs of resource depletion and the damage caused by pollution. As shown in figure 13, ANS rates in sub-Saharan Africa have been negative since 2004, and in 2008, they represented a negative percentage rate of 6.2 per cent of the region's gross national income.

This current pattern of economic growth is unsustainable over the medium and longer term. It is a cause for concern, particularly because, as Dasgupta (2008) has put it: "Ecosystems are capital assets. Like reproducible capital assets (roads, buildings, machinery), ecosystems depreciate if they are misused or overused. However, they differ from reproducible capital assets in three ways: (a) depreciation of natural capital is frequently irreversible (or at best the systems take a long time to recover); (b) except in a very limited sense, it isn't possible to replace a depleted or degraded ecosystem by a new one; and (c) ecosystems can collapse abruptly, without prior warning".

Secondly, this growth pattern is path dependent. Once established, these trends are likely to accelerate in the future with increasing population, rising living standards and structural transformation. If African economies are able to grow at least by 7 per cent per annum, which is the minimum required to generate sufficient employment opportunities to reduce poverty, their GDP would expand 2.1 times in 2020. If this performance is maintained, their GDP in 2050 would be 15 times greater than in 2010. Without any decoupling, material and energy use would increase concomitantly, exerting an impossible stress on resource stocks and environmental quality. In absolute terms, DMC would increase from 4.8 billion tons in 2010 to 10 billion tons in 2020 and 72 billion tons in 2050. If a "grow now, clean up later" approach is adopted, the increased consumption, greater exploitation of natural resources and energy use, as well as more pollution, atmospheric emissions and waste production, associated with the growth process, are likely in the long run to jeopardize the sustainability of the growth process itself.

Thirdly, delaying the implementation of a SST may become extremely costly in the future, if worsening environmental conditions force the early replacement

Figure 13. Adjusted net savings, including particulate emission damage in sub-Saharan Africa (% of gross national income)



Source: World Bank, *World Development Indicators* (2011).

of past investments (Liebowitz and Margolis, 1995; Hallegatte et al., 2011). This is because infrastructure and technology choices have a "lock-in" effect, in which countries get stuck on a particular development path, owing to the long life of physical capital investments. African structural transformation must necessarily involve massive new capital investments in infrastructure and this should be done in a way that promotes sustainability. If Africa becomes locked in due to traditional infrastructures, the future costs of dematerialization and waste/pollution abatement will become higher. Since most of Africa's infrastructure will be built in the next decades, the continent faces today the chance of developing in a clean and efficient manner.

Finally, decoupling can contribute to the creation of a virtuous development circle. The concept of decoupling actually means producing more with fewer resources and less pollution. In this sense, productivity gains can lead to larger amounts of value added in the economic system. This, along with the implementation of better technologies, helps expand the production possibilities of the economy and results in an efficient rearrangement of the factors of production. At the

firm level, improved resource efficiency should enhance profitability, while some researchers suggest that increased material productivity is also associated with improved competitiveness (Bleischwitz and Bringezu, 2011). On a global scale, the movement towards environmental sustainability is also likely to create new markets for sustainability technologies (Walz, 2011). For some African countries, there may also be first-mover advantages.

In short, by intervening early in the way in which resources are used in the context of SST, it is possible to alter the growth prospects of African countries, connect up with sustainability transitions occurring in other parts of the world and avoid locking Africa into development paths that will become unsustainable in the future. Within this perspective, resource and impact decoupling are not seen as ends in themselves, but rather as means by which the necessary process of structural transformation is made sustainable.

The pertinent question then is not whether — but how — Africa can implement a strategy of SST. The next section discusses questions related to the degree of decoupling, how priorities can be identified and some strategic issues related to the two key drivers of SST – investment and technology.

B. STRATEGIC PRIORITIES AND DRIVERS

1. The degree of decoupling

A first strategic issue is the degree of decoupling that African governments should aim for. This *Report* argues that African countries should aim for relative decoupling, rather than absolute decoupling. This means they still need to keep consuming more resources and energy to improve their levels of prosperity and quality of life. However, it also means that they should focus on improving resource productivity and seek to mitigate the environmental impacts of resource use.

The scale of the challenge can be roughly estimated using the simple IPAT equation (see chapter 1). Table 11 shows population projections for 2020 and 2050, as well as projections of GDP, assuming that African economies grow at least by 7 per cent per annum, which is the minimum required to generate sufficient employment opportunities to reduce poverty. If this were to occur, African GDP per capita in 2020 would be double that of 2010, and it would be seven times

higher in 2050 than in 2010 (see table 11). As discussed earlier, however, this would imply a massive increase in resource use and environmental impacts. In order to maintain the same level of material throughput with these higher incomes, resource productivity would have to double by 2020 and to improve more than 10 times compared with the one that existed in 2010 (figure 14).

Against this background, relative decoupling is a much more realistic option for Africa than absolute decoupling, as well as being fairer, given the continent's relatively small contribution to global material flows. The figures also indicate that population growth is an important variable that affects the scale of the challenge of SST. It is likely that rising prosperity and structural transformation will bring down population growth rates. It is worth noting, however, that the promotion of an early demographic transition by a faster decline in fertility rates has been a characteristic of successful cases of structural transformation in Asia, reducing the scale of the job creation challenge in the growth process.

