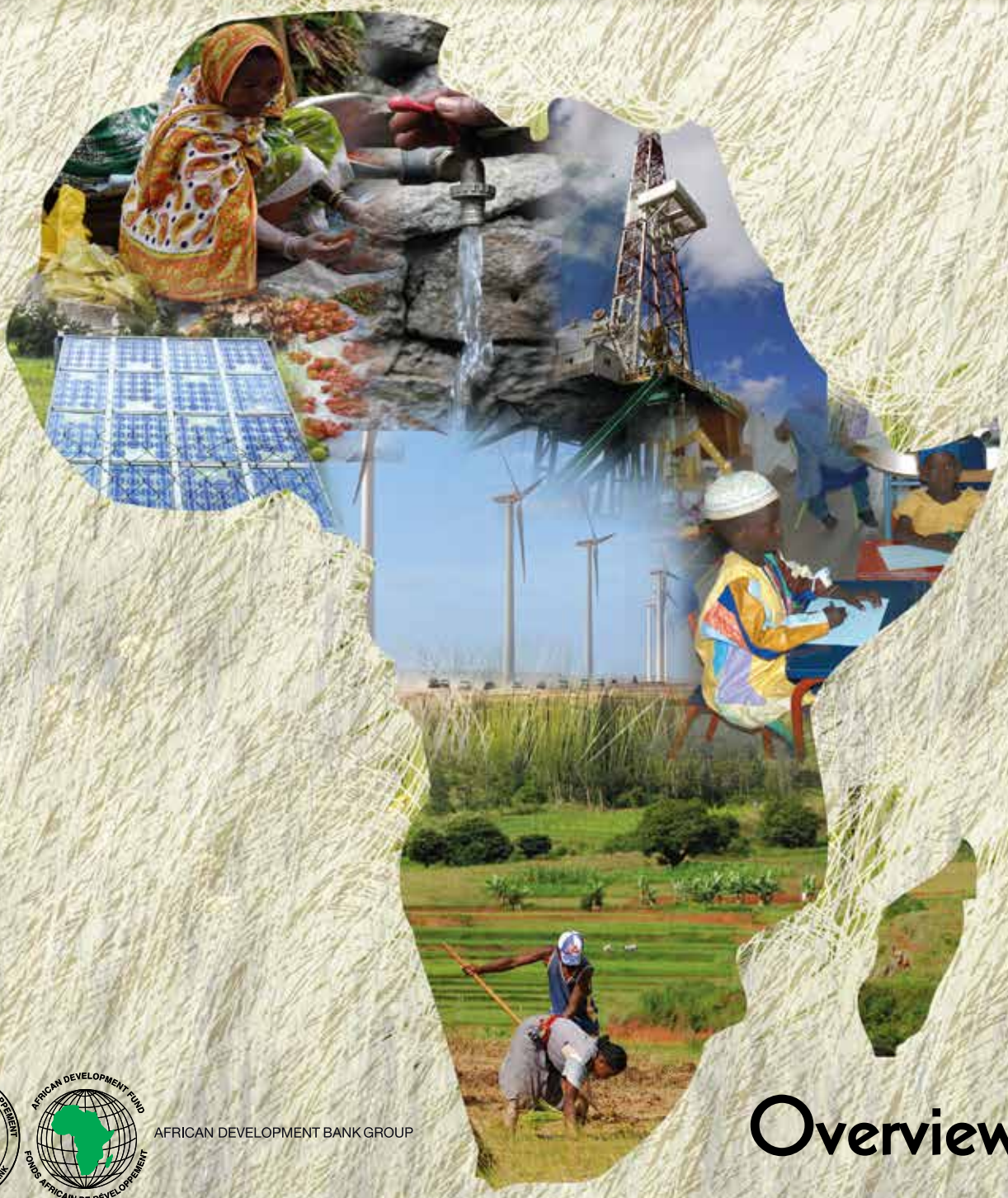
African Development Report 2012

Towards Green Growth in Africa



AFRICAN DEVELOPMENT BANK GROUP

Overview

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African Development Report 2012

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African Development Report 2012
Overview

Towards Green Growth in Africa

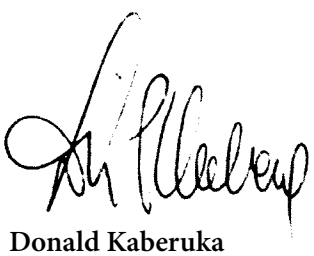
Foreword

Africa's robust economic growth, averaging five percent a year over the last ten years, has placed the continent among the fastest growing regions in the world. During the past decade, poverty rates on the continent have declined and the attainment of other MDG targets is within sight.

Although headcount poverty rates have decreased, Africa is still a poor continent and rapid economic growth has not reduced inequality. Hunger remains widespread on the continent, especially in sub-Saharan Africa, while access to energy is inadequate. Environmental and socioeconomic changes present further challenges for Africa. Notably, climate change, global population growth and shifting consumption patterns are putting additional pressure on Africa's natural resources.

Viable solutions to these and future challenges are anchored on growth pathways that encourage efficient and sustainable management of natural assets; are less carbon-intensive than conventional pathways; and ensure that the benefits of growth are shared equitably to ensure poverty reduction, reduce income inequalities, and improve livelihoods.

The African Development Bank has placed inclusive growth and the transition to green growth at the center of its new Ten-Year Strategy (2013-2022). The transition to green growth is part of a broader push for quality of growth and is focused on empowering African countries to reach their development objectives in a more resource efficient, sustainable and resilient manner. The Report underpins the Bank's emphasis on strengthening the robustness, sustainability and inclusiveness of growth on the continent in a time of rapid change. It provides innovative analytical perspectives and critical inputs into the discussion of what green growth means for Africa's development.



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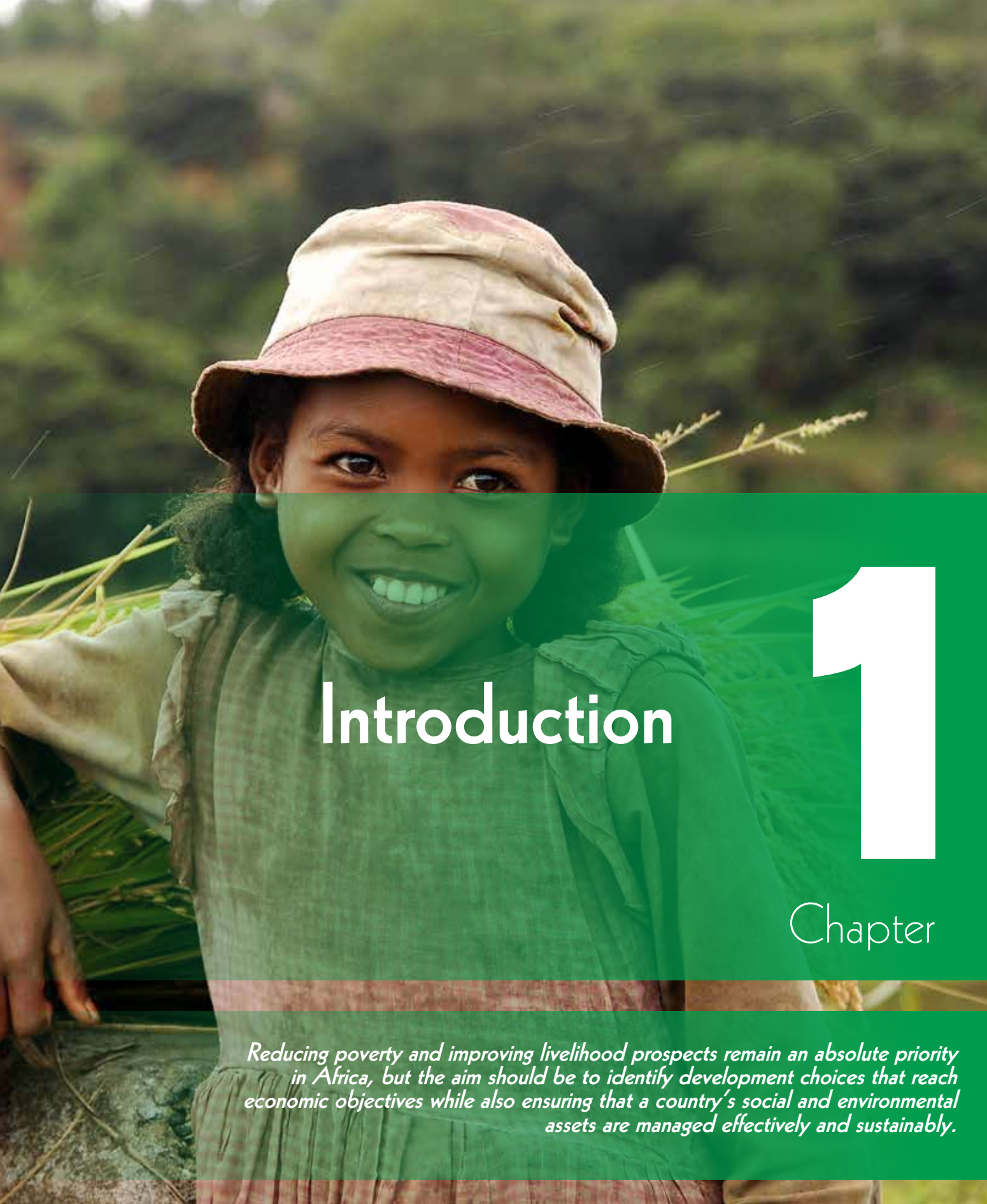
Abbreviations

