

Managing Africa's Natural Resource Base for Sustainable Growth and Development

Sustainable Development
Report on Africa IV

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Acronyms and Abbreviations

A21	Agenda 21
AATF	African Agricultural Technology Foundation
ABSF	Africa Biotechnology Stakeholders Forum
ABSP	Agricultural Biotechnology Support Programme
ADI	African Development Indicators
AEO	Africa Environment Outlook
AfDB	African Development Bank
AFF	African Forest Forum
AFWC	African Forestry and Wildlife Commission
AGRII	Second Africa Governance Report
AMCEN	African Ministerial Conference on the Environment
APRM	African Peer Review Mechanism
ARSCP	African Roundtable on Sustainable Consumption and Production
ATO	African Timber Organization
AU	African Union
AUC	African Union Commission
BIO-EARN-	Regional Programme and Research Network for Biotechnology, Biosafety and Biotechnology Policy Development
CAADP	Comprehensive Africa Agriculture Development Programme
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CEBIB	Centre for Biotechnology & Bioinformatics
CEN-SAD	Community of Sahelo-Saharan States
CERs	Certified Emissions Reductions
CGIAR	Consultative Group on International Agricultural Research
COMESA	Common Market for Eastern and Southern Africa
COMIFAC	Central Africa Forests Commission
COP	Conference of the Parties
CPIA	Country Policy and Institutional Assessment
CRED	Centre for Research on Environmental Decisions
CSD	Commission on Sustainable Development
CSP	Climate Science Programme
DAC	Development Assistance Committee

DPSIR	Driving Forces-Pressures-State-Impacts-Responses
DRC	Democratic Republic of the Congo
EAC	Eastern African Community
ECOWAS	Economic community of West African States
EU	European Union
FAO	Food and Agriculture Organization
FARA	Forum for Agricultural Research in Africa
FLEGT	Forest Law Enforcement, Governance and Trade
FLR	Forest Landscape Restoration
FMU	Forest Management Unit
FPI	Food Production Index
FRA	Forest Resources Assessment
FSC	Forest Stewardship Council
GDP	Gross Domestic Product
GEO	Global Environment Outlook
GHG	Greenhouse gases
GM	Genetic Modification
GNESD	Global Network on Energy for Sustainable Development
GNEST	Global Network for Environmental Science and Technology
GNI	Gross National Income
GRID	Growth-Related Integrated Development Strategy
HDI	Human Development Index
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
ICGEB	International Centre for Genetic Engineering and Biotechnology
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and Communication Technology
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IFF	Intergovernmental Forum on Forests
IGAD	Intergovernmental Authority on Development
IIED	International Institute for Environment and Development
ILO	International Labour Organization
ILRI	International Livestock Research Institute
IPCC	Intergovernmental Panel on Climate Change
IPF	Intergovernmental Panel on Forests
ISAAA	International Service for the Acquisition of Agri-biotech Applications
ISIC	International Standard Industrial Classification
ITNs	Insecticide-Treated Nets
ITTO	International Tropical Timber Organization
IUCN	World Conservation Union
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Programme
JPOI	Johannesburg Plan of Implementation
JRC	Joint Research Centre
KEMRI	Kenya Medical Research Institute
LDC	Least Developed Countries
LMOs	Living Modified Organisms

MAB	Man and the Biosphere
MDGs	Millennium Development Goals
MDGS	Millennium Development Goals
MERECOP	Mountain Elgon Regional Ecosystem programme
MMR	Maternal Mortality Ratio
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Programme of Action
NBI	Nile Basin Initiative
NCPCs	National Cleaner Production Centres
NEPAD	New Partnership for Africa's Development
NERICA	New Rice for Africa
NFP	National Forest Programme
NGOs	Non-Governmental Organizations
NLBI	Non-Legally Binding Instrument
NTFP	Non-Timber Forest Products
NWFPs	Non-Wood Forest Products
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OFAB	Open Forum on Agricultural Biotechnology in Africa
OFDA	Office of Foreign Disaster Assistance
PAs	Protected Areas
PES	Payment for ecosystem services
PFEs	Permanent Forest Estates
PFIA21	Plan for Further Implementation of Agenda 21
PIDA	Programme for Infrastructure Development in Africa
PIP	Public Investment Plan
PM	Particulate Matters
PPP	Purchasing Power Parity
PREM	Pressure Response Effect Mitigation Framework
PRSP	Poverty Reduction Strategy Paper
REDD+	Reducing of Emissions from Deforestation and Forest Degradation
ROA	Regional Office for Africa
SABIMA	Strengthening Capacity for Safe Biotechnology Management in sub-Saharan Africa
SADC	Southern African Development Community
SCP	Sustainable Consumption and Production
SDRA	Sustainable Development Report for Africa
SDRA	Sustainable Development Report on Africa
SFM	Sustainable Forest Management
SMD	Sustainable Mountain Development
SMFE	Small- and Medium-Scale Forest Enterprise
SOFO	State of Forests
SPS	Agreement on the Application of Sanitary and Phytosanitary Standards
SSA	Sub-Saharan Africa
TB	Tuberculosis
TBPT	Tree Biotechnology Project Trust
TBT	Technical Barriers to Trade
TWh	Terawatt hours

UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNSD	United Nations Statistics Division
UNU	United Nations University
UNWTO	World Tourism Organization
VPA	Voluntary Partnership Agreement
WB	World Bank
WECD	World Commission on Environment and Development
WEO	World Energy Outlook
WHO	World Health Organization
WMO	World Meteorological Organization
WRI	World Resource Institute
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization
YFP	Year Framework Programme

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Executive Summary

Introduction

Africa is endowed with a very rich and diverse natural resource base on which the livelihood of its people, especially the rural population, depends. Although Governments are placing pro-poor economic growth and environmental sustainability at the heart of their economic policies, planning systems and institutions, there persists a paradox. Africa remains one of the most vulnerable continents with deepening poverty levels and worrying trends of degradation of natural resources. Sustainable development demands a reversal of natural resource exploitation with little value-addition, which results in environmental degradation and natural resource depletion, with marginal benefits accruing to countries.

The underlying theme of this Fourth issue of the Sustainable Development Report on Africa (SDRA-IV) is “Managing Africa’s Natural Resource Base for Sustainable Growth and Development, focusing on five themes: biodiversity, forests, biotechnology, mountains and tourism”. Part I of the report assesses progress towards sustainable development in the region, using an indicator set that covers the economic, social and environmental pillars, as well as those relating to governance, which is considered overarching and indispensable to achieving sustainable development. Part II explores the contribution of five sectors, namely - biodiversity, forests, biotechnology, tourism and mountains to Africa’s growth and poverty reduction.

The assessment in this report is in keeping with the overall goal of the SDRA, which is to serve as an important medium for monitoring and assessing sustainable development in Africa. Efforts towards sustainable development are primarily driven or hampered by underlying driving forces, including demographic changes, economic processes, scientific and technological innovations, distribution patterns, and cultural, social, political as well as institutional processes. In order to make causal links explicit, the assessment uses the “pressure-response-effect-mitigation” (PREM) analytical framework also used in developing the African sustainable development indicators framework in combination with the issue-theme approach.

The report focuses on a number of core themes and sub-themes that, while not covering all sustainable development issues in Africa, capture priority sustainable development concerns for the region. The themes are: governance; poverty; demographic changes; state of the economy; sustainable consumption and production; social equity and opportunities; education; health; agriculture and food security; the natural resource base; energy; climate change; natural and man-made disasters; and financing sustainable development. For each theme and

sub-theme, monitoring indicators have been selected, taking into account their relevance, effectiveness, reliability, ease of comprehension, conceptual soundness, capacity to show trend over time, and data availability.

Key findings

Part I: Assessing progress towards sustainable development in Africa

Governance

Overall, Africa has registered appreciable improvements in governance and institutional reforms. The region continues to make progress that should provide a basis for economic, social and environmental sustainability. Steps towards improving governance at various levels are yielding incremental advances in coherent and integrated policies as well as a reduction of overlaps in institutional mandates. There is evidence of increased governance influencing sustainable development efforts, albeit slowly. This is also trickling down to lower levels yielding popular participation at various levels, including in natural resources management. This has been made possible through efforts to improve the capacity of regional and subregional organizations and States to promote and undertake cross-sector implementation of sustainable development programmes. The progress made is reflected in the positive trends in political and economic governance as well as strategies to promote peace and security.

Poverty

African countries have realized that an increase in GDP alone is not a true measurement of economic well-being, as steady progress is made in reducing income poverty. Although considerable progress is reported in access to basic services such as safe drinking water, stagnation continues in poverty aspects like sanitation. There are also worrying trends in sustaining efforts towards improved access to energy and decent housing. Even though Africa has registered significant growth rates in the past decade, this has not translated into the desired level of poverty reduction. Most countries continue to register marginal declines in the proportion of people living below the poverty line, which is not sufficient to meet the MDG target by 2015. Furthermore, the continent's rural and urban populations continue to have inadequate access to improved water and energy

resources. Appropriate interventions are required to reverse the trends in provisioning of adequate sanitation, water, energy and decent housing in order to comprehensively eradicate poverty and reverse the negative sustainable development trends.

Demographic changes

The burgeoning African population, expected to double by 2050, constitutes a significant threat to the achievement of sustainable development outcomes, due to increased demand for goods and services and excessive pressure on natural resources. Although progress is notable in the various supportive policies that foster sustainable population growth rates and investments in reproductive health, it will be critical to further intensify the ongoing investments in human and social development. Africa needs a population base that is well educated with the right skills mix, to meaningfully contribute to the achievement of sustainable development goals. At the current rapid urbanization rate, critical challenges are foreseen for many cities in terms of guaranteeing access to basic services such as water and sanitation and adequate housing, transport and security. The escalating challenges of food and water shortages, poor infrastructure and housing that African cities face require specific attention to reducing the proportion of slum dwellers and strategies to address the attendant social, economic and environmental threats to well-being and the natural resource base.

State of the economy

Africa has recorded mixed trends in macroeconomic performance, value addition and contribution of tourism. The continent continues to make progress in economic growth. This is spurred by the adoption of appropriate policies, improved macroeconomic management and overall economic governance. However, not many countries are sustaining the benefits of economic progress from social and environmental outcomes. There is a strong desire to make African economies globally competitive and sustain high economic growth rates in order to ensure improved living standards. Any transformation to this end must ensure equity, inclusiveness and environmental sustainability. The global economic crisis of 2009 had significant but varying impacts on African economies. Recovery has been fast, mainly propelled by a rebound of commodity prices, steady flow of remittances and rise in foreign direct investment. Efforts should be made to ensure tracking of both the positive

economic performance and any underlying depletion of the natural resource base and resultant poverty reduction outcomes. For a more robust, diversified and sustainable economic development, diverse opportunities in manufacturing value addition and sustainable tourism development will be crucial.

Sustainable consumption and production

Africa is making steady progress in sustainable production, but significant efforts are still needed to ensure sustainable consumption to meet the basic needs of a growing population and the demands of an increasingly affluent middle class. The concept of sustainable consumption and production is relatively new in Africa and has not been adapted fully, especially at local levels. Poverty reduction means improving welfare and the quality of life and involves an increase in consumption, in particular food, shelter, energy and water, all of which are extracted from the environment. Other effects of the food production and consumption chain include the impact of transportation, processing, packaging and retailing of food and the food wastes generated at the point of consumption. The burgeoning African middle class is a clear target for SCP campaigns. To achieve SCP objectives, Africa must address such organizational challenges as poor institutional capacity and many system-wide flaws such as lack of monitoring, inadequate capacity and lack of consumption and production models.

Social equity and opportunities

Inequality in Africa remains a challenge, in particular with respect to income distribution and outcomes of economic development. The assessment reports wide disparities between subregions, States, gender groups, age groups and other categories in terms of income and employment opportunities. Progress is being made in overall empowerment of women showing positive trends in equitable gender distribution of opportunities in education, health and civil liberty, but much remains to be done. Thus, further attention to women and youth participation in sustainable development through targeted equitable access to education and employment opportunities will be desirable.

Education

Gains have been made in human resource development, which are important for the capacity of society to re-

spond to challenges and opportunities for wealth creation and social sustenance. Improvements are clear in enrolment, gender parity, completion of basic education and education coverage. Though progress is slow, this overall positive trend indicates that Africa is on the path to meeting the primary education-related targets. However, challenges persist in terms of quality of education. Progress in adult literacy is also slow, with indications of inability to meet the 2015 targets, and persistent major gender disparities. Development interventions must recognize the linkages between education and culture as key ingredients of transformation. In this regard, appropriate policies in educational and cultural areas are being designed with a view to shaping Africa's future, including through its own model of knowledge societies. African Governments and regional agencies should continue to undertake curriculum and educational systems renewal at various levels. This should include the development of local content, teaching and learning materials.

Health

The increased burden of health challenges, including diseases, is slowing progress towards sustainable development. There is progress towards reduction of maternal and child mortality in many countries, but not fast enough to meet the 2015 targets. There is marked improvement in combating major diseases like HIV/AIDS and malaria, although the 2015 targets will mostly not be reached. In recognition of the link between health outcomes and sustainable development, African Governments are focusing on the underlying causes of maternal and infant mortality, as well as morbidity associated with principal diseases like HIV/AIDS and malaria. It is desirable to enhance the ongoing improvements in broad-based primary health care and intensification of prevention and control of communicable and non-communicable diseases.

Agriculture, food security and nutrition

The performance of agriculture as a key element of sustainable development is mixed. While progress has been made, resulting in increased agricultural production, structural transformation of the agriculture sector is still insufficient. High value products and transformation of raw materials are still not evidenced in the agriculture sector, preventing it from fully serving as an engine of growth. Efforts are being made to turn around current unsustainable agricultural methods by adopting sustain-

able practices that enhance productivity and competitiveness and do not harm natural resources. Although the proportion of the population below the minimum level of dietary energy consumption is declining, the absolute number of undernourished people has increased. Food security, nutrition and health goals will only be achieved if Africa improves real food supply by increasing agricultural productivity on existing land, reducing food waste and improving distribution of and access to food.

The natural resource base

There is continued depletion and degradation of Africa's natural resource base, undermining the fight against poverty. This is caused, inter alia, by unsustainable forest exploitation with worsening forest area loss and degradation. There is also growing evidence of difficulty in achieving sustainable water resources management as more and more people are living in water-stressed environments, and appropriate technologies for improved water use are adopted at a slow pace across sectors such as agriculture, industry, tourism and domestic application. Land degradation continues to be a critical constraint for sustainable development in Africa, caused inter alia by unsustainable agricultural practices and agricultural land expansion, insecure land tenure, and increasing demand for agricultural land-based products. Although responses are increasing, biodiversity continues to decline; the pressures upon it are increasing and the benefits derived by humans diminishing. The sustainable exploitation of mineral resources remains a challenge with limited value addition, marginal benefits to people, and continuing environmental degradation. Efforts to sustainably manage natural resources should be stepped up to ensure economic, social and environmental benefits for all now and in the future. Research and development, technological innovation and value addition are important in this regard.

Energy

There is a general stagnation in sustainable energy development as access to modern energy services that are affordable, clean, reliable and safe continues to elude the majority of Africans. Although Africa has a great potential for both renewable and non-renewable energy, such potential remains largely untapped due to limited investments and high risks. The exploitation of renewable energy in particular remains low, also due to limited implementation of policies that support renewable

energy exploration and adoption. Despite its great potential, there are mixed achievements in energy security for sustainable development, and Africa remains a net importer of oil. The energy intensity of Africa's economy has shown no significant improvement, with limited adoption of energy efficient technologies, while energy poverty is soaring. The link between energy and internationally agreed development commitments, including the MDGs, points to the need to integrate energy service provision into social and economic development policies.

Climate change

Climate change remains a key challenge to Africa's sustainable development efforts due to the region's reliance on climate sensitive sectors for its development. Africa's economies are increasingly vulnerable as the cost of adaptation and mitigation continues to escalate. Furthermore, despite its relatively low contribution to global warming, Africa's greenhouse gas emissions are on the rise. In particular, land use and land-use change, including deforestation, are major greenhouse gas sources in the region. Though still low compared to other regions, Africa's share of CDM projects is steadily rising, but the limited funding for adaptation and mitigation continues to constrain sustainable development efforts. Adaptation to climate change remains important with significant adjustments needed in natural and human systems. For Africa, adaptation is more important than mitigation and is of immediate concern. While support from developed countries will remain critical to adaptation and mitigation measures, comprehensive responses and management efforts require that African countries fully integrate climate change into development planning and poverty reduction strategies.

Natural disasters

There has been an increase in the number, severity and frequency of natural disasters. This is increasingly slowing down or disrupting progress towards sustainable development. More and more people, particularly the poor, and ecosystems are becoming vulnerable over time, unleashing greater economic, social and environmental impacts. Efforts should focus on monitoring, early warning systems and building people's capacity to respond to natural disasters. Transboundary efforts and resilience frameworks are also desirable.

Financing sustainable development

There is a steady rise in the level of funding for sustainable development in Africa, though there remains a considerable gap in the financing needs for sustainable development. There is an increasing reliance on domestic resources but the progress is yet to be sustained. While foreign direct investment is on the rise, it continues to be hampered by high risks, including governance challenges. Official development assistance to the region is on the decline. The requirements for financing sustainable development in Africa entail the deployment of resources to implement social, economic and environment management programmes, taking into account the MDGs and other internationally agreed development goals. The estimated cost of these programmes should of necessity be adjusted due to the anticipated cost of responding to the impacts of climate change.

Part II: Contribution of selected sectors to sustainable development and growth in Africa

Forests

Forests play a vital and significant role in the livelihoods and economies in the region. As such, they are crucial for Africa's sustainable development. The continuing loss of forest cover in Africa remains a cause for concern. Expansion of agriculture and settlements, illegal logging, extraction of wood for firewood and charcoal, and uncontrolled bush fires pose serious threats to forests. Recent policy, legal, institutional, technical and economic constraints also impede efforts for SFM. However, significant paradigm shift is under way with many success stories in sustainable forest management. These are aimed at reversing the trend of forest area loss and achieving sustainable forest management in the region. There is need to scale up these initiatives which include afforestation programmes, expansion of planting in riparian areas, urban settlements and cultivated areas and forest area protection.

Biodiversity

Biodiversity is important and its continued loss has serious implications for development throughout the region. Continuing with "business as usual" will jeopardize the future of all human societies, and none more so than the poorest that depend directly on biodiversity for a particularly high proportion of their basic needs. The loss of biodiversity represents not only a diminish-

ing resource base for the region but also a reduction in opportunities for addressing many of the development challenges facing Africa. Continued failure to slow current trends has potential consequences even more serious than previously anticipated and future generations may pay dearly in the form of ecosystems incapable of meeting the basic needs of humanity. The overarching challenge for Africa in the coming decades will be finding an appropriate balance between development and the conservation and sustainable use of biodiversity.

Biotechnology

Biotechnology has contributed and holds an enormous potential in contributing towards the sustainable development agenda in Africa. Applications in traditional, new and emerging biotechnologies provide opportunities for poverty alleviation, enhanced food security, industrial competitiveness and the promotion of sustainable use of natural resources. African countries are encouraged to adopt proactive strategies that will optimize harnessing of the economic, health, environmental and industrial benefits from biotechnology and management of potential challenges, risks and tradeoffs associated with the adoption, development and deployment of the technology. There is need for policy decisions and actions at the national and regional levels to be informed by science-based evidence taking into account domestic realities and challenges.

Mountains

There is substantial value in African mountain areas and their conservation is critical to sustainable development. The sustainable use of fragile mountain resources is possible, provided good management systems, technologies and practices are used during implementation of relevant and well developed programmes, projects and activities. A deeper understanding and appreciation of the benefits of ecosystem conservation accompanied by availability of alternative sources of livelihood, and involvement of the indigenous people and local communities in the management of mountain ecosystems has been shown to help reduce resource-use conflict and promote sustainable development in mountain regions. There are pertinent interlinkages between the various components of mountain ecosystems and resources and the use or management systems subjected to them. Our understanding of these interdependencies may foster synergized implementation of initiatives to achieve sustainable development in the mountain regions of Africa.

Tourism

With developments in the travel and tourism industry, Africa has the opportunity to capitalize on its advantages which include price competitiveness, a strong affinity for tourism and rich natural and cultural resources supported by efforts towards environmental sustainability. However, a number of obstacles remain to develop the sector, notably improving safety and security, upgrading health and hygiene levels, developing infrastructure and access to African sites and fostering the region's human capital. Improvements in these areas would help to harness the sector's potential to contribute to sustainable development in the region. The vast potentials of the tourism industry to contribute positively to the future of African economies cannot be overstated. It however will need to be given the prominence it deserves and will involve the concerted efforts of various stakeholders using relevant evidence and data to promote its development.

Harnessing interlinkages for sustainable development

Africa occupies an increasingly central position in the global political economy because of its natural re-

sources, in terms both of minerals and other land-based resources, and has now an unprecedented opportunity for transformation and sustained growth. Addressing the sustainable development needs of the continent by harnessing the inherent interlinkages presents both opportunities and challenges. Even as the interlinkages become apparent and necessary to integrate, resource productivity will become a key driver for economic development in the continent. However, there is a huge disparity between this natural wealth base and the benefits accruing to African countries. Governance systems reforms with interlinkages perspectives at all levels, including local resource management can improve the protection and restoration of habitats, forests, mountains and other natural resources and watersheds through effective coordination and planning. The various approaches for addressing interlinkages in sustainable development require adaptive governance that promotes flexibility, policy cohesion, cooperation and learning to cope with the challenges of integrated development and governance requirements.

1. Introduction

1.1 Background

Africa has enjoyed relatively high growth rates since the last decade, although it still remains the poorest region in the world with heavy reliance on natural resources. Natural resources, especially land, water, forests, plant and animal diversity, renewable energy sources and related ecosystem services are fundamental for improving livelihoods and achieving sustainable development in Africa (Sanginga and others 2010). Africa is endowed with a very rich and diverse natural resource base on which the livelihood of its people, especially the rural population, depends. Although Governments are placing pro-poor economic growth and environmental sustainability at the heart of their economic policies, planning systems and institutions (UNEP 2008), there persists a paradox. Africa remains one of the most vulnerable continents with deepening poverty levels and worrying trends of degradation of natural resources (Campbell 2009; Comim and others 2009).

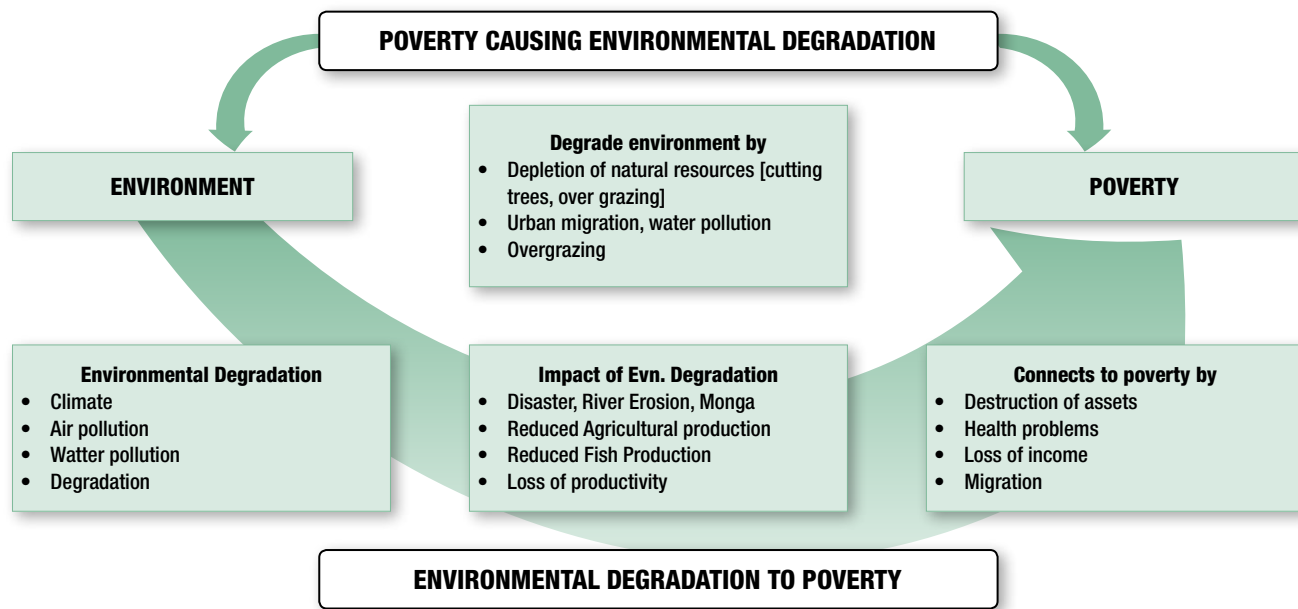
Poverty eradication in Africa heavily depends on the use of its natural resource base for the benefit of its people. There is a strong feedback relationship between poverty and natural resource degradation. The World Bank (2007) identifies key lessons concerning linkages between poverty and the environment with a focus on the contribution of environmental resources to household welfare. Figure 1 illustrates the causal links between poverty and environmental degradation.

Sustainable development demands a reversal of natural resource exploitation with little value-addition, which results in environmental degradation and natural resource depletion, with marginal benefits accruing to countries. It is essential to understand the contribution of Africa's natural resources to her poverty reduction and sustainable development goals. How natural resources such as land, water, minerals, biodiversity, forests and mountains are used for the benefit of all, now and in the future, determine the continent's trajectory towards sustainable development.

The underlying theme of this Fourth issue of the Sustainable Development Report on Africa (SDRA-IV¹) is "Managing Africa's Natural Resource Base for Sustainable Growth and Development, focusing on five themes: biodiversity, forests, biotechnology, mountains and tourism". The report makes the assumption that sustainable development outcomes depend

¹ SDRA-IV is a joint publication of the United Nations Economic Commission for Africa (ECA), the United Nations Environment Programme (UNEP), the Secretariat of the Convention on Biological Diversity (CBD Secretariat) and the Food and Agriculture Organization (FAO).

Figure 1: Causal links between poverty and environmental degradation



Source: Chowdhury and Ahmed (2010)

on using key natural resources in ways that ensure continued and equitable benefits. The report also takes an integrated and interlinkages approach to assessing the five thematic issues, which are interconnected in ways that affect outcomes of poverty eradication and sustainable development.

Africa's biodiversity supports multiple human and ecological processes due to its intrinsic value and serves as a source of myriads of goods and services. African forest resources supply wood fuel, timber and non-timber products for the rising population, urbanization and raw materials for industrialization while employing a large proportion of its population in the primary production of forest goods. In rural areas, many people rely on forests for food and as safety nets for supplemental income. The application of science and technology innovations (STI), especially biotechnology contributes to poverty reduction, food production assures many health benefits and supports environmental sustainability objectives. In Africa, tourism is on the upward trend bringing many economic, social, environmental and cultural benefits to countries and local populations in terms of employment and diversified livelihood opportunities. By their very nature of high relative relief and steep slopes, mountains in Africa are significant to livelihoods and serve as regulators of ecosystems cycles.

Part I of the report assesses progress towards sustainable development in the region, using an indicator set that

covers the economic, social and environmental pillars, as well as those relating to governance, which is considered overarching and indispensable to achieving sustainable development. Part II explores the contribution of five sectors, namely - biodiversity, forests, biotechnology, tourism and mountains to Africa's growth and poverty reduction. These sectors constitute the thematic cluster of issues in the 2011-2012 programmatic cycle of the United Nations Commission on Sustainable Development (CSD). See Box 1 for issues covered in the previous editions of the SDRA.

SDRA-IV addresses issues that are relevant to key outcomes of the United Nations Conference on Sustainable Development (Rio+20) which was convened to review progress in the implementation of sustainable development commitments, assess gaps and address new and emerging challenges. Discussions at Rio+20 focused on two themes: a green economy in the context of sustainable development and poverty eradication; and the institutional framework for sustainable development. Rio+20 rekindled and heightened political commitment to sustainable development. The cluster of issues discussed in the second part of this report offers insights into how growth in the sectors is being harnessed to ensure that it is inclusive, resource efficient and employment creating, thus contributing to sustainable growth and development.

On the second theme of Rio+20, it is a well-established fact that effective governance in the natural resource

Box 1: Previous issues of the SDRA

Launched in the 2004-2005 biennium, the SDRA is one of ECA flagship publications, which it produces jointly with sister United Nations agencies and African regional and subregional organizations. The SDRA serves as an important medium for monitoring and assessing sustainable development in Africa. It promotes a balanced integration of the three pillars of sustainable development. The three previous issues were produced under the following themes:

- SDRA-I: Managing Land-Based Resources for Sustainable Development (2004-2005);
- SDRA-II: Five-Year Review of the Implementation of the World Summit on Sustainable Development Outcomes in Africa (2006-2007); and
- SDRA-III: Sustainable Consumption and Production for Sustainable Growth and Poverty Reduction (2008-2009).

The publications can be accessed at: <http://www.uneca.org/publication-list>

sector requires institutions that are capable of guiding sustainable development and management of resources, including the promotion of cross-sectoral planning and implementation. Rio+20 discussed ways of reforming the global institutions to promote the balanced integration of the three pillars and to strengthen environmental governance within the institutional framework for sustainable development. This report highlights the interlinkages among the various sectors and the need for harnessing synergies through their sustainable development and management.

1.2 Purpose and scope of this report

The objective of the fourth issue of the SDRA is to provide a holistic assessment of the status of sustainable development in the region using indicators that cover the social, economic and environmental pillars as well as its governance dimension. In doing so, it adopts an integrated assessment approach to demonstrate interlinkages and makes a case for a balanced integration of the three pillars. The report is also intended to provide an analysis and showcase the contribution of forests, biodiversity, biotechnology, tourism and mountains to sustainable growth and development in the region. It highlights best practices, challenges and lessons learnt. It also outlines policy recommendations to enhance sustainable development and management of these valuable resources and sectors.

The assessment in this report is in keeping with the overall goal of the SDRA, which is to serve as an important medium for monitoring and assessing sustainable development in Africa. The report is targeted at African

countries, regional and subregional organizations and all partners. The aim is to spur actions necessary to accelerate progress towards achieving sustainable development in Africa. It is also intended to guide African countries in developing policies and programmes on sustainable development and to inform their deliberations and positions in relevant sustainable development forums.

1.3 Methodology

ECA led the preparation of Part I of the report. In this regard, ECA commissioned the development of a Sustainable Development Indicator Framework and Indicator Set for Africa. The draft framework and accompanying set of indicators were extensively discussed at a regional consultative workshop held in March 2011 in Addis Ababa² which was attended by experts from economic, social, environmental and statistics institutions of member States, as well as regional and subregional organizations and sister United Nations Agencies. The workshop endorsed the proposed framework and enriched the compendium of indicators.

The set of sustainable development indicators for Part I of the SDRA IV was based on the outputs of the consultative workshop. The indicators cover the three pillars of sustainable development (economic, social and environmental) as well as the governance dimension. The framework also takes into account internationally agreed goals, targets and indicators, such as the Millennium Development Goals (MDGs), which Africa has endorsed. While not covering all the proposed themes and sub-themes, the framework adequately reflects pri-

² The report of the Regional Consultative Workshop on Sustainable Development Indicator Framework for Africa can be found at: http://www.uneca.org/eca_programmes/sdd/events/Rio20/WorkshopIndicator.asp

ority sustainable development issues for Africa. It is aimed at providing an evidence-based and integrated assessment of the status and trends of sustainable development. A detailed statistical analysis was undertaken to cover the selected indicators and related subregional and country level variables. Relevant data were compiled from various national and international sources and databases for tracking progress in various themes and sub-themes. The statistical analysis report was presented for validation and enrichment at the Ad-hoc Expert Group Meeting (AEGM) convened in Addis Ababa from 14 to 16 December 2011. The full compendium of the statistical analysis has been published as a separate technical document. The AEGM also provided a forum for expert and institutional peer review of the SDRA.

The assessment framework is adapted from existing monitoring frameworks such as the sustainable development indicators process of the United Nations Department of Economic and Social Affairs (UNDESA), the Africa Environment Outlook (AEO) of UNEP and the Human Development Index of the United Nations Development Programme (UNDP) taking into account priority sustainable development issues for the region. ECA and sister United Nations agencies led the preparation of the thematic chapters in Part II of the report as follows: FAO - Forests; the CBD Secretariat - Biodiversity; ECA - Biotechnology; and UNEP - Tourism and Mountains. ECA also took the lead in preparing the Interlinkages chapter which was informed, among other things, by resources and inputs on interlinkages among the five thematic areas provided by all partner institutions.

Part I and the thematic chapters were reviewed at the AEGM of December 2011. They were revised on the basis of comments and inputs provided at the AEGM as well as subsequent observations and comments aimed at further refining the products. ECA then consolidated the report and circulated it for internal and external peer review. The report was finalized taking into account the comments and inputs provided through the final peer review process.

1.4 Limitations of the report

The assessment team recognizes some process and technical limitations of this report. Obtaining good quality and comprehensive data is critical to measuring progress towards sustainable development.

At the national, subregional and regional levels gaps exist on many indicators, making it difficult to present comparative trends in sustainable development indicators and sectors. There are significant data paucity with regard to completeness, comparability, indicator delimitation and quality. The assessment used both national and international databases in an attempt to fill the gaps. Even for available data, there are serious limitations with respect to reliability and comparability as well as disaggregation. Several indicators, for instance, are not adequately desegregated geographically or by gender and age group, thus limiting the extent to which various sustainable development dimensions can be explored. Furthermore, the type of data available does not make for an integrated assessment, being often sectoral in nature.

There is therefore a need to strategically invest in data capture, storage and sharing as well as capacity at all levels in order to complement existing measurements of progress, including Gross Domestic Product (GDP).

Finally, the thematic clustering does not adequately allow for overlap between and within themes and sub-themes some of which do not fall neatly under the assigned categories. For instance, while access to energy is a critical dimension of poverty, it could also be addressed under the energy theme. Whenever possible, linkages across the themes and sub-themes were drawn in the analysis, with a view to foster an integrated approach to assessing sustainable development.