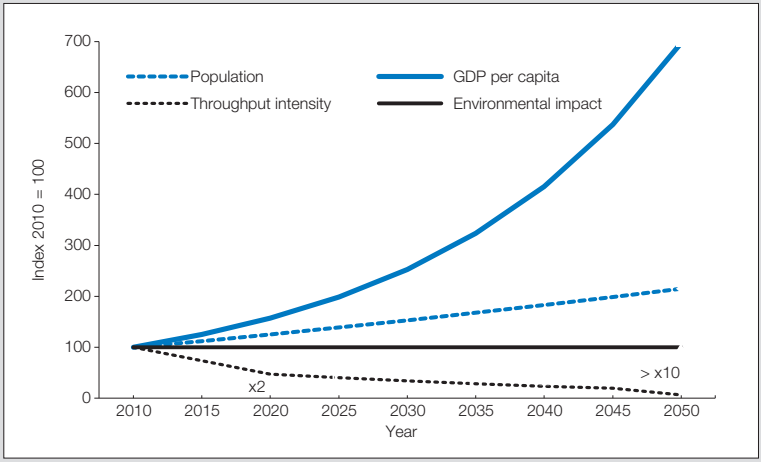
Table 11. Projected growth for population, GDP, GDP per capita and material, energy and carbon intensities by 2020 and 2050

Indicator	2010	2020	2050
Population	1.0 billion people	1.3 billion people (1.2 times that of 2010)	2.2 billion people (2.1 times that of 2010)
GDP	1.2 trillion[a]	2.6 trillion (2.1 times that of 2010)[a]	18.6 trillion (15 times that of 2010)[a]
GDP per capita	1,219[a]	$2,049 (1.7 times that of 2010)[a]	$8,500 (7 times that of 2010)[a]
Material intensity	4.1 (2008)[b]	Combined reductions of 2 times that of 2008	Combined reductions of more than 10 times that of 2008
Energy intensity	13,715 (2008)[c]		
Carbon intensity	0.9 (2009)[d]		

Source: Dittrich *et al.* (2011), United States Energy Information Administration and United Nations Statistics Division.

Notes: *a* Constant 2005 dollars;
b Domestic material consumption (tons)/GDP (thousands of 2005 dollars);
c Btu (British thermal unit) per 2005 dollars;
d Metric tons of carbon dioxide per thousands of 2005 dollars.

Figure 14. Projected population, GDP per capita and the required throughput intensity* to maintain 2010 levels of environmental impact



Source: Dittrich, *et al.* (2011). United States Energy Information Administration and United Nations Statistics Division.

* Throughput intensity was calculated as an average of material, energy and carbon intensities.

2. Sectoral and resource priorities

A critical strategic issue that governments face in the design of strategies of SST is the question of priorities. In any economy, particular sectors are more or less important in terms of resource use, and specific resources are associated with higher or lower levels of environmental impact. Effective relative decoupling policies would seek to identify the sectors and resources that offer the greatest opportunities for resource productivity and the mitigation of environmental pressures. However, a strategy of SST should seek to do this in such a way that economic growth rates are least constrained, and human well-being gains from economic growth, most enhanced.

This is a difficult task. However, strategic choices may be identified by assessing the relative merits of relative decoupling measures at a sectoral level, targeting economic sectors where resource use has been found to be more intensive, such as agriculture, industry, energy and construction. Concurrently, governments can

assess the relative merits of relative decoupling measures to enhance a sustainable use of specific renewable and non-renewable resources, such as water, land and soils, fossil fuels, materials, and metal and mineral ores. Figure 15 summarizes such an integrated approach. In addition, it is important for policymakers to bear in mind the life-cycle phases attached to economic resources and activities. Such a life cycle begins with the resource getting extracted, its transportation to the factory or manufacturing centre, followed by its conversion into commodities, the consumption of such commodities and finally the disposal of these commodities after use. Relative decoupling measures must thus aim to improve resource productivity and mitigate negative environmental impacts during each of these life-cycle phases, targeted at the end user, whether in the corporate or household sector.

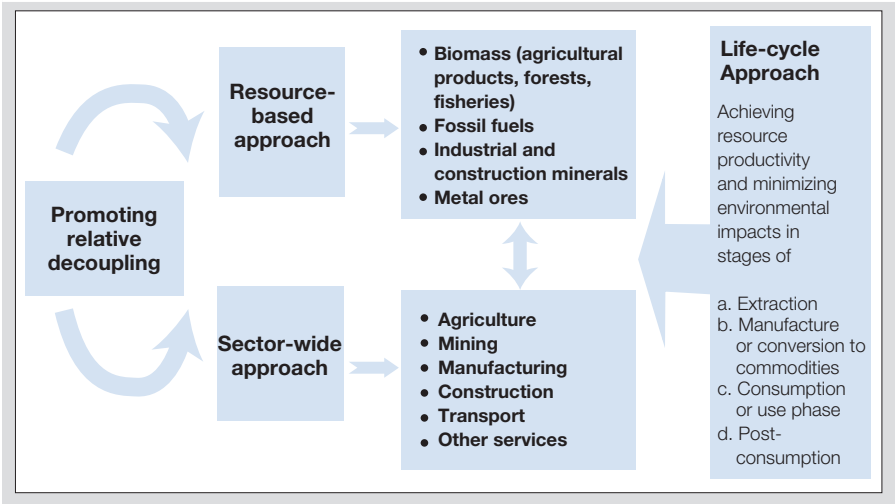
Sectoral and resource priorities are necessarily country specific. In general, it is likely that there will be major opportunities in many African countries to increase resource productivity and mitigate environmental impacts in energy, industry and agriculture.