AfDB	African Development Bank
AR4	Fourth Assessment Report of the Intergovernmental Panel on Climate Change
ADBI	Asian Development Bank Institute
AU/NEPAD	African Union's New Partnership for Africa's Development
CAADP	Comprehensive Africa Agriculture Development Program
CAR	Central African Republic
CDM	Clean Development Mechanism
CFU	Climate Fund Update
CGIAR	Consultative Group on International Agricultural Research
CIC	Climate Innovation Center
CO_2	Carbon Dioxide
CO_2 eq	Carbon Dioxide Equivalent
ECOSOC	United Nations Economic and Social Council
EEZ	Exclusive economic zone
EMBO	European Molecular Biology Organization
EITI	Extractive Industries Transparency Initiative
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GER	Green Economy Report
GHG	Greenhouse Gas
GHI	Global Hunger Index
GoE	Government of Ethiopia
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
IPRs	Intellectual Property Rights
IRENA	International Renewable Energy Agency
NTFPs	Non-timber Forest Products
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PRSP	Poverty Reduction Strategy Paper
REDD	Reducing Emissions from Deforestation and Degradation
RET	Renewable Energy Technology
R&D	Research and Development
SEA	Strategic Environmental Assessment
SEFA	Sustainable Energy Fund for Africa
SMEs	Small and Medium-sized Enterprises
SSA	Sub-Saharan Africa
SSA SDM	Sub-Saharan Africa Summary for Decision Makers
TT	Technology Transfer
T21	Threshold 21
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
UN-HABITAT	United Nations Human Settlements Program
WHO	World Health Organization
WWAP	World Water Assessment Program



Introduction

Chapter 1

Reducing poverty and improving livelihood prospects remain an absolute priority in Africa, but the aim should be to identify development choices that reach economic objectives while also ensuring that a country's social and environmental assets are managed effectively and sustainably.

1 Introduction

Africa's recent growth reflects many years of policy reforms coupled with a surge in extraction and export of its natural resources. To sustain this growth, and make it more inclusive, will require difficult policy choices in the long term. Current practices have implications for sustainability of natural assets, which are the source of livelihood for the vast majority of the population in Africa. For instance, the agriculture sector employs about 60 percent of Africa's total population and contributes a third of its GDP. With the challenges of the 21st century, such as climate change and population growth, it has become imperative for Africa to pursue a new model of growth, namely green growth.

Green growth, which focuses on environmental sustainability and inclusiveness, provides a unique opportunity for the future of Africa's economy and society. It is against this background that the theme of the African Development Report 2012 has been conceived. This Report discusses the importance of pursuing green growth for Africa's development while acknowledging the challenges for growth in the 21st century.

Green growth has different meanings depending on region and context. In this Report, however, the definition of the African Development Bank (AfDB) has been adopted. According to the Bank, green growth is "the promotion and maximization of opportunities from economic growth through building resilience and managing natural assets efficiently and sustainably, including enhancing agricultural productivity and promoting sustainable infrastructure."

The Report makes a case for growth pathways that use natural capital and ecological systems efficiently and sustainably; that are low-carbon; and that share the benefits of growth in order to reduce poverty and income inequality. The Report further discusses the financing needs of green growth in Africa, how to create an enabling environment, and the entry points for the AfDB in mainstreaming green growth in Africa.

The purpose of the Report is to stimulate discussion on the role of green growth in the African development process. Thus, the Report looks at the current characteristics of economic growth on the continent and discusses the environmental and socioeconomic challenges confronting Africa's societies and economies. In doing so, the Report explores the role of key sectors and technologies in promoting more sustainable growth and development options. These issues are taken up in Chapters 1 and 2. Chapters 3 and 4 discusses the management of Africa's renewable natural resources, consisting of agricultural land, water resources, forest stocks, fisheries and biodiversity. Chapter 5 examines the implications of improving energy security on the continent, taking into account the role of fossil fuels and opportunities for low-carbon development. Chapters 6 to 9 highlight strategies required to facilitate green growth in Africa. Chapter 6 focuses on the role of technology transfer in promoting development choices that enable green growth, while Chapter 7 discusses opportunities and challenges of financing green growth in Africa. Finally, the Report concludes by discussing how the enabling environment for green growth can be improved (Chapter 8), also taking into account the facilitating role the AfDB can play (Chapter 9). The broad scope of the discussions covered in these nine chapters of the main report is condensed into six chapters in this overview

The Necessity of Pursuing Green Growth

Chapter 2

To rectify the problems of environmental degradation and inequality while maintaining growth, African countries will need to pursue green growth pathways. Green growth should be viewed as a forward-looking model central to the development needs of the 21st century

2 The Necessity of Pursuing Green Growth

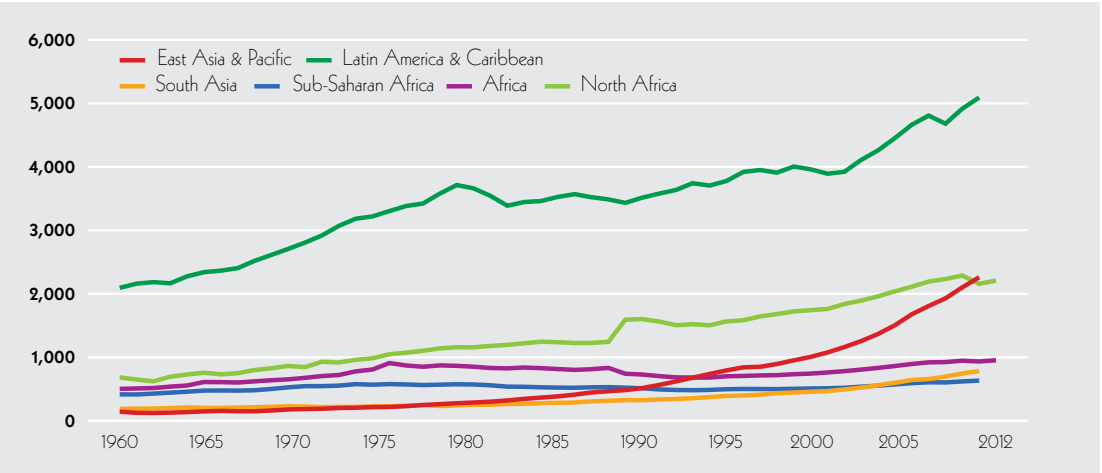
2.1 Africa's Economic Resurgence

Following several decades of economic stagnation, most African countries have experienced sustained economic growth in the last 15 years. This has placed a number of these countries among the fastest growing economies in the world. Between 2001 and 2012, Africa's average annual rate of GDP growth stood at 5.2 percent. Although the effect of the global crisis in 2009 on Africa was significant, it was less severe than in most other regions (AfDB et al., 2011).