1.5 Organization of the report

This report is divided into two parts. Part I provides a holistic assessment of the status of sustainable development in the region focusing on the following priority themes: governance; poverty; demographic changes; state of the economy; sustainable consumption and production; social equity and opportunities; education; health; agriculture and food security and nutrition; the natural resource base; energy; climate change; natural disasters; and financing sustainable development. While not covering all sustainable development issues, the 14 themes adequately reflect priority sustainable development concerns for the region.

Part II provides a critical analysis of the contribution of biodiversity, biotechnology, forests, tourism and moun-

tains to growth, poverty reduction and sustainable development in the region. In doing so, it highlights best practices, challenges, lessons learnt and policy recommendations to enhance management of the sectors and their contribution to sustainable growth and development.

The final chapter discusses the interlinkages among the various sectors and illustrates how synergies among them could be harnessed for sustainable growth and development through policy coherence, science and technology, adaptive management and broad-based governance. The chapter highlights cases of achievements made in addressing the interlinkages and cross-cutting issues as well as implementation challenges and constraints. It concludes by providing recommendations to foster their integrated development and management.

PART I

Assessing Progress Towards Sustainable Development in Africa

Key Messages

Assessing Progress Towards Sustainable Development in Africa

Progress on governance on the continent remains mixed: evidence abounds on improvements in the rule of law and economic governance, while progress in resolving conflicts in the region has been uneven, with several countries remaining relatively unstable. With marked improvements in political governance and institutional reforms, Africa continues to register progress that should provide a basis for economic, social and environmental sustainability. Steps towards improving governance at various levels are yielding incremental advances in coherent and integrated policies as well as a reduction of overlaps in institutional mandates. Africa recognizes that good governance and institutions are critical to achieving sustainable development, including poverty eradication. The region should therefore continue its efforts towards deepening political and economic governance and institution building.

Countries have realized that an increase in GDP alone does not truly reflect economic well-being, recognizing that poverty goes beyond income and includes access to safe and affordable basic services. Eradicating poverty remains the overarching sustainable development priority for the region. Africa has not seen the expected overall significant and sustainable reductions in income poverty, with several countries registering only marginal declines in the proportion of people living below the poverty line. Few countries are on the path to achieving the Millennium Development Goal (MDG) target by 2015. Although considerable progress is reported in access to basic services such as safe drinking water, not much progress has been made in the sanitation sector. There are also worrying trends regarding access to energy and decent housing which, in addition to improved sanitation and adequate water, are necessary to comprehensively eradicate poverty and reverse the negative sustainable development trends.

Although there is encouraging progress in supportive policies to harness the benefits of demographic changes, rapid population growth and unplanned urbanization constitute threats to sustainable development in the region. The burgeoning African population, expected to double by 2050, is a significant challenge to achieving sustainable development outcomes. Investments in human and social development can contribute to managing the potential negative impacts of unsustainable population growth rates – in particular, by ensuring a population that is well educated and has the right skills mix to adequately respond to the social, environmental and economic challenges of each country. These factors can

help the region to harness the demographic dividend for high and sustained economic growth, provided that the economy generates enough quality jobs for the additional labour force.

In terms of the state of the economy, Africa has recorded mixed trends in macroeconomic performance, value addition and the contribution of tourism. The continent continues to register marked progress in economic growth. Many countries have put in place economic development policies aimed at improving living standards. There is improvement in macroeconomic management and overall economic governance. However, not many countries are sustaining the benefits of economic progress in terms of social and environmental outcomes. There is a strong desire to make African economies globally competitive and sustain high economic growth rates in order to ensure improved living standards. Any transformation to this end must be mindful of ensuring equity, inclusiveness and environmental sustainability.

Africa is making steady progress in sustainable production, but significant efforts are still needed to ensure sustainable consumption to, at the same time, meet the basic needs of a growing population and the demands of an increasingly affluent middle class. The concept of sustainable consumption and production is relatively new in Africa and has not been adapted fully, especially at local levels. Poverty reduction requires improving welfare and the quality of life and involves increase in consumption, in particular, food, shelter, energy and water, all of which are extracted from the environment. Thus, the challenge for Africa is to produce and consume more, but sustainably. The establishment and operationalization of national cleaner production centres (NCPCs) should be encouraged to strengthen institutional efforts in sustainable production.

Economic growth in Africa is yet to translate into real employment creation and improved labour productivity for various social groups. Inequality in Africa remains a challenge, in particular with regard to income distribution and outcomes of economic and social development. The state and trends in social equity therefore remain mixed. There are wide disparities between subregions, States, gender groups, age groups and other categories in terms of income and employment opportunities. Progress is being made in overall empowerment of women showing positive trends in equitable gender distribution of opportunities in edu-

cation, health and civil liberty, but much remains to be done. Thus, further consideration for women and youth participation in sustainable development through targeted policies and equitable access to education and employment opportunities will be desirable.

Gains have been made in human resource development, which is important for the inherent capacity of society to respond to challenges and harness opportunities for wealth creation as well as social sustenance. There are mixed results on progress towards education targets. Improvements are clear in enrolment, gender parity, completion of basic education and adult literacy, although progress is slow. Moreover, challenges in terms of the quality of education persist. Progress in adult literacy is also slow with indications of inability to meet the 2015 targets and persistence of major gender disparities. Appropriate policies are needed to shape Africa's future, including the development of education curricula at all levels to equip the population with the skills required for transformation towards sustainability.

The increased burden of health challenges, including diseases, is slowing progress towards sustainable development on the continent. There is progress towards reduction of maternal and child mortality in many countries, but the rate of improvement is not enough, thus making it difficult to meet the related 2015 MDG targets. There is a marked improvement in combating major diseases like HIV/AIDS and malaria, although the 2015 targets will most likely not be met. Despite significant progress in health programmes, Africa still reels under a severe health burden occasioned by weak health systems and prevalence of communicable and non-communicable diseases, high mortality, recurrent epidemics and humanitarian crises. It is important to enhance the ongoing improvements in broad-based primary health care and intensification of prevention and control of communicable and non-communicable diseases.

Sustainable development in Africa will continue to rely heavily on success in agricultural productivity, which is essential to increasing overall economic growth and meeting the MDGs related to reducing poverty and hunger. However, the performance of agriculture as a key element of sustainable development is recording mixed results and trends. While some progress has been made in increased agricultural production and agricultural transformation, efforts are still insufficient. High value products and transformation of

raw material still do not constitute a significant element of the sector, thus hampering it from achieving its full potential as an engine of growth. There is nonetheless a positive move towards adopting sustainable agricultural practices through less resource-intensive agricultural technologies. Food security and nutrition in Africa remain linked to agricultural production. Although the proportion of the population below the minimum level of dietary energy consumption has declined, the absolute number of undernourished people has increased in the region. Food security, nutrition and health goals will only be achieved if Africa increases real food supply through structural transformation of the agriculture sector, sustainable agriculture, reducing food waste and improving distribution of and access to food.

There is continued depletion and degradation of Africa's natural resource base. This is caused, inter alia, by unsustainable forest exploitation with forest area loss and degradation worsening. There is also growing evidence of difficulty in achieving sustainable water resources management as more and more people are living in water-stressed environments. Moreover, appropriate technologies for improved water use are being adopted at a slow pace across sectors such as agriculture, industry, tourism and domestic application. Land degradation caused by, inter alia, unsustainable agricultural practices, land use change, insecure land tenure and increasing demand for agricultural land-based products, continues to critically constrain sustainable development in Africa. Biodiversity continues to decline due to increasing direct and indirect pressures. Harnessing the benefits of Africa's minerals remains a challenge with limited value addition, marginal benefits to the population and continued environmental degradation. Value addition, research and development as well as technological innovation should be enhanced for the natural resource base to continue supporting economic and social transformation.

There is general stagnation in sustainable energy development and the majority of Africans still do not have access to modern energy sources that are affordable, clean, reliable and safe. Although Africa has a great potential for both renewable and non-renewable energy, such potential remains largely untapped due to low investments and perceived high risks. Moreover, the limited adoption and implementation of policies to support the exploitation of renewable energy sources hampers development in the sector. Despite great potential, there are mixed achievements in energy security

and the continent remains a net importer of oil. Africa's economy continues to be energy-intensive, with limited improvements in terms of sustainable exploitation of natural resources and application of energy efficient technologies, while energy poverty is still rife. A sustained political focus is needed to keep up the momentum of making energy access a development priority.

Climate change remains a key challenge to Africa's sustainable development efforts. Its negative impacts are already being felt owing to increasing vulnerabilities and the increased social, economic and environmental cost of adaptation and mitigation. Despite its relatively low contribution to global warming, Africa's greenhouse gas emissions are on the rise. In particular, land use and land use change, including deforestation, represent a major source of greenhouse gases in the region. Though still low compared to other regions, Africa's share of Clean Development Mechanism (CDM) projects is steadily rising, which may contribute to lowering emissions. However, limited funding for adaptation and mitigation continues to constrain sustainable development efforts. While the support of developed countries remains critical to adaptation and mitigation measures in the region, African countries should be fully integrating climate change into development planning and poverty reduction strategies.

There has been an increase in the number, severity and frequency of natural disasters. This is slowing down or disrupting progress towards sustainable development. Sustainable management of natural disasters has become a significant challenge as more disasters are recorded. The frequency and severity of natural disasters, as well as vulnerability levels, have been on the increase with the poor and sensitive ecosystems most affected, resulting in greater economic, social and environmental impacts. Efforts should focus on early warning systems and building the capacity of the population to respond to natural disasters. Transboundary efforts and resilience frameworks are also desirable.

There has been a steady rise in the level of funding for sustainable development in Africa, though there remains a considerable shortfall in financing needs. There is increasing reliance on domestic resources, but more efforts are needed to sustain this trend. While foreign direct investment is on the rise, it continues to be hampered by high risks, such as governance challenges. The level of official development assistance (ODA) to Africa is on the decline. The requirements for financing

sustainable development in Africa entail the deployment of resources to implement social, economic and environmental sustainability initiatives, taking into account the MDGs and other internationally agreed development goals. The estimated cost of these initiatives should be adjusted due to the anticipated cost of addressing climate change challenges.

2. Assessing Progress Towards Sustainable Development

2.1 Drivers of change: An integrated and sustainability perspective

Efforts towards sustainable development are primarily driven or hampered by underlying driving forces, including demographic changes, economic processes, scientific and technological innovations, distribution patterns, and cultural, social, political as well as institutional processes (UNEP 2010b). The pressures on natural resources and on social and economic systems increased over the past decade, and scenarios of the future also project intensification of these changes (UNEP 2006; IPCC 2007). This has led on the one hand to increased pressure to move on a sustainable development path and, on the other hand, to additional challenges in the transition.

Demographic changes are imposing great pressure on natural resources through, inter alia, population increase and movement of human beings between urban and rural areas as well as across territorial boundaries (Basten and others 2011). Since 1990, Africa's population has increased by 34 per cent, driven by changing fertility rates and other demographic patterns. The increase in population leads to increasing pressure on Africa's natural resources and a shrinking natural resource base. For instance, the per capita land size (Figure 2) has been on a steady decline since 1990 as the population increased, with the population expected to surpass the 1.5 billion mark by 2030 (UNFPA 2010). There is therefore an urgent need to harness the potential of an expanding population, while at the same time managing the risks associated with it. Urgent measures are needed to capitalize on Africa's demographic dividend, through increased and sustained investments in health and education, particularly for women, the girl child, the youth and disadvantaged social groups, with a view to enhancing the continent's competitive advantages. Appropriate social, urban planning and macroeconomic policies should strengthen these measures.

Economic growth is a core component of developing sustainable communities and it indicates a stable quality of life as economic changes influence processes and patterns of production and consumption. Regional economic activity increased several fold between 1990 and 2010 (ECA and AUC 2011) but real GDP growth has been fluctuating (Figure 3). Other economic issues that drive sustainable development include domestic economic policies such as taxes, subsidies, international trade flows and other policies that change the diffusion of more efficient technologies and practices.

Figure 2: Projections of population and related changes in per capita land size



Source: Based on 2008 UN world population projections

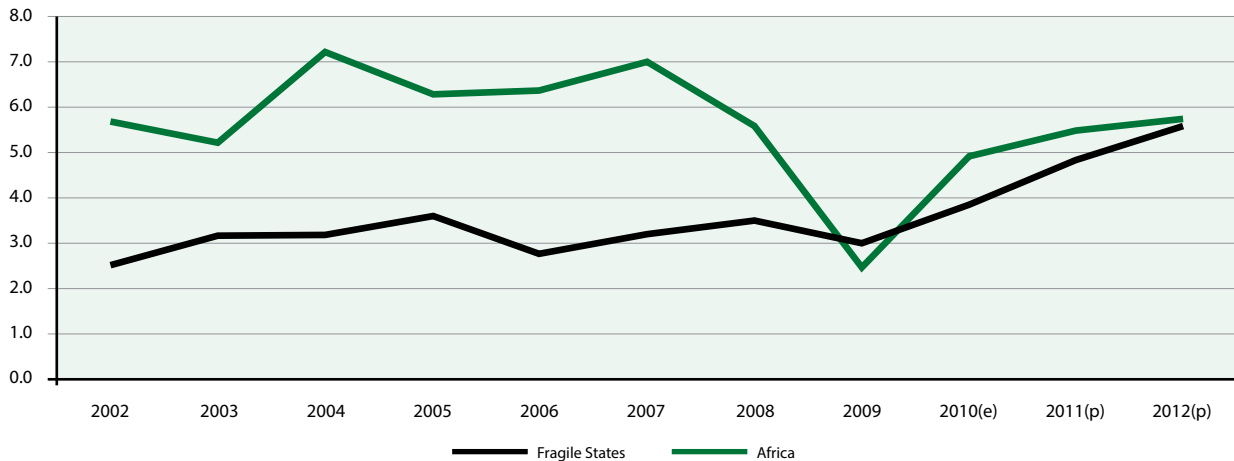
Culture and tradition dictate the choices made by communities on use and conservation of natural resources.

Culture, in all its dimensions, is a key factor in sustainable development as a repository of knowledge and sector of activity, through tangible and intangible heritage, creative industries and various forms of artistic expressions. In Africa, culture is a powerful contributor to sustainable economic development, social stability and environmental protection. Changes in lifestyle impose certain alterations in demand for goods and services due to changing consumption patterns. Aspects of societal changes like education, health and religion also dictate the patterns of natural resource use and hence their conservation and contribution to poverty eradication and sustainable development. Africa has diverse cultures and now faces the pressure of globally and locally driven social changes with significant implications for natural resources and efforts to secure sustainable development.

Technological innovation and other scientific advancements have been critical drivers of the trends in sustainable development (Juma and Serageldin 2007). Technological changes include the increasing role of information and communications technologies which have value for natural resource management, general development application and knowledge management for

sustainable development. Other technological changes which drive sustainable development include adoption of biotechnology and general science and technology innovations (Juma and Serageldin 2007). Furthermore, efforts towards green growth are gaining impetus in Africa with focus on green technology and technology transfer for leapfrogging to ecologically sensitive social and economic transformation.

In addition, **climate change is projected to continue to affect Africa in ways that interlink with several sustainable development and natural resource management spheres.** Africa's share of greenhouse gas emissions was 3.8 per cent, while it had 13 per cent of the world population (IPCC 2007). The climate change debate needs to be better framed as a sustainable development problem rather than only a climate mitigation issue. This would ensure that the priority goals of developing countries, and particularly Africa, are better addressed, while acknowledging that the driving forces for emissions are linked to the underlying development path (IPCC 2007), including patterns of human settlement and vulnerabilities of communities (Balk and others 2009) and ecosystems.

Figure 3: Real GDP growth

Source: AfDB and others (2011); IMF (2010)

Note: (e) = expected; (p) = provisional

2.2 Assessing Trends in Sustainable Development: A Thematic Review

2.2.1 The analytical and assessment framework

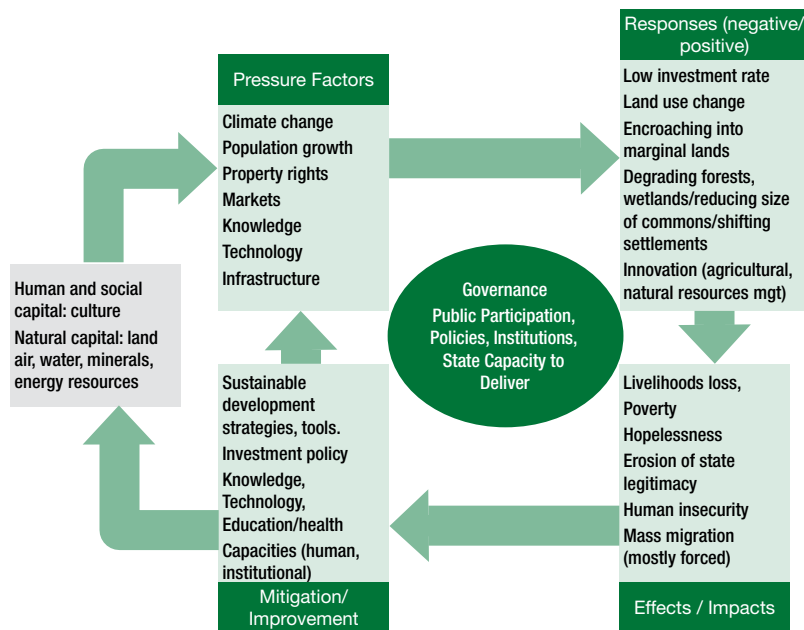
In order to make causal links explicit, the assessment uses the “pressure-response-effect-mitigation” (PREM) analytical framework also used in developing the African sustainable development indicators framework in combination with the issue-theme approach (ECA 2013). It is a modified form of the driving forces-state-impact-response framework used earlier by the United Nations Commission on Sustainable Development (UNCSD). The PREM analytical framework is an adaptation of the driving forces-pressures-state-impact-response (DPSIR) framework³. The analytical framework assumes that in highly natural resource-dependent economies, “the manner in which people use and manage natural resources for livelihoods is influenced by pressure factors: climate change, population growth, property rights, markets, knowledge, technology and in-

frastructure (both economic and social)” (ECA 2013a). In these economies, people and institutions respond to pressure factors by a variety of coping strategies with positive or negative implications for the resource base. Depending on the technology, knowledge, capacities and governance, the responses result in varying degrees of livelihood losses or gains as well as other development outcomes, including poverty and erosion of State legitimacy. Mitigation measures are thus considered to deal with the negative effects or impacts of the responses, including a broad range of sustainable development strategies which in turn have feedback effects on the use of natural resources. Central to all these relationships and loops is governance, which influences public participation, individual coping strategies, policies, and institutional processes and State capacity to deliver as illustrated in Figure 4.

The framework has been used as the underlying sustainable development toolkit for unearthing and analysing the trends and links between various indicators of natural resource management. It was fundamental in determining the considerations for identifying, defining and composing the indicators. The set of indicators was selected in line with the need to capture, in an integrated manner, progress under the three pillars of sustainable development – economic, social and environmental. The governance dimension of sustainable development, underlying efforts in all sectors and under the three pillars, has also been taken into account. In particular, the framework treats institutions and institutional processes as critical elements for progress towards sustainable development. Finally, the indicator set is selected to ad-

³ The DPSIR framework is in use in integrated environmental assessment and reporting processes such as *Africa Environment Outlook* and *Global Environment Outlook*. Driving forces are underlying factors influencing a variety of relevant variables. Pressure indicators describe the variables which directly cause social, economic and environmental problems. State indicators show the current condition of the society, economy and environment. Impact indicators describe the ultimate effects of changes of state. Response indicators demonstrate the efforts of society (i.e. politicians, communities, scientists and decision-makers) to solve the problems.

Figure 4: The pressure-response-effect-mitigation conceptual framework for indicator definition and sustainable development assessment



dress the information needs of various target audiences. Depending on data availability, the status and progress is presented at the regional and subregional levels. Where feasible, subject to data availability, cases are presented for national level achievements and challenges in relevant sectors.

The indicator set chosen for this assessment mirrors the revised indicators developed by UNCSA that contain a core set of 50 indicators (UNDESA 2007), bearing in mind existing internationally agreed goals, targets and indicators embraced by Africa. Building on the PREM framework, 14 priority themes for monitoring progress towards sustainable development have been identified, in consultation with member States and experts⁴.

Under the overall theme “managing Africa’s natural resource base for sustainable growth and development”, the fourth *Sustainable Development Report on Africa* focuses on a number of core themes and sub-themes that, while not covering all sustainable development issues in Africa, capture priority sustainable development concerns for the region. The themes are: governance;

poverty; demographic changes; state of the economy; sustainable consumption and production; social equity and opportunities; education; health; agriculture and food security; the natural resource base; energy; climate change; natural and man-made disasters; and financing sustainable development. For each theme and sub-theme, monitoring indicators have been selected, taking into account their relevance, effectiveness, reliability, ease of comprehension, conceptual soundness, capacity to show trend over time, and data availability. The selected themes and sub-themes provide a general yet comprehensive model of the priority areas to track, while the indicators allow a quantitative assessment of progress (see Annex I). The assessment framework also allows the undertaking of an integrated assessment, taking into account the multidimensional and integrated nature of sustainable development. Annex II illustrates the inter-thematic linkages and application of the PREM framework using selected indicators.

The assessment based on the PREM framework, selected themes, sub-themes and indicators, is presented in the rest of this chapter.

2.2.2 Governance

Good governance and institutions are critical to achieving sustainable development outcomes, including poverty eradication. While governance can be assessed from

⁴ ECA, jointly with the African Union Commission (AUC), the African Development Bank (AfDB), the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP), organized a workshop on the Sustainable Development Indicator Framework for Africa in March 2011. The workshop endorsed the proposed framework and enriched the compendium of indicators.

several aspects, this report explores critical elements of good governance in Africa and the extent to which they are already providing a basis for economic, social and environmental sustainability. The pursuance of sustainable development has benefited from the improved capacity of regional and subregional organizations to promote and undertake cross-sector implementation, assessment and reporting.

The African Governance Index (AGI) developed by ECA (ECA 2009) attempts to assess and monitor the progress on governance in Africa as well as to identify capacity gaps in governance institutions. Based on data from 35 countries, AGI combines 85 indicators spanning various aspects of governance in an aggregated index. The aspects considered are: political representation; institutional effectiveness and accountability; executive effectiveness; human rights and the rule of law; civil society organizations and the media; economic management; and control of corruption. Progress on governance on the continent remains mixed but evidence abounds of improvements in social inclusiveness, economic governance and public finance management, increasingly participatory natural resources management, decentralization and empowerment, and democratization with a resultant improvement in economic performance in Africa.

Political and economic governance

According to the second *African Governance Report* (ECA 2009), the core indicators of political representation and independence of civil society organizations and the media have shown a mixed result, with the former stagnating at 65 per cent and the latter recording a marginal increase of 2 percentage points from 53 per cent to 55 per cent between 2005 and 2009. Over the same period, there was marginal progress in observance of human rights (from 48 per cent in 2005 to 50 per cent in 2007) and the rule of law (49 per cent to 52 per cent) (ECA 2009). Despite these improvements, corruption

remains a major challenge in Africa. The corruption control index declined by 3 percentage points, from 48 per cent in 2005 to 45 per cent in 2007.

Progress towards good economic governance and public financial management is evident in many African countries, as shown in the analysis of the economic performance of Africa in the last decades (see Section 2.2.5). African countries have significantly increased their revenue mobilization capabilities (see Section 2.2.15), and more countries are adopting medium-term expenditure frameworks for their budgetary process. Although there is steady progress towards good governance, challenges remain in terms of corruption, integrity of the tax system, transparency and accountability (ECA 2009). Corruption may result in the loss of resources and habitats and the degradation of ecosystems, with direct and indirect effects on the livelihood of local communities. A number of sectors are particularly vulnerable to corruption, including forestry, illegal trafficking in endangered species, tourism, infrastructural development, water supply, oil exploitation, fisheries, and hazardous waste management. Corruption, left unchecked, may distort the enforcement of natural resource management regulations and laws by allowing unsustainable practices and disregarding activities in protected areas meant to conserve biodiversity, forests and mountains. The enhancement of transparency, accountability, democracy and good governance as well as the commitment of politicians and policymakers are indispensable requirements for strengthening the legal framework and relevant institutions and reining in wanton corruption. The challenges require continued institutional reforms and the creation of an enabling environment for private-sector development as well as capacity development. The report (ECA 2009) concludes that Africa's ability to achieve sustained structural transformation depends on the political commitment to support capacity building and to implement reforms that will allow effective use of the natural and human resources endowment.

	Indicator trend	Remarks on status and sustainability trends
Governance	↑	Overall positive improvement (albeit slow) in good governance and institutional reform, but more remains to be done
<i>Political governance</i>	↔	Mixed trends – with various subregions and countries showing different trends. Persistent challenges in terms of corruption, transparency and accountability
<i>Economic governance</i>	↑	Progress towards good economic governance and public financial management is evident in many African countries, and is reflected in Africa's strong economic performance
<i>Peace and security</i>	↔	Mixed results in peace and security. Generally positive trend but marked conflicts remain or are emerging in some subregions

Based on the indicators of political commitment and economic governance, including country policy and institutional assessment (CPIA) ranging from 1 to 6, there are differences in the quality of national policies and institutions. Between 2001 and 2008, the average CPIA score for sub-Saharan African countries increased by 0.1 (from 3.1 to 3.2), performing better than South Asia⁵. By 2009, the CPIA scores of most countries were 2 or 3. Benin, Burkina Faso, Cape Verde, Ghana, Lesotho, Mali and Rwanda have performed well with CPIA scores of at least 4.

Improved governance supports sustainable development endeavours by promoting principles that consider the impact of decisions on broader economic, social and environmental settings while facilitating long-term planning and avoidance of exploitation that depletes natural resources. The link between good governance and natural resources has clear implications for poverty reduction outcomes. Good governance often results in reduced natural resource-based conflicts and transaction costs while promoting public participation and policy dialogue at all levels. It also fosters deliberative custodianship of natural resources in ways that may lead to more positive cooperative behaviour. Decisions and actions on biodiversity, forests, mountains, and tourism resources and outcomes are thus bound to be more legitimate, democratic and equitable in terms of the sustainable development process and poverty reduction outcomes. National governance arrangements for sustainable development need to be harmonized with subregional, regional and international efforts focusing on technical and capacity support, and must translate into good governance at sectoral, institutional and local levels.

In support of these efforts, there have been a number of regional and subregional processes for reporting on sustainable development, including the ECA-coordinated *African Governance Report*, the *Sustainable Development Report on Africa* and other regional, subregional and thematic reports. These have offered regional and subregional platforms for benchmarking on sustainable development targets and cross-country comparisons. The African Peer Review Mechanism, for instance, provides a platform for encouraging partnerships that rate and support each other on sociopolitical and economic development governance (APRM Secretariat 2011). The African Union (AU) has over the years designed several

instruments to support democratization, governance and development that are at various stages of ratification by member countries. The most recent is the African Public Service Charter of 2011. Countries are increasingly promoting integrated planning and use of development frameworks that are consistent with sustainable development, including poverty reduction strategies based on the MDGs. All in all, political governance has improved and continues to support the path towards sustainable development.

Peace and security

Various forms of conflict have been witnessed across the continent. Towards 2005 there were significant regional variations in conflict trends for Central, East, West, and Southern Africa. Many conflicts were related to natural resource disputes while some were armed conflicts perpetuated by political instability (Marshall and Cole 2011). Over this period the total numbers of “forcibly displaced populations” (refugees and internally displaced persons) skyrocketed but has since fallen sharply towards 2010. These trends heightened varying levels of attention to the humanitarian plight of the displaced. Figure 5 shows changes in the global fragility index between 1995, 2002 and 2010.

Progress in resolving conflicts and reducing the number of conflicts has been charted in each of the four subregions of sub-Saharan Africa, although Central and Eastern Africa remain relatively unstable. The recent political conflicts that occasioned regime changes in North Africa, especially Libya, Tunisia and Egypt, are slowly ending with normalcy returning after local and international sociopolitical, legal and institutional interventions. Countries that have recorded remarkable stability have benefited from political reforms and enhanced peace building capacity to manage conflict. Proactive regional and international engagement (spearheaded by the African Union and Governments) has been crucial in helping countries to manage social tensions and stimulate the development of self-regulating civil societies. National governance arrangements for sustainable development need to be coupled with integrated national strategies across sectors, local empowerment and decentralization of decision-making, and transparency and accountability.

Living in an environment of peace and security is fundamental to human dignity and is often recognized as a precondition for reducing poverty and even achieving

5 World Development Indicators, available at <http://data.worldbank.org/indicator/IQ.CPA.BREG.XQ>

Figure 5: Changes in global State fragility index between 1995, 2002 and 2010

Source: Center for Systemic Peace Global Conflict Trends - <http://www.systemicpeace.org/conflict.htm>

sustainable development. Moreover, wars and conflicts have devastating human, economic, social and environmental impacts. Many of Africa's poorest communities live in conflict areas or poorly governed ecosystems. Peace and security are therefore critical elements for sustainable development – and at the same time without development and poverty eradication no sustainable peace can be achieved. Despite this fundamental awareness, conflicts remain in some parts of Africa.

Conclusion

Overall, Africa has registered marked improvements in governance and institutional reforms. The region continues to make progress that should provide a basis for economic, social and environmental sustainability. Steps towards improving governance at various levels are yielding incremental advances in coherent and integrated policies as well as a reduction of overlaps in institutional mandates. There is evidence of increased governance influencing sustainable development efforts, albeit slowly. This is also trickling down to lower levels yielding popular participation at various levels, includ-

ing in natural resources management. This has been made possible through efforts to improve the capacity of regional and subregional organizations and States to promote and undertake cross-sector implementation of sustainable development programmes. The progress made is reflected in the positive trends in political and economic governance as well as strategies to promote peace and security.

2.2.3 Poverty

Eradicating poverty remains the overarching sustainable development priority for the region. The drive to reduce poverty must include, as essential elements, economic growth, social development and environmental protection. Pressures to develop and achieve economic well-being have traditionally led to an excessive focus on increasing a country's GDP at the expense of social and environmental sustainability. Poverty, however, goes beyond income poverty: access to basic services, such as safe water and sanitation, electricity, and decent housing are all dimensions of poverty that Africa must address if it is to achieve its vision for sustainable development.

	Trend indicator	Remarks on status and sustainability trends
Poverty	↔	Despite improvements in poverty levels, many countries are not on track to meet the poverty-related MDG, while access to basic services remains uneven.
<i>Income poverty</i>	↔	Overall, steady progress is being made, though many countries are not on track to meet the MDG target
<i>Access to decent housing</i>	↓	Declining trends in sustainability are largely due to increasing unplanned urbanization and slum proliferation
<i>Drinking water</i>	↑	There is overall improvement in the water sector although rural populations remain largely under-served
<i>Sanitation</i>	↓	More than half the continent's population lacks improved sanitation services, and most countries will not meet the MDG target
<i>Access to energy</i>	↓	Negative trends toward improving access to modern and sustainable energy, in particular in rural areas, are being registered

Africa has recorded mixed results with respect to poverty reduction.

Income poverty

The first of the MDGs calls for the eradication of extreme poverty and hunger by 2015. This entails cutting by half the proportion of people in the developing world living on less than \$1.25 a day by 2015. According to the *Millennium Development Goals Report 2010* (UN 2010a), progress on poverty reduction is steady despite significant setbacks due to the 2008-2009 economic downturn and the food and energy crises. Figure 6 illustrates the share of population living on less than \$1.25 a day and the absolute numbers of people living on less than \$1.25 a day for 2009 in Africa.

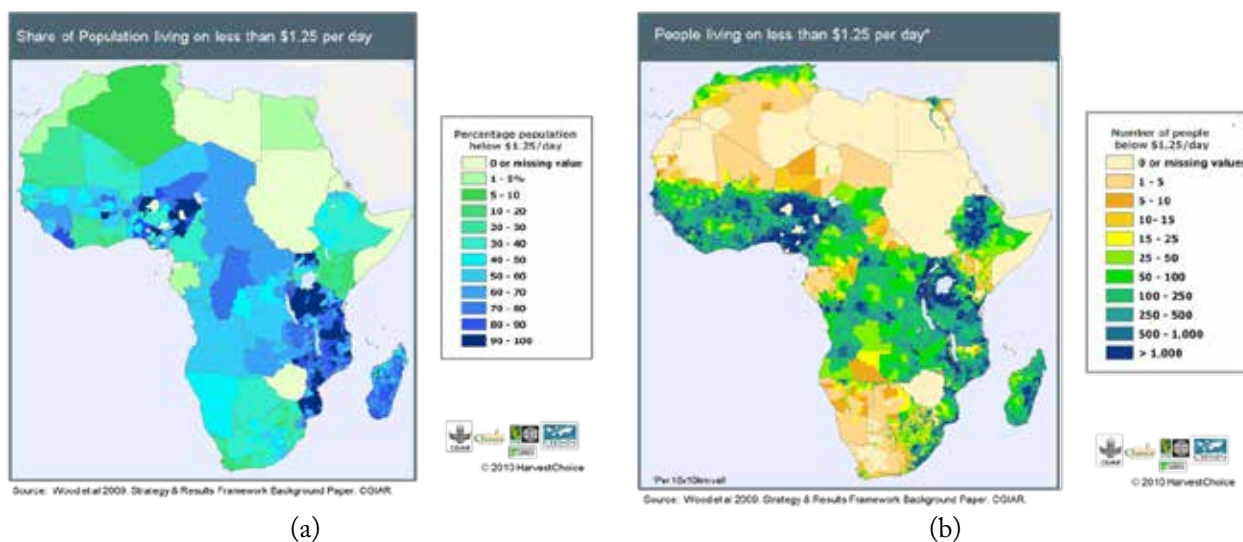
Although Africa has contributed significantly to global economic growth over the past decade, economic performance has not translated into a significant reduction in poverty among its populations (AUC and others 2011). The proportion of sub-Saharan Africans living below the international poverty line of \$1.25 day⁶ marginally decreased from 58 per cent in 1990 to 51 per cent in 2010 (World Bank 2010). The decrease is not substantial enough to help achieve the target of 29 per cent by 2015. The cumulative impacts of the food, fuel and financial crises between 2006 and 2008 actu-

ally reversed the gains made in reducing absolute poverty. Widespread data inadequacies remain obstacles to monitoring progress in poverty reduction in Africa. Furthermore, the *Rural Poverty Report 2011* (IFAD 2010) provides evidence that rural poverty is still very high in sub-Saharan Africa. Although the subcontinent reduced rural poverty by 5.1 per cent between 1998 and 2008, developing countries in other global regions fared much better (AUC and others 2011).