The development of manufacturing activities, on both national and regional scales, will be critical for structural transformation processes in Africa. However, industrialization is likely to exacerbate environmental pressures by more intensive use of materials, water and energy, increased air emissions and pollution, greater discharge of effluents and more waste production. African countries must therefore aim not simply to achieve industrial development, but also to improve efficiency of resource use and mitigate pollution and waste.

A focus on agriculture is equally necessary, because it is clear that successful structural transformation usually begins with agricultural productivity improvements and an increase in reliable food supplies. This is particularly important in Africa, as the majority of the population still earns its livelihood from agriculture. However, a major finding of chapter 2 was the inefficiency of prevailing land use practices in terms of biological productivity. Thus, a major focus of policy must be the intensification of sustainable agriculture, which involves producing more output from the same area of land, while mitigating the negative environmental impacts and sustaining natural capital.

Finally, energy will be critical to SST. In this regard, the findings of chapter 2 imply that there is a need not simply for higher energy efficiency and a shift towards renewable energy sources, but also a substantial increase in energy supply. Greater

Figure 15. An integrated framework for relative decoupling in Africa



Source: UNCTAD (2012).

access to energy, and in particular electricity, is a key enabler of increased resource efficiency. It is essential to enable productive activities to take place by means of small and microenterprises, for instance, relying on the use of machinery and electrical equipment, and to ensure productivity gains by allowing these enterprises to operate beyond daylight hours.

Specific sectoral policies in each of these three sectors will be discussed in the next chapter.

3. Drivers of sustainable structural transformation: Investment

The two key drivers of structural transformation are investment and technology. SST is driven by exactly the same processes. Investment is the vehicle by which new productive capacities are created. Technology, understood in the broadest sense to mean new products, production processes and ways of organizing production, is the vehicle through which the development of productive capacities becomes greener. SST in Africa will be driven by massive capital investments and also the acquisition, adaptation and deployment of technologies that facilitate greater resource efficiency and mitigate the environmental impacts of resource use.

With regard to capital investment, the experience of successful developing countries indicates that structural transformation generally requires investment rates as a share of GDP to rise to at least 25–30 per cent, and public investment to reach at least 7 per cent of GDP (Commission on Growth and Development, 2008). Successful cases also increasingly rely on domestic savings to finance investment growth. The very process of structural transformation thus requires that current generations make sacrifices to improve the lives of future generations. SST would simply extend this principle by taking account of the environmental bads undermining environmental sustainability that are associated with the growth process.

Within structural transformation per se, the focus of the investment process has been on the productivity-enhancing effects of man-made (physical) capital, in particular machinery, equipment and structures. Public investment in infrastructure has been vital, acting both in terms of delivering required services and in crowding in private investment in underdeveloped economies. This must remain central to SST. Box 4 provides some estimates of the costs involved in building the energy infrastructure, which will be at the heart of SST. However, greater attention must also be paid to investing in natural capital. Natural capital can be preserved by re-using certain resources, recycling by-products and finding renewable substitutes for non-renewable resources.

Resource rent can play a significant role in financing SST in Africa. Many African countries are endowed with significant amounts of natural resources. This rich resource base has been a major driver and engine of economic growth in the region. Foreign exchange from resource exports has made it possible for African countries to import important intermediate inputs and also finance national development programmes. While African countries have benefited from their resource endowments, some of these resources are non-renewable, meaning that their rapid depletion by the current generation will limit the capacity of future generations to meet their consumption needs, particularly if the rent from these resources is not invested in assets that support future growth.

In the past, most governments in the region used resource rent to increase domestic consumption, with very little going into productive investments needed for long-term growth. Further, poor management of resource rent has often exacerbated economic instability, social conflicts and environmental problems in the region. Against this backdrop, one of the challenges facing African governments

Box 4. The investment costs of African energy infrastructure

Investment in energy infrastructure should be a critical element of sustainable structural transformation in Africa. The African Development Bank (2010) has estimated that 7,000 megawatts of new generation capacity must be installed annually so as to extend access and keep up with projected economic growth. There are various estimates of the costs of achieving this. According to the African Development Bank, the total capital investment requirements to provide universal access to reliable and increasingly cleaner electric power in all the countries in Africa by 2030 are close to $547 billion (see box table 2). This averages out to $23.8 billion per year starting from 2008. For sub-Saharan African countries and island States, the total capital requirements are estimated at $282 billion or, on average, $12.3 billion per year (for more information, see African Development Bank, 2008).

Box table 2. Indicative capital investment requirements of the African Development Bank to attain universal access to reliable electric power by 2030

	Total capital investment (billions of 2005 dollars)				Indicative average investment (billions of dollars per year)
	Generation	Transmission	Distribution	Total	
Northern Africa	82	29	62	173	7.5
South Africa	77	5	10	92	4.0
Sub-Saharan Africa: 41 countries	102	54	119	275	12.0
Island States: 6 countries	4	1	2	7	0.3
Africa	265	89	194	547	23.8

Source: African Development Bank (2008).