Remarkably, Africa's recent solid performance has occurred against a backdrop of global headwinds (including the Eurozone debt crisis), adverse supply shocks from drought in both eastern and western Africa, and a series of country-specific shocks, including the spillover effects from the civil conflicts in a number of African countries such as Côte d'Ivoire and Mali. Thus, even after factoring in the effect of these crises and the effect of the Arab uprising in North Africa, which lowered the continent's growth, Africa's growth has remained resilient, rebounding strongly to nearly 7 percent in 2012. The medium term prospects are also solidly firm, with growth expected to average 5 percent between 2013 and 2014.

In spite of this progress, many challenges remain. As shown in Figure 1, Africa still lags behind other developing regions, such as East Asia and the Pacific and the Latin American countries, in terms of GDP per capita. The environmental basis for growth and poverty reduction is also progressively being eroded. In some parts of the continent, growth has been driven mainly by high rates of extraction or depletion of natural capital, such as

Figure 1: GDP Per Capita by Region (Constant 2000 US Dollars)



Source: African Development Report 2012 team, based on data sourced from AfDB and World Bank databases.

forest stocks, fossil fuels, agricultural soil, fisheries and mineral resources (AfDB, 2012; Sperling et al., 2012). Available evidence indicates that, between 2000 and 2005, Africa accounted for more than half of the global forest loss (FAO, 2007; UNDP, 2007). Water is becoming increasingly scarce, as population growth, agricultural expansion and industrialization all contribute to growing demand. Most aquifers in Africa are dropping (Oteino, 2013; Stock 2004).

There is a strong inverse relationship between economic growth and poverty in the continent. Despite this, growth has not been inclusive. Africa exhibits a greater degree of inequality than all other regions of the world, except Latin America (Günther and Grimm, 2007). In 2011, 6 of the world's 10 most unequal countries were in Africa: Namibia, South Africa, Lesotho, Botswana, Sierra Leone and Central African Republic (the latter two are classified as fragile states). In addition, job creation has been limited, and those without employment lack adequate social protection.

To rectify these problems of environmental degradation and inequality while maintaining growth, African countries will need to pursue green growth pathways.

2.2 Africa in the 21st Century

The need to pursue green growth becomes even more apparent when global and regional trends in the 21st century, in particular climate change and population growth, are considered. The effects of climate change are increasingly becoming visible around the globe, and it is by now well established that human activities are the predominant cause (IPCC, 2007a). Managing the risk associated with climate change has long been recognized as a pivotal development issue (e.g., AfDB et al. 2003). Population growth creates both opportunities and challenges. On the one hand, it means a potentially larger work force that can be more productive, provided the right educational measures and employment opportunities are created. On the other hand, more people will need to share natural resources at a time when many ecosystem goods and services are in decline (MEA 2005). Green growth's emphasis on improving resource use efficiency, minimizing waste and pollution, and enhancing resilience is central for preparing the African continent for the demands of population growth and climate change.

Climate Change and its Impacts on Africa

By altering the continent's natural resource systems, climate change poses a serious threat to Africa's economic growth and the well-being of its citizens. Africa is widely viewed as being particularly vulnerable to changing climate conditions due to its high climate sensitivity and relatively low adaptive capacity (IPCC, 2007a; Collins, 2011). The contribution of the Working Group II to the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC), in its discussion of Africa, states that "projected reductions in crop yields in some African countries could be as much as 50 percent by 2020, and crop net revenues could fall by as much as 90 percent by 2100, with small farmers being the most affected" (IPCC, 2007a). Other studies have found similarly disconcerting results. For example, Lobell et al. (2011) report that about 65 percent of present maize-growing areas in Africa would experience yield losses for each one degree Celsius increase in warming under optimal rain-fed management. Large losses in crop yields could have significant macroeconomic consequences, particularly with respect to poverty reduction. Therefore, Africa should be ready to adapt by investing in critical human capacity as well as flexible and functional institutional capabilities to cope with shocks.

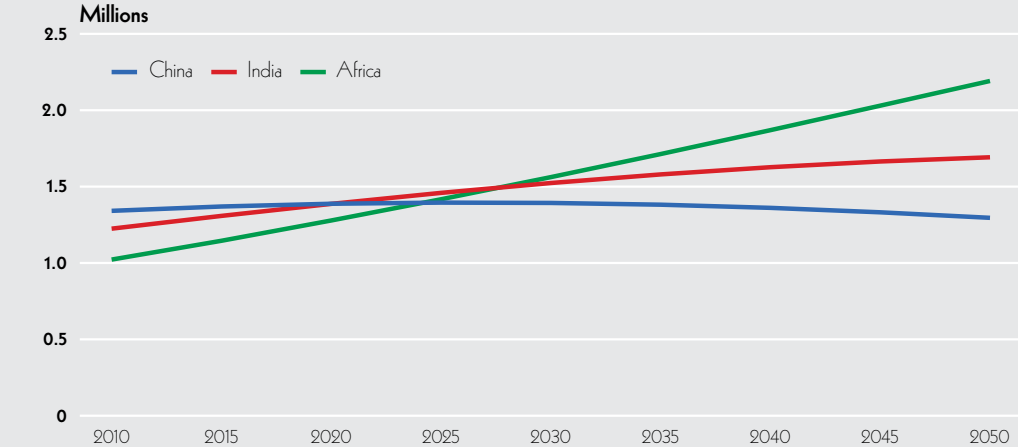
Furthermore, although Africa emits less than 4 percent of global CO_2 emissions, during the last decade, the total CO_2 emissions from the continent increased by 35 percent (IEA, 2012). Given Africa´s vulnerability to changing climatic conditions, African countries have an interest in being part of the solution to climate change, both through implementation of effective and efficient mitigation policies and through advocacy for these policies within the global community.

Africa's Population Growth

The population of Africa is projected to more than double between 2010 and 2050, accounting for nearly half of the world´s population growth over this period (see Figure 2). By 2025, the population of Africa is projected to surpass that of China and, by 2030, Africa will be more populous than India. By 2050, nearly one person in four on the planet will be an African. Moreover, nine out of ten persons in Africa will reside in sub-Saharan Africa (SSA).

Although this growth in population, especially of the working-age population, offers Africa a great economic opportunity, it carries substantial challenges. If the continent continues to grow at current rates, the size of the African economy in 2050 could be larger than that of China in 2010, with worrisome implications for greenhouse gas emissions. Well before then, increased population pressure could result in significant resource constraints, such as competition for land and water from municipal and industrial uses that could undermine growth opportunities.

Figure 2: Medium Variant Population Projections



Source: African Development Report 2012 team, based on United Nations Population Division data.

The Role of Green Growth in Promoting More Sustainable Growth and Development Options

Chapter 3

Pursuing green growth pathways will entail African countries making "smart" investments now, focusing on activities necessary to sustain Africa's progress. These include investing in sustainable infrastructure, energy and urban settlements; better management of natural resources including land, fish stocks, water and forests; building resilience to natural disasters and climate change; and enhancing food security.

3 The Role of Green Growth in Promoting More Sustainable Growth and Development Options

Africa is still the poorest continent in the world. The chronic hunger rate remains the highest in the world; the percentage of the population with access to electricity is the lowest in the world. Therefore, reducing poverty and improving the prospects of African livelihoods remain absolute priorities. Fortunately, some green growth practices and technologies not only promote sustainable growth but also meet short-run development needs. But the evidence also indicates that there can be a tradeoff between green growth solutions and meeting immediate socioeconomic needs. For example, deforestation is often the consequence of an increase in exports of forest products, growth in agriculture, and households' use of affordable wood fuels. Similarly, countries endowed with cheap fossil fuel may find it hard to pursue green growth pathways based on technology that is more costly. The challenge facing the continent, then, is to ensure that near-term development needs are met, while attaining a development trajectory that does not jeopardize sustainability and economic growth prospects over the longer term. The following sub-sections discuss the role and benefits of green practices and technologies for natural resources and the energy sector.