The depth of poverty can be assessed by looking at the poverty gap ratio, i.e. the per capita amount of resources needed to eliminate poverty, or reduce the poor's shortfall from the poverty line to zero through perfectly targeted cash transfers. Figure 7 shows that the sub-regional variations in the poverty gap ratio are high. Despite progress made, the absolute number of people living in extreme poverty has been rising from 296 million (1990) to 388 million (2005) and further to over 500 million (2010).

Africa contributes less than all other developing regions towards the global progress in poverty reduction. Efforts to reduce the high poverty gap ratios should target sectors where the poor and vulnerable are most active with appropriate social reforms and equitable economic interventions that specifically improve this ratio. The link between poverty and environment is in a downward

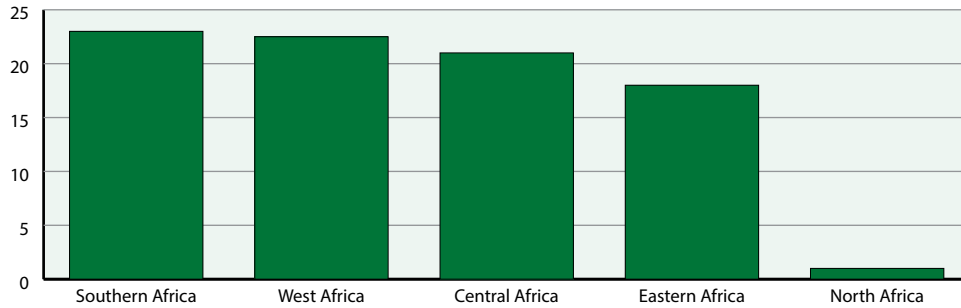
Figure 6: Poverty rates: (a) Share of population living on less than \$1.25 a day, % (2009); (b) Absolute numbers of people living on less than \$1.25 a day (2009)



Source: Consultative Group on International Agricultural Research (CGIAR) (2010)

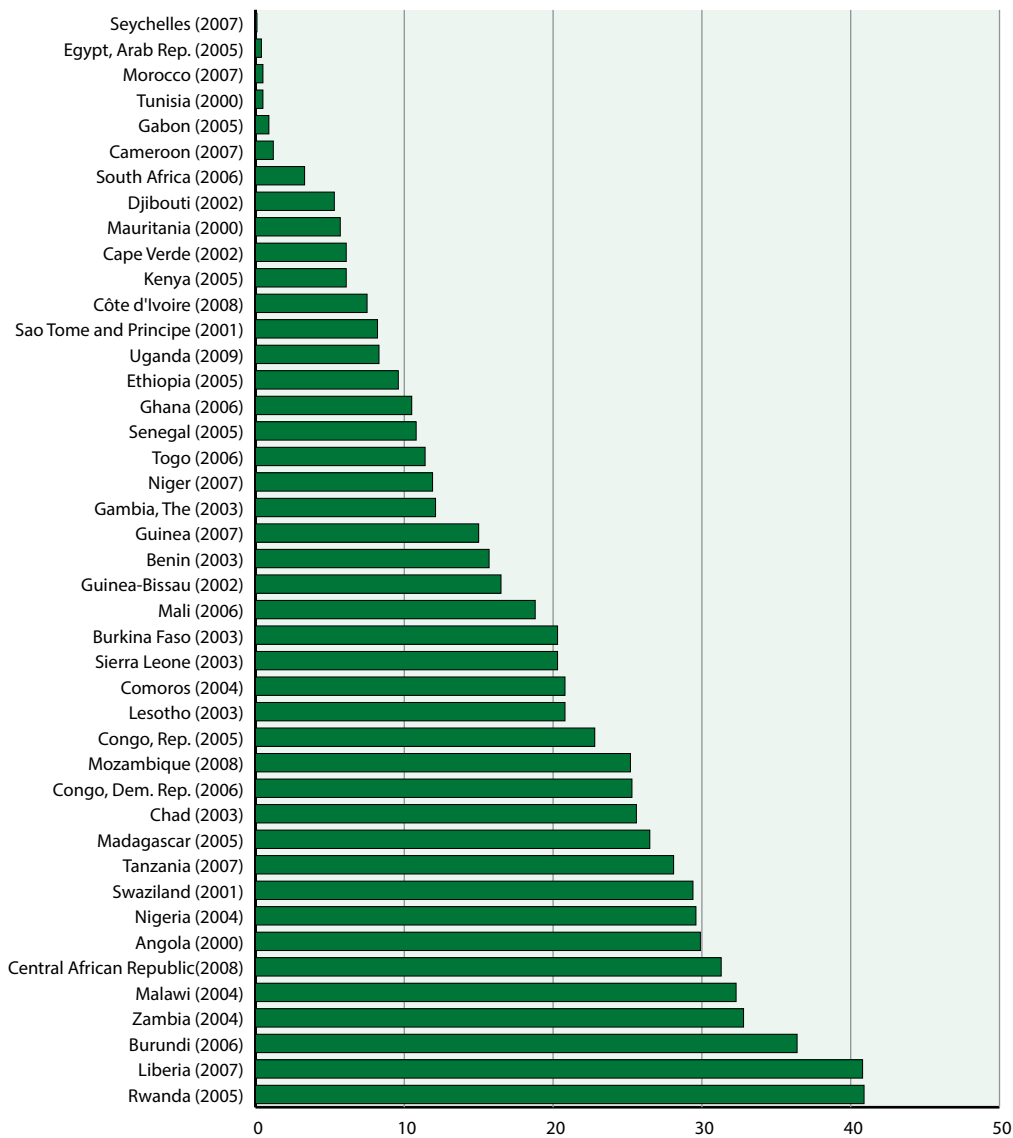
6 The global measurement of poverty levels as indicated by the proportion of people living below the poverty line of \$1 a day was adjusted to \$1.25 in reference to the 2005 purchasing power parity (PPP).

Figure 7: Poverty gap ratio by African subregions, 2008 (%)



Source: AUC and others (2011)

Figure 8: Poverty gap ratio for selected African countries



Source: ECA (2013), based on data from World Development Indicators (World Bank) (Years in parentheses indicate latest available data)

spiral with population growth and economic marginalization often leading to environmental degradation. In Africa, the link between poverty reduction and natural resource conservation continues to play out with the majority of the poor living in vulnerable ecosystems and putting pressure on land, forests and biodiversity and mountain resources. Development efforts must take cognizance of the link between poverty reduction and sustainable development pillars. The ultimate goal of sustainable development must be an increase in real income, especially for the vulnerable; improvements in health and nutritional status, especially for children and women, the elderly and the chronically sick; literacy; access to resources; equitable distribution of income; basic freedoms and guaranteed security for citizens; respect for and a responsible relationship with the environment. Africa is on a steady but slow path to sustainable poverty reduction.

Decent housing

Trends in sustainable development and poverty reduction are also reflected in the quality of housing. Decent houses should provide reasonable thermal comfort; be in a reasonable state of repair; and provide reasonably modern facilities and services (UN-Habitat 2011). Decent housing also accords the dwellers reasonable and stable access to services – water, energy, sanitation, health, security and less exposure to crime. With the proliferation of slums in many African cities and the increasing urbanization rate, this indicator has become important in the past decade as a measurement of quality of life. The proportion of households living in non-decent houses differs greatly between rural and urban areas. The main constraints to the provision of decent housing in Africa include: population growth with increasing and unplanned urbanization; shortage of housing finance; land tenure and cost; unavailability and high cost of building materials; low incomes of prospective buyers; low priority for housing in the construction sector; and impacts of climate change, including damage by floods.

Governments are, however, taking action to achieve economic, social and civic development goals through housing-related initiatives. Improving conditions and addressing the current housing crisis should be a high priority for national Governments. Globally, one out of every three city dwellers – nearly a billion people – lives in a slum and that number is expected to double in the next 25 years (UN-Habitat 2006). Although Africa has

the largest slum population in the world with 75 per cent of its urban population living in slum areas (UN-Habitat 2011) some progress has been made with the lives of 24 million slum dwellers improved in the last decade through improved housing (AUC and others 2011). In sub-Saharan Africa, as much as 70 per cent of the urban housing stock is of poor quality and not in compliance with local regulations (Kissick and others 2006). Housing is critical to sustainable development, especially from a health perspective. Health is directly linked to housing and housing-related basics such as water and sanitation (WHO 2010), and in turn is affected by access to land, cost of access to decent housing and other social perils.

To support sustainable development goals, issues of social housing, homelessness or integration are important in Africa's policy agenda. As a way of avoiding social exclusion and poverty, African Governments should respect the right to social and housing assistance. National Governments have the task of developing housing policies that spur sustainable quality of life for both rural and urban dwellers. There are, however, some challenges to be tackled in this regard, namely: bridging the urban/rural housing divide; renewal of old housing stock, dealing with slum proliferation; supporting the young and disadvantaged groups to gain access to improved housing; and promoting access to water and sanitation along with energy efficiency and climate proofing in housing systems.

Drinking water

Access to safe drinking water has direct implications for sanitation, a key indicator of poverty levels. It is also the outcome of sustainable management of resources such as forests and mountains which serve as water towers. Many countries have made considerable efforts towards the MDG target of reducing by half, by 2015, the proportion of people without sustainable access to safe drinking water. Between 1990 and 2008, the proportion of Africa's population with access to improved drinking water sources increased by 16 per cent from 56 per cent in 1990 to 65 per cent in 2008 (see Table 1). Most of the countries in Africa have made progress in the percentage of the population served with improved water, and the proportion of the population with access to improved water is increasing in all subregions. However, improved water coverage in Eastern Africa and West Africa is still considerably lower than in other subregions. Coverage in Eastern Africa increased from 38 per

Table 1: Proportion of total population served with improved water (%)

Subregion	1990	1995	2000	2005	2008	% Increase 1990-2008
West Africa	49	54	58	61	64	31
Southern Africa	63	65	68	72	74	17
North Africa	81	82	83	84	84	4
Eastern Africa	38	40	44	49	51	34
Central Africa	46	48	51	53	54	17
Africa	56	58	61	64	65	16
World	77	80	83	86	87	13

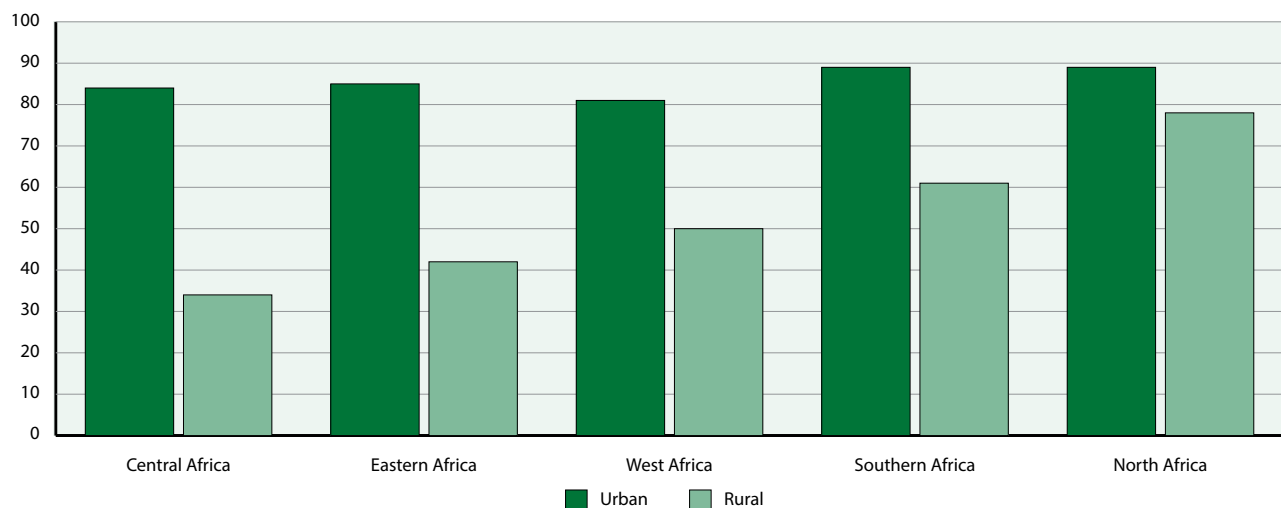
Source: WHO/UNICEF Joint Monitoring Programme for Water and Sanitation (<http://www.wssinfo.org/>)

cent in 1990 to 51 per cent in 2008 and the coverage in Central Africa increased from 46 per cent in 1990 to 54 per cent in 2008.

Compared to 1990, progress continues to be made with respect to the proportion of people served with improved water. In 2008, over 90 per cent of the population in nine countries, namely Botswana, Comoros, Djibouti, Egypt, the Gambia, Mauritius, Namibia, South Africa and Tunisia, were served with improved water. Countries with less than 50 per cent coverage comprised: the Democratic Republic of the Congo, Ethiopia, Madagascar, Mauritania, Mozambique, the Niger, Sierra Leone and Somalia. There are major disparities between urban and rural areas with respect to this in-

dicator. This urban–rural divide in access to improved water source continues to pose a policy challenge.

Despite progress in the proportion of rural households served with improved water, which increased from 42 per cent to 52 per cent during the period 1990–2008, with the exception of North Africa, the continent’s rural population continues to have inadequate access to an improved water source. While the worldwide urban water coverage has remained high throughout the past 20 years and reached 96 per cent in 2008, the coverage for Africa was 85 per cent by 2008. Emerging challenges like climate change continue to stress water resources and expose populations to risks. The push for sustainability, equity and efficiency in water resources management underpins poverty eradication efforts as the liveli-

Figure 9: Proportion of urban and rural population with access to improved water (%) in 2008

Source: ECA (2013), based on data from WHO/UNICEF Joint Monitoring Programme for Water and Sanitation (<http://www.wssinfo.org/>)

hood strategies of the poor are constrained by inadequate water access and availability. Progress in biodiversity, forests, mountains, tourism and science and technology contributes to improved access to clean drinking water. African countries must make choices to address specific problems in water resource management with a bearing on poverty eradication in relation to sanitation, health and production. Good water resources management to secure quality, availability and access translates into sound livelihood outcomes and poverty reduction through improved health and food security.

Sanitation

Adequate sanitation is critical to populations in the pursuit of good health outcomes but it is also related to strategies for environmental management. Access to adequate sanitation is a basic human right that defines a population's quality of life. The proportion of population using an improved sanitation facility for Africa increased by only 14 per cent over a period of 20 years, from 36 per cent in 1990 to 41 per cent in 2008 (Table 2). The figure is under 50 per cent in all subregions, except North Africa and Southern Africa. Major disparities exist between urban and rural areas for this indicator (Figure 10). In general, the continent's rural population, with the exception of North Africa, has inadequate access to an improved sanitation facility.

The rapid population growth witnessed in Africa and anticipated for the future puts a lot of stress on Africa's natural resource base, jeopardizing gains in sustainable development. Issues with food security, land tenure, conflicts over resources, environmental degradation and the lack of water supply are likely to remain as the population grows unchecked. Much of the population

growth now takes place in urban areas occasioning new and challenging sustainable development constraints. A good percentage of urban dwellers live in slum conditions, without decent housing, legal rights and access to water and energy, and where waste disposal presents a tremendous health hazard. Urbanizing patterns are presenting barriers to the desire to have ecologically friendly sustainable development in Africa. With respect to sanitation, Africa is registering mixed sustainable development outcomes and trends.

Access to energy

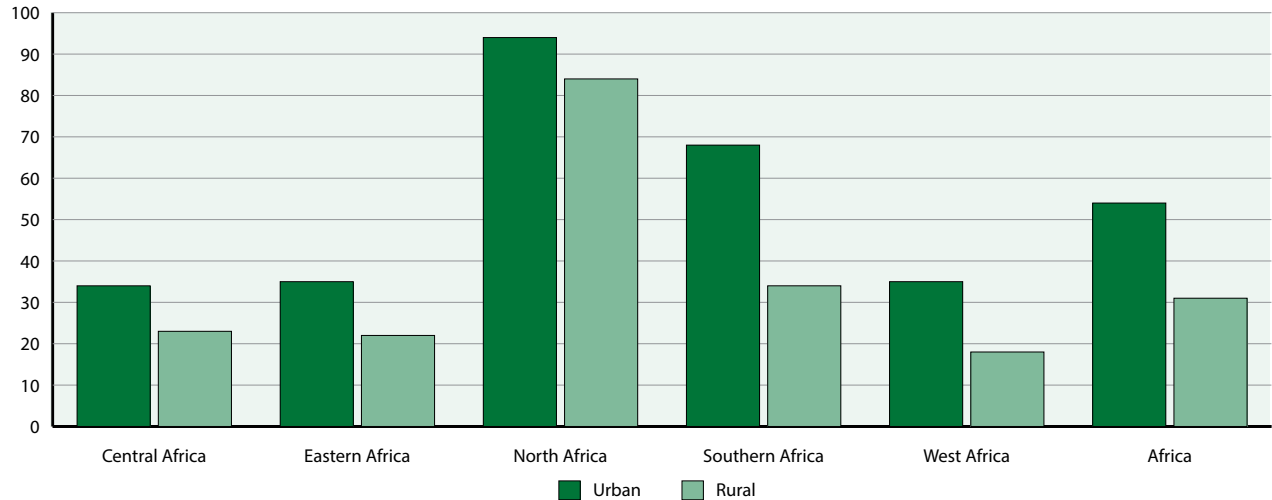
Progress in accessibility and affordability of electricity services contributes to addressing poverty and deprivation and also facilitates the removal of limits to social and economic development. The United Nations (UN 2010, 2010a, 2010b) indicates that the goal of eradicating extreme poverty by 2015 would be possible if an additional 395 million people obtained access to electricity and one billion gained access to more modern cooking facilities that minimize the harmful health effects of smoke in the next few years. According to the International Energy Agency (IEA 2011), the proportion of the world's population with access to electricity will rise over the coming years, but over a billion people will still be without power in 2030 with 746 million of them in Africa, making over 42 per cent of the total population. Despite vast endowment with both fossil and renewable energy sources, only 20 per cent of Africa's population has direct access to electricity and 70 per cent of the population in sub-Saharan Africa lives without access to clean and safe energy for cooking, lighting and heating. The electrification rate in Africa in general and sub-Saharan Africa in particular is inadequate and is even worse in rural sub-Saharan Africa (Figure 11).

Table 2: Proportion of the population with access to improved sanitation facility

Subregion	1990	1995	2000	2005	2008	% Increase 1990-2008
Central Africa	17	19	22	25	27	59
Eastern Africa	19	20	22	24	25	32
North Africa	65	69	73	76	77	18
Southern Africa	47	49	51	53	55	17
West Africa	27	27	26	26	27	0
Africa	36	37	39	40	41	14

Data Source: WHO / UNICEF Joint Monitoring Programme for Water Supply and Sanitation

Figure 10: Proportion of urban and rural population with access to an improved sanitation facility in 2010



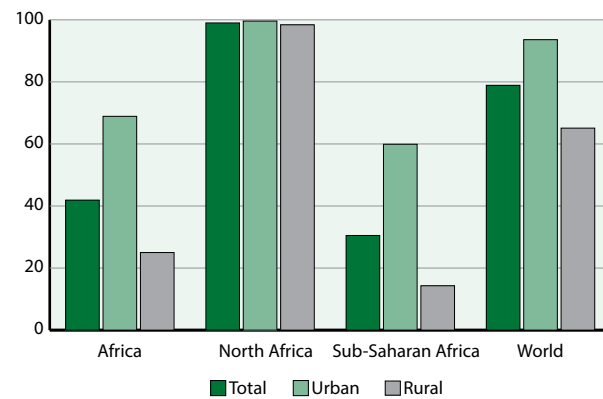
Source: ECA (2013), based on data from WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation

The share of people without access to electricity differs significantly across subregions, but is much greater in sub-Saharan Africa. Furthermore, access to electricity varies noticeably among countries in the same region. More than 80 per cent of the world population without electricity access live either in sub-Saharan Africa or in South Asia. In rural areas of the developing countries, access to electricity was considerably lower than in urban areas in 2008 (Figure 12).

Energy poverty remains an urgent sustainable development issue in Africa. The importance of energy to de-

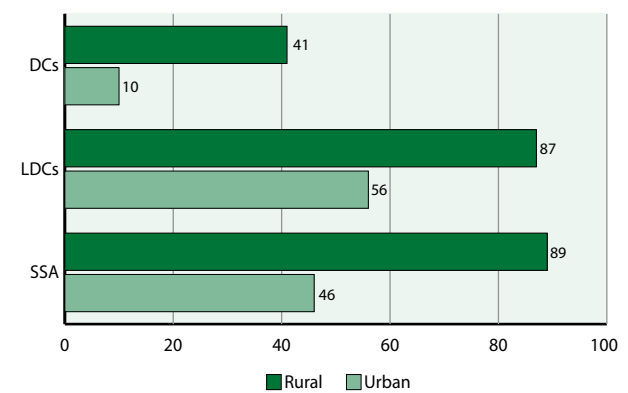
velopment has been proven through empirical evidence (UNDP and WHO 2009). Various measurements of sustainable development such as the human development index (HDI), environmental integrity, measurements of poverty and deprivation and of child and maternal mortality are all linked to energy access. This is because access to modern energy services improves productivity and allows for local income generation by freeing up people’s money and time for more productive uses that can improve human welfare (GNESD 2007; UNDP and WHO 2009). It is therefore critical to improving quality of life. The push towards sustainable de-

Figure 11: Electrification rate in 2009



Source: ECA (2013), based on data from World Economic Outlook

Figure 12: Share of population without electricity access in rural and urban areas for least developed countries (LDCs) and sub-Saharan Africa (SSA), 2008



Source: UNDP & WHO (2009)

velopment requires an increase in the proportion of the population with access to clean and renewable sources of energy. Africa still remains a heavy biomass consumer with 71 per cent of the population relying on biomass for energy. According to the World Bank (2011b), in 47 sub-Saharan Africa countries, most rural and urban residents rely on wood-based biomass to satisfy their energy needs, especially for cooking, and about 81 per cent of households burn solid fuels, far more than any other region in the world, with about 70 per cent depending on wood-based biomass as their primary cooking fuel. Almost 60 per cent of urban dwellers in Africa also use biomass for cooking (IEA 2010). There is thus a heavy pressure on forests as demand for wood-based biomass increases. Access to modern and clean energy is a prerequisite for protection of natural resources, especially forests and biodiversity.

Conclusion

African countries have realized that an increase in GDP alone is not a true measurement of economic well-being, as steady progress is made in reducing income poverty. Although considerable progress is reported in access to basic services such as safe drinking water, stagnation continues in poverty aspects like sanitation. There are also worrying trends in sustaining efforts towards improved access to energy and decent housing. Even though Africa has registered significant growth rates in the past decade, this has not translated into the desired level of poverty reduction. Most countries continue to register marginal declines in the proportion of people living below the poverty line, which is not sufficient to meet the MDG target by 2015. Furthermore, the continent's rural and urban populations continue to have inadequate access to improved water and energy resources. Appropriate interventions are required to reverse the trends in provisioning of adequate sanitation, water, energy and decent housing in order to comprehensively eradicate poverty and reverse the negative sustainable development trends.

2.2.4 Demographic changes

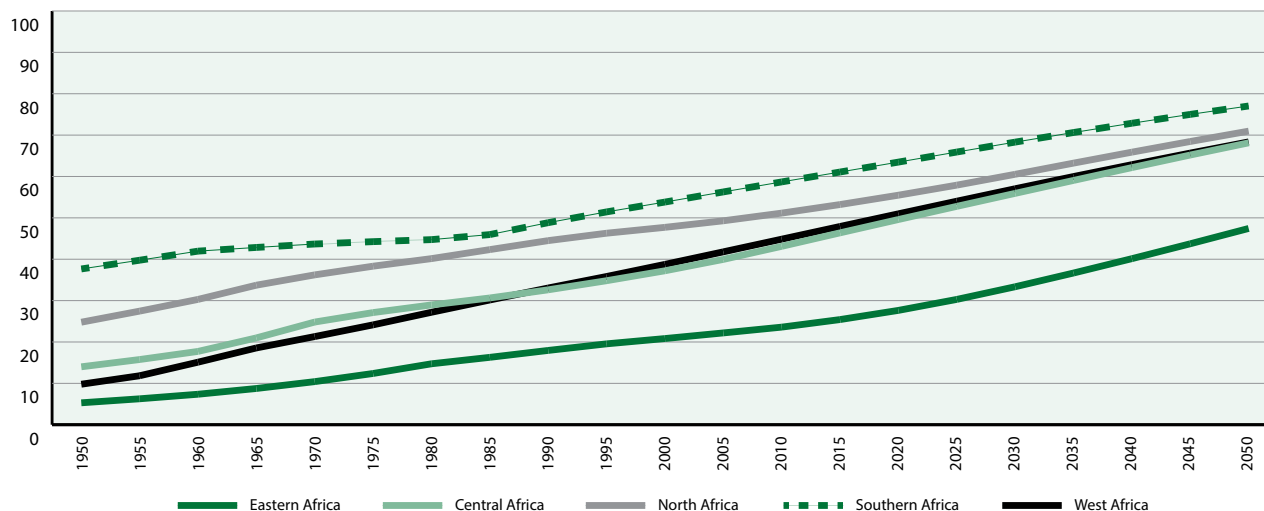
Demography remains the single most important driver of sustainable development affecting both production and consumption through increased demand for goods and services as well as social amenities, but at the same time poses threats to the sustainable exploitation of natural resources. Africa's population will more than double by 2050 with almost all the net increase in population already occurring in the urban areas where the number of people living in poverty is rising (Balk and others 2009; Hermann and Khan 2008). Efforts to address this require a supportive development environment that facilitates sustainable population growth, and investments in reproductive health and HIV prevention, education, and empowerment of women and the youth. Investments in human and social development can also contribute to managing the potential negative impacts of rapid population growth – in particular, by ensuring a population base that is well educated and has the right skills mix to adequately respond to the social, environmental and economic challenges of each country. These factors can help the region to harness the demographic dividend for high and sustained economic growth, provided that the economy generates enough quality jobs for the additional labour force. The magnitude of the demographic dividend will depend on the rate of fertility decline, the ability of the economy to absorb and productively employ the extra work force, and the nature of economic reforms that countries adopt in order to encourage investment and savings.

Population growth

Africa is home to about 1 billion people, or 15 per cent of the world population. The continent's population growth is forecast to remain well above the world average for the next few decades (UN 2011; UNFPA 2011; Basten and others 2011). The consequence of these continuing trends is that Africa will see further increases in its youth dependency ratio and increasing pressure on the fragile natural resource base, infrastructure and

	Trend in sustainability	Remarks on status and sustainability trends
Demographic changes	↓	Overall demographic changes are putting increasing pressure on resources and services, and call for increased investments in the social sector to harness the demographic dividend
<i>Population growth</i>	↓	Increasing population growth is a significant challenge to achieving sustainable development outcomes
<i>Urbanization</i>	↓	Increased unplanned urbanization is producing negative trends in sustainability, with pressure on services and constraints in poverty reduction

Figure 14: Proportion of population residing in urban areas

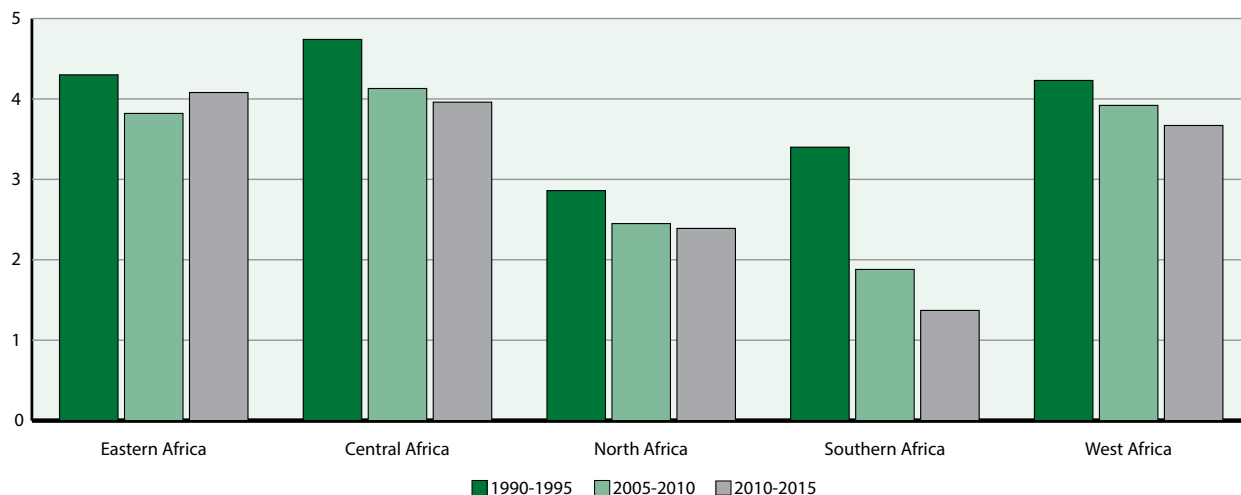


Source: ECA (2013), based on data from United Nations Department of Economic and Social Affairs (UNDESA) Population Division

increased demand for goods and services and excessive pressure on natural resources. Although progress is notable in the various supportive policies that foster sustainable population growth rates and investments in reproductive health, it will be critical to further intensify the ongoing investments in human and social development. Africa needs a population base that is well educated with the right skills mix, to meaningfully contribute to the achievement of sustainable development goals. At the current rapid urbanization rate, criti-

cal challenges are foreseen for many cities in terms of guaranteeing access to basic services such as water and sanitation and adequate housing, transport and security. The escalating challenges of food and water shortages, poor infrastructure and housing that African cities face require specific attention to reducing the proportion of slum dwellers and strategies to address the attendant social, economic and environmental threats to well-being and the natural resource base.

Figure 15: Average annual urbanization rates



Source: ECA (2013), based on data from UNDESA (2011)

Table 3: Subregional urbanization levels and rates by 2010

Subregion	Population	Urbanization level	Urbanized population	Annual rate of urbanization
Eastern Africa	268,305,978	30.7%	55,595,730	4.0%
Central Africa	112,096,660	50.4%	44,036,804	3.3%
West Africa	282,230,752	41.9%	123,104,081	3.8%
North Africa	208,921,202	60.0%	115,633,687	2.5%
Southern Africa	132,120,485	39.5%	60,401,322	3.6%
Total	1,003,675,077	44.5%	398,771,624	3.4%

Source: ECA (2013), summarized from AfDB data and World Bank Development Indicators

2.2.5 State of the economy

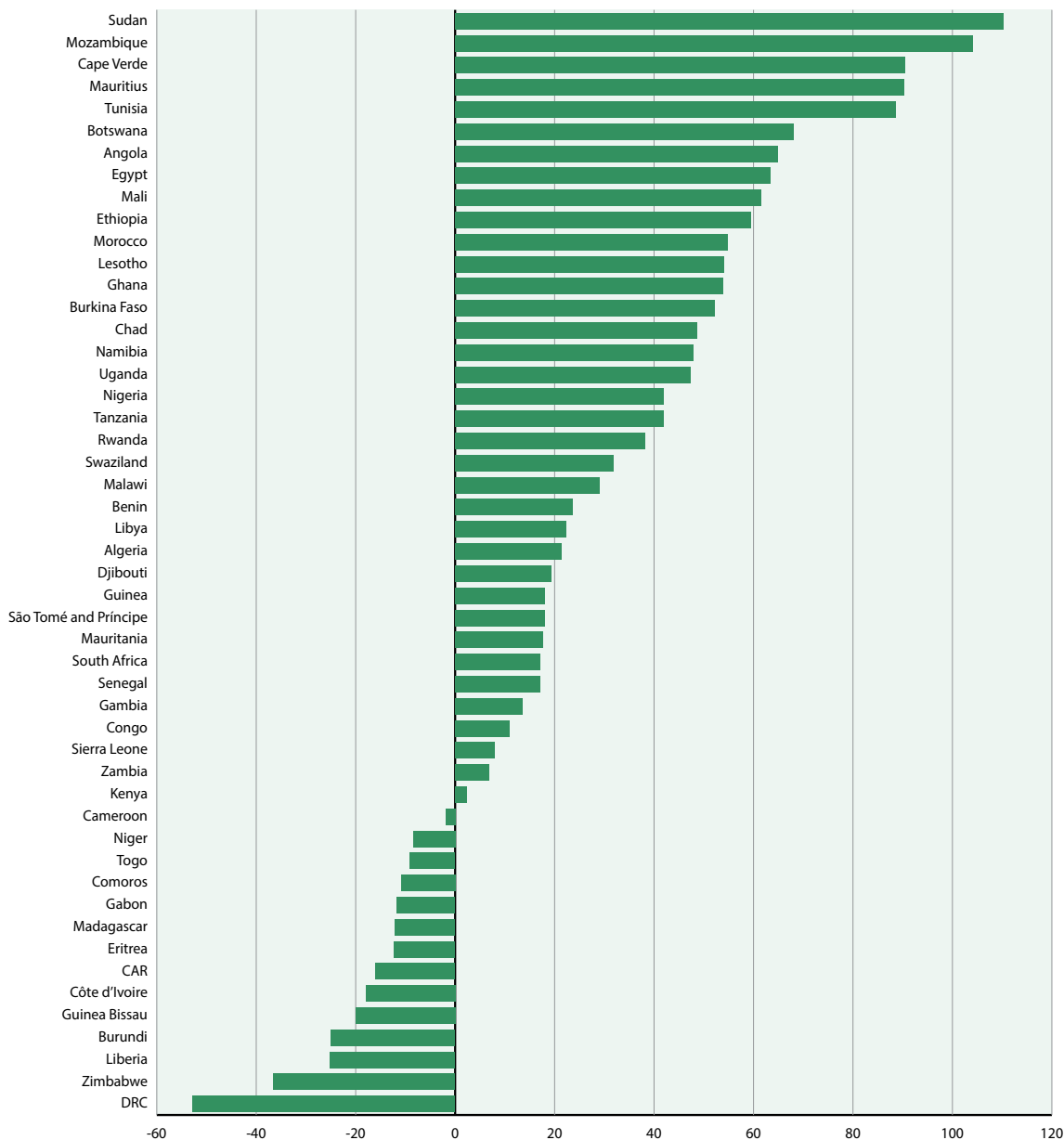
Economic growth and development are necessary for poverty reduction and improved well-being of citizens – however, they must be pursued with a view to balancing economic growth objectives with social and environmental objectives. African countries are continuing to put in place economic growth and social development policies aimed at improving living standards across the continent, sustainable deployment of resources, and reduced income inequality and poverty (ECA 2013). There is evidence of improvement in macroeconomic management, the business environment and overall economic governance (ECA 2009; 2010 and 2011). However, few countries are sustaining high economic growth rates over extended periods and achieving high levels of social development. For Africa to remain globally competitive, sustainable and high economic growth rates must be ensured through widespread economic diversification and institutional transformation, taking into account the imperatives of equity, inclusiveness and environmental sustainability. The general status and trends in economic sustainability in Africa as reflected in wealth and macroeconomic performance, value addition, and tourism and travel are summarized below.