World Bank estimates of the costs of meeting sub-Saharan Africa's energy needs are somewhat higher. Foster and Briceno-Garmendia (2010) indicate that the overall costs for the power sector in sub-Saharan Africa are nearly $41 billion a year. Roughly 65 per cent are required as capital investment and the rest for operations and maintenance. These authors estimate that 44 per cent of sub-Saharan Africa overall infrastructure investment needs, including operations and maintenance, are in the power sector.

is how to put resource rent to productive use and to manage them in a manner that improves living standards for both current and future generations.

Following the Hartwick rule, it has been suggested that one way in which resource-rich countries could use their resources in support of development and

achieve intergenerational equity is to invest resource rent in reproducible (physical, human or financial) capital (Hartwick, 1977). However, in African countries with very high poverty levels, a strict application of the Hartwick rule, which involves investing all resource rent in reproducible capital, does not seem appropriate. What makes sense from the African perspective is for a certain percentage of the resource rent to be invested in reproducible capital, while the rest is used to finance current consumption and other poverty-reduction programs.

This *Report* recommends that African governments earmark a certain percentage of their annual resource rent for promoting SST. The exact percentage of resource rent to be used for this purpose will vary across countries, but should be arrived at through consultations with parliament and other local stakeholders. The allocated amount should be kept in a special fund and used to promote domestic investment in the priority areas deemed crucial for SST in Africa, namely, energy, industry and agriculture. African countries can also impose environmental taxes on their primary commodity sectors in order to internalize the costs of environmental harm in the production costs of firms in those sectors. Such taxes can also raise revenues that can feed into the special fund. The fund proposed here differs in at least two ways from the sovereign wealth funds that have been created by several resource-rich developing countries. First, it is not meant primarily to be a stabilization fund. Second, unlike existing sovereign wealth funds that are predominantly invested in foreign assets, the focus of the special fund will be on domestic investment.

A relevant issue in managing the special fund is how to ensure that African governments will indeed use the allocated amount for the purpose for which it was intended. Transparency and accountability are critical for addressing this challenge effectively. One mechanism for ensuring that there is domestic accountability is for the executive branch of government to sign an agreement with parliament and other local stakeholders indicating that each year it will publish in the national newspapers the amount allocated to the special fund, as well as how it is spent. An independent committee chosen by parliament and other local stakeholders should also be set up to monitor and verify information provided by the executive branch. The Extractive Industries Transparency Initiative (EITI) can also play a role in enhancing domestic accountability by monitoring whether African governments observe and implement its rules. So far, 20 countries in the region have joined the Initiative: the Central African Republic, Ghana, Liberia, Mali, Mauritania, Niger, Nigeria, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, the Democratic Republic of the Congo, Gabon, Guinea, Mozambique, the Republic of the Congo, Sierra Leone, the United Republic of Tanzania, Togo and Zambia.

Africa's development partners should also contribute to domestic efforts to promote accountability by joining the EITI and ensuring that firms registered in their countries and doing business in Africa publish the amount of money they pay to African governments for resource extraction. This will make more information available to the African public and compel them to hold their leaders accountable for misappropriation or inefficient spending of resource rent.

4. Drivers of sustainable structural transformation: Technology

Technological change and innovation are the second key driver of SST. Innovation is broadly understood here to mean the introduction of products, processes and organizational systems that are new to a country or firm, rather than new to the world. In this domain, the experience of successful developing countries shows that importing foreign technologies is critical in the early stages of the development process. However, this is best achieved when there are existing absorptive capabilities in a country, in the sense of the ability to acquire, use and adapt foreign technologies. This depends on the presence of general and specific human capital skills, such as engineers, as well as the technological capabilities of domestic firms. In successful cases of structural transformation, there is a progressive build-up of technological capabilities in specific sectors. Eventually, capabilities are formed to develop and commercially introduce products and processes that are new to the world.

Technological change is central to the process of structural transformation because it is through innovation in the broad sense that new sectors emerge and upgrading within sectors takes place. This applies to SST as much as to structural transformation in general. However innovation in the case of SST would be more oriented to improving resource productivity, mitigating environmental impacts and promoting a more sustainable development pathway (see Berkhout, Angel and Wieczorek, 2009).

An important issue is whether African countries can engage in "technological leapfrogging", in which they adopt clean and resource-efficient technologies right from the start as they embark on structural transformation and thereby skip the dirty stages of development experienced by now-rich countries. This is certainly an opportunity for some countries. South Africa, for example, already has some medium-level technological competences in sustainability technologies and material efficiency (Walz, 2011). However, the possibilities for technological leapfrogging will be limited in many African countries because the level of technological capabilities

of their domestic firms and farms are weak (see Lall and Petrobelli, 2003; Oyelaran-Oyeyinka, 2006).

It is clear, therefore, that African governments must pay particular attention to improving capabilities relating to science, technology and innovation as a central part of their policies to promote SST. In this regard, it is encouraging that there is much interest in policies relating to science, technology and innovation in many African governments, a trend that has been encouraged by the New Partnership for Africa's Development (NEPAD). However, it is important that these new technology policies do not simply adopt a science-push approach to innovation, but rather focus on building the technological learning capabilities of firms and farms. It is also good practice to adopt a systemic approach that supports the development of the local and national innovation systems within which they are embedded. This implies fostering greater linkages between enterprises and research institutes, as well as linkages among firms, for example by encouraging the formation of technological clusters (Oyelaran-Oyeyinka and McCormick, 2007) The requirements for the emergence of "sustainability-oriented innovation systems", to use the concept of Stamm et al. (2009), should be further explored in the African context.