3.1 Getting the Most out of Renewable Natural Resources Endowments

The majority of Africa's poor depend heavily on natural resources for their livelihoods. As noted earlier, the agriculture sector is responsible for about 60 percent of Africa's total population and contributes a third of Africa's GDP. The total number of households relying on traditional biomass for fuel is predicted to increase in absolute numbers, from 657 million in 2009 to 922 million in 2030 (OECD and IEA, 2010). Agricultural productivity and the availability of traditional energy sources depend on the state of natural resources, including land, water and forests. Therefore, continued use of natural resources to satisfy these needs inevitably requires that resources are managed in a sustainable way. In what follows, we briefly present evidence on the role of green solutions in achieving the sustainable management of such resources.

Agriculture, Forestry and Sustainable Land Management

The agricultural sector in Africa has experienced stagnation during the last half-century. In areas where output has increased, much of it has come through increasing the area under cultivation and not from higher productivity (Bluffstone and Köhlin, 2011). In addition, there are concerns that agricultural intensification and reduced genetic diversity may be contributing to low and declining yields (Rosegrant and Livernash, 1996).

There is evidence that green agricultural practices can reverse the continent's declining agricultural productivity. A recent study (UNEP, 2011) found that practices such as integrated pest management, integrated nutrient management, low-tillage farming, agroforestry, aquaculture, water harvesting and livestock integration could increase average yields by as much as 79 percent. Similarly, an analysis of organic or near-organic practices of 114 projects in 24 African countries found that yields had more than doubled where the practices have been introduced (UNCTAD and UNEP, 2008). Moreover, because agricultural growth is

more pro-poor than that of other sectors (World Bank, 2007), increasing agricultural yields is likely to be particularly helpful in reducing poverty and narrowing income disparities. For example, an impact assessment study in Burkina Faso found that conversion to organic farming resulted in improved farmers' incomes, food security and overall livelihoods (Pineau, 2009), while an Ethiopian study found evidence of increased household income and environmental improvement due to green agricultural practices (Kassie et al., 2009).

Some countries, however, have improved food security through strategies that include chemical inputs. Ghana, for example, reduced its Global Hunger Index score by 59 percent between 1990 and 2011 by combining investments in agriculture (provision of information and inputs such as pesticides and fertilizer) with improvements in infrastructure, rural development, education, and health (Kufuor, 2011). It is also noteworthy that a recent study examining relative yield performance of organic and conventional farming systems globally found that the yield differences depend largely on system and site specific characteristics (Seufert et al., 2012). Increasing agricultural production in Africa on a sustainable basis requires a diverse toolkit including both green and conventional practices – with the clear target of preserving the natural systems on which food security depends.

Forests are an important source for food security, fuel, and income for the population living nearby. For example, it has been estimated that about 70 percent of African households use wood fuels (fuel wood and charcoal) for cooking and heating, while forests act as safety nets for many rural households, providing food and income earning opportunities (Somorin, 2010).

Besides providing direct benefits, Africa's forests provide services beyond the boundaries of the continent. Forests sequester carbon dioxide, both in biomass (roots, stems, branches, and leaves) and in soil (Beedlow et al., 2004). Roughly 2.2 to 9.5 tons of carbon dioxide could be captured by a forest area of an acre (Birdsey, 1996). It thus makes policy sense to pay farmers or landowners in exchange for green solutions such as enhancing forest stocks or reducing the loss of forest biomass. International initiatives such as Reducing Emissions from Deforestation and Degradation (REDD) or the Clean Development Mechanism (CDM) have provided funds to African countries to offer economic incentives for farmers or landowners in exchange for taking on these green solutions.

Perhaps more so than with other natural capital, there is a tradeoff between the green solutions presented above and immediate economic and social needs. Decreasing the rate of deforestation can come at the expense of exports, growth in agriculture, and access to affordable fuels. For example, central and southern Africa's dry Miombo forests provide charcoal for an estimated 25 million urban people (Campbell et al., 2007). Policy makers must weigh the benefits associated with sustainable forest management against the opportunity cost of the loss of economic and social opportunities associated with forest degradation.

Integrated Water Resource Management

Water is an essential resource for Africa's development. Water resources are crucial inputs for agriculture, which is the biggest user. Because the bulk of the African population depends on agriculture for its livelihood, increased water supply could enhance food security, reduce poverty and increase economic growth. According to available data in the World Bank World Development Indicators database, the agriculture sector accounts for 85 percent of total African annual water withdrawals, with the remainder allocated between domestic use (10 percent) and industrial use (5 percent). However, domestic, municipal and industrial uses of water are increasing due to rising urbanization and incomes. Africa's urban population is projected to grow by about 45 percent between 2010 and 2030, according to the United Nations Human Settlements Program (UN-HABITAT, 2010). Due to increasing competition for water between agriculture and non-agriculture (municipal and industrial) uses, water management must be viewed as an economic, social and political issue encompassing all sectors of the economy.

Green growth strategies for integrated water resources management include water harvesting (storage and distribution infrastructure) as well as water governance and institution

building. These strategies manage water availability and safeguard agricultural production against climate shocks. Water management in Africa should therefore target efficient water resource utilization, especially in agriculture. Delivering and applying water to crops more efficiently and increasing crop yields per liter of water are critical. This is especially important for the majority of countries on the continent, which face severe water scarcity.

Increasing water availability through distribution infrastructure, such as irrigation, may increase agricultural yields. Irrigation remains relatively underdeveloped in all parts of Africa, besides North Africa and South Africa (Kamara et al., 2009; You et al., 2011). The continent irrigates only about 6 percent of its collective cropland, which is less than a third of the world's average (Svendsen et al., 2009; Salami et al., 2010). This is despite the fact that irrigation could raise productivity by at least 50 percent. However, the example of North Africa also shows how extensive irrigation practices can lead to an unsustainable use of water resources. Irrigation should be used to increase water availability, and not to over-use water resources that are already scarce in Africa.

In extensive drought-prone areas of southeastern, eastern and northern Africa, where the average rainfall is less than 1,000 mm per annum, groundwater is crucial in supporting village subsistence-level cropping and water supply for local industries. Public investment and development assistance are required to develop the skills and infrastructure needed to develop and maintain groundwater systems. By contrast, areas that receive large volumes of rainfall and depend on rain-fed agriculture have to develop the required water storage infrastructure for irrigation, as well as for water supply, hydropower, and flood control. Currently, countries in SSA store only 4 percent of their annual renewable flows, compared to between 70 and 90 percent in industrialized countries (WWAP, 2009).

In addition to water infrastructure, appropriate water governance is essential for sustainable, equitable and efficient water resource management. According to the United Nations Development Program (UNDP, 2007), water governance entails "the political, social, economic and administrative systems put in place to develop and manage water resources at different levels of society." Options for governance include new forms of decentralized institutions such as basin committees, Catchment Management Agencies, and, at the local level, Water Users' Associations, as well as private-public partnerships. It is also likely to entail a declining financial and technical role for the state/public sector (Nigigi, 2009; Salami et al, 2011).

Fisheries Management

Total fish production in Africa is estimated at around 7.6m tons per year, which amounts to around 8 percent of total global fish landings. Besides providing jobs for about 10 million people in SSA (Markwei et al., 2008), fish supplies around 17 percent of the animal protein consumed in Africa, and is particularly important where livestock is scarce (Tidwell and Allan, 2001). Small-scale capture fisheries[1] employ fishing methods that have a relatively small carbon footprint. Fisheries management may also have direct spillovers for other natural resources. For example, wildlife might be overexploited as an alternative source of protein if fish were not available (Brashares et al., 2004). Moreover, by providing an important alternative protein source and a pro-poor livelihood option, the fishery sector can reduce pressure on land for agriculture.

However, most capture fish stocks in Africa have historically been de facto open access, meaning that anyone can fish without regulation, and with little active management. With increasing levels of fishing effort, and improved fishing technology, the offtake (or catch) has exceeded the levels that allowed the fish species to regenerate, as illustrated by the declining catch per unit of effort in many capture fisheries within the continent. Moreover, foreign fleets hardly adhere to quotas (where they exist) and have contributed to this situation, especially with regards to offshore fish stocks within the exclusive economic zones (EEZ) of African countries.