Wealth and macroeconomic performance

Although the global economic crisis of 2009 had significant but varying impacts on African economies, recovery from the crisis was better than expected (AUC and ECA 2013). The aggregate GDP growth in 2010 was 4.7 per cent. Africa's growth fell from 4.6 per cent in 2010 to 2.7 per cent in 2011, mainly owing to the political turbulence in North Africa (AUC and ECA 2013). This saw private investment decline due to higher investor risk aversion despite high domestic demand and rising exports. The economic outlook remains strong, with growth of 5.1 per cent projected for 2012. However, shrinking export revenue and persistent high unemployment is undermining this. The recovery has been propelled by a rebound of commodity prices, steady flow of remittances and rise in official development assistance (World Bank 2010). In some subregions, however, GDP per capita growth fell from 3.5 per cent to -1.2 per cent (Figure 16). Relative to other regions output per worker remains low in Africa (except North Africa). The output per worker has been increasing in Africa since 2002, but dipped in 2009 due to the global economic crisis (AUC and others 2011). In North Africa, for instance, the growth of labour productivity remained positive but was curtailed – dropping from 2.9 per cent in 2007 to 1.6 per cent in 2009.

	Trend	Remarks on status and sustainability trends
State of the economy	↔	There is a marked positive economic performance but negative sustainability outcomes reflected in adjusted net savings
<i>Wealth and macroeconomic performance</i>	↑	Increasingly many countries are recording higher economic growth rates
<i>Value addition</i>	↔	Despite some improvements in manufacturing and the agricultural sector, Africa does not yet have the capabilities to fully and sustainably process its raw materials into final products
<i>Tourism and travel</i>	↔	Positive development in the tourism sector, but more efforts are needed to ensure sustainability

Figure 16: Percentage change in GDP per capita of selected countries, 1990-2009

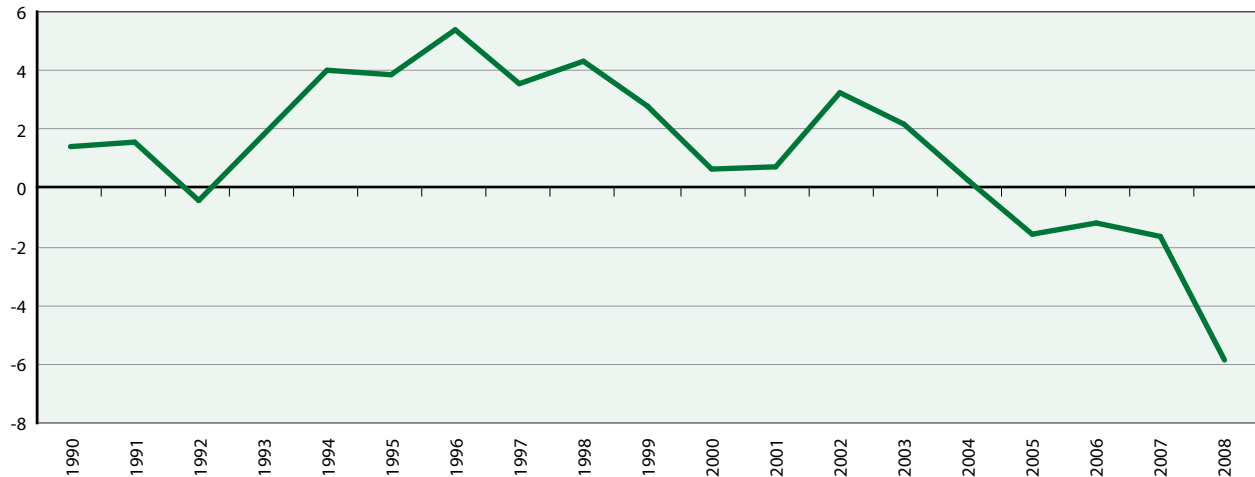


Source: AUC and others (2010)

However, this positive economic performance as measured by GDP growth masks the continued depletion of the natural resource base and increasing pollution levels as well as other social development markers. Adjusted net savings provide a measurement of a country's sustainability by measuring the change in comprehensive wealth during a specified accounting period (World Bank 2010). This must be viewed in the context of natural resource use over the same period and take into account the fact that some natural resources are impossible to replace. Between 2000 and 2008, a total of 14 countries had negative adjusted net savings indicating a

net decline in total wealth. Policies to reverse the negative adjusted net savings must be considered for the affected countries. For the entire sub-Saharan Africa, the adjusted net savings were positive from 1993 to 2004 and declined (ranging from -1 per cent to -6 per cent) between 2004 and 2008, implying a gross decline in total wealth of sub-Saharan countries as shown in Figure 17.

As an indicator of sustainability, adjusted net savings give a policy pointer for natural resource and environmental challenges within a sustainability framework

Figure 17: Adjusted net savings (excluding PM 10 damage) trends in sub-Saharan Africa

Source: ECA (2013), based on data from World Bank Development Indicators (<http://data.worldbank.org/indicator>)

(World Bank 2011a). A number of resource-dependent countries have low or negative genuine domestic savings. It is therefore possible that in these countries the aggregate national wealth was actually decreasing, to the detriment of current and future well-being and future development prospects. Thus, unsustainable development can be happening while there are positive economic growth indicators. Attention must be paid to the source and effect of domestic savings. In all African countries there is a need to expand domestic savings through sound macroeconomic policies. Management of natural resources can also safeguard sustainability by raising development finance and ensuring efficient use of forests, biodiversity, mountains and other natural resources. The trade-off between economic growth and the environment is made explicit through application of the adjusted net savings indicator in sustainable environmental management. The declining trends in adjusted net savings show that Africa is moving in a positive direction towards sustainable development in an economic sense.

Value addition

Africa is endowed with significant natural resources which are often being extracted by foreign companies or exported as raw material, with almost no value addition in the process and little or no attention paid to the environmental and social implications of the exploitation. This is a missed opportunity for more robust, diversified and sustainable economic development. The picture is reflected in forests, biodiversity and mountains as in other natural resource bases. To create and sustain

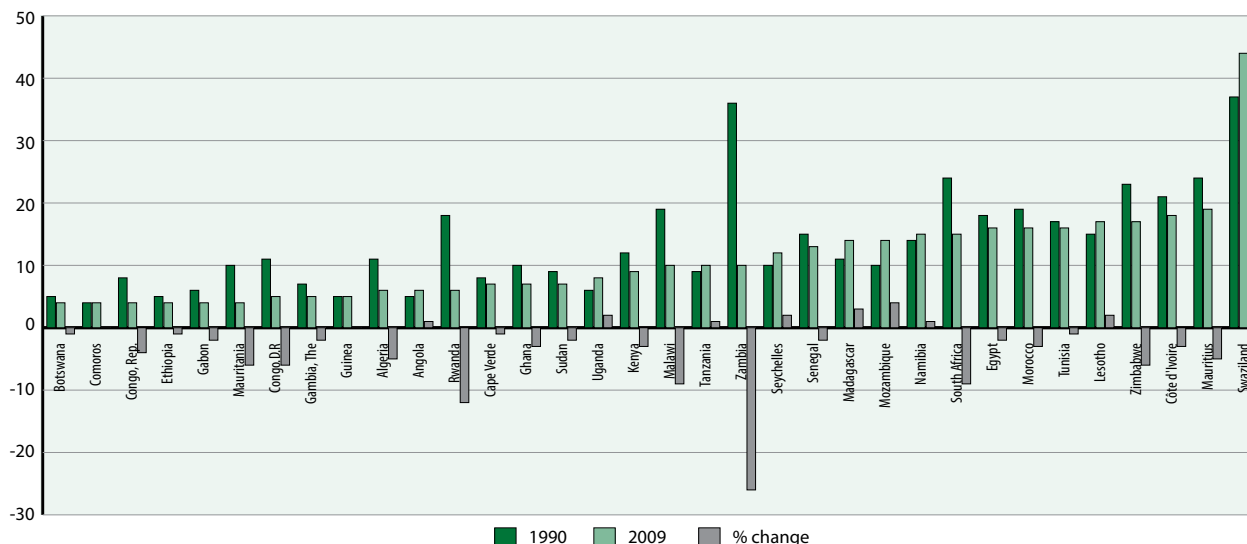
wealth and production in the long term, Africa's natural resources should be sustainably exploited and converted into other forms of capital with higher economic, social and environmental value. This would also help to generate new jobs for a growing young population (see also Section 2.2.4) and propel the desire to sustainably manage forests, biodiversity, mountains and other natural resources.

The strength of the manufacturing sector and the degree to which it is developing in Africa are a good indication of this. For Africa as a whole, manufacturing value added⁷ showed a significant change between 1990 and 2009. The value added in manufacturing as a percentage of GDP varies significantly across countries (Figure 18). The share of manufacturing value added in the GDP of Swaziland was the highest in Africa both in 1990 and 2009. The value added in manufacturing as a percentage of GDP decreased between 1990 and 2009 in 23 countries, and increased in nine (Angola, Lesotho, Madagascar, Mozambique, Namibia, Seychelles, Swaziland, Tanzania and Uganda). The highest reductions were in Zambia (26 per cent) and Rwanda (12 per cent).

Despite some progress in value addition in manufacturing and the agricultural sector (see Section 2.2.10), Africa does not yet have the capabilities to fully and sustainably process its raw materials into final products. The main barriers are gaps in technical know-how, business skills, product design and marketing expertise.

⁷ Manufacturing value added reflects the net output of the manufacturing sector, taking into account industries belonging to the International Standard Industrial Classification (ISIC) divisions 15-37.

Figure 18: Manufacturing value added (Share of GDP)



Source: ECA (2013), based on data from World Development Indicators (<http://data.worldbank.org/indicator>)

These barriers constrain attempts to add value to natural resources and other primary products for stable household and national incomes that would have a strong bearing on poverty eradication. Overall, sustainability trends are stagnant with respect to ability to add value to natural resource primary products.

Tourism and travel

As an emerging sector, tourism plays a critical role in enhancing the economic well-being of countries and populations. Depending on the model of tourism pursued, it can lead to either environmental degradation or conservation. Tourism is one of Africa's most flourishing and emerging industries, with international receipt shaving grown by 7 per cent over the last 10 years, and

total tourism expenditure amounting to over \$40 billion in 2010 (UNWTO 2010). In addition to its potential for creating employment opportunities and foreign exchange in any economy, the tourism industry can also enhance infrastructure development in the destination country. It can also promote cooperation and understanding among people all over the world. Tourism has become a means by which countries improve their income base and showcase their traditional heritage (Olorunfemi and Raheem 2008; Kester 2003). Over the past decade, the contribution of the tourism industry to GDP and exports in many African countries has been improving (UNWTO 2010). Between 1990 and 2011, the total contribution of travel and tourism to GDP rose and is highest in North Africa compared to other subregions.

Table 4: Trends in tourist arrivals, market share and growth rate for Africa (1990 – 2011)

Region/ subregion	International arrivals (millions)							Market share (per cent)	Change (per cent)		Average an- nual growth (%) 05 – 11*
	1990	1995	2000	2005	2009	2010	2011*		10/09	11/10-	
World	435	528	674	799	883	940	985	100	6.4	4.6	3.5
Africa	14.8	18.8	26.2	34.8	45.9	49.7	50.2	5.1	8.5	0.9	6.3
North Africa	8.4	7.3	10.2	13.9	17.6	18.8	17.1	1.7	6.7	-9.1	3.5
Sub-Saharan Africa	6.4	11.5	16.0	20.9	28.3	31.0	33.1	3.4	9.6	6.9	7.9

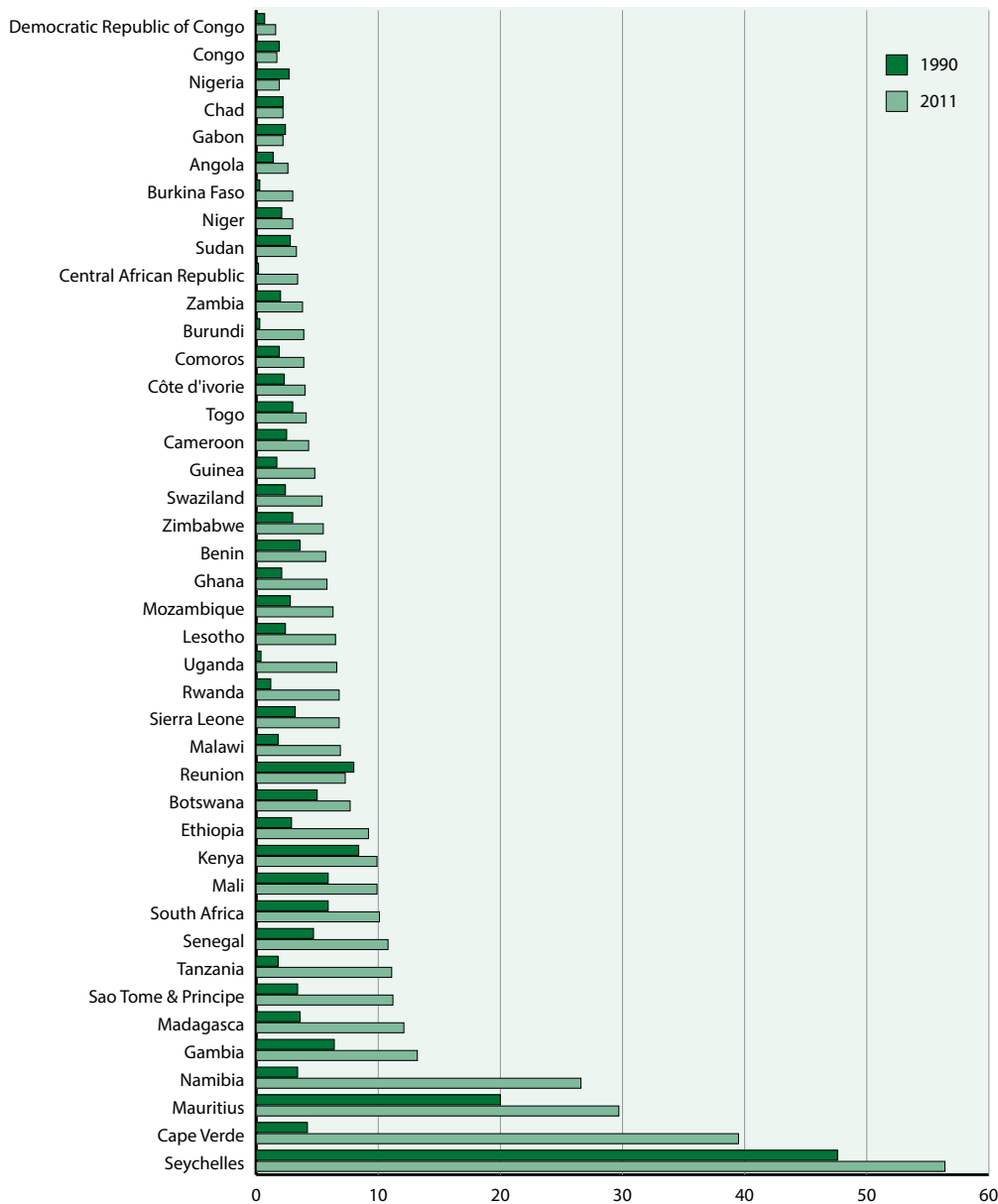
Source: Based on data from UNWTO (2012)

Africa, the only region to post positive trends in tourism arrivals in 2009, maintained growth during 2010 (UNWTO 2010). International arrivals increased by 3 million (+7 per cent) to 49 million in 2010 and 50 million in 2011, while the receipts increased by \$3 billion to reach \$31 billion (+4 per cent in real terms). By 2011, Africa had over 5 per cent of the global share of international arrivals. Overall, international tourist arrivals in Africa increased only slightly (1 per cent) in 2011 (UNWTO 2012) with a marginal gain of two million

arrivals for sub-Saharan destinations (+7 per cent) offset by the losses in North Africa (-9 per cent) due to the recent political turmoil. Receipts from international arrivals increased by 2 per cent in real terms, reaching \$33 billion in 2011.

South Africa, which accounts for over a quarter of total arrivals in sub-Saharan Africa, saw arrivals grow by 15 per cent in 2010, following the successful staging of the World Cup. Other countries like Madagascar

Figure 19: Total contribution to employment of travel and tourism between 1990 and 2011



Source: ECA (2013), based on data from UNWTO (2011)

(+21 per cent), Cape Verde (+17 per cent), Tanzania, Seychelles and Morocco (+11 per cent) posted above average figures.

The upsurge in African tourism is also captured by the changes in bed-night equivalent which has improved. For instance, in Kenya hotel bed-night occupancy increased from 33.6 per cent in 2003 to 47.2 per cent in 2007 before falling to a low of 26 per cent at the height of post-election violence in 2008. It has since bounced back to the present level of 42.3 per cent. Furthermore, the region saw a significant change in total contribution to employment of travel and tourism from 1990 to 2011, with the total contribution increasing, particularly in North Africa which recorded higher figures than sub-Saharan Africa (Figure 19). The industry is in a unique position to power Africa's sustainable growth, but it must have clear policy support to reach this potential.

Sustainable tourism must be promoted in order to continuously reap the poverty eradication, economic and environmental benefits. This is because tourism has an inherent link with poverty reduction and other sectors; and its development determines progress in sustainable development. The ecological footprint of tourism activity is significant, as the industry and its associated infrastructure tend to be concentrated in biodiversity hotspots such as mountains, forests, national parks and reserves. New developments in tourism constitute a remarkable opportunity to advance the cause for sustainable development. Increased trends in tourism may have positive impacts on poverty reduction through higher employment opportunities and rising income levels, positive environmental changes and access to services such as water supply and sanitation, transport and health care facilities that may be developed to boost the tourism sector. With emphasis on sustainable tourism development African destinations will see conservation of mountains, biodiversity and even beaches and other niche tourism segments. These efforts will embody the principles of integrated environmental, economic and sociocultural sustenance while making optimal use of environmental resources, respecting the sociocultural

authenticity of host communities and ensuring viable, long-term economic operations.

Conclusion

In terms of the state of the economy, Africa has recorded mixed trends in macroeconomic performance, value addition and contribution of tourism. The continent continues to make progress in economic growth. This is spurred by the adoption of appropriate policies, improved macroeconomic management and overall economic governance. However, not many countries are sustaining the benefits of economic progress from social and environmental outcomes. There is a strong desire to make African economies globally competitive and sustain high economic growth rates in order to ensure improved living standards. Any transformation to this end must ensure equity, inclusiveness and environmental sustainability. The global economic crisis of 2009 had significant but varying impacts on African economies. Recovery has been fast, mainly propelled by a rebound of commodity prices, steady flow of remittances and rise in foreign direct investment. Efforts should be made to ensure tracking of both the positive economic performance and any underlying depletion of the natural resource base and resultant poverty reduction outcomes. For a more robust, diversified and sustainable economic development, diverse opportunities in manufacturing value addition and sustainable tourism development will be crucial.

2.2.6 Sustainable consumption and production

Sustainable consumption and production (SCP) has been on the international sustainable development agenda since the United Nations Conference on Environment and Development, held in Rio de Janeiro in June 1992. While it is necessary to ensure that production and consumption patterns are sustainable, it is paramount that SCP should be adapted to local conditions and development levels. For Africa, the overarching objective of poverty reduction will require improv-

	Trend	Remarks on status and sustainability trends
Sustainable consumption and production	↔	Overall improvements in terms of production trends, but consumption trends remain unchanged
<i>Sustainable consumption</i>	↓	Limited efforts causing general declining trends in sustainability of consumption patterns
<i>Sustainable production</i>	↑	General progress made in sustainable production showing positive trend

ing the welfare and quality of life of Africa's citizens. This will definitely be accompanied by an inherent increase in consumption, in particular due to demand for food, shelter, energy and water. Policies and investments to sustain and enhance the natural capital assets – water, soils, forests, biodiversity, mountains, fisheries and minerals – on which many poor communities depend for their livelihoods, can be instrumental in translating SCP concepts into action in the region, while ensuring that these do not become obstacles to poverty eradication efforts.

Sustainable consumption

Promoting sustainable consumption is critical to limiting negative environmental and social externalities and providing markets for sustainable products, however, Governments in the region have paid limited attention to this. Although this can partly be attributed to relatively low levels of consumption in Africa, Governments must begin to realize that growing numbers of the African middle class are quickly attaining social and environmental footprints that are equal, if not higher, than those of their counterparts in developed countries. This limited attention to sustainable consumption is reflected in the paucity of data available to measure progress in the area. For this reason, waste-related indica-

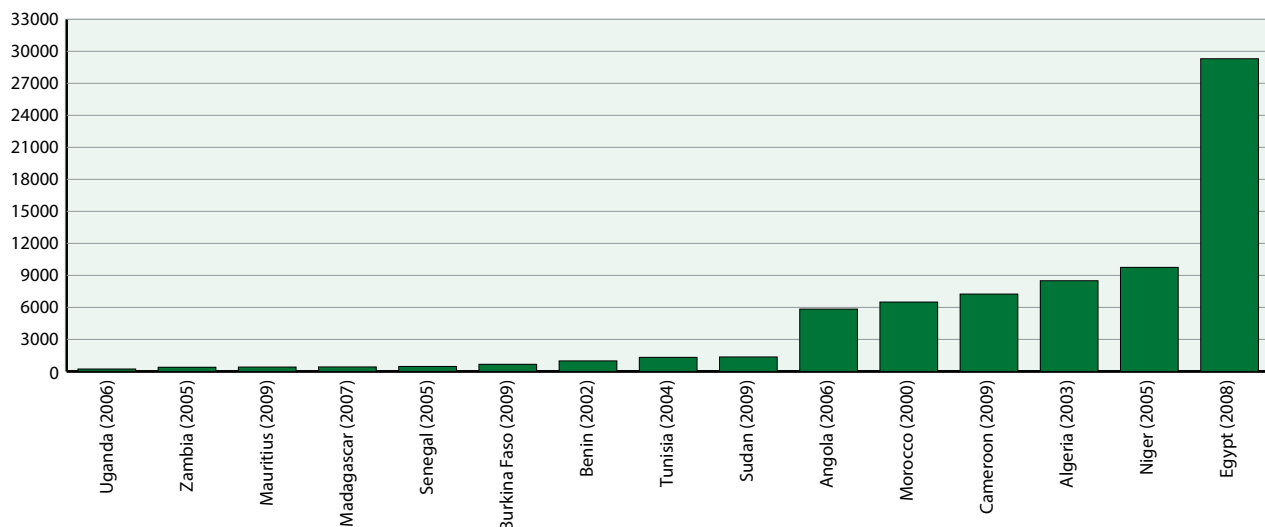
tors are treated in this report as proxies for consumption behaviour in the region.

An integrated waste management approach is a crucial part of international and national sustainable development strategies. There are, however, inadequacies in data on municipal waste for most African countries. The municipal waste collected by some African countries for which data are available is presented in Figure 20.

For the countries with data, municipal waste collected varies considerably ranging from 224,000 tonnes in Uganda to 29,306,000 tonnes in Egypt. The municipal waste collected was at least 6,500,000 tonnes in Algeria, Cameroon, Morocco and the Niger. The variation is attributed to differences in consumption patterns and the economic wealth of the countries. With respect to disposal of waste, over 90 per cent of the municipal waste collected was landfilled in Algeria, Burkina Faso, Cameroon, Madagascar, Mauritius, Morocco, Tunisia and Uganda (Figure 21).

For African countries with data, the per capita served municipal waste collection also varies, ranging from 127 kg per capita served in Madagascar to 603 kg per capita served in Cameroon as shown in Figure 22. To a great extent, this variation depends on the organization of municipal waste collection and management and

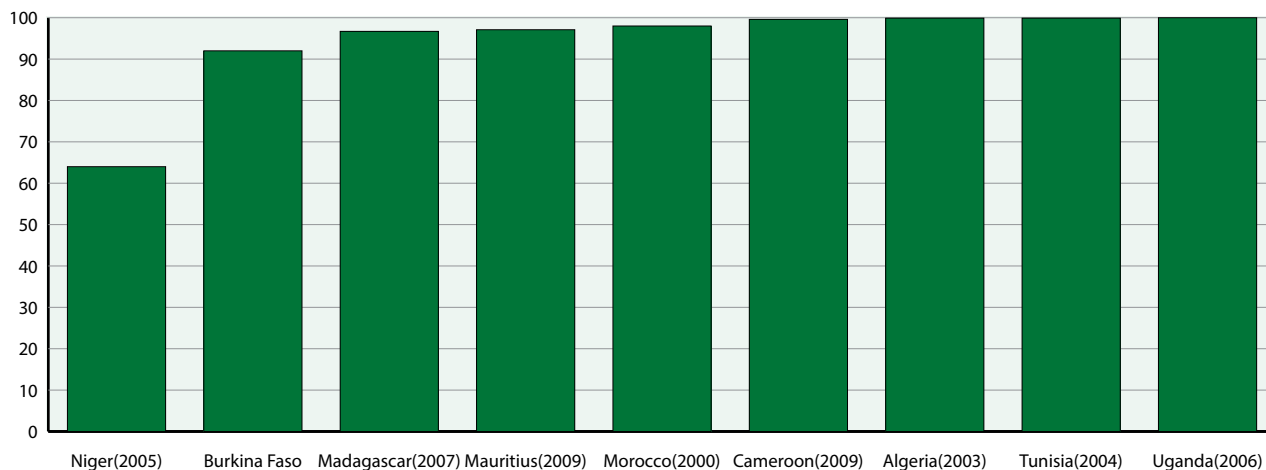
Figure 20: Municipal wastes collected (1,000 tonnes) by some African countries



Source: ECA (2013), based on data from United Nations Statistics Division (UNSD)*

* **Note:** For Senegal, the quantities of waste collected by municipal services cover only a few years and are available only for the urban community of Dakar. For Angola, the data refer to the amount of municipal waste generated. For Burkina Faso, these are estimates based on household and marketplace surveys conducted in 1996 and 2004 in 13 regions of Burkina Faso. The estimates include only the urban population, since rural waste is dispersed in the environment and is usually combined with agricultural waste.

Figure 21: Municipal waste landfilled (%) by African countries with data



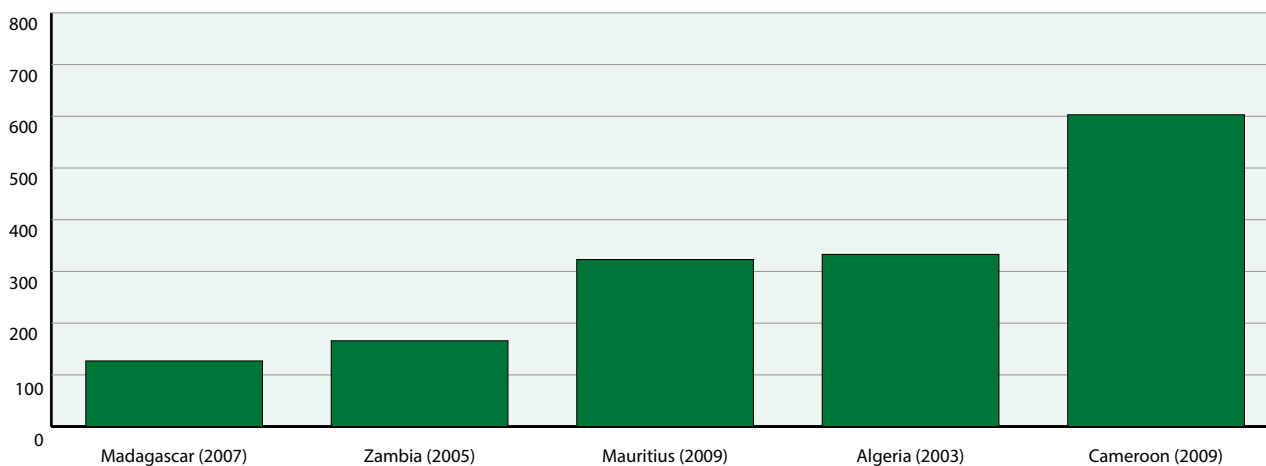
Source: ECA (2013), based on data from UNSD

is an indication of differences in consumption patterns and economic wealth of the countries. The trends are driven by consumption patterns of the middle class and increasing need for food, shelter and manufacturing inputs to serve the ever-growing population.

A large proportion of the disposal sites in Africa are simply open dumps. Some countries have recently made efforts to improve the landfill practice. The organic content of the municipal solid waste in many African countries exceeds 70 per cent (wet basis). The management of such waste does not include technologies for centralized composting, anaerobic digestion and gas recovery. There is still poor understanding about the market potential of municipal solid waste. The consumption status and trends are pegged on other sustainable development as-

pects that are discussed in other sections of this report, namely: economic growth and welfare; international trade and its impacts on production; sociodemographic trends of relevance to consumption such as increased affluence and expansion of the middle class, which spurs consumption by the State and households; and progress in sustainable developments in water, energy, industrial and tourism sectors. According to the African Roundtable on Sustainable Consumption and Production report of 2009, achievement of poverty eradication in ways that promote SCP requires strategies that accelerate industrial development to provide employment and enhance incomes and financial resources needed to stimulate growth. Such efforts must, however, be environmentally sustainable and not contribute to further environmental degradation. Any effort to increase agri-

Figure 22: Municipal waste collected (kg per capita served)



Source: ECA (2013), based on data from UNSD

cultural production for food security must avoid degradation of the natural resource base. Specifically, depletion of water resources, degradation of land, encroachment into forests, mountains and vulnerable ecosystems, and energy inefficiency in production processes must be avoided.

Sustainable production

In Africa, sustainable production activities have largely been centred on institutional participation in awareness-raising and capacity-building, but have had limited impact. National Cleaner Production Centres (NCPCs) have been established in Ethiopia, Egypt, Kenya, Morocco, Mozambique, South Africa, Tunisia, Uganda and Zimbabwe. Development of national pilot SCP programmes has either been completed or is ongoing in Egypt, Ethiopia, Ghana, Mauritius, Mozambique, Senegal and Tanzania. The sustainable production focus continues to be on:

- Chemicals and hazardous waste management with many African countries having ratified major conventions relating to chemicals and waste, including the Stockholm and Bamako conventions;
- Cleaner production and eco-efficiency spearheaded by the NCPCs for awareness-raising and training, demonstrations and assessments, and technical support for cleaner production, policy advice and consumer support;
- Sustainable industrial development and corporate social responsibility spearheaded by the African Union's Africa Productive Capacity Initiative strategy of the New Partnership for Africa's Development (NEPAD); and
- Sustainable tourism development, including adoption of policies that unlock opportunities for the poor within tourism, and the Global Code of Ethics for Tourism.

Marked progress has also been made in the development of policies and plans in support of SCP through national regulatory frameworks, the creation of environmental administrations, funding and more effective enforcement. The NCPCs are the drivers of clean production although their role is hampered by factors such as low funding, lack of information on emerging

clean technologies, insufficient human and technical capacity, negative attitudes and weak policies and regulations. The NCPCs should be further developed to create national impact through strategic partnerships with bodies such as the waste minimization clubs in South Africa. The emerging good results from NCPCs should be consolidated to motivate key decision-makers in the financial sector to pursue clean production investments. In countries like Uganda and Rwanda, clean production is already being mainstreamed into the national policy and regulatory frameworks.

A range of policies and initiatives in Africa already facilitate SCP through resource efficiency, cleaner production, environmental management systems, corporate management practices and consumer education. Africa has made a number of achievements in SCP, although the impact and penetration are still very limited in most countries (ECA 2009b). This situation has been linked to low regional capacity for the practice, failure to enhance legislation and enforcement coupled with weak institutional capacity for implementation (ECA 2009b). This is exacerbated by the prevailing limited awareness of the benefits of SCP and limited human and technical capacity. In Africa SCP hinges on meeting basic needs sustainably.

Progress in Africa on SCP is based on the African 10-Year Framework Programme launched with the strategic aim of linking SCP with the challenges of meeting basic needs more sustainably around four thematic areas: energy; water and sanitation; habitat and sustainable urban development; and industrial development. The Programme brings together the African Round Table on Sustainable Consumption and Production, the Marrakech Task Force on Cooperation with Africa and the development of national and local SCP action plans in some countries. There is a need to develop an Africa-wide SCP indicator framework and monitoring protocol for reporting progress.

Conclusion

Africa is making steady progress in sustainable production, but significant efforts are still needed to ensure sustainable consumption to meet the basic needs of a growing population and the demands of an increasingly affluent middle class. The concept of sustainable consumption and production is relatively new in Africa and has not been adapted fully, especially at local levels. Poverty reduction means improving welfare and the

quality of life and involves an increase in consumption, in particular food, shelter, energy and water, all of which are extracted from the environment. Other effects of the food production and consumption chain include the impact of transportation, processing, packaging and retailing of food and the food wastes generated at the point of consumption. The burgeoning African middle class is a clear target for SCP campaigns.