C. THE ROLE OF THE STATE

In successful developing countries, structural transformation is carried out by an effective developmental State. Such a State is one which adopts long-term growth and structural transformation as its basic objective and seeks to devise policies and institutions that facilitate the evolution of the economic system so that the goals of economic development are achieved. For SST, the State will have to take on not only a development role but a broader sustainable development role.

Promoting economic development is not a simple task and not all developmental States have successfully met that end. Successful developmental States have a common approach towards governance. Perhaps the most basic, and one which is often misunderstood, is that they have not sought to replace the private sector through State ownership or to directly control large parts of the economy. Rather they have sought to fulfil the vision through design policies and institutions that harness private ownership, the animal spirits of entrepreneurs and the drive for profits to achieve national economic development goals. Thus the creation of a dynamic and development-focused private sector should be at the heart of policies to promote SST by a developmental State. Key elements of the strategy are public

investment to crowd in private investment as well as production sector policies designed to generate a strong private-sector response geared towards increasing investment and technological change in the development directions the government is seeking to achieve (UNCTAD, 2009).

Successful developmental States have also had a number of other common features. Firstly, they have formulated a clear vision for the developmental future of the economy, which has provided a common-sense approach to coordinating the evolution of different parts of the economic system. Secondly, they have sometimes encouraged the emergence of political elites who are not committed first and foremost to the enhancement and perpetuation of their own privileges. Thirdly, they have built technically competent bureaucracies which have been relatively insulated from sectional interests and been able to act in the general interest. In addition, they have established institutions for dialogue, particularly for government-business relations, to support the formulation and implementation of policies that can support the general interest of business. They have also made sure that any incentives and resources provided to lead and guide the activities of the private sector are contingent on performance and are time bound. Further, they have undertaken policy experimentation, policy learning and institutional adaptation and innovation based on the constant monitoring of what works and what does not. Finally, successful developmental States have built their legitimacy on development results, ensuring that the benefits of development are widely shared and that the population is actively engaged in the common national project of development (UNCTAD, 2009).

All these characteristics of development governance are also relevant for promoting SST. However, the State should also view the environment as an intrinsic component of the development strategy. The State would thus play a leadership role in formulating a vision that sets clear and plausible goals to change the structure of the economy, engage in a relative decoupling of resource use and environmental impacts, and increase human well-being in the short-, medium- and long-term. It should also formulate a set of appropriate policies, regulations and incentives to ensure the successful fulfilment of SST objectives and take necessary measures, working with and through key stakeholders, and in particular the private sector, to ensure their effective implementation. Significantly, policy instruments and this vision should not be expressed in a special document that is separate from the main policy process. SST should be a key component of national development strategies.

An important feature of the types of policies successful developmental States have adopted is that they have not simply involved macroeconomic policy or a framework approach such as getting the overall investment climate right. Instead they have involved a combination of macroeconomic, mesoeconomic and microeconomic policies. Thus economic governance has invariably involved some kind of industrial policy or more broadly, some kind of production sector policy. As Ocampo (2011) points out, once the process of economic growth is seen as a process of structural change, such policies become a central element of national development strategies. Such policies should be at the heart of national strategies to promote SST.

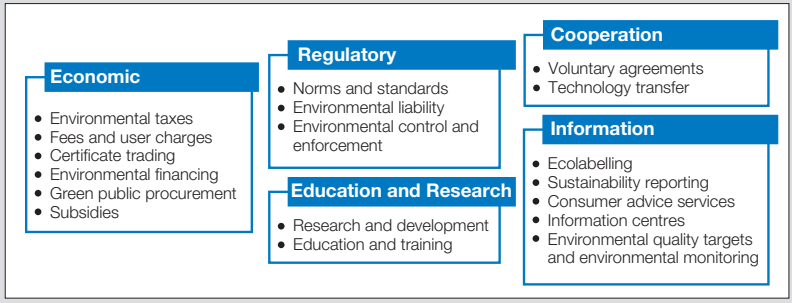
As indicated above, investment and technological change are key drivers of SST; therefore, policies and institutions should be designed to lead these drivers in the desired way. It is possible to do this with a range of policy instruments that include command-and-control approaches, market-based tools, information, cooperation, education and research (see box 5).

Selecting the optimal mix of policy instruments is crucial. The challenge is to design an appropriate and balanced combination that is sound enough to achieve the required objectives. Such a policy mix should provide both incentives and penalties. In addition, hard measures should be complemented with softer instruments, since implementing just one of these two types in isolation would be insufficient to deliver the expected results. For example, the objective of an environmental tax responds to the need of incentivizing changes in behavioural patterns among economic agents. Consequently, the latter require access to financial, technological and information resources in order to adequately modify their actions. In the absence of these complementary measures, the tax would just hinder their efficiency, and thus their ability to change. Finally, it is also important to consider the costs and benefits associated with the intended policies. It is up to each African country to conduct cost–benefit analyses to decide on the optimal mix of policy instruments to use by selecting instruments that prove to be the least-cost option available. The potential benefits to be gained from resource- and impact decoupling (lesser environmental costs, savings from resource use, for example) and in the form of revenues from fiscal instruments should be weighed against potential costs derived from administering the instrument, disincentive effects on labour and capital, switching costs induced by the instrument and losses in competitiveness. Moreover, factors that may influence the suitability of one instrument over the other for a given country include institutional and human capacities, social capital, economic structure and level of development governance.