Green growth strategies to halt the overfishing problem include the enforcement of fishing regulations, investment in fisheries development, and promotion of aquaculture. Coastal countries in Africa, particularly along the west and

1 A capture fishery means that fish are caught in the wild rather than farmed.

southwest of the continent, must improve the enforcement of their fishing regulations. To do this, they must engage in the international enforcement agenda, particularly with respect to other countries whose boats are fishing in their waters. Furthermore, adequate investments must be made in fisheries development, including stock assessment and marine reserves. Aquaculture (fish farming) currently accounts for over a third of total fish production worldwide, but for only 3 percent in SSA. Aquaculture development in inland freshwater and in coastal waters is critical in order to reduce the pressure on capture fisheries.

3.2 Energy Security, Fossil Fuels and Opportunities for Low-Carbon Development

Energy security is essential for Africa's development. Sub-Saharan African countries require "subsistence emissions" to fulfill their basic human needs (Agarwal and Narain, 1991; Sachs and Someshwar, 2012), which stand in sharp contrast to the "luxury emissions" that support affluent lifestyles in developed nations. However, as the size of Africa's economy continues to grow, a delicate balance has to be sought in prioritizing green growth measures in the energy sector, recognizing the role that low-cost energy can play in supporting development, while also seeking to ensure that African economies are sustainable, efficient and hence competitive in an increasingly carbon constrained and inter-connected world. This will require a careful analysis of how African countries use renewable and non-renewable energy resources.

Fossil Fuels and Fossil Fuel Subsidies

Africa is endowed with large deposits of fossil fuels (oil, gas and coal). According to recent estimates, all but nine African countries possess proven and/or probable oil and/or gas reserves. As of 2011, the continent accounted for about 9.5 percent of the global proven oil reserves, while the share of natural gas stood at 8 percent. Africa's coal deposits account for 4 percent of global endowment. (BP, 2012). A significant amount of the fossil fuel resources produced in Africa – over 70 percent of crude oil, 55 percent of dry natural gas, and 23 percent of coal – is exported outside the continent (IEA, 2011). These resources generate revenues in sizable amounts, and attract foreign direct investment (FDI). Between 2000 and 2009, about 75 percent of FDI to Africa flowed to its oil-producing countries. Yet, despite these bountiful reserves in many African countries, energy security remains a big challenge for the continent. In 2008, only 42 percent of the African population had access to electricity and by 2040, only two thirds of Africa's population will have access to electricity (PIDA, 2011).

African governments are often under great social and political pressure to avoid disseminating oil price shocks to consumers. For example, Nigeria has recently experienced popular protests against removal of gasoline subsidies, as interest groups have come to see subsidies as entitlements. Thus, in order to improve access to energy for the poor, as well as foster economic growth, a number of countries in Africa subsidize fossil fuels. Subsidies stabilize domestic prices and keep them lower than world market prices, thereby potentially enhancing the purchasing power of households. Fuel subsidies can also slow deforestation by discouraging the use of wood fuel and charcoal in cooking and heating.

On the other hand, there are strong arguments against subsidies. Critics advocate for removing, or reforming, the regime of subsidies to make them more efficient. This is because oil subsidies increase consumption, resulting in higher CO_2 emissions. They also benefit the rich more than the poor. Furthermore, subsidies tend to discourage investments in renewable energy technologies (RETs) and divert public resources away from priority areas such as education, healthcare and basic infrastructure investments. For example, in South Africa, the average fossil fuel subsidy is 6.4 percent of the market price. Therefore, the removal of these subsidies would result in a gain in economic efficiency of 0.1 percent of GDP and reduce energy consumption and CO_2 emissions by 6.3 percent and 8.1 percent, respectively (UNFCCC, 2007).

Although on balance the environmental and efficiency considerations for reducing or removing subsidies have received intellectual support, subsidy reform remains a contentious issue. When such reforms are necessary to foster

long-term economic growth, governments must put in place appropriate social safety net programs to protect the most vulnerable. Indeed, environmental concerns should not take precedence over social and economic considerations. The process of reforming subsidies should begin with an assessment of the impacts of reform, and garner public support by creating awareness about the reasons for reform and the long-term benefits to be expected. Implementation requires transparency and a well-designed sequential approach.

Renewable Energy Technologies (RETs) Options

Africa is endowed with tremendous renewable resources. It is estimated that the solar potential alone amounts to between 155,000 and 170,000 terawatt hours (TWh) per annum, spread broadly across the continent. However the North and West African regions are especially well-endowed. The potential for wind energy in Africa is equally substantial, amounting to 5,000-7,000 TWh largely concentrated in the north and east of the continent. Geothermal potential stands at 1-16 TWh exclusively in the east of the continent. Africa's hydro power endowment, covering central and southern Africa, stands at 1,844 TWh.

In comparison, total energy production in Africa amounted to 13,584 TWh in 2010 (IEA, 2012). Biomass offers a further 82-372 exajoules[2] of potential, spread throughout the continent (although, as discussed below, there are often serious health and environmental concerns associated with the use of this resource). Table 1 presents information on renewable energy potentials across African regions.

While RETs are in general still more expensive than fossil energy technologies, their costs are falling, whilst those for fossil energy technologies are increasing. Countries with energy infrastructure deficits may consider investing now in RETs to avoid investments in technologies and systems that would lock them into high carbon pathways for decades into the future (Doig and Adow 2011; Byrne et al., 2012).

Besides helping to reduce GHG emissions, deployment of RETs could generate a wide range of benefits in Africa. RETs are likely to create jobs in the service end of the supply chain, including distribution and sales, installation, and maintenance. Moreover, the deployment of non-biomass

2 An exajoule is 10^{18} joules.

Table 1: Renewable Energy Potentials Across African Regions

Region	Wind (TWh/yr)	Solar (TWh/yr)	Biomass (EJ/yr)	Geothermal (TWh/yr)	Hydro (TWh/yr)
East	2,000-3,000	30,000	20-74	1-16	578
Central	-	-	49-86	-	1,057
North	3,000-4,000	50,000-60,000	8-15	-	78
South	16	25,000-30,000	3-101	-	26
West	0-7	50,000	2-96	-	105
Total Africa	5,000-7,000	155,000-170,000	82-372	1-16	1,844

Source: IRENA (2011), based on a compilation of various sources.

RETs can reduce deforestation pressure if they replace wood and charcoal as sources of energy. This could also result in the reduction of local pollutants, especially particulates that the use of wood and charcoal creates. Evidence shows that more than half a million deaths per year in SSA are attributable to indoor air pollution from these practices. This is the highest rate per million in the world (UNDP-WHO, 2009). Thus, reducing particulates could mean "a saving of 20 million disability adjusted life years (DALYs) from outdoor air pollution and more than 24 million DALYs from household air pollution" (Johansson et al., 2012), compared with just the introduction of air-quality legislation that is currently planned.

In spite of the attractiveness of RETs, there remain complex challenges in making a shift from interdependent high carbon energy systems or traditional biomass technologies to new low-carbon alternatives. The International Energy Agency estimates that 80 percent of people in SSA rely on traditional biomass as their primary source of fuel for cooking (IEA, 2011). Concerted efforts must be made to encourage households to switch to RETs. Policy options should encourage adoption of cleaner technologies that put the user at center-stage and employ social norms to change energy-related cultural practices (Griskevicius et al., 2008). Providing users with training on how to maintain their systems and feedback on cost savings from using such systems will also yield great benefits. Most importantly, financial arrangements of more efficient subsidies should be in place to make the switch economically attractive.

Finally, energy efficiency is an important supplement to the deployment of RETs for the energy sector to pursue green growth pathways. This is true on both the demand and supply sides of the energy system. According to Farrell and Remes (2008), cost-effective energy efficiency measures could reduce projected energy demand by almost 20 percent by 2020 worldwide. This could lower emissions and expenditures for consumers; for firms, lower energy costs can translate into increased investment, productivity and profitability. It could also save governments the costs of energy-supply infrastructure.

Technology Transfer for Green Growth in Africa

Chapter 4

Africa should go beyond hardware financing for technology transfer and begin to assess its technological needs and appropriate technologies, as well as develop innovation capacities through knowledge flows. This can be promoted through Climate Innovation Centers.