Establishing and operationalizing NCPCs should be encouraged to strengthen institutional efforts in sustainable production with a focus on chemicals and hazardous waste management, cleaner production and eco-efficiency, sustainable industrial development and corporate social responsibility as well as sustainable tourism development. Policies and plans in support of SCP are being improved through institutional strengthening and regulatory measures. The challenge for Africa is to produce and consume more, but sustainably. To achieve SCP objectives, Africa must address such organizational challenges as poor institutional capacity and many system-wide flaws such as lack of monitoring, inadequate capacity and lack of consumption and production models. There is a need to prevent and minimize waste and maximize reuse, recycling and use of environmentally friendly alternatives. Data on SCP is limited, and national, subregional and regional efforts on capacity-building and harmonization should be stepped up in this regard.

2.2.7 Social equity and opportunities

Sustainable development outcomes should benefit all segments of society. Opportunities for economic and social transformation must also be equitably distributed to populations in various social groups and over generations. Social equity is primarily dependent on the distribution of the economic benefits of development across the population. Although Africa has largely rebounded from the economic crises of the last few years, economic growth is yet to bring about the desired levels of employment creation and improved labour productivity for various social groups. The state and trends in social

equity as a measurement of sustainable development remain mixed.

The situation is reflected in unstable employment trends. Better employment policies are needed, focusing on expanding productive employment opportunities and improving social protection (ILO 2011). More than three quarters of workers in sub-Saharan Africa are in vulnerable employment and around four out of five workers live with their families on less than \$2 a day. Table 5 illustrates the trends in both male and female unemployment between 2000 and 2010.

Income inequality

While average income levels are important indications of economic growth, the inclusiveness and equitability of such growth is of paramount importance to ensure that it contributes to poverty eradication within the sustainable development framework. One widely used and accepted measurement of income distribution inequality is the Gini index, which measures the degree of inequality in the distribution of family income. As a measure of both income and wealth disparity, it captures the gap between the rich and the poor. Where it is high, appropriate government policies need to address income inequalities and wealth redistribution. Income inequity across social groups and generations has been tracked using the share of the poorest quintile in national income or consumption as well as the Gini index.

The Gini indices for the top 10 countries in Africa are indicated in Table 6. South Africa, for instance, has specific social grants for tackling income inequality, making her the biggest welfare State in the world as at 2010. These States spend the largest part (about 3.2 per cent) of their GDP on social grants and assistance.

Income inequality trends reflect the degree of access by various social groups to goods and services obtained from the production and consumption processes in all sectors. The benefits accruing from forests, mountain resources, tourism and biodiversity remain skewed away

	Trend	Remarks on status and sustainability trends
Social equity	↓	General decline in overall social inclusiveness, as inequality remains significant, in particular with respect to income distribution and access to essential services
<i>Income inequality</i>	↓	Negative trends due to increasing disparities
<i>Empowerment of women</i>	↑	Progress is being made in overall empowerment of women, but much remains to be done
<i>Youth employment</i>	↓	Little or no progress made and declining sustainability trends

Table 5: Trends in total unemployment by gender in North Africa and sub-Saharan Africa (2000–2010), including estimates for 2011

Subregion	Gender	2000	2005	2006	2007	2008	2009	2010	2011*		
									CI lower bound	Estimate	CI upper bound
North Africa	Male	11.5	9.0	8.2	8.1	7.5	7.3	7.4	7.7	8.2	8.8
	Female	20.8	19.6	10.8	16.1	16.0	16.5	16.4	18.0	19.0	20.1
	Total	13.6	11.5	10.5	10.1	9.6	9.6	9.6	10.3	10.9	11.6
Sub-Saharan Africa	Male	8.5	7.8	7.7	7.6	7.6	7.7	7.7	7.4	7.7	6.7
	Female	10.0	9.0	8.9	8.8	8.8	8.7	8.7	8.5	8.8	9.1
	Total	9.2	8.3	8.2	8.1	8.1	8.2	8.2	7.9	8.2	8.5

Source: ILO (2011)

from the vulnerable poor communities, gender groups and segments of society in Africa. The income inequities further exacerbate the ability of disadvantaged groups, especially women and youth, to secure benefits from other sustainable development outcomes, such as access to energy, drinking water, sanitation and overall food security.

The poorest quintile's percentage share of national income or consumption is the share that accrues to the bottom fifth of the population. It captures the extent of relative inequality in the distribution of income. Complete and recent data for this indicator are unavailable. The poorest quintile's share in national income or consumption of countries in Africa based on available data is presented in Figure 23.

The share of income (or consumption) of the poorest 20 per cent of the population in Africa was at most 10.8 per cent. The highest share was registered by Seychelles (10.8 per cent) followed by Ethiopia (9.3 per cent), Egypt (9 per cent) and Burundi (9 per cent). The share of income (or consumption) of the poorest 20 per cent of the population is compared with other quintile groups in selected African countries in Figure 24.

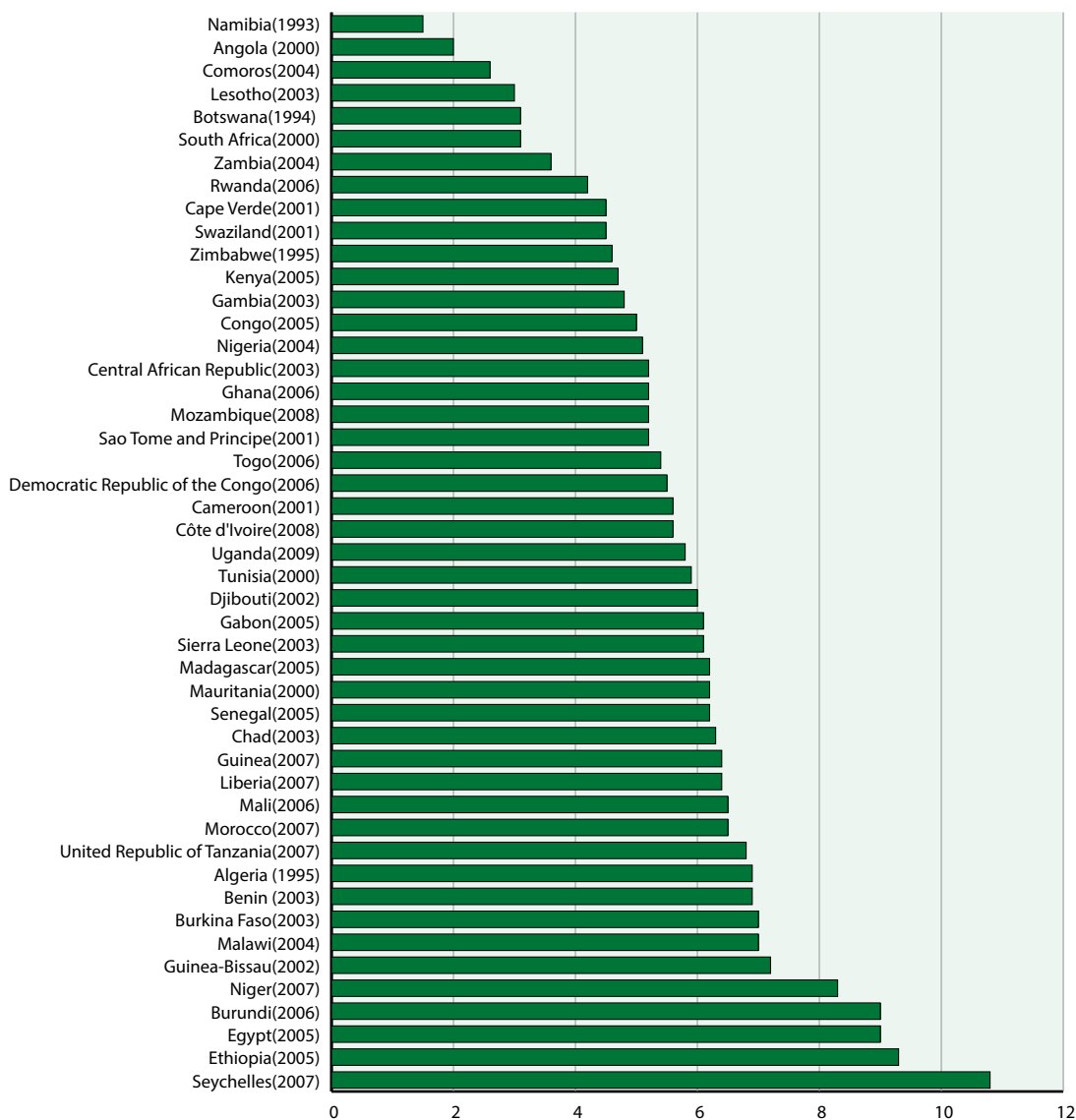
The share of income (or consumption) of the richest 20 per cent of the population in every country is much greater than the share in other quintile groups. For subregions and countries with adequate trends data, there is evidence of worsening levels of the poorest quintile's share of national income. This continues to erode sustainable development gains and the ability of the population in this lowest ebb of society to secure

Table 6: Gini index of the top 10 African countries for various years

	Country	Distribution of Family Income – Gini Index	Year of Information
1	Namibia	71	2003
2	Seychelles	66	2007
3	South Africa	65	2005
4	Lesotho	63	1995
5	Botswana	63	1993
6	Sierra Leone	63	1989
7	Central African Republic	61	1993
8	Zambia	51	2004
9	Swaziland	50	2001
10	The Gambia	50	1998

Source: World Fact Sheet - <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2172rank.html>

Figure 23: Poorest quintile's share in national income or consumption



Source: ECA (2013), based on data from United Nations Millennium Development Indicators (years in parentheses indicate latest available data)

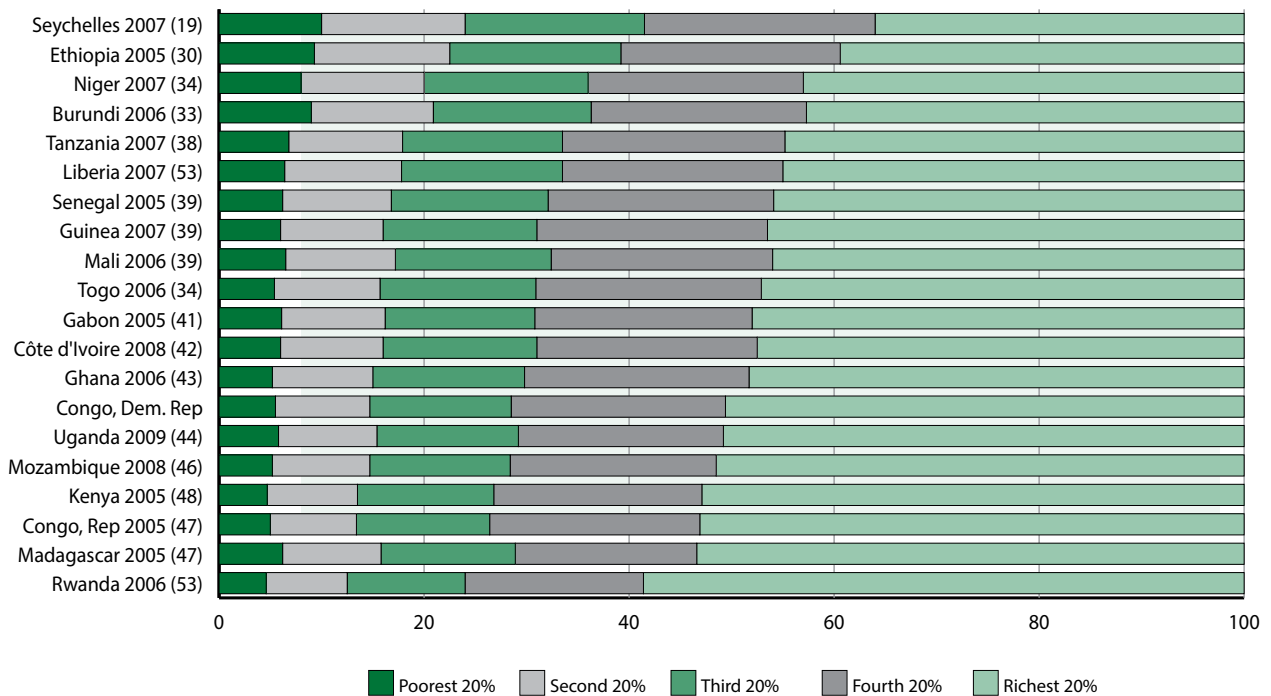
sustainable benefits from economic, social and environmental processes.

Empowerment of women

Sustainable exploitation of natural resources depends on the extent to which women as custodians and vulnerable gender group are empowered to make decisions and access factors of production and other opportunities for income security such as employment. Africa remains strongly committed to the promotion of gender equality as both a target and a means for sustainable development. Consideration of gender equality and the

rights and interests of women and girls has been identified as appropriate investment in the human capital needed to ensure sustainability. Efforts to this end have targeted equitable access to education, maintenance of good health, ensuring women's civil and political rights and addressing the gender differentiated impacts of environmental issues such as climate change.

As shown in Table 5, however, there continues to be gender inequality in employment. Women have a much higher unemployment rate than men (15 per cent versus 7.8 per cent), which is of particular concern because female labour force participation rates are still low. The

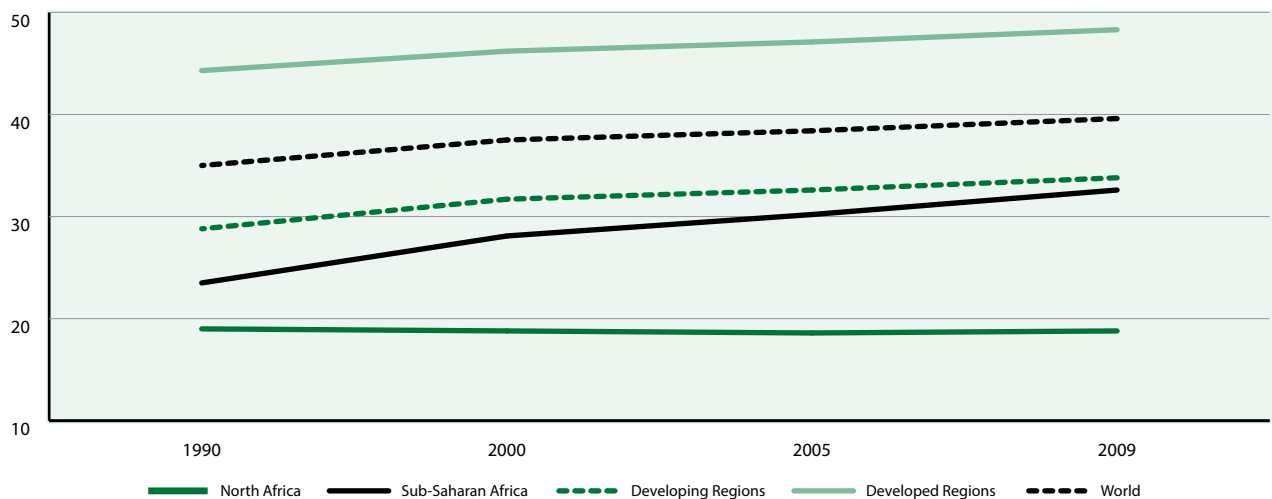
Figure 24: Share of income or consumption by quintile groups

Source: WDI 2011

percentage of employees in non-agricultural wage employment who are women is increasing globally and in Sub-Saharan Africa in particular, although it is nearly constant in North Africa (Figure 25).

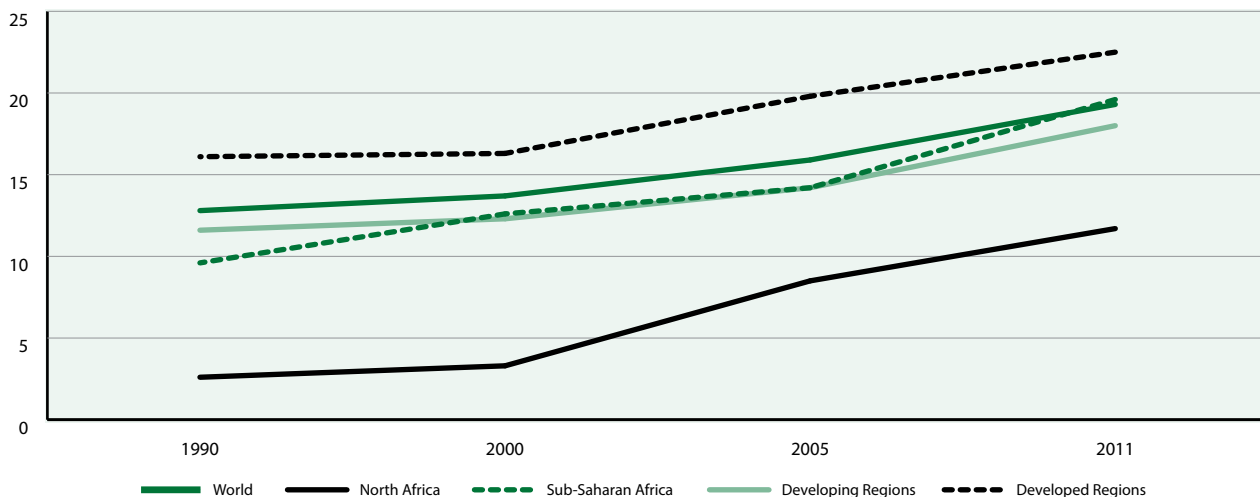
Women in five African countries (Botswana, Central African Republic, Ethiopia, Namibia and South Africa)

have the highest share (over 40 per cent) of employment in the non-agricultural sector, while in Algeria, Egypt, Liberia, Libya and Senegal, under 20 per cent of women are employed outside agriculture. However, significant progress has been made in terms of women's political empowerment. The percentage of parliamentary seats held by women is increasing in all regions, and sub-

Figure 25: Percentage of women employees in non-agricultural wage employment

Source: ECA (2013), based on data from MDG Indicators Report 2011

Figure 26: Percentage of parliamentary seats occupied by women



Source: ECA (2013), based on data from the MDG Indicators Report 2011

Saharan Africa has a better representation of women in national parliaments than North Africa (Figure 26). The proportion of parliamentary seats occupied by women in 23 of the 32 African countries with available data for both years (1990 and 2011) increased, although it declined in seven countries, namely Botswana, Kenya, Liberia, Libya, Morocco, Somalia and Swaziland. Rwanda has had the highest percentage of parliamentary seats occupied by women since 2004, peaking at 56.3 per cent in 2011.

Youth employment

Youth (typically 15–24 year olds) employment is an important labour market indicator which, together with the employment-to-population ratio, provides the broadest indicator of labour market performance. It is a measure of the inability of an economy to generate employment for those persons who are not employed but are available and actively seeking work. Healthy economies have a majority of their workers engaged in some form of economic activity in the informal economy and/or in self-employment. In Africa, an alarming 42 per cent of economically active young people were unemployed in 2010 (ILO 2010). Between 2007 and 2009 over 1 million young people dropped out of or had a delayed entry into the labour market, indicating a colossal number of disenfranchised youth in addition to the increase in youth unemployment (ILO 2010) (Table 5).

The youth unemployment rate shows a decreasing trend in North Africa and in some countries in sub-Saharan

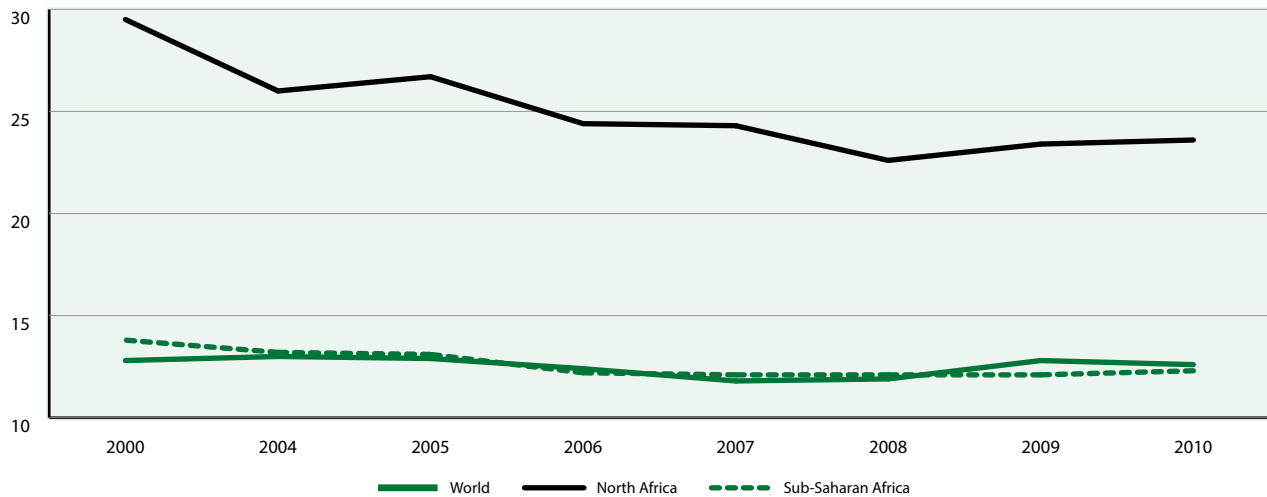
Africa though the decline in sub-Saharan Africa is not significant (Figure 27). Furthermore, the youth unemployment rate in North Africa is much higher than that in sub-Saharan Africa. The global youth unemployment rate stood at 12.6 per cent in 2010, up from 11.8 per cent in 2007. Compared with 2000, the youth unemployment rate in 2009 and 2010 fell, especially in North Africa (from 29.5 per cent in 2000 to 23.4 per cent in 2009). Associated consequences of youth unemployment, including social strife, have also hampered sustainable development in the region.

Conclusion

Inequality in Africa remains a challenge, in particular with respect to income distribution and outcomes of economic development. The assessment reports wide disparities between subregions, States, gender groups, age groups and other categories in terms of income and employment opportunities. Progress is being made in overall empowerment of women showing positive trends in equitable gender distribution of opportunities in education, health and civil liberty, but much remains to be done. Thus, further attention to women and youth participation in sustainable development through targeted equitable access to education and employment opportunities will be desirable.

2.2.8 Education

Human resources provide society with the means to respond to challenges and opportunities for wealth

Figure 27: Trends in youth unemployment between 2000 and 2010

Source: ECA (2013), based on data from ILO (2010)

creation and social sustenance. Many constitutions of African countries recognize education as a fundamental human right and the most powerful lever for the promotion of welfare, and civic and social advancement. Universal knowledge, including scientific and traditional knowledge, cultural diversity and natural resource custodianship are prerequisites for prosperity. Education is therefore a pivotal foundation for sustainable development, economic growth and poverty reduction. The diversity in African culture, though rooted in divergent ancestral values, is also a source of dialogue, exchange, innovation and creativity, and the foundation stone of endogenous systems of solidarity, forms of expression and ways of transmitting knowledge that are as valid for meeting the challenges of tomorrow as for preserving the traditions of the past (UNESCO 2009). Obviously, the interaction between culture and education – and the many synergies it implies – is a major factor in widening the range of options open to all in ensuring sustainable development. Africa continues to register modest growth in education as a key component of sustainable development.

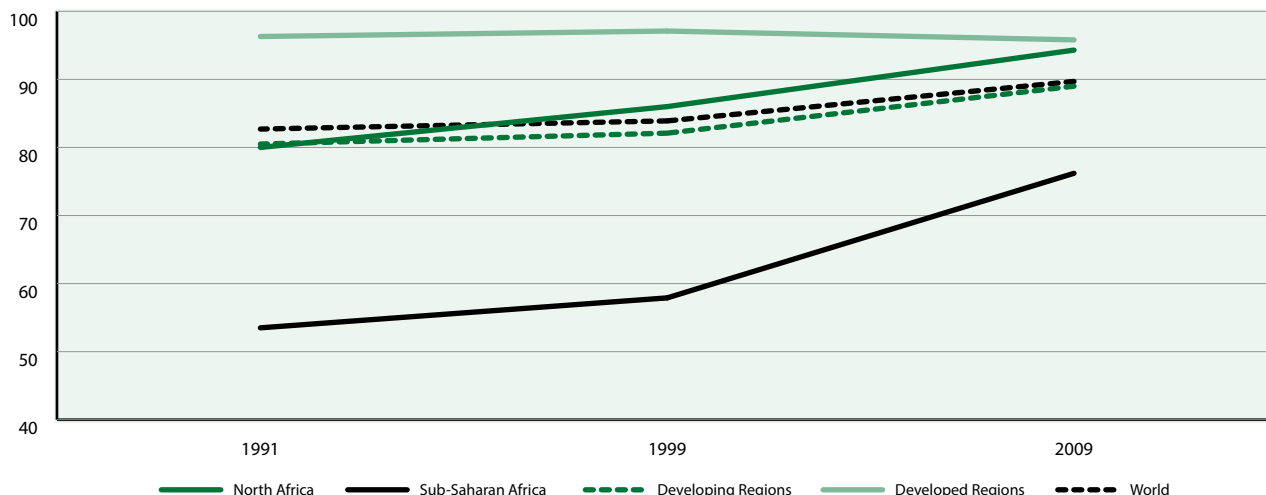
Enrolment level and coverage

In a bid to fast-track achievement of the second Millennium Development Goal, strategies for universal primary education are in place in many countries (GNESD 2007). Many countries in Africa have maintained good performance on most of the education targets and in net enrolment in primary education in particular. The majority of African countries are likely to achieve MDG 2 by 2015, but ensuring excellence and quality of primary education is a major challenge. There was a significant change in net enrolment in primary education between 1991 and 2009. However, net enrolment in sub-Saharan Africa remains much lower than in North Africa and developed regions.

All over Africa the enrolment of girls and boys in primary schools is increasing with outstanding gains registered in several countries. Despite these gains, some countries are still far from attaining universal primary education. By 2009, Algeria, Burundi, Egypt, São Tomé and Príncipe, Tanzania, Togo and Tunisia had achieved the target, while Benin, Cameroon, Malawi, Morocco, Mozambique, Namibia, Seychelles, South Africa, Uganda,

Theme/Indicator	Trend in sustainability	Remarks on status and sustainability trends
Education	↑	Overall, positive progress towards education targets, in particular with respect to enrolment and completion rate. Adult literacy and the quality of education, however, continue to be challenges
<i>Enrolment level and coverage</i>	↑	Positive, but slow progress towards key targets, such as enrolment levels, completion rate, education coverage and gender parity
<i>Adult literacy</i>	↔	Slow progress with indications of inability to meet the 2015 targets with major gender disparities

Figure 28: Trends in net enrolment ratio in primary education



Source: ECA (2013), based on data from MDG Indicators Report 2011

and Zambia were less than 5.5 percentage points short of being on track. However, 17 countries are more than 11 percentage points away from the target. In 2009, five countries (Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea and the Niger) had a net primary enrolment rate ranging from 37.8 to 58.1 percentage points away from the target (Figure 29). If current trends persist, several countries will fail to reach the target by 2015 suggesting the need for scaling up interventions to improve primary enrolment. Strategic planning and international aid, coupled with increased budgetary allocation to the primary education sector will be crucial for success.

There is also increased participation in secondary education with impressive improvement in gender parity (AUC and others 2011). Noticeable improvement in the enrolment of girls has also been registered at the

tertiary level, although men still dominate. According to UNICEF (2010), girls' education has been expanding all over Africa although not fast enough to clear the gender gap in access to primary, secondary and tertiary education. For the subregions, gender parity in primary school enrolment has been increasing steadily since 1990 (Figure 30).

Despite the many recent initiatives aimed at promoting the enrolment of girls, especially at the primary school level, parity between boys and girls is yet to be achieved in Africa, except in North Africa. In 2008 there were 91 girls enrolled in primary school for every 100 boys while only 84 girls enrolled in junior secondary school for every 100 boys (AUC and others 2011), although most countries are on target to achieve gender parity at the primary education level by 2015. Major and sig-

Figure 29: Net enrolment ratio in primary education in 2009 and percentage points away from the target

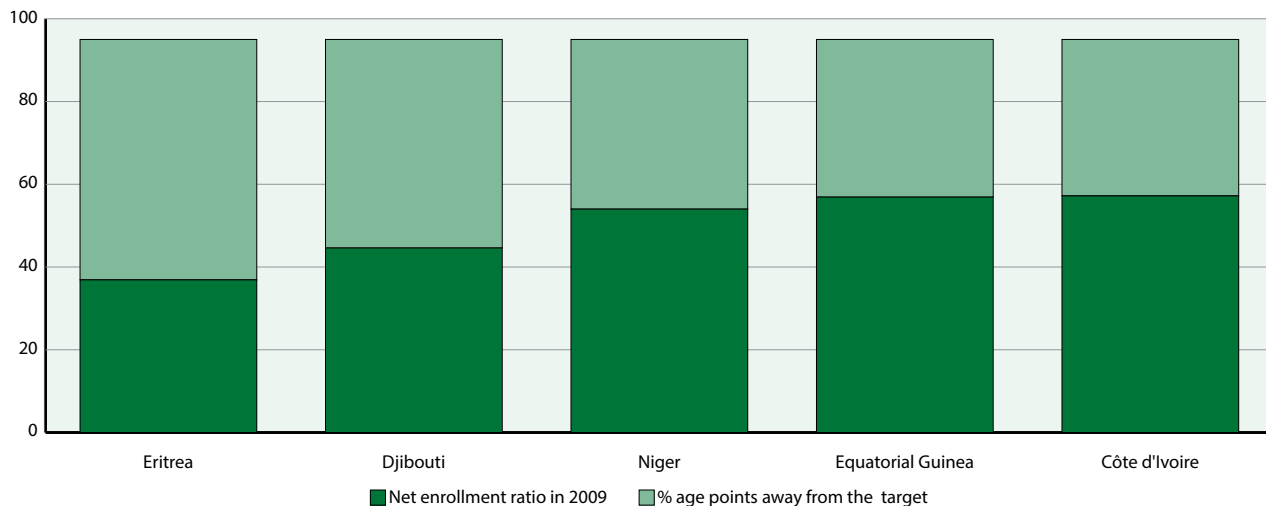
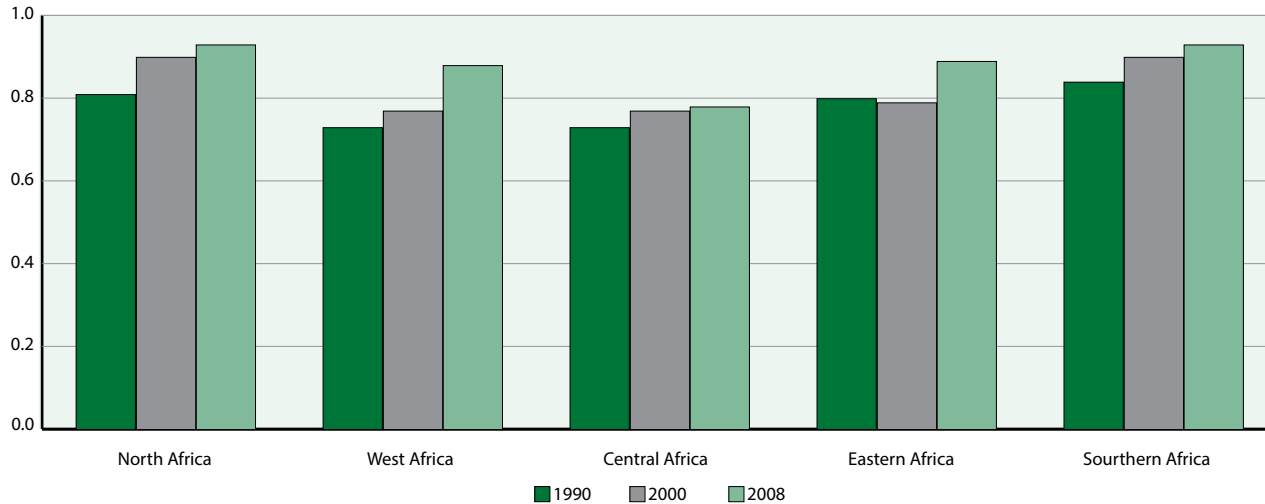


Figure 30: Gender parity index in primary education enrolment, 1990 - 2008

Source: AUC and others (2011)

nificant differences exist between the completion rates of boys and girls with girls recording lower rates for a number of socioeconomic reasons, including gender-linked poverty, as shown in Figure 31.

Challenges that still constrain parity achievement include poverty tied to gender decisions on schooling as well as cultural and traditional practices that reduce girls' enrolment. Countries that have initiated free primary and secondary education have better gender parity. The persistent unequal access to education services particularly affects the low-income households, weakens retention and learning outcomes, undermines the quality of education and increases grade repetition. It is now widely accepted that women have a crucial role to play in achieving sustainable development in Africa: progress towards achieving parity in education at all levels is therefore crucial as it relates to positive outcomes such as food security, health, income and natural resource management.