Box 5. Policy instruments for promoting sustainable structural transformation

Box figure 1 summarizes the different types of policy instruments that can be used to promote resource and impact decoupling.

Box figure 1. Overview of policy instruments that promote resource and impact decoupling



Source: GTZ (2006).

- **Regulatory or command and control:** These are rules and targets that are set up by the State and are legally enforced. They can achieve numerous aims, such as increasing resource or energy efficiency; reducing emissions, waste and the use of toxic substances; and protecting ecosystems. They may also aim to incentivize the use of certain technologies, address the polluter-pay principle and monitor the compliance of existing regulations.
- **Market-based:** These instruments make use of market mechanisms to incentivize a positive behaviour among economic agents. These encompass a broad array of policy tools, ranging from environmental taxes and marketable certificates to subsidies. They might be applied across a similarly wide-ranging set of policy areas, such as land, water and air management. They allow economic agents a larger flexibility in deciding how and when to meet their targets, while encouraging the implementation of new and improved technologies. These instruments can also lower regulatory expenditures, as less monitoring and surveillance is often required. In addition, some of these instruments help raise public revenue (see UNEP, 2004).
- **Information:** These measures positively affect environmental quality by promoting changes in consumer and producer behaviour. They often do not involve direct governmental intervention and thus may not involve the use of public funds to put them into operation. Some of these measures allow stakeholders to make better-informed choices, such as in the case of ecolabels and consumer advice services. Other types encourage organizations to enhance their public reputation by disclosing or reporting information about their sustainability performance. Information centres,

Box 5 (contd.)

however, can provide information on resource efficiency and related topics to small and medium-sized enterprises, which do not usually have access to this kind of knowledge.

- **Cooperation:** These include measures implemented by governments to promote cooperation between the private sector and civil society, as well as with public and private foreign parties. They might be designed to facilitate technology transfer focused on resource efficiency, or to improve voluntarily the performance of public and non-State actors beyond existing environmental legislation.
- **Education and research:** These measures promote public education and training, as well as R&D focused on resource and environmental efficiency. These aspects are key activities in any country and are an essential part of economic and human development. African States should thus encourage an increase in applied and experimental research activities among governmental departments, universities, research institutes, private companies and non-governmental research bodies. Furthermore, they should carry out the continuous task of educating local populations about the benefits derived from environmental protection and resource efficiency measures.

Within the African context, a major negative side effect of the structural adjustment phase was the erosion of State capacities. Building up developmental States' capabilities to formulate and implement structural transformation policies will thus be an important challenge. In this regard, it is important to realize that when successful developing countries such as those in East Asia embarked on their development process, the technical capacities of their governments were not strong. These capacities were built up slowly through policies of meritocratic recruitment and policy learning. It is also clear that improving government effectiveness across the board, a very difficult task, is not a necessary condition for success; rather it is necessary to initiate positive change within a few strategically important agencies (see UNCTAD, 2009).

One important area where much more work is needed is for governments to establish a system for monitoring and evaluating progress towards relative decoupling. This will involve strengthening statistical capacities in designing sustainability indicators, in using a national system of accounts to keep track of the environmental state and to monitor resource productivity (green national accounts, MFA and so forth), strengthening institutional capacities to set and monitor sustainable development targets over a given period of time and acting on progress made towards these indicators to review policymaking. In addition, the current institutional setting for implementing, monitoring and evaluating environmental

measures should be reviewed in terms of assessing the needs for new institutions and revising legal, regulatory and supervisory frameworks. Moreover, it needs to be revised in relation to the need for building the capacities of existing institutions and agents, and delineating their respective roles and responsibilities for greater transparency and accountability.

A national development vision is particularly effective when it becomes a shared national project and there is societal mobilization behind the goals of the project. In this regard, some non-governmental organizations (NGOs) can be influential in promoting societal mobilization of environmental sustainability. The number of NGOs in Africa has risen sharply during the last two decades. Some of them advocate measures that can contribute to relative resource and impact decoupling by promoting the preservation and restoration of natural resources, such as forests or fisheries. For example, the Green Belt Movement in Kenya, founded by Nobel laureate Wangari Maathai, engages communities in setting up tree nurseries and planting seedlings on public lands, degraded forest areas and private farms. Other NGOs promote the use of sustainable energy sources, such as Africa's International Network for Sustainable Energy, whose more than 35 NGOs operating in 18 African countries strive to produce sustainable energy solutions to protect the environment and reduce poverty.

D. THE ROLE OF THE INTERNATIONAL COMMUNITY

While African governments must play the leadership role in formulating and implementing strategies of SST, it is essential that an appropriate enabling environment, including support measures, should be established at the international level. The international enabling environment should seek to apply the principle of common and differentiated responsibilities which was articulated at the 1992 United Nations Conference on Environment and Development. This can be interpreted in various ways. However, in broad terms, it implies an approach whereby (a) African countries should not be hindered in their pursuit of accelerated economic growth and structural transformation and should seek to enhance environmental sustainability by means of relative, rather than absolute, decoupling, the latter being much more relevant for developed countries that have already achieved high living standards; and (b) developed countries provide financial support and facilitate technology transfer to support SST and design the international trade regime and intellectual property rights regime in a way that facilitates the sustainable development process.