4 Technology Transfer for Green Growth in Africa

Access to technologies can be an important driver for a successful green growth strategy. Technology Transfer (TT) can increase land productivity in Africa by facilitating reductions in the use of water, fertilizer, pesticides, energy and other inputs. It can also improve irrigation and soil management techniques. In fisheries management, evolving equipment and techniques can improve stock assessment as well as the efficiency of finding, harvesting, handling, processing and distributing aquatic resources and products (FAO, 2012). Agriculture and fisheries are intertwined as sources of food and water security. Therefore, TT focusing these sectors has the potential to tackle food insecurity and address problems of water scarcity.

The benefits of TT in the forestry sector are immense. Improved technologies could lead to increased sustainable forest productivity, biodiversity conservation and enhanced profitability from the national level to the level of the forest stand, and from the perspective of single forest practices to broader socioeconomic approaches (IPCC 2000, 2007b).

In addition, TT can improve energy access and climate resilience across Africa. Green, low carbon energy technologies have much to contribute to improving energy access and security. New technologies can improve energy generation and increase the efficiency of consumption. Other areas where green TT can play a critical role in Africa include transport infrastructure development, as well as rural and urban infrastructure planning.

Yet, to date, TT policy in Africa has failed to achieve the scale or pace required to deliver significant development benefits, or to address global climate change. The principal focus has been on providing additional funding to incentivize investment in green technological hardware in developing countries, such as the provision of carbon credits under the Clean Development Mechanism. This has resulted in a low level of technology diffusion across the region. A revised understanding of TT is therefore necessary to change this.

There are three key conditions necessary for Africa to take full advantage of TT in order to achieve long term green growth and human development:

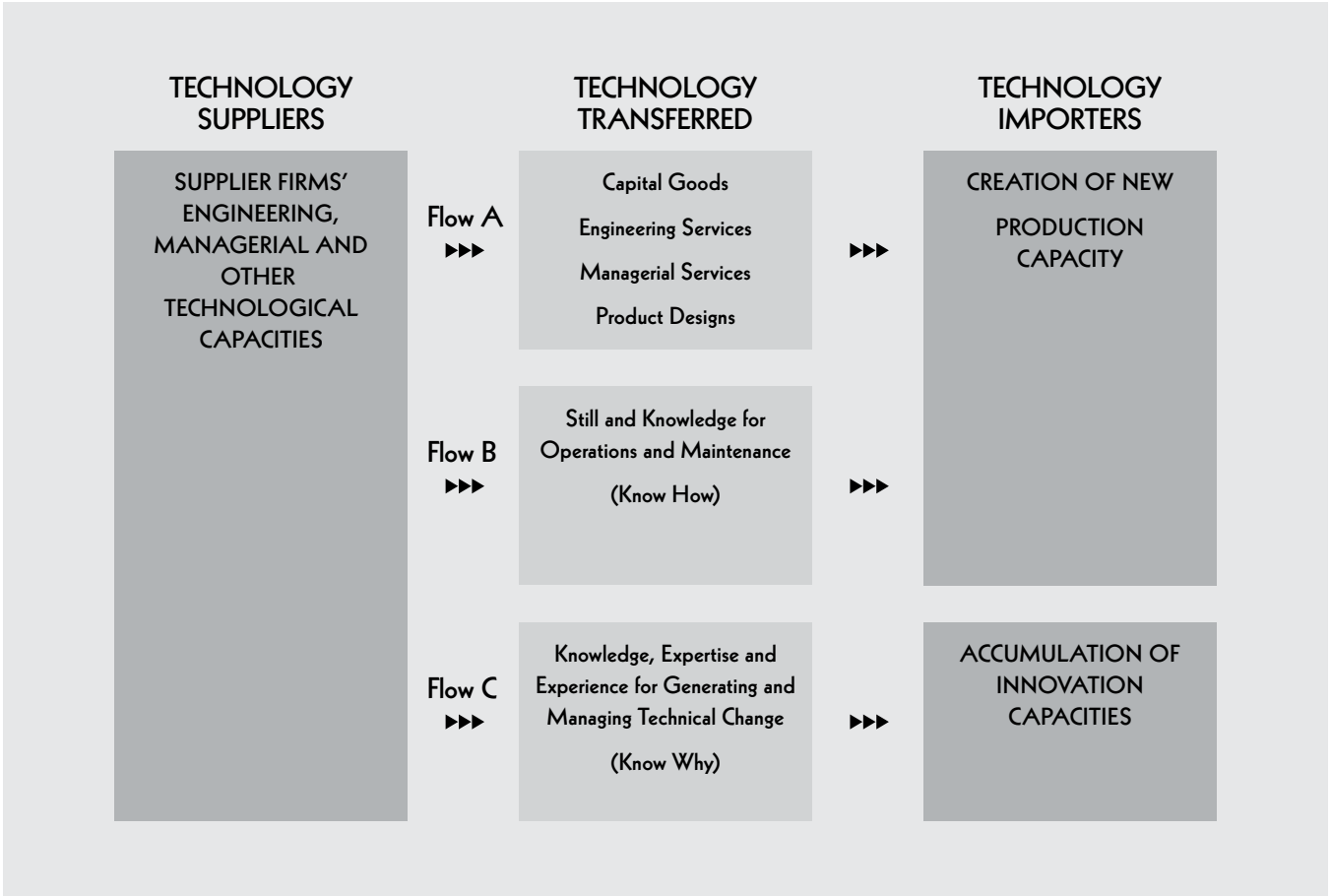
» Domestic innovation capacities should be built and supported. Africa must begin to assess its technological needs, as well as develop innovation capacities through knowledge flows. The significant variations in technology needs across nations and the multiple context-specific considerations necessitate different and appropriate interventions, as illustrated in Figure 3. If efforts are made to develop innovation capacities and related systems across African nations, green technology transfer could lead to green growth on a significant scale (UNCTAD, 2007). This can be facilitated by nationally located Climate Innovation Center, building on in-depth, stakeholder led assessments in each country and region.

» Intellectual Property Rights (IPRs) have been observed to prevent green TT to Africa. Several firms regularly express concerns that IPRs might act as a barrier in attempting to reach the technological frontier of certain technologies. This is the case, say, for thin film solar photovoltaic technologies. Without access to IPRs, firms in developing countries are unable to adopt and work with these technologies. A policy option for climate technologies is to make funds available to buy

up IPRs and make them publicly available. However, access to IPRs is unlikely to be successful unless accompanied by strategic attention to facilitating tacit knowledge flows, education, training, international exchanges, and efforts to connect all players in the value chain.

» Greater public support for TT is also required to ensure that green technologies yield benefits to society, not fully captured by the market.

Figure 3: Qualitatively Different Flows of Hardware and Knowledge in the Technology Transfer Process and their Contribution to Different Types of New Capacity



Source: Adapted from Bell (1990).

Financing Green Growth in Africa

Chapter 5

Financing the initial stages of the transitioning process to green growth will require ambitious policies, market incentive structures and regulatory frameworks.

5 Financing Green Growth in Africa

Financial resources are necessary for successful implementation of green growth strategies. At the global scale, for example, the estimated annual financing requirement for green growth is estimated to be between US$ 1.05 trillion and US$ 2.59 trillion between 2011 and 2050 (UNEP, 2011). Nevertheless, the question of how much it will cost to "green" global growth pathways should be accompanied by the reverse question: what will it cost the global economy if it continues with Business As Usual? Here, estimates suggest that the cost of the latter (inaction) is ultimately higher than the former, at least in the medium to long term.

Within the broader scope of green growth, climate change impacts illustrate that the cost of inaction may ultimately be larger than the cost of action. The Stern Review estimated the annual cost of reducing emissions to avoid the most adverse consequences of climate change to be around 1 percent of global GDP. This would mean pursuing lower-carbon development pathways and stabilizing greenhouse gas concentrations in the atmosphere at a level which would limit global warming to about 2˚C. By contrast, Business As Usual and the associated impacts from unabated climate change, such as declining agricultural production, heat waves, droughts, floods and other extremes, are estimated to cost 5-20 percent of global GDP per year. Depending on the social discount rate, this estimate suggests that the cost of inaction may be higher than the cost of action by a factor of between 5 and 20.

The amount required for green growth calls for the need to explore several financing options. For African countries, there are several strategies to finance green growth. These include (i) optimizing resource efficiency and productivity gains in priority sectors; (ii) reducing the fiscal cost of subsidies through realignment; (iii) leveraging global financing options for green growth, (iv) building targeted public-private partnerships, and (v) harnessing other fiscal and environmental policy tools.