Adult literacy

The adult literacy rate (the percentage of people aged 15 and above who can, with understanding, read and write a short, simple statement on their everyday life) for 2008 compared to that in 1990 had increased in all regions (Figure 32). The adult literacy rate in the developed regions is much higher than that in North Africa and sub-Saharan Africa. However, given the current trends, it is unlikely that most countries will achieve the goal of increasing adult literacy by 50 per cent. Fur-

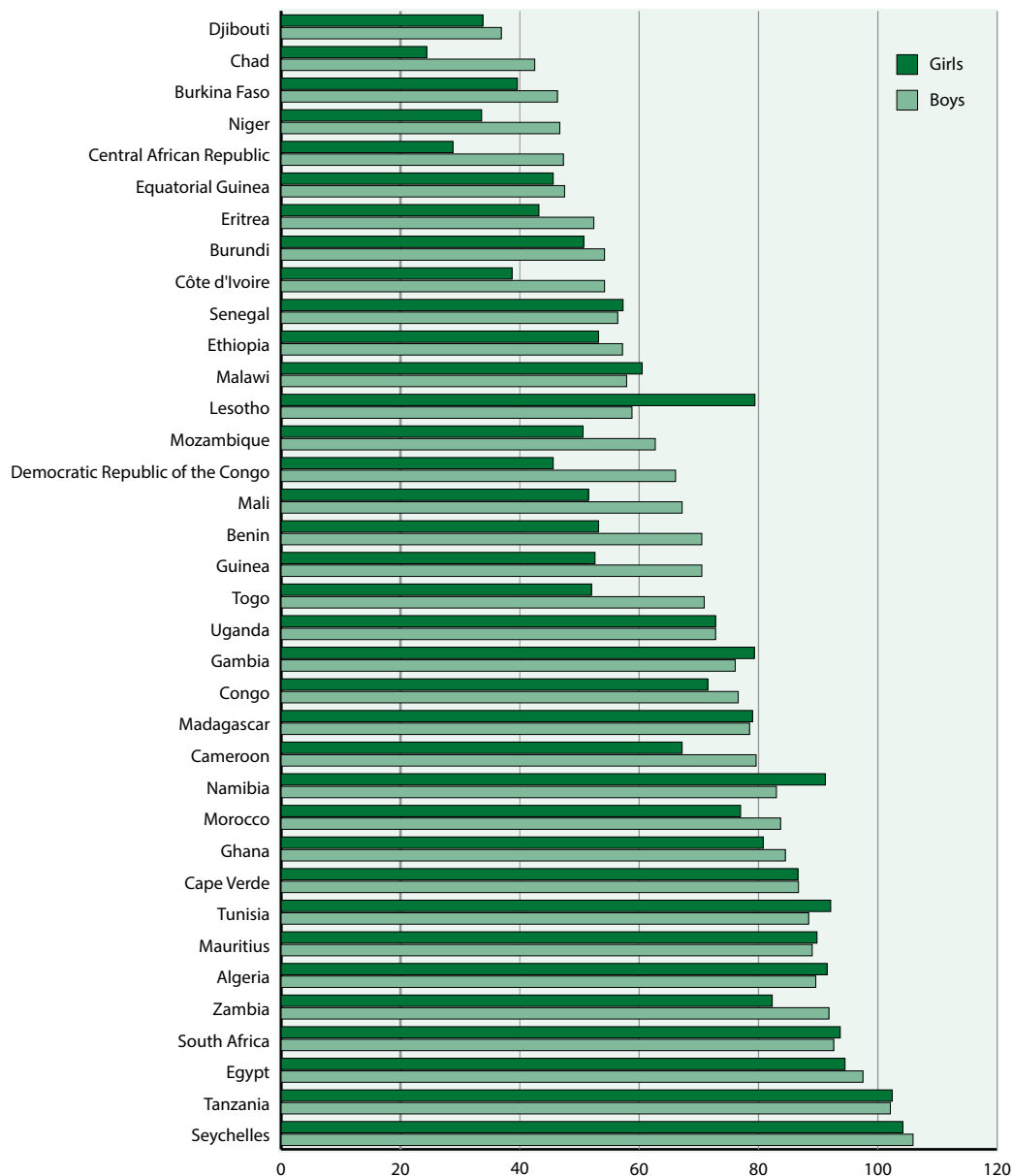
thermore, there are major disparities between males and females in the percentage of literate people aged 15 and above. Progress towards improving the adult literacy situation is of paramount importance for Africa, in particular with a view to developing a pool of skilled labour that can engage in new and emerging economic activities, and that is able to use new technologies and responsibly use natural resources.

The evident male-female divide in the adult literacy rate continues to pose a policy challenge. The proportion of literate male adults is higher than that for female adults. Nonetheless, the proportion of literate female adults increased from 34.6 per cent in 1990 to 58.1 per cent in 2008 in North Africa and from 43.1 per cent in 1990 to 53.6 per cent in 2008 in sub-Saharan Africa. In general, the adult literacy rate is rising in all regions.

Conclusion

Gains have been made in human resource development, which are important for the capacity of society to respond to challenges and opportunities for wealth creation and social sustenance. Improvements are clear in enrolment, gender parity, completion of basic education and education coverage. Though progress is slow, this overall positive trend indicates that Africa is on the path to meeting the primary education-related targets. However, challenges persist in terms of quality of education. Progress in adult literacy is also slow, with indications of inability to meet the 2015 targets, and persistent major gender disparities.

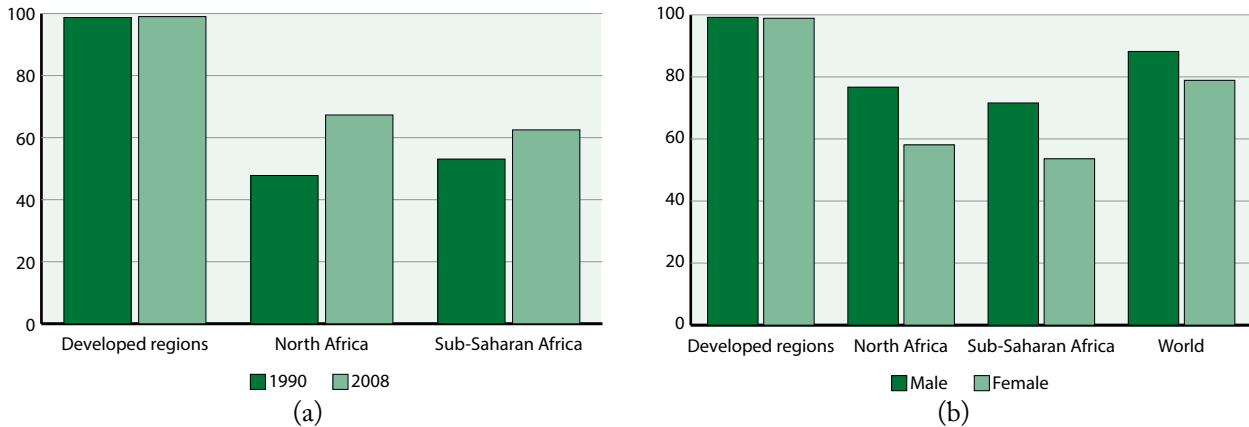
Figure 31: Primary completion rate by sex, 2009



Source: ECA (2013), based on data from UNSD 9 August 2011

Development interventions must recognize the linkages between education and culture as key ingredients of transformation. In this regard, appropriate policies in educational and cultural areas are being designed with a view to shaping Africa's future, including through its own model of knowledge societies. African Governments and regional agencies should continue to undertake curriculum and educational systems renewal at various levels. This should include the development

of local content, teaching and learning materials. African cultural heritage is rich and should be conserved through awareness-raising and ensuring inter-generational ownership. In this regard, formal and non-formal educational structures and channels should be strengthened. Focus is now shifting to tertiary and technical education with special emphasis on the advancement of Africa-led science and technology for innovation for sustainable development.

Figure 32: Adult literacy rate (%): (a) both sexes; (b) differentiated by gender

Source: ECA (2013), based on data from UNESCO Institute for Statistics, Data Centre, September 2010

2.2.9 Health

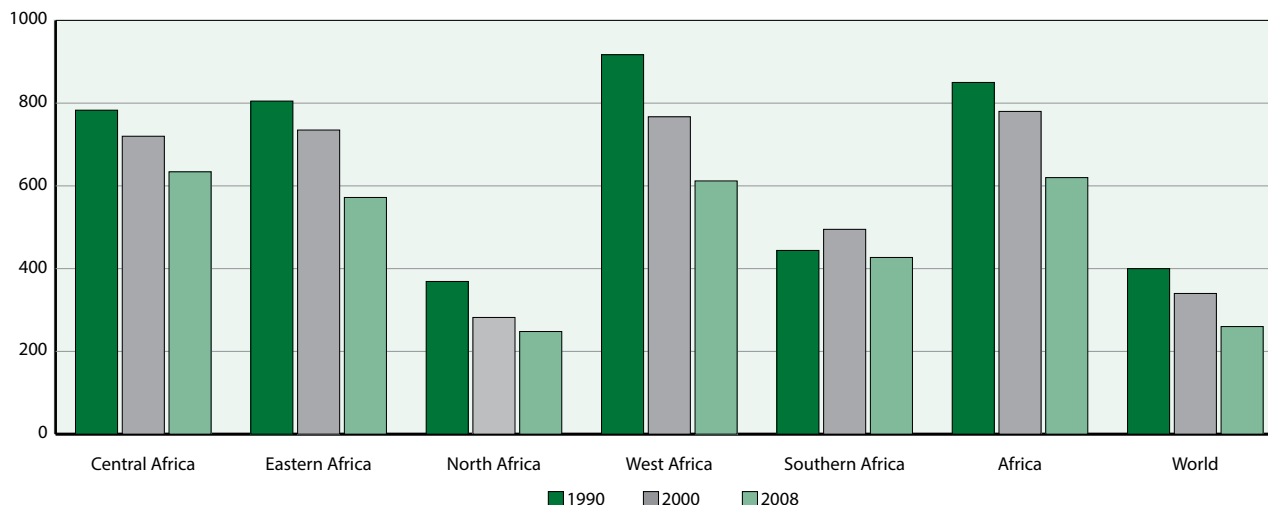
As an essential component of human development, health is central to sustainable development through creation of opportunities for improving the health of people, enhancing quality of life and ensuring a better future (WHO 2010b). Africa is still reeling under a severe health burden resulting from weak health systems and a prevalence of communicable and non-communicable diseases, high child and maternal mortality, recurrent epidemics and humanitarian crises aggravated by disasters, climate change and the global financial crisis. Broad-based primary health care focusing on the health of mothers and children, continued attention to HIV/AIDS, malaria and tuberculosis, and intensification of prevention and control of communicable and non-communicable diseases are some of the key responses witnessed in the last few years (WHO 2010a). As an important indicator of sustainable development the status and trends in key health parameters are summarized below:

Maternal and infant mortality

The maternal mortality ratio (MMR) is the number of women who die during pregnancy and childbirth per 100,000 live births. It is an indication of the risk of death once a woman becomes pregnant. The fifth Millennium Development Goal aims to improve maternal health with a target of reducing MMR by 75 per cent between 1990 and 2015. To achieve this, Africa must attain a 5.5 per cent annual decline in MMR from 1990.

Maternal mortality has decreased globally, although not at the rate needed to achieve MDG 5. During this period modest progress was made in Africa, the region with the highest levels of maternal mortality. With an overall annual decline of less than 2.3 per cent, none of the subregions of Africa is on track to achieve MDG 5, though North Africa and West Africa, with an average percentage decline in MMR of 2.2 per cent between 1990 and 2008, have performed relatively better. Figure 33 illustrates the changes from 1990 and 2000 to 2008.

	Trend in sustainability	Remarks on status and sustainability trends
Health	↔	Though improving, the remaining health challenges are slowing progress towards sustainable development
<i>Maternal and infant mortality</i>	↔	Though both maternal and infant mortality rates have declined in the region, progress is not enough to meet 2015 targets
<i>Morbidity</i>	↑	Marked improvements in combating diseases like HIV/AIDS and malaria, although the 2015 targets will most likely not be met

Figure 33: Maternal mortality ratio: 1990, 2000 and 2008


Source: ECA (2013), based on trends in maternal mortality: 1990–2008 by WHO

Under-five mortality estimates the number of newborn babies that will die before reaching their fifth birthday, based on current age-specific mortality rates for each country. The indicator provides a robust determinant of the health of children as it refers to the probability of dying before age five per 1,000 newborns. Under-five mortality levels are influenced by poverty; education, particularly of mothers; the availability, accessibility and quality of health services; health risks in the environment such as access to safe water and sanitation; and nutrition, among other factors. The trends in under-five mortality rates for the subregions of Africa between 1990 and 2009 are presented in Table 7.

Between 1990 and 2009, the under-five mortality rate declined in all regions, and in North Africa it dropped by 39 per cent – from 83 deaths per 1,000 live births in 1990 to 51 in 2009. However, the decline in the mortality rate for sub-Saharan Africa was only about 5 per cent. While North Africa has made the most progress in reducing under-five mortality among the subregions of Africa, the rate of decline for Africa in general remains insufficient to reach the MDG 4 target. The highest rates of child mortality continue to be in Central Africa, where one child in seven dies before age five (144 deaths per 1,000 live births) – nearly 24 times the average of one in 167 for developed regions. Both maternal and child mortality rates are outcomes of economic

Table 7: Deaths of children before reaching the age of five per 1,000 live births

Region	1990	1995	2000	2005	2006	2007	2008	2009	Decline, 1990–2009 (per cent)	Average annual rate of reduction, 1990–2009 (per cent)
Central Africa	152	151	150	147	146	146	145	144	5	0.3
Eastern Africa	148	144	126	111	108	105	103	100	32	2.1
North Africa	83	71	62	55	54	53	52	51	39	2.5
North Africa excluding the Sudan and Mauritania	80	60	46	33	31	30	28	26	68	5.9
Southern Africa	125	123	122	107	103	98	93	90	28	1.7
West Africa	196	186	166	143	139	135	132	128	35	2.2
Developed regions	12	9	8	7	6	6	6	6	50	3.6
World	89	86	77	67	66	63	62	60	33	2.1

Source: Levels and Trends in Child Mortality Report 2010. Estimates developed by the United Nations Inter-agency Group for Child Mortality Estimation and United Nations (2011a)

and social policies. They also both reflect investments in education and empowerment, especially of women and the youth. The two ratios demonstrate improvements in health services, nutrition and gender equity.

Morbidity

African Governments are alive to the fact that the goals of sustainable development cannot be achieved when there is a high prevalence of debilitating illnesses and the health of the population cannot be maintained without ecologically sustainable development. Good management of natural ecosystems brings both social and economic gains. There is therefore a link between health and development since good health usually facilitates development and development often promotes improved health. This is evident in the environmental, social and economic burden of health which weighs down the GDP and other national capital resources. The challenges related to health and development interlinkages are critical in Africa. Vulnerable groups are most affected as seen in individual countries.

Sub-Saharan Africa is most heavily affected by HIV/AIDS with the highest HIV prevalence rate of any other region of the world (Table 8). HIV has continued to afflict the continent and hamper improvement in human conditions. Progress is being made in a number of countries but this is constrained by several factors. According to UNAIDS (2010), Africa has sustained the progress made in tackling HIV/AIDS; the reduction in HIV prevalence and mortality rates reported in 2007 is continuing and the HIV/AIDS-related mortality rate has stabilized.

Both HIV prevalence rates and the number of people dying from AIDS vary significantly among African regions and countries, with prevalence estimates ranging from less than 0.1 per cent to more than 20 per cent in

some countries. Compared to East and Southern Africa, West Africa has been less affected by HIV/AIDS, but some countries, especially in Central Africa, are experiencing rising HIV prevalence rates. In Cameroon HIV prevalence is now estimated at 5.1 per cent and in Gabon it stands at 5.9 per cent. Adult HIV prevalence in Eastern Africa exceeds 5 per cent in Tanzania and Uganda. Overall, rates of new HIV infections in sub-Saharan Africa peaked in the late 1990s, and HIV prevalence declined slightly, although it remains at an extremely high level. Figure 34 shows that the prevalence of HIV declined in most African countries in 2009 compared to 1990.

An aggressive prevention programme combined with increased access to treatment and behaviour change appear to be the main drivers of this improvement. Although in some regions AIDS is increasingly being viewed as a forgotten epidemic, African Governments, civil society and other actors have sustained awareness and management campaigns on the continent.

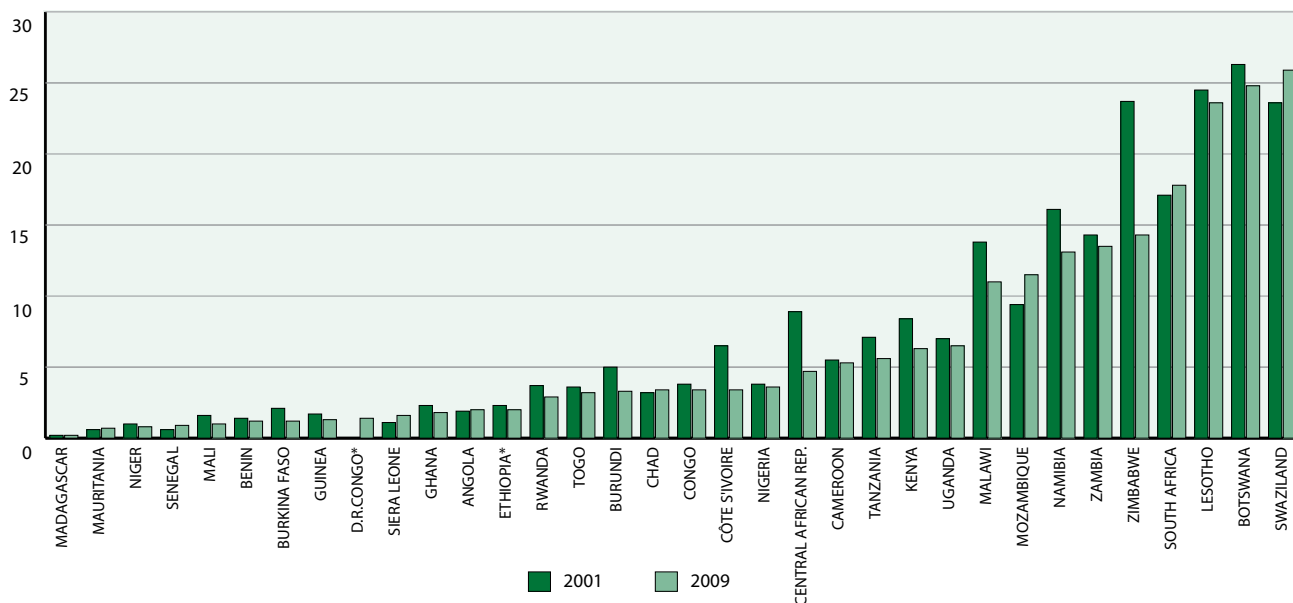
The MDG target of halting malaria by 2015 and thereafter reversing its incidence is still a mirage to many African countries. According to WHO (2010b) and AUC and others (2011) malaria is still an endemic in most African countries and is a major cause of morbidity and mortality. However, considerable progress has been made in improved access to insecticide-treated nets to prevent malaria with the highest ever disbursements recorded in 2009 at \$1.5 billion. Still more work and investment are needed to reach households, especially the most vulnerable children under five, pregnant mothers, poor households in rural areas and slums, the elderly and patients with AIDS and tuberculosis. A number of issues across the entire health and sustainable development spectrum also need to be addressed, including the linkages with natural resources.

Table 8: HIV prevalence of adults aged 15-49

Region	1990	2001	2009
North Africa	<0.1	<0.1	0.1
Sub-Saharan Africa	2.1	5.5	4.7
Developing regions	0.3	0.9	0.9
World	0.3	0.8	0.8

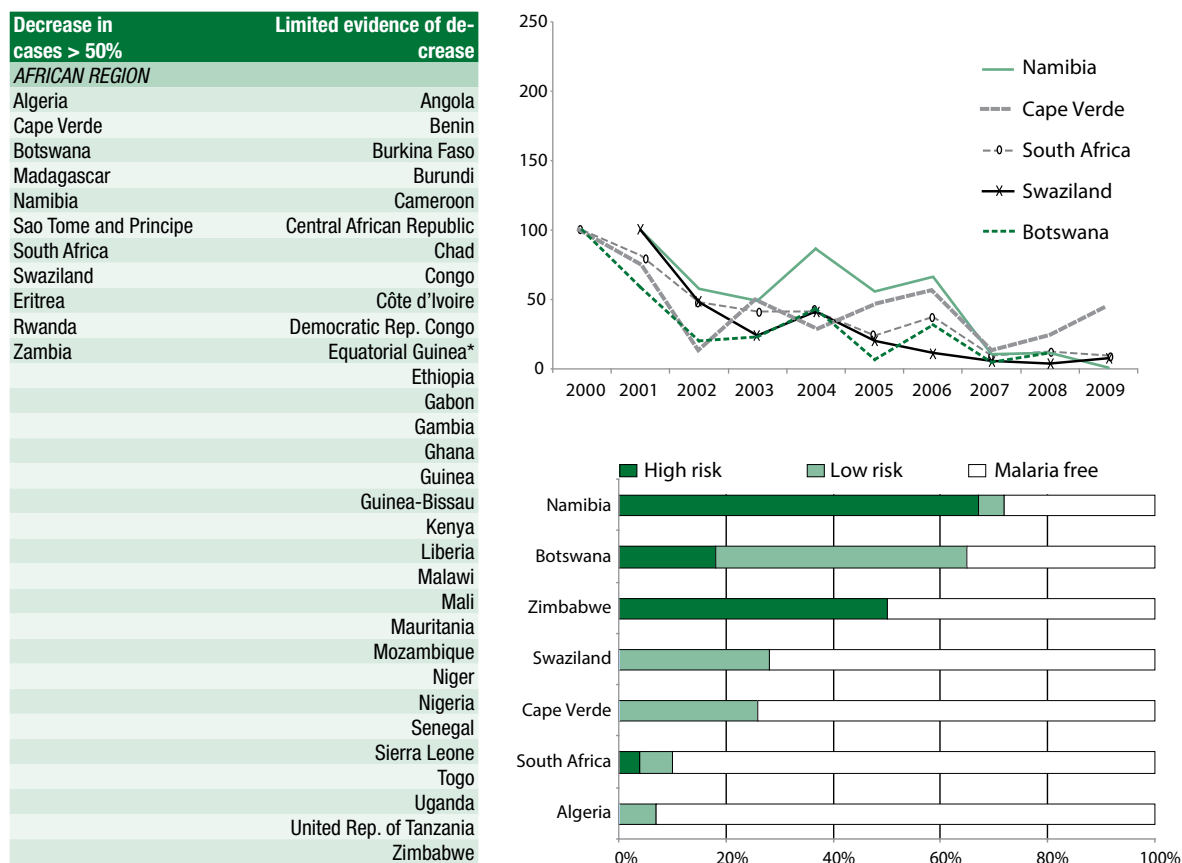
Source: United Nations (2011a)

Figure 34: HIV prevalence among adults 15-49 years in sub-Saharan African countries, 2001-2009



Source: UNAIDS (2010)

Figure 35: Summary of progress in reducing the number of malaria cases between 2000 and 2009 (left); changes in confirmed cases for countries with sustained decline in prevalence (right) and population risk (right bottom)



Source: WHO (2010c)

Human health in Africa is closely linked to natural resources (both positively and negatively). The Libreville Declaration on Health and Environment (WHO 2009) puts emphasis on multisectoral actions on health and environment linkages to achieve substantial health and environmental improvements and their co-benefits, as well as meeting the MDGs (UNEP 2008). Priority areas are safe drinking water; sanitation and hygiene services; management of environmental and health risks related to climate change and variability; sustainable management of biodiversity, forests and wetlands; management of natural and human-induced disasters; and ensuring food and nutrition security.

Conclusion

The increased burden of health challenges, including diseases, is slowing progress towards sustainable development. There is progress towards reduction of maternal and child mortality in many countries, but not fast enough to meet the 2015 targets. There is marked improvement in combating major diseases like HIV/AIDS and malaria, although the 2015 targets will mostly not be reached. In recognition of the link between health outcomes and sustainable development, African Governments are focusing on the underlying causes of maternal and infant mortality, as well as morbidity associated with principal diseases like HIV/AIDS and malaria. It is desirable to enhance the ongoing improvements in broad-based primary health care and intensification of prevention and control of communicable and non-communicable diseases.

2.2.10 Agriculture, food security and nutrition

It is widely recognized that achieving rapid growth in agricultural productivity is essential to raising overall economic growth in Africa and meeting the MDGs, especially those related to reducing poverty and hunger

(NEPAD 2006, UN 2010c; World Bank 2010a). The welfare of rural populations throughout much of Africa remains linked to agriculture, which in turn relies on the natural resource base. At the same time, agriculture poses a threat to the integrity of forests, mountains, biodiversity and other natural resources through expansion of cultivated land and unsustainable practices. Agriculture is a direct beneficiary of biotechnology, for example, the introduction of new varieties, breeds and sustainable technologies. Agriculture's reliance on natural resources as a basis of production defines its link with sustainability and vulnerability to natural challenges such as climate change. African natural ecosystems widely provide fruits, vegetables, honey, spices, oils, bush meat, fish, edible worms and mushrooms which augment food security sources, and biodiversity on the continent is a major source of medicinal items such as oils of cedar, cypress, liquorice, myrrh and poppy. Achieving food security and nutrition thus requires integrated policy responses that integrate health, agriculture, sustainable natural resource management and education efforts. In general terms the performance of agriculture as a key element of sustainable development is recording mixed results and trends.

Food production

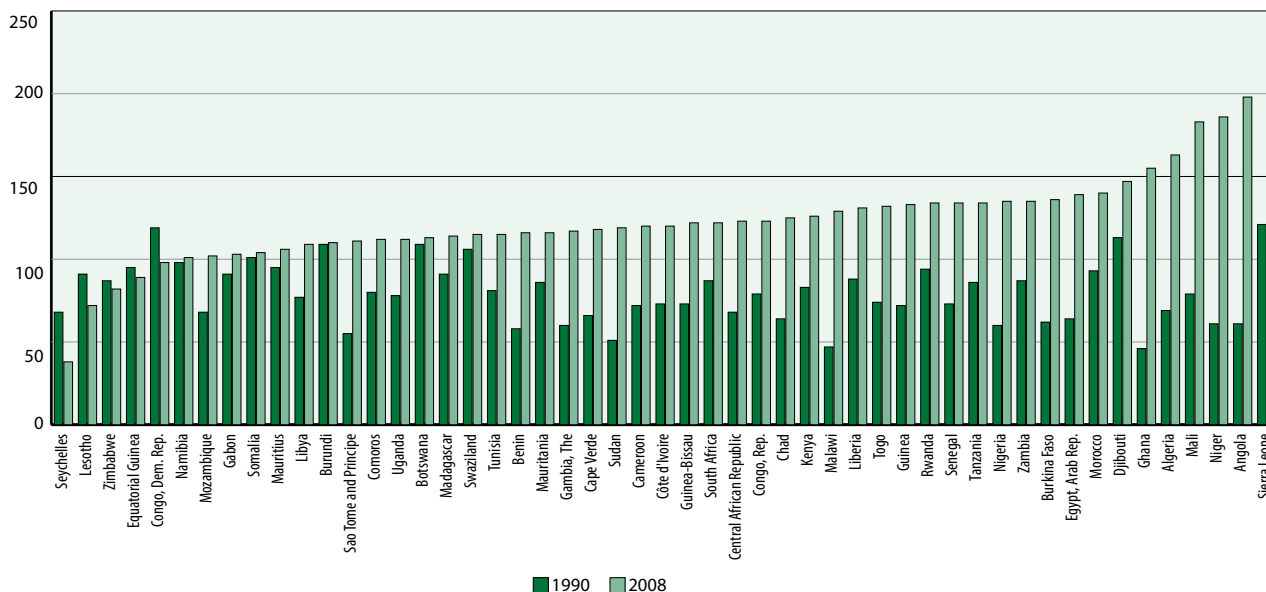
Food production, as measured by the food production index, is increasing in Africa with significant changes since 1990 (Figure 36).

The food production index increased in 2009, compared to 1990, in all countries except the Democratic Republic of the Congo, Equatorial Guinea, Lesotho, Seychelles and Zimbabwe. Countries with relatively high food production (FPI > 150) in 2009 were Algeria, Angola, Ethiopia, Ghana, Mali, the Niger and Sierra Leone.

Applying the strategies and principles embodied in the AU/NEPAD Comprehensive African Agricultural

	Trend in sustainability	Remarks on status and sustainability trends
Agriculture, food security and nutrition	↔	Mixed trends in the agriculture sector, with challenges in food security and nutrition
<i>Food production</i>	↔	Africa is on a positive path to increased food production, but not enough to meet its needs
<i>Agricultural transformation</i>	↔	There is stagnation in structural transformation of the agriculture sector
<i>Sustainability of agricultural practices</i>	↑	There are efforts to turn around the current unsustainable agricultural practices
<i>Nutrition</i>	↔	Although the proportion of the population below the minimum level of dietary energy consumption is declining, the absolute number of undernourished people has increased in the region

Figure 36: Food Production Index: 1990-2001=100



Source: ECA (2013), based on data from World Development Indicators (World Bank 2010)

Development Programme (CAADP) many countries have embarked on programmes to spur integrated development and investment in agriculture. The CAADP principles and country compact processes further mainstream the declaration of the 2009 World Summit on Food Security, including mechanisms for ensuring comprehensive food security and for fostering strategic coordination at the national, regional and global levels to improve governance, promote better allocation of resources, avoid duplication of efforts and identify response gaps. There should also be broad-based investment in country-owned agricultural investment plans, aimed at channelling resources to well-designed and results-based agricultural production programmes and partnerships. Under CAADP African Governments have agreed to invest 10 per cent of their GDP in agriculture in order to achieve a 6 per cent annual agricultural sector growth rate.

Agricultural transformation

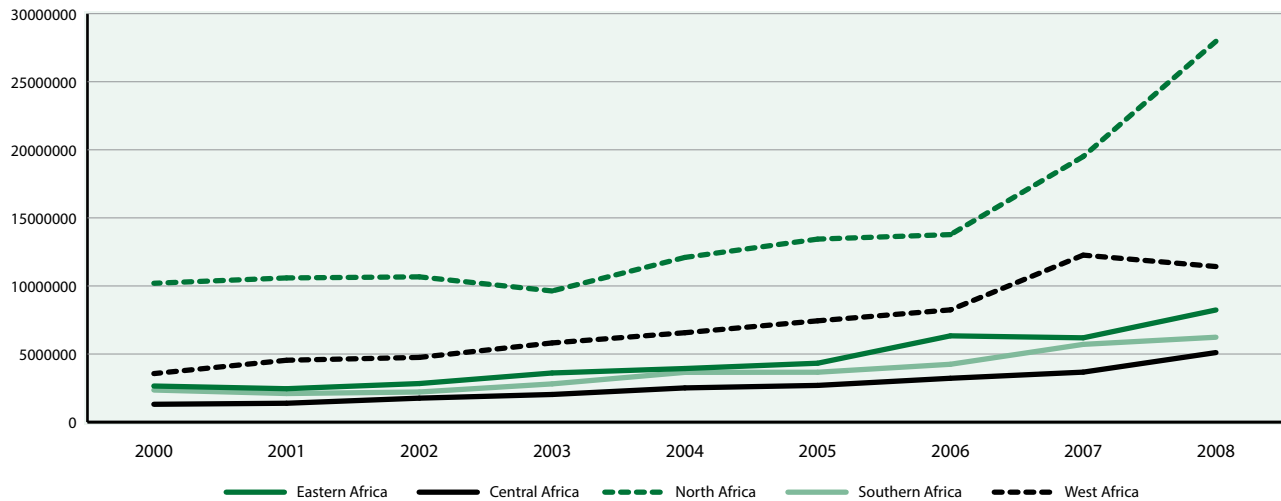
The changing face of African agriculture is critical to sustainable development as more and more value is obtained from agricultural production, investment and trade. Demand for food is increasing due to rising incomes and an additional population to feed. Agricultural trade is undoubtedly the single most important link between trade and poverty in sub-Saharan Africa, where farming accounts for more than two thirds of total employment and constitutes the main income

source for the vast majority of the poor (World Bank 2010). In 2010, according to United Nations Conference on Trade and Development⁸, Africa imported food items worth approximately \$63 billion. These are vast amounts of money that the region can ill afford to externalize, and which could be used to revitalize agriculture, particularly low-input agriculture whose yields are limited, and thus increase productivity. The trends in import values of agricultural products for the subregions of Africa are presented in Figure 37.

These trends show that import values of agricultural products increased in all the subregions of Africa though slightly declined in 2008 compared to 2007 in West Africa. The total value of agricultural products is highest in North Africa, followed by West Africa, but lowest in Central Africa. Similarly, the export values of agricultural products are rising in all the subregions of Africa as shown in Figure 38. Similar trends can be seen in the import and export values of food (excluding fish).

These are important elements that should be read in conjunction with value addition in agriculture to monitor the transformation occurring in Africa's agriculture. In 2008, the share of exports in total agriculture/total merchandise in 10 African countries placed them among the top 20 countries in the world. Algeria, Angola, Equatorial Guinea, Lesotho and Libya with a share of exports between 0.01 and 0.16 per cent, were

8 See <http://unctadstat.unctad.org/TableViewer/tableView.aspx>

Figure 37: Trends in import values of agricultural products (\$1,000) (2000-2008)

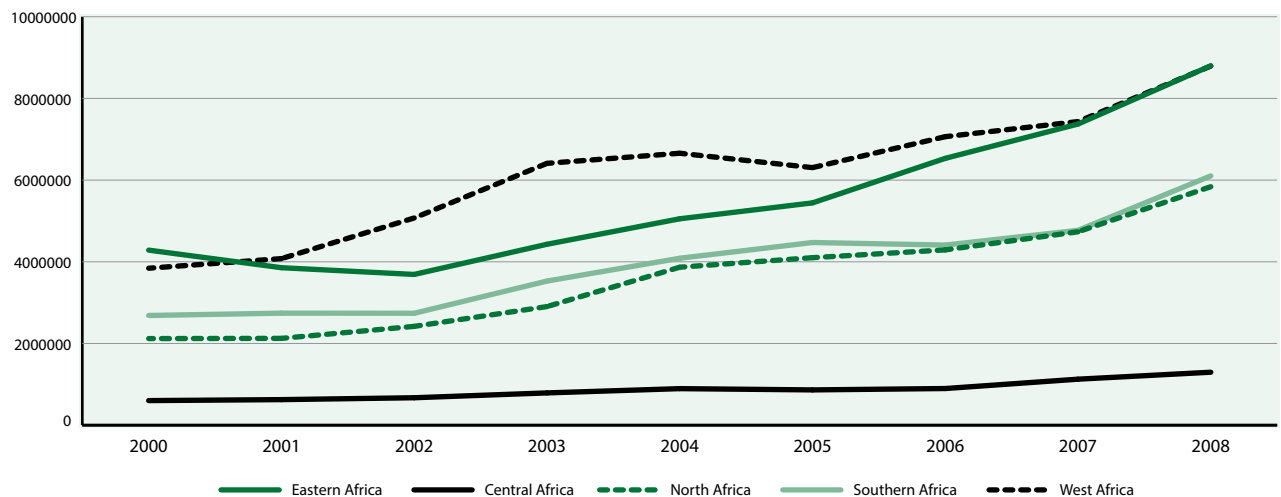
Source: ECA (2013), based on data from FAOSTAT

among the last 20 countries in the world in 2008. On the other hand, in 2008, the share of imports in total agriculture/total merchandise put 13 African countries among the top 20 countries in the world.