The policy agenda is a broad one and the purpose of this section is to identify a few areas in which increased policy attention would be desirable. These relate to: (a) the financing of SST; (b) technology transfer and development; (c) the international trade regime; and (d) South–South Cooperation.

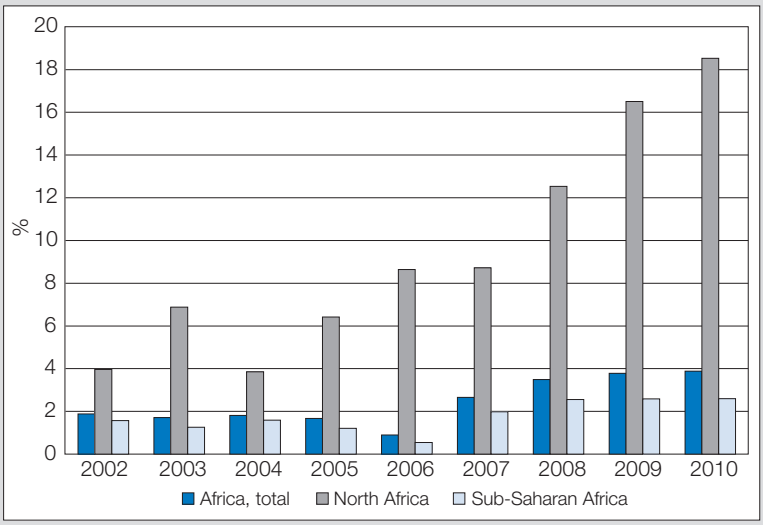
1. Finance

African countries need long-term development finance to support structural transformation. A critical issue in this regard is to shift the balance of development aid so that a higher proportion is devoted to building productive capacities. For example, Aid for Trade in Africa should be used to facilitate increased value-added from commodity exports and the diversification into new sectors. For SST, the energy sector is critical. As indicated previously, this is the major component of Africa's infrastructure financing needs; the investment costs to provide energy access for all and increase the share of renewables is substantial. These needs cannot be met through domestic sources, and past experience suggests that the private sector is unwilling to undertake the risks. Development aid can play an important role in enhancing public investment in energy. Although the share of the energy sector in total official development assistance (ODA) disbursements has been increasing in North Africa, only around 2 per cent of total ODA to sub-Saharan Africa went to the energy sector from 2005 to 2010 (see figure 16). In absolute terms, the amount of ODA disbursements to the energy sector in Africa actually doubled in real terms between 2007 and 2010. Yet in practice, ODA disbursements to the energy sector in 2010 were only $806 million, compared with World Bank estimates of infrastructure investment needs of $41 billion per year. Increasing the share of aid to the energy sector in sub-Saharan Africa should be a priority for the international community. However, it is important that this aid, and development aid in general, should not be made conditional on the achievement of externally required environmental sustainability targets.

Another area where ODA will be important is technical assistance. This should support improved governance of sustainable development. Technical assistance to build statistical capacities to integrate development and environmental concerns is a priority in this regard.

Within the last few years, various innovative international mechanisms for financing environmental issues have been developed that should offer a source of financing for SST additional to ODA. However, it is important that these mechanisms be designed in such a way that they are accessible to African countries. The Global

Figure 16. Official development assistance disbursements to the energy sector, 2002–2010 (%)



Source: OECD DAC, Creditor Reporting System database, online, March 2012.

Environment Facility (GEF), for example, is a multi-partnership financing facility that provides grants to developing countries for projects in a range of environmental areas such as climate change and is the financing mechanism behind several multilateral environmental agreements. Numerous concerns have been expressed by developing countries about the manner of governance of the Facility, and difficulties in accessing the funds. African countries should continue to push for governance reforms at the Facility (ECA and Africa Partnership Forum, 2009), while seeking technical assistance from the United Nations and NGOs to increase their utilization of funds from the Facility. Similarly, governance reforms could help increase the relevance of the LDC Trust Fund for Climate Change, given that the Fund is designed to help these countries adapt to climate change (see UNCTAD, 2010b).

Payments for ecosystem services (PES) are an innovative source of financing that may be particularly relevant for Africa. They could support various areas, such as the conservation of biodiversity, carbon sequestration, watershed protection and sustainable agriculture. The basic idea behind the PES scheme is to provide

incentives, by means of payments to farmers, local communities, landowners and resource owners for sustainably managing their resources in exchange for the provision of ecosystem services. The East African Forum for Payment for Ecosystem Services is a regional initiative to promote PES schemes. The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) is an international PES scheme from which Africa can benefit enormously, given the richness of its forest resources. REDD+ strategies are being developed in several African countries, notably Ghana, Liberia, Madagascar, the United Republic of Tanzania, Zambia and the Congo Basin countries.

Another important source of external development finance in Africa is FDI. How it can contribute to sustainable development is the subject of other UNCTAD work, which is forthcoming. However, this *Report* suggests that African governments should seek to use innovative ways to leverage support for SST from multinational corporations investing in Africa. For example, multinational corporations involved in the natural resource extractive industries may be legally mandated to hold interest-bearing deposits, equivalent to a share of their initial investment, at the national Central Bank of the country, as collateral warranty against potential environmental damage. Such an initiative can take place under a sustainable corporate social responsibility programme initiated by the government. If no major environmental damage is associated with their activities, the multinational corporations can then retrieve from the Central Bank such deposits in full with interest at the end of their operations in the country. In cases where environmental impact assessments conducted regularly throughout the operating period reveal that their activities caused environmental harm, then penalties can be applied to the environmental collateral to pay for environmental damages. Such an initiative not only gives incentives to multinational corporations to minimize environmental impacts from their activities, but it also provides the national banking system with additional loaning capacities that can be deployed to finance sustainable development projects in the economy. For multinational corporations, participation in such an initiative can help them build good reputations by means of sustainable corporate social responsibility on the international scene.