» *Optimizing Resource Efficiency and Productivity Gains by Greening Value Chains:* Given the huge inefficiencies in the existing infrastructure in less developed countries, there are many options to improve resource efficiency and productivity, especially in Africa. For example, global investments of around US$ 90 billion in promoting energy efficiency in developing countries could provide US$ 600 billion in net savings (McKinsey and Company, 2010). Similarly, over US$ 18 billion worth of water a year globally is considered non-revenue water (NRW) – as a result of leakage, illegal connections and dysfunctional meters. In dysfunctional domestic water supply systems, NRW can range from 15 percent to more than 70 percent. This is particularly significant in a context where water demand outstrips current forms of supply, and global government expenditure for upstream water supply at the global scale could increase from the current US$ 40 to 45 billion per annum to around US$ 200 billion per annum by 2030, excluding distribution costs.

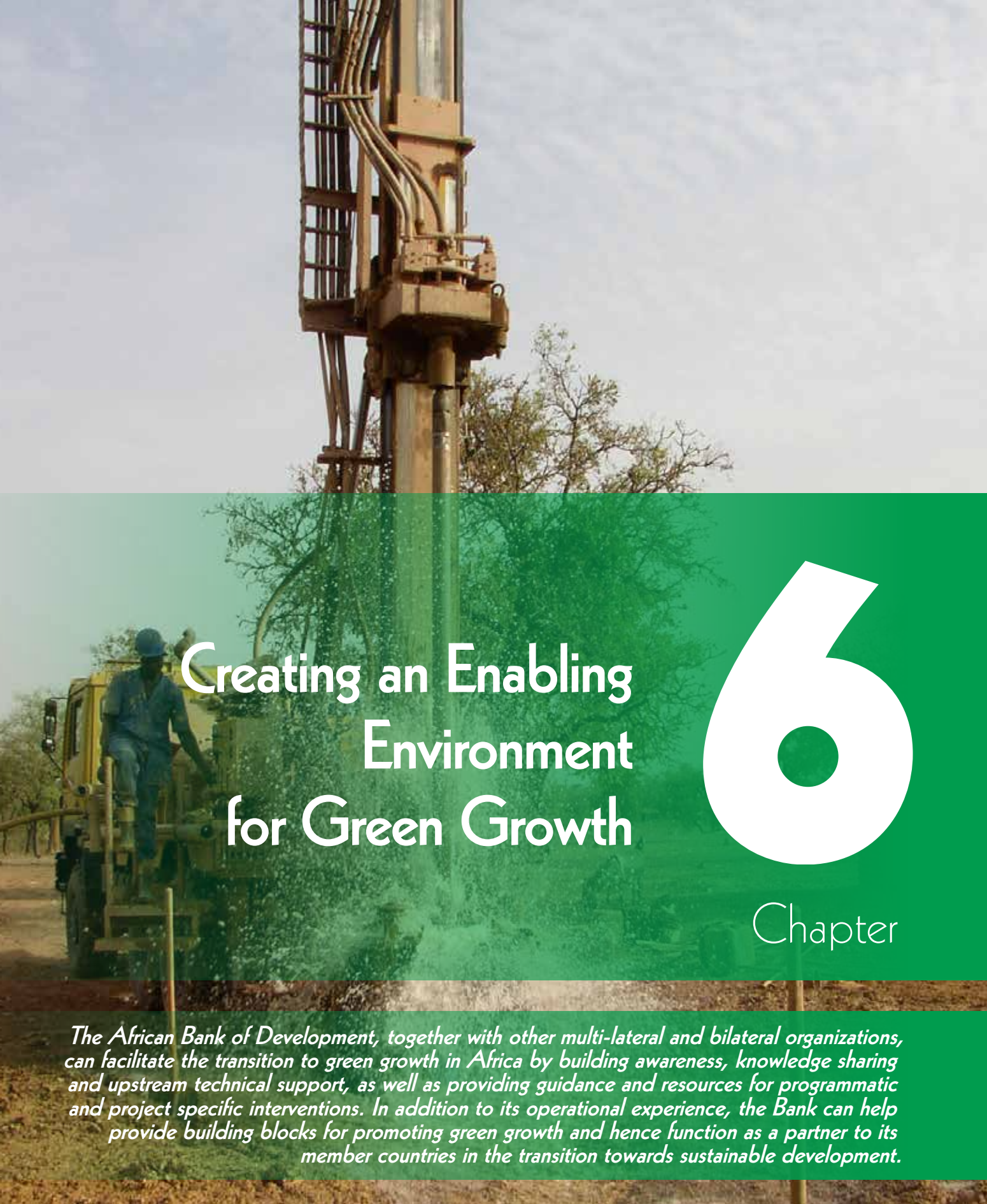
» *Reducing the fiscal cost of subsidies through realignment:* As discussed above, this is another financing option which could be explored by African countries. In 2010-11, over half of all African countries had some subsidy in place for fuel products, and these subsidies consumed, on average, 1.4 percent of GDP in public resources. Of the 25 countries with fuel subsidies, the fiscal cost of subsidies in six countries—primarily oil exporters—was at or above 2 percent of GDP in 2011 (World Bank, 2012a).

» *Leveraging global financing options for green growth:* In addition to Foreign Direct Investments (FDI), there are significant opportunities for countries to access complementary finance for climate change adaptation and mitigation, biodiversity conservation, and other issues of environmental sustainability. Available finance through all these mechanisms has increased during the past decade, and will continue to increase in the near future.

» *Building targeted public-private partnerships:* Private sector financing will be essential in transitioning to green growth. With foreign direct investment increasingly exceeding Official Development Assistance (ODA) on the African continent, governments will need to provide the right enabling and regulatory environment for the private sector to invest in green projects in priority sectors, depending on the comparative and competitive advantages of countries.

» *Harnessing other fiscal and environmental policy tools:* Fiscal and environmental policy tools are probably the most immediate financing mechanisms available to countries. These might include green taxation, green procurement, green bonds, micro-credit, weather index insurance, valuation/payments for ecosystem services, etc., in order to help promote resource efficiency and sustainable livelihoods. For African countries, it is important to strengthen the capacities of countries to monitor their natural resource base and assess the cost of environmental degradation and pollution in order to be able to make informed decisions about environmental regulations and taxation. The early involvement of the Ministries of Finance and Planning is key in order to ensure that green growth concerns are also integrated into national budgeting processes and adequate resources are mobilized.

Overall, green growth offers huge potential opportunities for self-financing through efficiency and productivity gains. However, financing the initial stages of the transition to green growth will require ambitious policies, market incentive structures and regulatory frameworks to realize opportunities. Specific tools include realigning costly subsidies; internalizing externalities of growth through payments for ecosystem services and other fiscal policy measures; leveraging traditional financing mechanisms (including FDI and ODA); and making use of emerging global funds for climate change, biodiversity and environmental sustainability.



Creating an Enabling Environment for Green Growth

Chapter 6

The African Bank of Development, together with other multi-lateral and bilateral organizations, can facilitate the transition to green growth in Africa by building awareness, knowledge sharing and upstream technical support, as well as providing guidance and resources for programmatic and project specific interventions. In addition to its operational experience, the Bank can help provide building blocks for promoting green growth and hence function as a partner to its member countries in the transition towards sustainable development.

6 Creating an Enabling Environment for Green Growth

The previous sections have described characteristics of Africa's economic progress, discussed development gains and shortfalls, and outlined key development trends that need to be managed over the near to long-term. It has also discussed the key economic sectors and explored the role of technology and financing instruments for promoting sustainable development pathways. Achieving the transition towards growth that is both inclusive and increasingly green will take time and great effort. It also requires the right enabling environment, policies, institutional structures, technical capacities and incentive mechanisms.

Africa has a tremendous opportunity to make significant development gains in the 21st century. But such progress can only be achieved and sustained if the continent prepares for and simultaneously adapts to environmental and socioeconomic changes it is currently confronted with. In order to master the more complex challenges of this century, more cross-sectoral analysis and collaboration is required.

There are critical entry points for systematic promotion of green growth and the AfDB and other development organizations can facilitate this transition.