Despite the critical importance of agriculture, the net output of the sector after taking account of all outputs and intermediate inputs (value added as percentage of GDP) has been declining in Africa, though these values are greater in sub-Saharan Africa compared to North Africa (Figure 39). An insignificant transformation towards high-value products and, above all, transformation of raw material, is required to ensure that agriculture becomes an engine for sustainable growth and job creation.

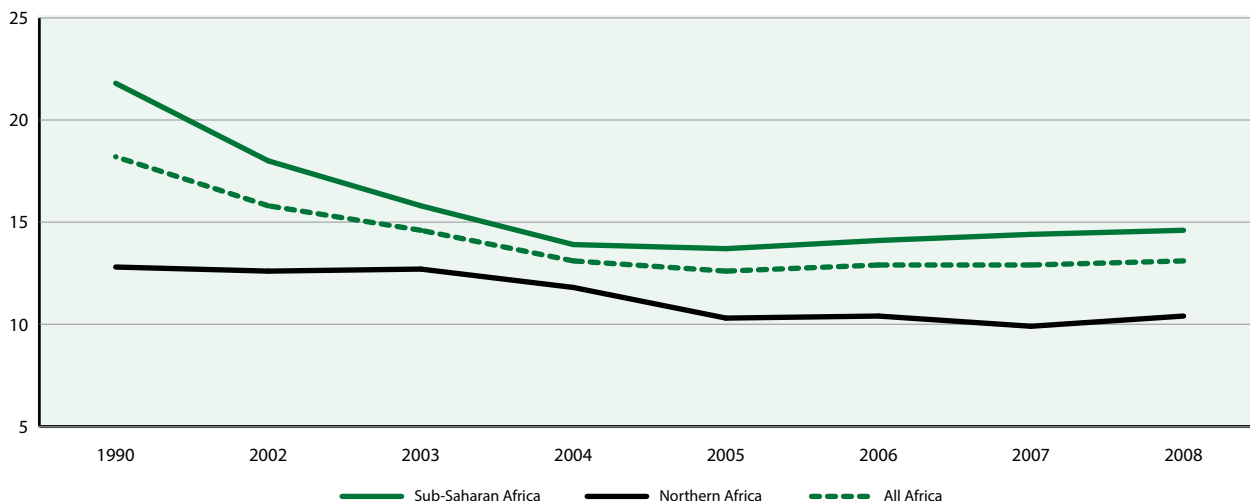
Africa is on the right path to transforming its agriculture through sustainable value addition and profitable local, regional and international trade. There are positive trends in technological innovations, investments in infrastructure and supporting policies, including direct and indirect subsidies that have been more effective in North Africa while sub-Saharan Africa has lagged behind.

Appropriate government policies and programmes should be designed to most effectively achieve substantial increases in agricultural productivity, bearing in mind the need to ensure the sustainable use of natural assets such as land and water. For instance, efficient fertilizer use is needed to sustainably spur agricultural

Figure 38: Trends in export values of agricultural products (\$1000) (2000-2008)

Source: ECA (2013), based on data from FAOSTAT

Figure 39: Value added of agriculture (% GDP)



Source: ECA (2013), based on data from the World Bank (2010)

productivity and food security while addressing the associated environmental and economic feasibility concerns with special reference to smallholder farmers. In addition, agricultural practices need to consider climate change – both its potential impacts on agriculture and the effects of agricultural practices on climate change.

Sustainability of agricultural practices

Addressing the issue of agricultural productivity brings the challenge of soil health and the need to invest in intensification through fertilizer use (IAASTD 2008). The soil quality decline witnessed in the past resulted from disappearing fallows, deforestation, general land degradation affecting over 65 per cent of Africa’s agricultural land and negative nutrient balances. The average intensity of fertilizer use throughout sub-Saharan Africa remains much lower than elsewhere (ranging from 5 to 10 kg per hectare compared with 90 kg/ha in Latin America, 110 kg/ha in South Asia and 150 kg/ha in South-East Asia). The figure has not changed significantly since 1990.

The Abuja Declaration (NEPAD 2006) on Fertilizer for an African Green Revolution contained a resolution to increase fertilizer use from 8 kg to 50 kg of nutrients per hectare by 2015. Already there are notable positive upward trends in fertilizer use in sub-Saharan Africa. For instance, between 1990 and 2008, fertilizer consumption per hectare in Kenya increased from 21 to 33 kg/ha while Angola increased consumption from 3.3 to 8.3 kg/ha. Despite these gains, fertilizer consumption levels, particularly for sub-Saharan Africa, are still ex-

tremely low. Although African agriculture may benefit from increased fertilizer inputs, concerns about misuse and costs must be addressed.

Agriculture remains the largest withdrawer of water (with 88 per cent of total water use), yet only 7 per cent of total cultivated land is under irrigation. A minimum level of development and management of water resources for secure food and agricultural production is therefore needed.

Africa remains on course to achieve sustainable agriculture practices. As Africa moves forward, it will be necessary to increase productivity on existing crop and pasture land; remodel farming to be an attractive economic development opportunity for the youth and other people living in rural areas - smallholder farmers and small to medium entrepreneurs; and conserve the natural resource base by halting the expansion of agriculture into sensitive ecosystems, reducing resource intensity and employing sustainable agriculture technologies. Efforts are needed to halt the degradation of the complex and fragile natural resource base of the continent while science and technology, if well harnessed, will increase productivity and the competitiveness of African agriculture through reduction of unit costs of production and distribution. This requires enhanced public and private investment in agricultural research, education and development and robust advisory service systems.

The strategies and principles embodied in CAADP have rekindled interest in investment in agriculture. More efforts are needed to ensure comprehensive food

security and to foster strategic coordination at the national, regional and global levels to improve governance and promote better allocation of resources to the priority agricultural development needs of each State. The import value of agricultural products has increased in all the subregions of Africa but the net output of the sector has been declining. Agricultural transformation requirements must entail high-value products and ensure that agriculture remains an engine for sustainable growth and job creation.

Nutrition

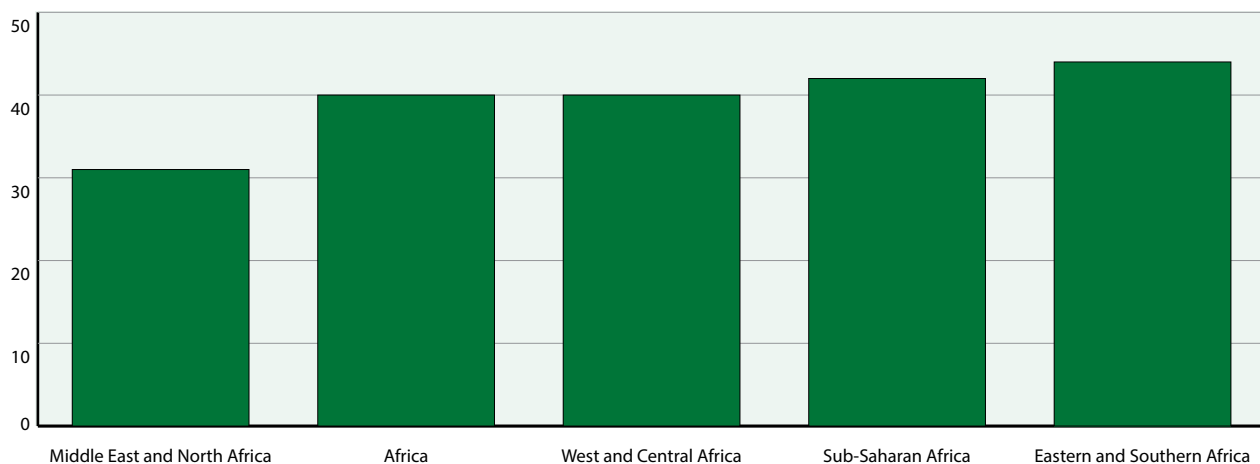
Food security and nutrition need to be pursued hand in hand. African food security strategies, although a major health determinant, remain linked to agricultural production. The success of health and nutrition programmes, especially policies and actions taken to combat problems of undernutrition and impaired physical development of children, is illustrated by the prevalence of stunting. It is a compound indicator that tracks integrated development by relating malnutrition to other environmental and socioeconomic circumstances. Between 2003 and 2009, African subregions registered various levels of prevalence of stunting (Figure 40). Prevalence of stunting in East and Southern Africa was higher than in West and Central Africa, as well as the Middle East and North Africa. The prevalence of stunting during 2003-2009 was at least 50 per cent in Ethiopia, Madagascar, Malawi and Rwanda, while it was under 50 per cent in other countries of Africa. The prevalence of stunting from 2003 to 2009 ranged from 15 per cent in Algeria to 53 per cent in Malawi.

The proportion of the population below the minimum level of dietary energy consumption (also referred to as prevalence of undernourishment) shows the percentage of the population whose food intake is insufficient to meet dietary energy requirements. A value of 2.5 per cent signifies a prevalence of undernourishment (World Bank 2011a). Many African countries face the challenge of providing the minimum level of dietary energy consumption, but there is evidence of the region being on course towards achieving sustainable nutrition provisioning. Although the absolute number of undernourished people in the region has increased on average, the proportion of the population in Africa below the minimum level of dietary energy consumption declined marginally from 31 per cent between 1990 and 1992 to 26 per cent between 2005 and 2007, apart from in North Africa, where in 2005-2007, fewer than 5 per cent were undernourished (Figure 41).

If current trends persist, only West Africa is on track to meet the target of reducing by half the proportion of the population that is undernourished. This is mostly due to superior progress in Nigeria and Ghana. However, the proportion of undernourishment increased in the Gambia, from 14 per cent in 1992 to 19 per cent in 2007. Progress in East and Southern Africa (with the exception of Seychelles and South Africa) has been slow on this indicator, and if current trends persist, the two subregions will fail to meet the MDG target.

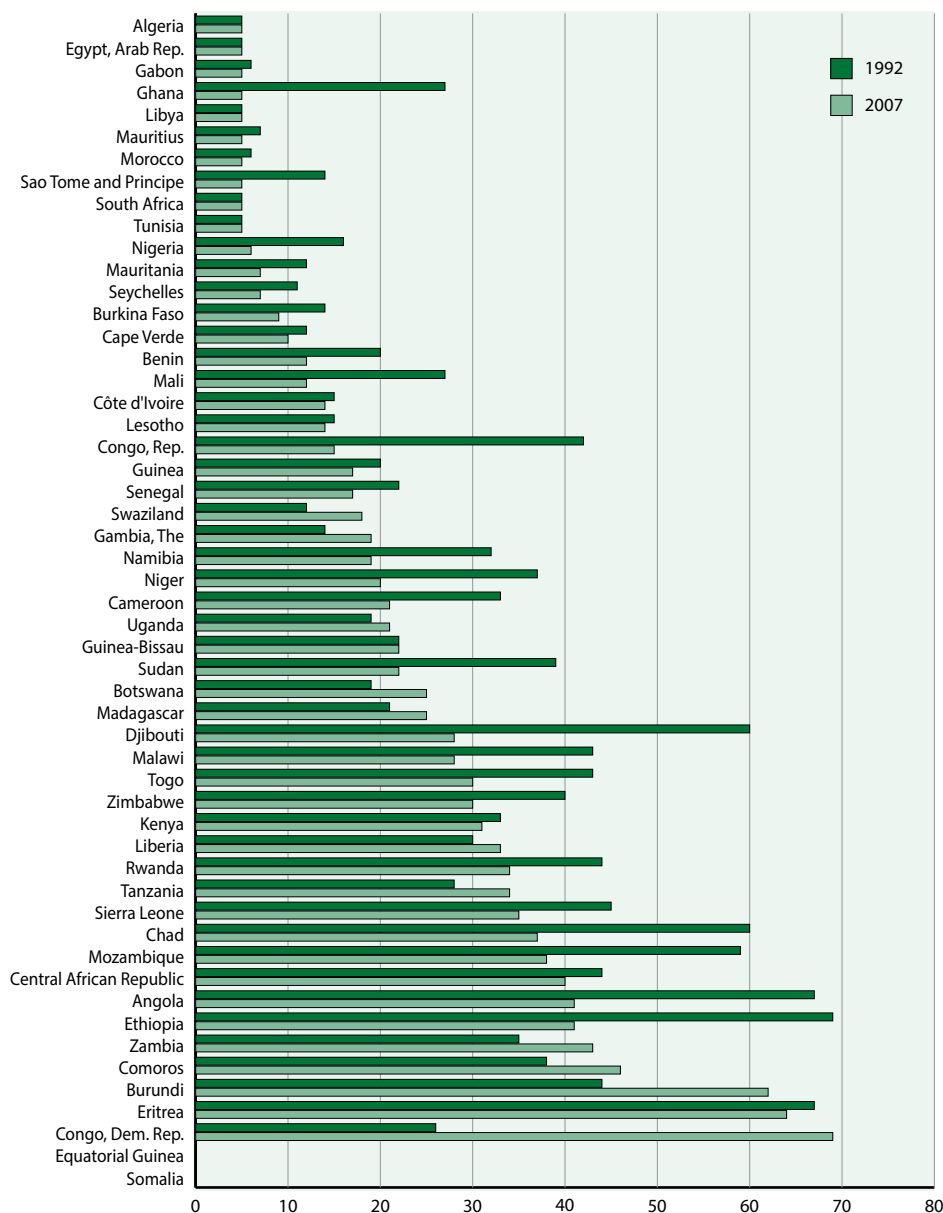
Although there is great concern about undernutrition, there is also evidence of the problem of over-nutrition (especially among affluent households in economies like

Figure 40: Prevalence of stunting, 2003-2009



Source: UNICEF and others (2012)

Figure 41: Percentage of population undernourished



Source: ECA (2013), based on data from World Development Indicators (World Bank, 2011a) and FAOSTAT

South Africa and Egypt) leading to increasing cases of both child and adult obesity and related complications. According to WHO (2010d), 15 per cent of children below five in Egypt and Algeria were overweight in 2009 compared to 8-9 per cent in 2002. In Africa as a whole, the estimated prevalence of under-five overweight increased from 4 per cent in 1990 to 7 per cent in 2011 (UNICEF and others 2012). Some countries are experiencing a “double burden” of malnutrition, having high rates of both stunting, and overweight. In Guinea-Bissau and Malawi, for example, more than 10

per cent of children are overweight, while around half are stunted (UNICEF 2010)

Conclusion

The performance of agriculture as a key element of sustainable development is mixed. While progress has been made, resulting in increased agricultural production, structural transformation of the agriculture sector is still insufficient. High value products and transformation of raw materials are still not evidenced in the agriculture

sector, preventing it from fully serving as an engine of growth. Efforts are being made to turn around current unsustainable agricultural methods by adopting sustainable practices that enhance productivity and competitiveness and do not harm natural resources.

Although the proportion of the population below the minimum level of dietary energy consumption is declining, the absolute number of undernourished people has increased. Food security, nutrition and health goals will only be achieved if Africa improves real food supply by increasing agricultural productivity on existing land, reducing food waste and improving distribution of and access to food. There is also a need to slow down and ultimately halt agricultural expansion into sensitive natural ecosystems and increase efficiency in the use of agricultural inputs such as water, energy and fertilizer. The current unsustainable withdrawal of water resources, soil degradation and soil nutrient depletion should also be addressed through sustainable production technologies while protecting natural resources. Sustainable development in Africa will continue to rely heavily on success in agricultural productivity which is essential to raise overall economic growth and meet the MDGs related to reducing poverty and hunger.

Decisive efforts are needed to spur agricultural development and transformation in Africa by addressing markets, promoting prudent water and land management and enhancing the application of science and technology. Furthermore, agricultural input and product markets can be improved through quality infrastructure and support services such as information and communication, and should be integrated at the national, subregional, and regional levels. With such changes, Africa will effectively seek out and respond to emerging global market opportunities. From a policy perspective, the most important approach is to formulate and implement food and nutrition security policies and practices

at all levels in order to sustainably increase food production, stabilize food prices, minimize downturn effects on poor households and protect fragile countries from current and future food price turbulence.

2.2.11 The natural resource base

Natural resources, especially land, soil, water, forests, plant and animal diversity, vegetation, renewable energy sources and related ecosystem services are fundamental to improving livelihoods and achieving sustainable development in Africa (Sanginga and others 2010). Progress has varied in specific natural resources sub-themes, namely forests, water, land, biodiversity and mineral resources, as illustrated below:

Forests

Forests play a pivotal role in sustainable development in Africa. They provide sources of livelihoods for the population, especially in rural areas. For instance, firewood, building materials, and extensive supplies of non-timber forest products, such as wild foods and medicinal plants for local communities, are harvested daily from forest resources in the region. In addition, forests have a critical role to play in protecting vital ecosystem services, such as water supply and biodiversity, not to mention their role in moderating global warming through carbon sequestration.

Despite the importance of forest resources, forest loss and degradation continue to afflict the region. The estimated forest area in Africa is 675 million hectares (FAO 2011) accounting for 17 per cent of global forest area and 23 per cent of the total land area in the region. Table 9 shows the trends and changes in subregional forest cover from 1990 to 2010. Central Africa accounted for 37 per cent of the total forest area, Southern Africa for 29 per cent, North Africa for 12 per cent, and East-

	Trend in sustainability	Remarks on status and sustainability trends
The natural resource base	↓	Trends show continued degradation and depletion of the natural resource base
<i>Forests</i>	↓	Unsustainable forest exploitation continues with forest area loss and worsening degradation
<i>Water</i>	↓	Sustainable water resources management continues to be a challenge as more and more people live in water-stressed environments
<i>Land</i>	↓	Land degradation continues to be a critical constraint for sustainable development in Africa, caused by socioeconomic drivers such as insecure land tenure
<i>Biodiversity</i>	↓	Biodiversity continues to decline and the pressures on it continue to increase
<i>Mineral resources</i>	↓	Sustainable exploitation of mineral resources is a challenge, with limited value addition, marginal benefits to the population and continued environmental degradation

ern Africa and West Africa for 11 per cent each (FAO 2010; FAO 2011). Over the last two decades, the rate of net forest loss in the region reduced from 4 million hectares a year in the decade 1990–2000 to 3.4 million hectares a year during the period 2000–2010. In North Africa, for instance, the net loss dropped from 590,000 ha a year to just 41,000 ha a year. Southern Africa had the highest net loss at the subregional level over the last 20 years, although the rate has slowed in recent years. Countries with large areas of forest also reported the most significant losses.

According to FAO (2011), although continued forest loss was reported in Africa, the overall trend in net forest loss in the region slowed between 1990 and 2010. The area of planted forests is increasing especially in West Africa and North Africa. This resulted from elaborate forest planting programmes aimed at combating desertification and also improving wood resources for industrial wood and energy use.

As one of the most diverse and prevalent ecosystems, forests fulfil multiple environmental, social, economic and cultural roles in many countries. Forest cover is a strong indicator of sustainable development. A continuously fast declining proportion of forest area is an indication of unsustainable practices in the forestry and agricultural sector. There was a significant change in the proportion of land area covered by forest between 1990 and 2010. In 15 countries of Africa, forests covered no more than 10 per cent of the total land area in 2010. These include all countries in North Africa except the Sudan and Morocco which are often referred to as low forest cover countries. The underlying causes of defor-

estation are multifaceted and diverse, ranging from pressure to convert land to agriculture, to marginalization of the poor who harvest forest resources unsustainably for their survival. A full understanding of the underlying causes and how they link to other sector policies and incentives is needed to halt and reverse forest loss and degradation. For instance, understanding the link between agricultural expansion policies and deforestation will lead to integrated planning that takes into account the negative impact of agricultural policies on other natural resources.

Water

Africa's water resources, which include inland fresh water and underground aquifers, strongly support sustainable development in the region. There are wide differences by subregion in terms of water availability per capita, and more than 40 per cent of Africa's population live in water-stressed environments, including arid, semi-arid and dry sub-humid areas. There is a continuing water resource management and provisioning paradox in African water systems: surplus and scarcity, and underdeveloped and over-exploited water resources (UNEP 2010a). The amount of water available per person, currently 4,008m³ according to UNEP (2010a), remains well below the global average. There is also a skewed water withdrawal for agriculture. An estimated 88 per cent of all freshwater use is for agriculture, 7 per cent for domestic purposes and 5 per cent for industry. Africa has the highest proportion of people living in water-stressed environments (Figure 42).

Table 9: Subregional forest cover and change in 1990, 2000 and 2010

Subregion	Area (1 000 ha)			Annual change (1 000 ha)		Annual change rate (%)	
	1990	2000	2010	1990–2000	2000–2010	1990–2000	2000–2010
Central Africa	268 214	261 455	254 854	-676	-660	-0.25	-0.26
East Africa	88 865	81 027	73 197	-784	-783	-0.92	-1.01
North Africa	85 123	79 224	78 814	-590	-41	-0.72	-0.05
Southern Africa	215 447	204 879	194 320	-1 057	-1 056	-0.50	-0.53
West Africa	91 589	81 979	73 234	-961	-875	-1.10	-1.12
Total Africa	749 238	708 564	674 419	-4 067	-3 414	-0.56	-0.49
World	4 168 399	4 085 063	4 032 905	-8 334	-5 216	-0.20	-0.13

Source: FAO (2011)

Table 10: Area of forest designated primarily for conservation of biodiversity in Africa, 1990–2010

Subregion	Area (1 000 ha)			Annual change (1 000 ha)		Annual change rate (%)	
	1990	2000	2010	1990–2000	2000–2010	1990–2000	2000–2010
Central Africa	7 463	8 243	9 711	78	147	1.00	1.65
East Africa	4 806	6 110	7 865	130	176	2.43	2.56
North Africa	13 325	12 597	12 769	-73	17	-0.56	0.14
Southern Africa	9 661	9 429	9 199	-23	-23	-0.24	-0.25
West Africa	14 672	14 972	15 328	30	36	0.20	0.24
Total Africa	49 927	51 351	54 873	142	352	0.28	0.67
World	270 413	302 916	366 255	3 250	6 334	1.14	1.92

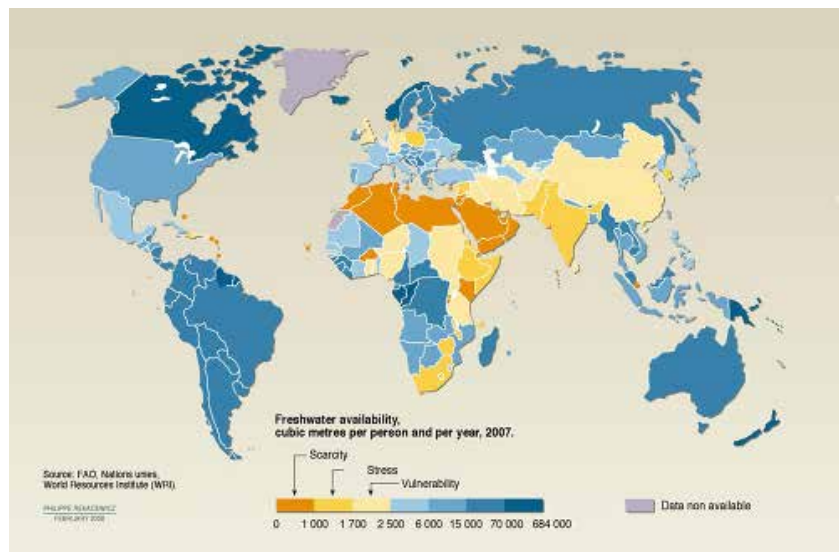
Source: FAO (2011).

Significant linkages exist between water, other natural resources and poverty, and water-related diseases like diarrhoea and malaria remain leading causes of child mortality. Many challenges of sustainable development concerning poverty can be linked to Africa's water-related problems, which include food shortages, water-borne diseases and other vectors, drought and flood damage, among other risks. While poverty contributes to the widespread lack of access to improved water sources, wealth is often linked to overconsumption of water resources (UNEP 2010a). In all dimensions of sustainable development, water is a factor of production. Investment in water infrastructure and services is thus a catalyst for local and regional development. Furthermore, reduced vulnerability to water-related haz-

ards boosts investments, production and development as well as ecosystem conservation, while improved access to clean water increases productive capacities from improved health.

Land

Sustainable development strategies in Africa continue to depend on the exploitation of natural resources, including land as the foundation for agricultural production, mining, energy, water and other biological resources. Land is the basis for many life support systems, through the production of biomass that provides food, fodder, fibre, fuel, timber and other biotic materials for human use. Land is also the basis for terrestrial biodiver-

Figure 42: Proportion of people living in water-stressed environments

Source: Vital Water Graphics. UNEP

sity, providing the biological habitats and gene reserves for plants, animals and microorganisms, and serves as the key source and sink of greenhouse gases. The significance of land for sustainable development is also its regulatory function for the storage and flow of surface and groundwater; its influence on air and water quality; and also as receptor, filter, buffer and transformer of hazardous compounds. Sustainable land management is therefore critical for addressing the various dimensions of sustainable development. A key to how countries reap the benefits of land in sustainable development is demonstrated by land tenure systems and outcomes (Box 2).

Africa accounts for 27.4 per cent of global land degradation and 500 million hectares of the African continent are moderately to severely degraded. One study estimated that 14 per cent of degraded soil results from vegetation removal, 13 per cent from over exploitation, 49.5 per cent from overgrazing and 24 per cent from agricultural activities (UNEP 2006). Soil losses are reported to be significant in North and Eastern Africa. In Ethiopia and Uganda, soil erosion accounts for over 80 per cent of the cost of environmental degradation (about 1-4 per cent of GDP). Ethiopia is reported to be losing 1.9 billion tonnes of top soil from the highlands annually, while Burundi is losing 80 to 150 tons/ha/year and Rwanda about 557 tons/ha/year (UNEP 2006). In South Africa, soil losses are estimated to be as high as 400 million tons annually and in Malawi, soil losses range from 0 to 50 tons/ha/year (UNEP 2011).

The populations in African countries living on degraded land by 2010 are presented in Figure 43. Burkina Faso, Eritrea, Ethiopia, Lesotho and Mali had more than 50 per cent of their population living on degraded land, while between 30 per cent and 50 per cent of the popu-

lation in Chad, Kenya, Morocco, the Sudan and Tunisia were living on degraded land in 2010.

Sustainable land management remains elusive in Africa due to the challenges of land tenure, intensive agriculture and other land use, and increasing demand for agricultural and land-based products.

Biodiversity

Biodiversity conservation and sustainable use with equitable sharing of benefits derived from its natural services are the basis of human well-being (CBD Secretariat 2010). The goods and services obtainable from natural resources, including underlying ecosystem services, can shape the development paths of a country, while development choices in turn determine the fate and state of biodiversity and ecosystem services. Like elsewhere in the globe, the most important threats to biodiversity have long been habitat loss, due to large-scale conversion of land to agriculture and urban centres, introduction of invasive alien species, over exploitation of natural resources and pollution. Africa is home to eight of the world's 34 biodiversity hotspots: Cape Floristic Province, Coastal Forests of Eastern Africa, Eastern Afromontane, Guinean Forests of West Africa, Horn of Africa, Madagascar and Indian Ocean Islands, Maputaland-Pondoland-Albany and the Succulent Karoo (UNEP 2008).

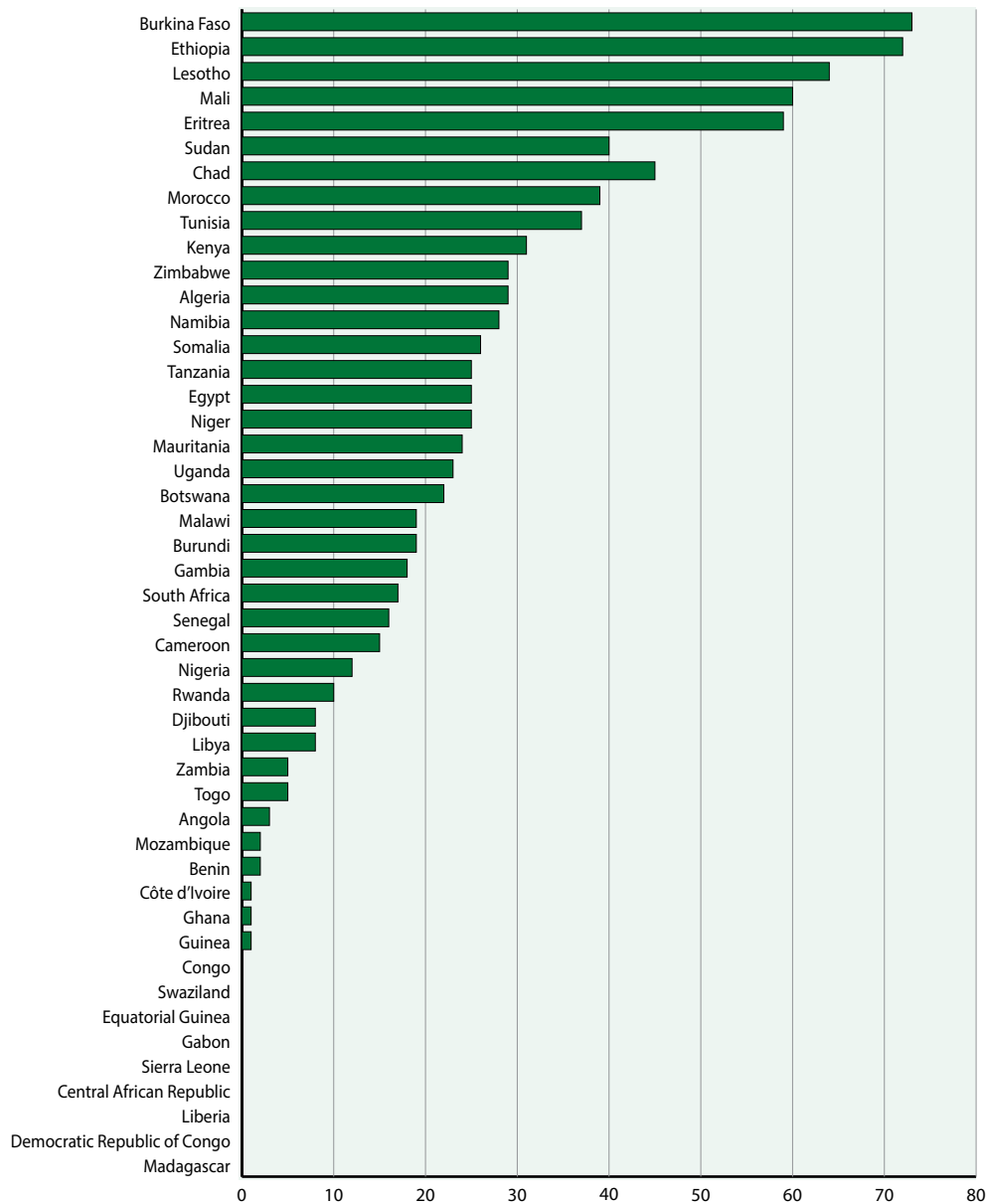
Deterioration in ecosystem services resulting from biodiversity loss has severe poverty consequences for human societies and economies. The poor are particularly vulnerable because they are often directly dependent on biodiversity for their day-to-day survival and are generally not in a position to afford substitutes.

Box 2: The importance of land tenure

Appropriate land policies are a prerequisite for sustainable development because of the importance of land for food security. According to the AUC-ECA-AfDB land policy initiative*, "secured land rights, improved land management and land use, and better land governance are crucial to Africa's social, political and economic development, sustainable resource management, as well as the achievement of peace and security in Africa". Land tenure in its various dimensions (distribution, access, use, tenure, administration and adjudication) continues to be marked by worsening inequity in terms of women's land rights, with a strong bearing on food security and poverty reduction. How land tenure affects investment and production in agriculture is influenced by the inherent unequal distribution of land, suboptimal use of land and insecure tenure.

Effective land tenure systems are those that grant more democratized local decision-making and a resource base for smallholders. They promote equitable and sustainable food security and livelihoods. However, there still remain concerns regarding policy implementation (ECA 2009a).

* See <http://www.uneca.org/lpi>

Figure 43: Percentage of population living on degraded land

Source: ECA (2013), based on data from UNDP (2010)

According to *Global Biodiversity Outlook 3* (CBD Secretariat 2010), biodiversity in Africa is declining as it comes under increased pressure and offers fewer benefits for humans, and there are insufficient responses to its loss. The key response contained in national biodiversity conservation strategies has been targeted at enhancing equity in benefits from biodiversity resources through sustainable conservation.

While biodiversity loss is a critical challenge to sustainable development with many species threatened with extinction, there is a growing awareness of how bio-

diversity supports human livelihoods (UNEP 2010b). Twenty-one per cent of freshwater species in continental Africa are threatened with extinction, putting the livelihoods of millions of people at risk. Among areas in Africa with important concentrations of threatened species are the Upper Guinea forests of West Africa, the forests of western Cameroon and eastern Nigeria, the Albertine Rift of Central Africa, the Eastern Arc Mountains of the United Republic of Tanzania, and Madagascar. The status of conservation of threatened species in Africa is presented in Figure 44.

Box 3: International demand for African land resources

There is an emerging cross-international trend in land demand in Africa of unprecedented proportions leading to the now famous “land grab” phenomenon. According to the International Institute for Environment and Development (2009) this is in line with globalization and “teleconnections” in land use and related social and economic activities in which land demands are to an increasing extent driven by factors anchored elsewhere. Over the past five years, Africa has seen the acquisition of land by foreign land users, either through land leases or land purchases. The volume of international investment in agricultural land and agricultural production has increased considerably but little has been achieved in terms of benefits to the local poor. The sustainable development challenges of African land resources are better addressed through land reforms that assist poor farming households to enhance land use efficiency.

The percentage of species not expected to become extinct in the near future is declining, implying that the proportion of species threatened with extinction is rising, with North Africa having a higher percentage of species threatened with extinction than sub-Saharan Africa. The number and proportion of threatened and/or extinct species varies among countries. Cameroon, Madagascar, Seychelles and Tanzania are among the top 20 countries in the world with the highest number of threatened amphibians, i.e. amphibians listed as critically endangered, endangered or vulnerable. Tanzania is among the top 20 countries in the world with the highest number of endangered birds and also with the greatest responsibility towards protecting globally threatened bird species (IUCN Red List of Threatened Species).