2. Technology transfer and technology development

Most African countries will be technology followers rather than technology leaders. It is thus necessary to develop global institutional arrangements that

increase international cooperation and collaboration in all areas relevant to SST and to accelerate the transfer, adoption and adaptation of relevant technologies in African countries. This is how leapfrogging can become possible.

There are various ways international cooperation can take place to promote technology transfer and development as part of supporting SST. Firstly, as recognized in Agenda 21 (para. 34.9), a large body of technological knowledge lies in the public domain. Many of the environmental technologies that developing countries are seeking to access are off patent (UNCTAD, 2011b). In this case, there is a need for improved access to such technologies as well as the know-how required to use them. A technology bank could facilitate search and access. Lack of financial resources may be a key barrier to use licensed technology; therefore, there may be a case for establishing international funds to enable developing countries to purchase and manufacture relevant technologies.

Secondly, major efforts should be made to expand the space for technologies in the public domain and to stimulate the transfer of publicly funded technologies to developing countries in general, and African countries in particular (Ocampo, 2011). In this regard, increased international cooperation for public funding and joint planning of research and development (R&D) programmes, based for example on the model of the Consultative Group on International Agricultural Research, should be considered. Within Africa, the establishment of regional research centres to support science, technology and innovation would be relevant.

Thirdly, attention must be paid to ways in which the intellectual property rights (IPR) regime affects the transfer of technologies that support environmental sustainability objectives. It is important in particular that IPR facilitate technological development and do not act as a barrier preventing African countries from accessing and using the technologies necessary for leapfrogging. This is a complex issue. According to Ocampo (2011), “a delicate balance must be struck between the advantages and costs IPR have for technologically dependent countries”, and the following reforms to the global IPR regime could be supportive: (a) broader room for compulsory licensing (replicating in the area of environmental sustainability the agreement on Trade-Related Aspects of Intellectual Property Rights and on public health of the World Trade Organization (WTO)); (b) strengthening patenting standards, particularly standards of breadth and novelty; (c) limiting the length of patent protection; and (d) allowing innovators to use existing patented knowledge to generate new innovations.

Finally, there is an important role ODA can play in building the technological capabilities of African firms and farms. This is currently a major blind spot in development assistance (see UNCTAD, 2007). Particular attention should be given to use aid to support agricultural R&D and the extension of sustainable agricultural intensification in Africa.

3. International trade regime

There are number of key considerations with regard to the international trade regime. Firstly, it is important that the increased interest of the international community in global environmental sustainability does not translate into protectionist measures in Africa's trading partners, which could damage export growth.

Secondly, increased domestic value added for commodity exports contributes to GDP growth. This is tantamount to relative decoupling in the sense that the country is gaining and retaining more for each unit of domestic resource extraction. Therefore, any aspects of trade regime that constrain increased domestic value added from commodity exports also constrain relative decoupling. Thus, for example, tariff escalation in importing countries should be reduced, as it acts as a disincentive for countries to make greater use of their domestic resources.

Given the state of their human, institutional and technological capacities, African countries need policy space to enable infant economic activities to develop. This is necessary to enable economic diversification in general, to make the leap to low-carbon economies and to achieve competitiveness in producing environmentally friendly goods and services. African countries should thus be allowed the policy space to apply measures that will help them achieve economic diversification and relative decoupling. In the multilateral arena, African countries must remain vigilant in preserving policy space to pursue SST in order to meet their sustainable development objectives, when negotiating on rules under WTO agreements and bilateral and regional free trade and investment agreements. African countries must also ensure that agreements signed at the bilateral, regional and international levels facilitate rather than hinder their abilities to engage in SST processes, including green industrial development.

Finally, African countries should work towards ensuring policy coherence and policy synergies at the national, regional and international levels (Chaytor, 2009) with regard to trade, investment and environment. For instance, at the national level, the preservation of fossil-fuel subsidies is incoherent with the objective of fostering

a transition to a low-carbon, sustainable economy. At the international level, unless talks on climate change mitigation and adaptation are followed by actual disbursements of resources and transfers of clean technologies from developed to developing countries, no significant results can be achieved in terms of protecting the global environment. African countries need to remain vigilant on such kinds of policy incoherence and heighten the awareness of the development community about the need to iron out policy inconsistencies relating to trade, investment and the environment.

4. South–South cooperation

South–South cooperation and triangular cooperation mechanisms for accelerating the transfer, assimilation and deployment of environmentally sound technologies (EST) in Africa should be considered. Such cooperation can involve the provision of technical assistance to African countries on the use and deployment of EST, grants for the purchase of patented EST, training of African nationals abroad in the area of green technology use and adaptation, and support to African technological research institutions and universities. Recent research suggests that the EST sector is growing, and that many large developing countries, namely Brazil, China and India, are participating in EST transfer. It also argues that EST transfer is not necessarily a unidirectional process from developed to developing countries (World Intellectual Property Organization (WIPO), 2011), suggesting that triangular cooperation mechanisms should be fostered.