Entry Points for Green Growth

There are several levers for promoting green growth and enabling the transition towards greener economies in Africa. The most strategic of these is the progressive mainstreaming of green growth into upstream development planning and ensuring that the right institutional enabling environment is put in place. Key entry points for mainstreaming green growth are the national development planning cycles.

National Development Plans and Poverty Reduction Strategy Papers set development priorities for a country and hence determine investment priorities. Specific development objectives, such as increasing agricultural productivity and energy access, can be realized through a number of alternative approaches. Emphasizing green growth means carrying out appropriate upstream diagnostics to determine which of these approaches are most appropriate for a particular country from an economic, social and environmental perspective. Smaller levers for green growth are further downstream and focus on integrating principles of resource use efficiency, sustainability and resilience into the design of development programs and projects.

Strengthened upstream and systematic planning also requires a broader integration of sectors. The need for a high-level political commitment coupled with long-term development visions and more integrated and programmatic development approaches (AfDB and OECD, 2013). Improved diagnostic, information and monitoring capabilities are important for adequately capturing a country's natural resource wealth, assessing risks to sustainability and monitoring progress. Only when development progress is defined and monitored along appropriate economic, social and environmental criteria will it be possible to assess the quality of growth in terms of sustainability.

Strengthened upstream and systematic planning also requires a broader integration of sectors. The need for high-level political commitment coupled with long-term development visions and more integrated and programmatic development approaches are particularly essential (AfDB and OECD, 2013). Improved information and monitoring capabilities are also important to adequately capture a country's natural resource wealth, assess risks

to sustainability and monitor progress. Only when development progress is defined and monitored along appropriate economic, social and environmental criteria will it be possible to assess the quality of growth in terms of sustainability.

Many of the building blocks for green growth are already in place, but not systematically integrated into development planning and implementation. Thus, a more systematic application of Strategic Environmental Assessments can help in assessing development options in their impact on natural assets. Integrated planning tools such as the Threshold 21 model can further strengthen the evaluation of development pathways in terms of synergies and tradeoffs between economic, social, and environmental objectives. Other tools offer opportunities to identify likely cost-effective entry points for specific thematic areas, such as options for low-carbon development. For example, greenhouse gas abatement cost curves help in the identification of the least cost mitigation options within or across development sectors, and were an integral component of Ethiopia's green growth strategy (GoE, 2011).

In addition to guiding broader strategy development, there is a range of tools that help to identify opportunities for efficiency gains, promote sustainability and minimize vulnerabilities. These tools can complement social and environmental safeguards by operating farther upstream and helping to optimize project design early on in the project cycle. In the natural resource management context, sustainable land and integrated water management represent cross-disciplinary approaches, which seek to generate development objectives across multiple sectors and link broader policy level interventions with project specific measures. Climate Risk Screening Tools, developed by the AfDB and other organizations, can help in identifying climate-related vulnerabilities of projects and provide early guidance on possible risk mitigating measures.

Green growth strategies, which are necessary to address these challenges, provide concrete policy frameworks on how economic development and environmental sustainability can reinforce each other and create a win-win synergy to overcome the tradeoffs associated with green growth (Girouard, 2011).

A number of conditions and additional reforms should accompany green policies to set the stage for green growth. These include, inter alia, making appropriate land reforms and policies, public investment in green growth, and strengthening transparency and good governance.

Land reforms are necessary for the continent to benefit from implementing the green growth agenda. In recent years, there is evidence of fierce competition for land and very high pressures on tenure systems in Africa. In a number of countries in eastern and southern Africa, for example, cultivated land per capita has halved over the last generation. Land reforms can encourage farmers to invest in soil conservation, to use land as collateral to obtain credit to improve land productivity, and to adopt new agricultural technologies.

Public investment in capacity building efforts is critical in contributing to greener growth by reducing investment costs for private companies. The public sector can help improve the skills and competence of the workforce needed to support green growth, including research and development , skills for development of low-carbon, climate-resilient technologies, as well as the skills necessary to construct, manufacture, install and maintain these systems (Corfee-Morlot et al., 2012).

Furthermore, public investment in infrastructure development has to be based on a framework for green infrastructure – which is the ecological framework needed for environmental, social and economic sustainability (World Bank, 2012b). Africa has a huge infrastructure deficit and this presents an opportunity to carefully consider the tradeoffs between "building right" (which relates to economic plus environmental concerns) and "building more" (which relates to satisfying social needs). Moreover, future climate conditions are to some extent uncertain, and this may adversely impact less-resilient infrastructure.

Finally, Africa needs to strengthen transparency and good governance in order to effectively pursue green growth. Relative to advanced regions, African countries are less democratic and have more corrupt formal institutions. Studies have found that countries with stronger institutional, legal, and political capacities tend to be more developed economically (Kuncic, 2012). Weak institutions breed corruption and rent-seeking behavior, leading to mistrust in public policy, inefficiency, and suboptimal management of natural and reproducible capital, including public infrastructure. In this context, all resource-rich African countries are encouraged to sign into organizations such as the Extractive Industries Transparency Initiative that promote and support transparency, improved governance and increasing scrutiny over government revenues.

The African Development Bank

In partnership with other multi-lateral and bilateral organizations, the AfDB can facilitate the transition to green growth in Africa. This includes facilitating awareness, knowledge sharing, and upstream technical support as well as providing guidance and resources for programmatic and project-specific interventions.

While there may be efficiency gains and cost savings associated with green growth, there are likely to be upfront investment costs, which could constrain the transition. In addition to its traditional financing instruments, the AfDB is managing or hosting a range of innovative financing instruments that may help to overcome these financial barriers.

For example, through the Climate Investment Funds and the Sustainable Energy Fund for Africa, the Bank has several funding instruments that help mainstream climate mitigation and adaptation issues into development activities and promote scaling up of clean energy solutions at different levels. The Bank is also helping to channel resources from the Global Environmental Facility to address a range of environmental issues in Africa. Through the Africa Water Facility, the Bank is providing support for managing essential resources more sustainably.

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With the increasing volume of foreign direct investment, the engagement of the private sector in promoting green growth will become even more critical. Thus, the Bank's private sector arm can help strengthen the countries' investment climate for green technologies. Equally, the Bank can help regional member countries foster and strengthen Public-Private Partnerships, which can be mainstreamed to reduce the risk private sector actors face in investing in new, green technologies.

Through its operational experience, the Bank already has a number of building blocks for promoting green growth and can hence function as a partner to its member countries in the transition towards more sustainable development pathways. However, this is the starting point which requires adjustments over time and mutual learning by development partners and client countries. In addition to strengthening awareness and knowledge foundations, there is need for more concerted action by development actors to enable such programmatic approaches. This requires collaboration across sectors, departments, ministries and institutions. Developing more integrated solutions requires awareness and willingness among all involved development partners. The current fragmentation of resources and funding instruments will also require refining. Not all of these changes can be achieved at once, but the time to start is now.

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Green growth in Africa encompasses the achievement of critical development objectives while seeking to maximize efficient use of natural resources, minimize waste and pollution, and enhance the resilience of livelihoods. Seeking such a delicate balance is crucial because, as the size of Africa's economy continues to grow, natural resource degradation and the global GHG problem may increase, eventually putting a brake on the region's progress. This could have serious implications for livelihoods.

Pursuing green growth pathways will entail African countries making "smart" investments now, focusing on activities necessary to sustain Africa´s progress. These include investing in sustainable infrastructure, energy and urban settlements; better management of natural resources including land, fish stocks, water and forests; building resilience to natural disasters and climate change; and enhancing food security.

The largest and most systematic lever for promoting green growth is the progressive mainstreaming of green growth into upstream development planning and ensuring that the right institutional environment is put in place. Smaller levers for green growth are further downstream, focusing on integrating principles of efficient use of resources, sustainability and resilience into the design of development programs.

The AfDB, together with other multi-lateral and bilateral organizations, can facilitate the transition to green growth in Africa by building awareness, knowledge sharing and upstream technical support, as well as providing guidance and resources for programmatic and project specific interventions. In addition to its operational experience, the Bank can help provide building blocks for promoting green growth and hence function as a partner to its member countries in the transition towards sustainable development.

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