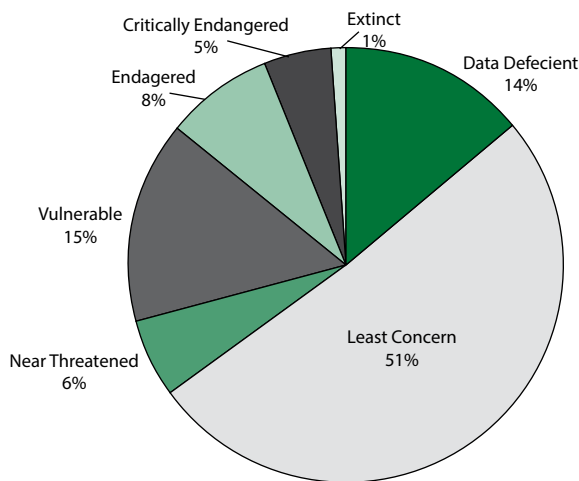
Mineral resources

Africa is well endowed with mineral resources, with the world’s largest mineral reserves of platinum, gold, diamonds, chromites, manganese and vanadium (ECA 2009c). The continent produces about 17 per cent of

the world’s uranium. With improved geological mapping these statistics may be adjusted upwards. There are important environmental, economic, social and health impacts and benefits of the sector that form the basis of its contribution to sustainable development. Sustainable use of mineral resources has to take account of the role of the mining sector and its linkages with other social, economic and environmental issues on the continent. The extractive industries in Africa, including exploration and mining of oil, gas, coal and minerals such as diamond, gold, uranium, titanium and diatomite, produce essential inputs (energy, metals and minerals) for both African and global economies.

As demand for these inputs soars, Africa is grappling with how to sustainably manage the industry. The mining sector has far-reaching implications for many other sectors, including the environment, health, agriculture, tourism and manufacturing. It has implications for economic development and youth employment. Many conflicts on the continent have their root causes in natural resources extraction and are related to land, forests, oil

Figure 44: Conservation status of threatened species in Africa



Source: Based on the IUCN Red List of Threatened Species showing the conservation status of assessed species in Africa

Table 11: Key mineral resources in Africa

Mineral	African Percent of World Production	Rank	African Percent of World Reserves	Rank
Platinum Group Metals	54 Percent	1	60+ Percent	1
Phosphate	27 Percent	1	66 Percent	1
Gold	20 Percent	1	42 Percent	1
Chromium	40 Percent	1	44 Percent	1
Manganese	28 Percent	2	82 Percent	1
Vanadium	51 Percent	1	95 Percent	1
Cobalt	18 Percent	1	55+ Percent	1
Diamonds	78 Percent	1	88 Percent	1
Aluminium	4 Percent	7	45 Percent	1

Source: ECA (2009c)

and other minerals, while several injustices and social perils such as child labour, human trafficking, money laundering and land grabbing relate to the industry. Investments in the sector must focus on sustainable exploitation, promoting improved and equitable access to stakeholders and coordination of environmental and social policies, guidelines and procedures. An integrated approach to improving the industry's contribution to Africa's sustainable development is needed to help eradicate the adverse environmental, social and governance impacts that may outweigh whatever economic and social benefits accrue to the domestic economy and the poor.

Although mining, by its extractive nature, is inherently unsustainable, assurance of sustainability is possible through the downstream, upstream and sidestream integration that it forms with other sectors of the economy (Campbell 2009). The mining sector is linked to others through reliance on land, posing a threat to sustainable forest, mountain areas and biodiversity management. Over the last decade economic reforms have increasingly opened up many African countries to international extractive industry investment and many Governments have had to make major concessions at the expense of social and environmental goals. There is also a need to improve the sector through value addition, research and development, as well as technological information underpinned by development-oriented mineral policies which include instruments to increase value addition and local benefits.

Conclusion

The assessment shows continued depletion and degradation of Africa's natural resource base, undermining the fight against poverty. This is caused, inter alia, by unsustainable forest exploitation with worsening forest area loss and degradation. There is also growing evidence of difficulty in achieving sustainable water resources management as more and more people are living in water-stressed environments, and appropriate technologies for improved water use are adopted at a slow pace across sectors such as agriculture, industry, tourism and domestic application. Land degradation continues to be a critical constraint for sustainable development in Africa, caused inter alia by unsustainable agricultural practices and agricultural land expansion, insecure land tenure, and increasing demand for agricultural land-based products. Although responses are increasing, biodiversity continues to decline; the pressures upon it are increasing and the benefits derived by humans diminishing. The sustainable exploitation of mineral resources remains a challenge with limited value addition, marginal benefits to people, and continuing environmental degradation. Efforts to sustainably manage natural resources should be stepped up to ensure economic, social and environmental benefits for all now and in the future. Research and development, technological innovation and value addition are important in this regard.

2.2.12 Energy

Energy deeply influences people's lives as it is central to practically all aspects of human welfare, including access

to water, agricultural productivity, health care, education, job creation, climate change and environmental sustainability (UNDP and WHO 2009). Both renewable and non-renewable energy rely on forest, water and other natural resources. Their exploitation affects biodiversity and other ecosystem services. Africa still relies heavily on biomass for energy and access to clean energy such as electricity remains poor. By 2009, 58 per cent of people in Africa lacked electricity (466 million in rural and 121 million in urban areas) according to *World Energy Outlook 2011* (IEA 2011). In sub-Saharan Africa the figure stands at 68 per cent. Access to modern energy services that are affordable, clean, reliable and safe continues to be elusive and the majority of people pay high prices for poor-quality substitutes. The status and trends in the key components of energy for sustainable development are summarized below:

This situation is an impediment to sustainable development as lack of access to energy “entrenches poverty, damages health, constrains delivery of local services, increases vulnerability to climate change, limits expansion of opportunities, erodes environmental sustainability at the local, national and global levels, and creates negative impacts on education and health” (GNEST 2007; UNDP 2007; Geoghegan and others 2008; JRC/EU 2011). As discussed in Section 2.3.3, countries’ commitments to expanding access to energy services vary significantly, and there is general stagnation in sustainable development of energy with respect to supply, security and intensity.

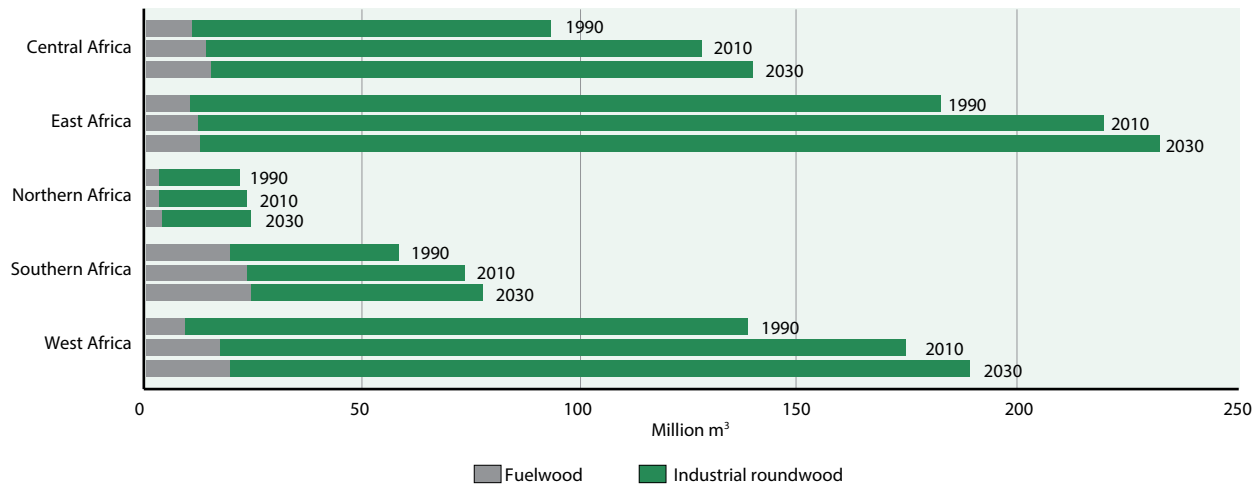
Energy supply

Africa is endowed with vast renewable and non-renewable sources of energy and it is estimated that the continent has 1,750 terawatt-hours potential of hydropower and 14,000 MW of geothermal energy potential (UNIDO 2009). Africa also receives abundant solar radiation throughout the year as well as abundant wind energy resources, especially along the coastal and some inland

locations. The vast energy endowments remain largely underused. Many countries have initiatives for advancing the use of alternative energy such as small-scale solar, wind and geothermal devices in both urban and rural areas. Simple and clean technology-based alternative sources of energy production are especially useful in remote locations where the poor and vulnerable live. Renewable forms of energy technology have the potential to alleviate many of the problems that face Africans today if implemented in sustainable ways that support human well-being. Efforts are being made to reverse the current trend with investments in renewable energy rising from \$750 million in 2004 to \$3.6 billion in 2011, largely as a result of strong performances *from Egypt and Kenya (UNEP and Bloomberg New Energy Finance 2011). Countries such as Egypt, Ethiopia, Kenya, Morocco, Nigeria, South Africa, Tunisia and Tanzania have made modest starts with wind power, for instance. However, comprehensive data on the uptake of renewable energy technologies in Africa – and their contribution to total energy production – are not available.

Addressing the social implications of energy challenges requires Governments to facilitate individual and collective access to land, houses, health, energy, credit and employment. Building capacity for innovation among people remains critical and should be through facilitation of local economic opportunities and other capacities to manage risks associated with natural resource exploitation. Better governance at all levels through stronger institutions, poverty-sensitive policies and resolving conflicts is important. For instance, only 5 per cent of the continent’s hydropower potential has been exploited, and only 0.6 per cent of geothermal energy potential (UNIDO 2009). In 2007, the continent contributed 12 per cent of global oil production but only consumed 3 per cent of the oil consumed globally, thereby effectively making Africa a net exporter of oil (UNIDO 2009; JRC/EU 2011). This means Africa continues to experience energy poverty which, coupled with inefficient energy use in various sectors, constrains

	Trend in sustainability	Remarks on status and sustainability trends
Energy	↔	Access to modern energy sources that are affordable, clean, reliable and safe remains a challenge
<i>Energy supply</i>	↔	The deployment of modern energy technologies remains constrained by high costs and limited investments. Renewable energy potential, in particular, remains largely untapped
<i>Energy security</i>	↔	There are mixed results for the prospect of energy security in Africa as the region remains a net importer of fossil fuels
<i>Energy intensity of the economy</i>	↔	No significant improvements in the energy intensity of Africa’s economy

Figure 45: Wood removals in Africa

Source: FAO (2007).

economic and human development. In spite of its negative implication for the environment (and even human health), traditional biomass forms the bulk of energy sources in Africa accounting for 70–90 per cent of primary energy supply in many countries and as much as 86 per cent of energy consumption (UNIDO 2009). The absolute number of people relying on biomass energy in Africa is also projected to increase by about 27 per cent towards 2030 (IEA 2011). The wood removals for energy production purposes (Figure 45) reflect this picture.

Many African countries and subregions are increasing the contribution of renewable energy to total energy supply. The leading African subregions in the production of solar and wind energy are North Africa and Southern Africa. Development of renewable energy offers a huge opportunity to redirect future investments into “green energy” and “green growth” (UNIDO 2009) and renewable energy is emerging as a viable option for addressing the continent’s energy challenges. In Africa, focus has been on removing obstacles to the full-scale deployment of renewable energy technologies. Kenya is already investing in non-hydro renewable energy pro-

Box 4: Removing barriers to renewable energy development in South Africa through policy changes

South Africa is putting in place ambitious policies to remove barriers to deployment of renewable energy. The Renewable Energy Feed-in Tariff (REFIT), for example, drafted in 2009, aims at increasing to 10,000 GWh electricity generation from renewables by 2013. Sources targeted include wind, solar, biomass and biogas generation. The country’s Integrated Resource Plan of 2010 also sets the target for renewable energy generation at 17.8 GW by 2030. REFIT guidelines issued by the National Energy Regulator of South Africa are aimed at stimulating the renewable energy sector. The key barriers that REFIT aims to dismantle include utility monopoly and encouragement of independent power producers, frequent shifts in policy and regulation. Key issues being addressed to encourage renewable energy improvements include:

- guaranteed access to the national grid;
- guaranteed purchase price for a fixed duration;
- an obligation to purchase and to discharge the power generated;
- burden sharing of the additional cost throughout electricity consumers;
- a dynamic mechanism that reflects market, economic and political developments;
- the potential to set a cap on the maximum available subsidy a year;
- a willing seller, willing buyer approach.

Source: Energy Resource Centre (2010)

duction from geothermal sources (IEA 2011). However, there are many barriers to full deployment of renewable energy sources. South Africa (Box 4) is making policy adjustments aimed at removing these barriers.

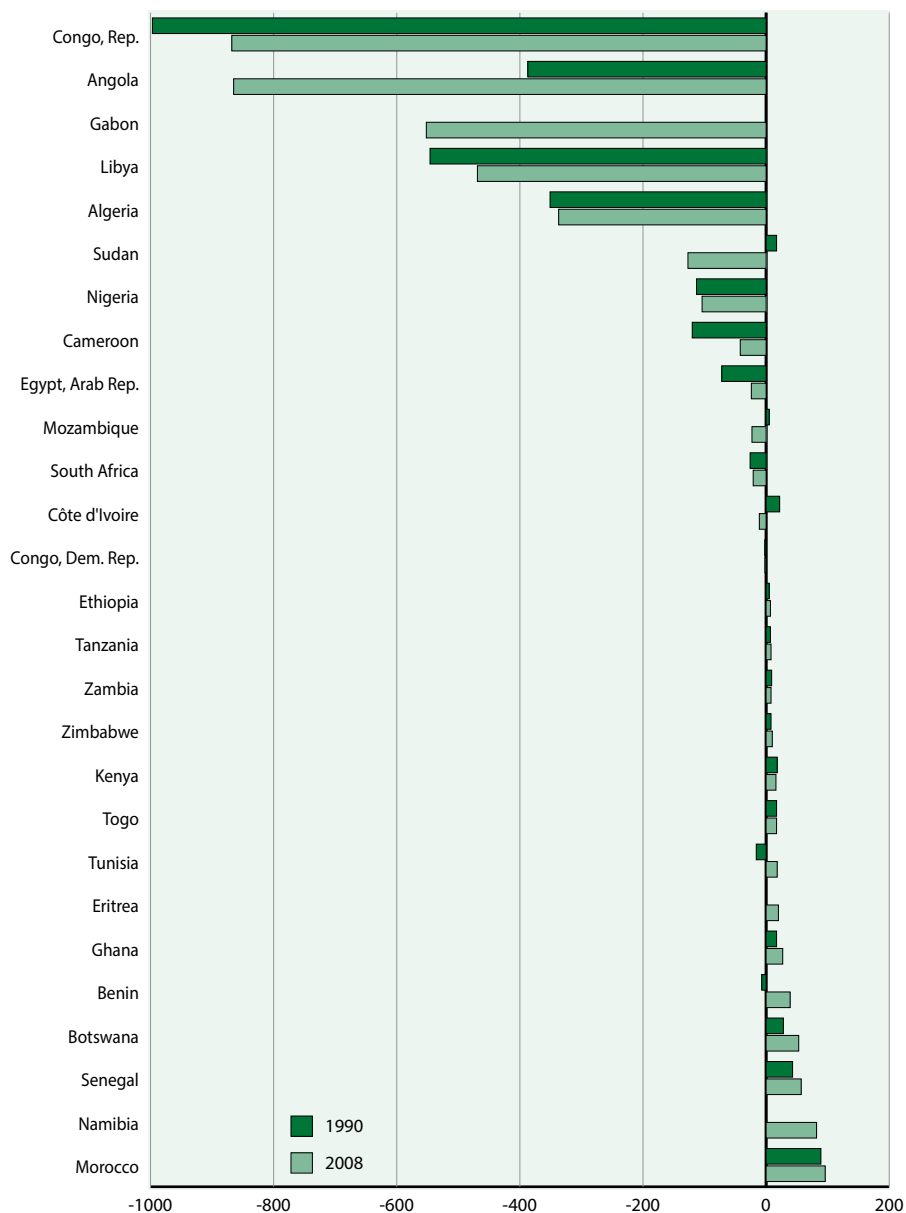
Energy security

As a determinant of sustainable development, net energy imports of a country show the level of balance of trade and overall energy security. Measured in oil equivalents, net energy imports (total energy use less production) in Africa between 1990 and 2008 did not

change significantly. The net energy imports, for all energy types, for selected countries in Africa are presented in Figure 46. Thirteen countries in Africa had negative values for this indicator, implying that these countries are net exporters of energy.

Eradicating poverty and achieving sustainable development requires energy security, especially from renewable sources. Strong energy demand is putting pressure on local and imported fossil fuels and increasing price volatility. With an imminent oil supply crunch, national energy policies must control oil dependence. Importantly,

Figure 46: Net energy imports (% of energy use) in 1990 and 2008



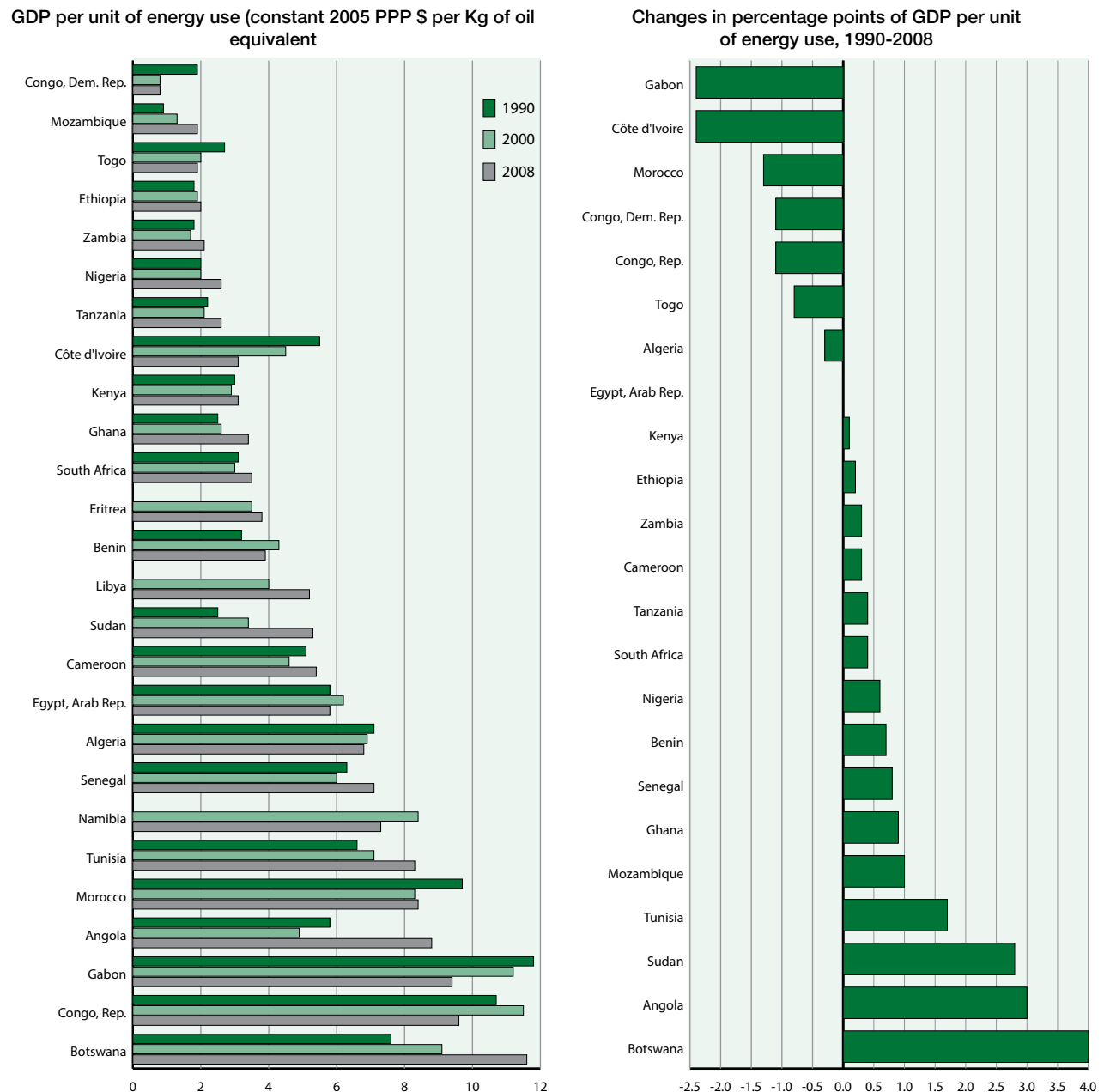
Source: ECA (2013), based on data from World Development Indicators and the World Bank - <http://data.worldbank.org/indicator>

policies and action to reduce carbon emissions and promote reliance on secure and safe energy resources are needed to spur economic viability of energy investments and operations. Renewable energy continues to attract an upsurge in investment and should be mainstreamed into the energy mix of countries. However, the wide deployment of renewable energy technologies remains constrained by high costs and limited investments.

Energy intensity

This indicator measures energy use efficiency in an economy and captures the sustainability parameters, including the many factors that influence overall energy intensity. It reflects requirements for general standards of living, other environmental management issues and energy conservation practices and technologies. Figure 47 illustrates the GDP per unit of energy use as the gross domestic product converted to a 2005 constant in international dollars using purchasing power parity rates. There was no significant change in the PPP GDP

Figure 47: GDP per unit of energy use and changes in percentage points of GDP per unit of energy use, 1990-2008



Source: ECA (2013), based on data from World Development Indicators and the World Bank, <http://data.worldbank.org/indicator>

per kilogram of oil equivalent of energy use between 1990 and 2008. It actually decreased in seven countries (Algeria, Côte d'Ivoire, Democratic Republic of the Congo, Gabon, Morocco and Togo) out of the 23 countries shown. Conversely, PPP GDP per kilogram of oil equivalent of energy use increased in 15 countries but remained unchanged in Egypt.

Priority action is needed to address the energy intensity challenges which define Africa's energy poverty situation. Dependence on the insufficient and increasingly threatened inefficient traditional biomass, used mainly for cooking and water heating in households, poses challenges to human health and induces forest depletion. Energy poverty diminishes Africa's productive capacity.

Conclusion

There is a general stagnation in sustainable energy development as access to modern energy services that are affordable, clean, reliable and safe continues to elude the majority of Africans. Although Africa has a great potential for both renewable and non-renewable energy, such potential remains largely untapped due to limited investments and high risks. The exploitation of renewable energy in particular remains low, also due to limited implementation of policies that support renewable energy exploration and adoption. Despite its great potential, there are mixed achievements in energy security for sustainable development, and Africa remains a net importer of oil. The energy intensity of Africa's economy has shown no significant improvement, with limited adoption of energy efficient technologies, while energy poverty is soaring.

The link between energy and internationally agreed development commitments, including the MDGs, points to the need to integrate energy service provision into social and economic development policies. In Africa, the constraints to energy access include technical, social, infrastructural and institutional factors. These obstacles can be addressed through targeted investments and sustained political focus to maintain the momentum of making

energy access a development priority. To that end, the NEPAD 2012 business plan details the Programme for Infrastructure Development in Africa which focuses on developing and strengthening policy frameworks for the development of geothermal and solar energy and the safe use of nuclear energy (NEPAD 2012).

2.2.13 Climate change

Climate change impacts are being increasingly felt in climate sensitive sectors such as water, land, forests and biodiversity. According to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, there is already evidence that Africa is warming faster than the global average, and this is likely to continue (IPCC 2007). By 2020 between 75 million and 250 million people in Africa are projected to be exposed to increased water stress due to climate change. Climate change impacts are already being detected in a variety of ecosystems, particularly in Southern Africa, at a faster rate than anticipated. It is estimated that by the 2080s, the proportion of arid and semi-arid lands in Africa may increase by 5-8 per cent (Collier and others 2008). Climate change impacts on Africa's ecosystems will probably negatively affect tourism as some 25-40 per cent of mammal species in national parks in sub-Saharan Africa will become endangered (Boko and others 2007). Appropriate adaptation and mitigation measures are therefore required. The status and trends in climate change adaptation and mitigation efforts show mixed results in Africa.

Adaptation

Adaptation to climate change is important in sustainable development and poverty eradication. It involves adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2007). The adaptive capacity of Africa (people and natural systems) is important in defining the continent's resilience. The link between climate change and sustainable development is seen in the fact that cli-

	Trend in sustainability	Remarks on status and sustainability trends
Climate change	↓	Climate change is already affecting sustainable development negatively, owing to increasing vulnerabilities and increased social, economic and environmental cost of adaptation and mitigation
Adaptation	↓	As the impacts of climate change intensify, the cost of adaptation escalates
Mitigation	↓	Africa's emissions are on the rise with increasing affluence and economic activities. At the same time, Africa's share of Clean Development Mechanism projects is steadily rising
Climate change financing	↔	Limited funding constrains adaptation and mitigation efforts

mate change is a constraint to development, and sustainable development is key to capacities for mitigation and adaptation (FAO 2010).

The challenges of climate change are a high priority for countries and there are signs of political recognition of the fact, including in platforms of international negotiations such as the Conference of Parties of the United Nations Framework Convention on Climate Change (UNFCCC), and in the allocation of resources and national adaptation plans of action (NAPAs) aimed primarily at ensuring food and energy security and designing long-term plans for managing and adapting to climate risk. The achievement of any of these goals requires good governance, access to appropriate technology, investment in innovation, the involvement and commitment of all segments of society, and international, national and regional cooperation (FAO 2010).

For Africa, adaptation is a much more important and immediate concern than mitigation (AMCEN 2011), as the cost of dealing with the impacts of climate will escalate if responses are delayed. Such responses are currently, but variably, aimed at enabling a large and vulnerable population to adapt and be resilient. This requires the integration of risk management culture into national and regional policies and practices. The goal is to sustain long-term wealth creation and quality of life in Africa and support existing development frameworks (CAADP, MDGs, Poverty Reduction Strategy Papers, NAPAs, strategies for disaster reduction and others). Some efforts in adaptation include strengthening production systems, building economic assets, improving access to markets and information, diversifying to less climate-sensitive livelihoods, reducing disaster risks through local planning and preparation, and building foundations for all these initiatives through more effective institutions of local governance and resource management (AMCEN 2011). The African Development Bank (AfDB 2011) estimates that adaptation costs in Africa will be in the range of \$20-30 billion a year over the next 10 to 20 years. There has been approximately \$350 million of adaptation funding approved from various sources for spending in Africa, of which just \$130 million has been disbursed (AfDB 2011).

A number of initiatives have been launched to address adaptation needs. The Nairobi work programme on impacts, vulnerability and adaptation to climate change is one of the programmes that have been put in place to address adaptation (UNFCCC 2007). Its first phase

(2005-2010), focused on improving the understanding and assessment of impacts, vulnerability and adaptation to climate change. The main emphasis was on support for decision-making for practical adaptation through improved research, technologies, methods and tools, data and observations, and modelling.

Mitigation

Mitigation of greenhouse gases is considered an important part of the sustainable adaptation criteria by African Governments (Eriksen 2009). Africa's greenhouse gas emissions have remained relatively low compared to the rest of the world (Hepburn and Stern, 2008) with most of the contributions largely associated with land-use change and forest degradation. Data for per capita emissions of carbon dioxide, excluding land-use change, indicate that in most subregions emissions are less than 1.5 tonnes per capita. Sub-Saharan Africa, with 11 per cent of the world's population, accounts for just 3.6 per cent of world emissions of carbon dioxide. The trends in CO₂ emissions per capita (metric tonnes) for the subregions of Africa are presented in Table 12.

In Africa, CO₂ emissions per capita increased from 0.9 metric tonnes in 1990 to 1.2 metric tonnes in 2007 and none of the subregions of Africa have shown a reduction in CO₂ emissions per capita. The change in CO₂ emissions was insignificant between 1990 and 2007, although per capita emissions in North Africa are significantly higher than in other subregions, in part because of their higher levels of income and fossil fuel use per person. Among the countries in Africa, Nigeria, Libya and South Africa have the highest CO₂ emissions per capita (about 9 metric tonnes per person), while Mauritania showed a reduction in CO₂ emissions per capita, from 1.3 metric tonnes per person in 1990 to 0.6 metric tonnes per person in 2007. There is a growing demand for increased sustainable energy investments and international technology cooperation to deal with climate change. There is still very little transfer of hard technologies and technology cooperation agreements to date have not yielded substantial results.

It is clear that increasing energy demand and continued land-use change and deforestation may result in fast-growing greenhouse gas emissions in Africa, despite the relatively low level of development. It is therefore of paramount importance that African countries, with international support, adopt clean technologies and strengthen their renewable energy production potential.

Table 12: CO₂ emissions per capita (metric tonnes)

Subregion	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	Average annual increase 1990-2007 (%)
Central Africa	1.1	0.4	1.0	1.4	1.6	1.4	1.4	1.3	1.3		1.01
Eastern Africa	0.25	0.7	0.8	0.7	0.7	0.9	0.8	0.9	0.7		1.06
North Africa	2.2	2.3	2.3	2.2	2.3	2.4	2.4	2.4	2.4		1.005
Southern Africa	1.5	1.8	1.7	1.7	1.7	1.8	1.9	1.9	2.0		1.02
West Africa	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3		1.02
Africa	0.9	0.9	1.1	1.1	1.1	1.2	1.2	1.2	1.2		1.02
World*	4.1	3.9					4.2			4.4	1.004**

Source: World Development Indicators and *(UN 2011a)

** Average annual increase 1990-2008 (%)

With respect to mitigation funding, Africa accounts for 2 per cent of global CDM projects, with only 48 projects registered under the CDM being in Africa by 2008. This figure has been increasing but not significantly enough to tilt the balance towards Africa's share of the funding. The top four African countries with the most climate projects are the Democratic Republic of the Congo, Cameroon, South Africa and Tanzania (World Bank 2011).

With a sustainable development check, countries are able to shape implementation of the CDM at the national level (Pfeifer and Stiles 2009). Some countries (including South Africa, Ethiopia, Mauritius, Mozambique, Tanzania and Zambia) have developed their own multiple criteria for screening CDM projects. In sub-Saharan Africa, priority should be given to addressing significant capacity gaps that continue to limit the region's participation in the fast-expanding carbon

market. According to UNEP and UNDP (2011), this is already involving efforts to raise awareness among policymakers about the carbon market and potential integration of the CDM in overall sustainable development policies as well as mapping economic sectors to assess mitigation potential while increasing institutional capacity and technical resources.

Climate change finance

The Stockholm Environment Institute estimated that in 2008, North Africa and the Middle East received 16 per cent of global climate finance, with sub-Saharan Africa receiving only 8 per cent. Of the total adaptation finance, sub-Saharan Africa receives 5 per cent (\$168 million). The region's vulnerability to climate change suggests early prioritization should be given to adaptation activities, but adaptation finance is clearly lacking. Around 80 adaptation projects (totalling \$154 mil-

Box 5: Africa's forests and climate change

Africa's forests hold the key to mitigation efforts (Chandler and others 2009; FAO, 2007) to reduce the "sources" of greenhouse gases and enhance the "sinks" to remove carbon dioxide from the atmosphere. This is particularly important for sustainable development given the new integrated approach under the REDD+ (Reducing Emissions from Deforestation and Forest Degradation) initiative. Over the past years, countries have developed carbon sequestration rules in response to compliance requirements and market considerations (Siry and others 2009). Despite Africa's growing participation in the carbon market, African projects accounted for only 3 per cent of Clean Development Mechanism (CDM) projects at the end of 2006 and 5 per cent at the end of 2007. According to Pfeifer and Stiles (2009), Africa's participation in the global carbon market has been relatively small due to the low emission levels of African countries, lack of dedicated financing institutions, perceived high risk, low capacity and lack of awareness about the potential of CDM even in relatively advanced countries like South Africa, Nigeria, and Egypt. The high investment risks in some African countries result in potentially lower prices for certified emissions reductions (CERs), while the overall policy framework in potential host countries are less conducive to CDM (including high levels of taxation, high interest rates, lack of support for foreign direct investment and uncertainties around fiscal policy).

Source: Summarized from Mansourian and others (2009)

lion) are being implemented within the Africa region through dedicated bilateral and multilateral climate funds, according to the Climate Funds Update website. The African Development Bank plays a key role within the region, implementing investments identified by the World Bank-administered Climate Investment Funds (CIFs). It is expected that CIFs will channel approximately \$625 million through AfDB for clean technology projects over the next year. Funding for both adaptation and mitigation must be directed to efforts that also spur sustainable development and lead to improved resilience of people, as well as forests, mountains and other ecosystems, while also supporting sustenance of stable biodiversity.

Conclusion

Climate change remains a key challenge to Africa's sustainable development efforts due to the region's reliance on climate sensitive sectors for its development. Africa's economies are increasingly vulnerable as the cost of adaptation and mitigation continues to escalate. Furthermore, despite its relatively low contribution to global warming, Africa's greenhouse gas emissions are on the rise. In particular, land use and land-use change, including deforestation, are major greenhouse gas sources in the region. Though still low compared to other regions, Africa's share of CDM projects is steadily rising, but the limited funding for adaptation and mitigation continues to constrain sustainable development efforts.

Adaptation to climate change remains important with significant adjustments needed in natural and human systems. For Africa, adaptation is more important than mitigation and is of immediate concern. Many initiatives have been launched to address adaptation needs, including attempts to increase the understanding and assessment of impacts, vulnerabilities and adaptation to climate change. African countries, with international support, are boosting mitigation efforts through adoption of clean technologies and strengthening renewable energy production. Forests remain key to mitigation efforts under the impetus of the REDD+ initiative. While support from developed countries will remain critical to

adaptation and mitigation measures, comprehensive responses and management efforts require that African countries fully integrate climate change into development planning and poverty reduction strategies.

2.2.14 Natural disasters

Natural hazards, such as earthquakes, drought, floods, tsunamis, landslides and volcanoes, threaten not only human livelihoods, but also forest and mountain ecosystems and biodiversity. In Africa, disasters such as earthquakes and volcanoes are threats to sustainable development. Weather-related disasters are increasing in intensity and are expected to increase with climate change (IPCC 2007). In any form of disaster, the most vulnerable remain the poor. Reducing vulnerability to disasters is an integral part of the fight against poverty (World Bank and United Nations 2010a and 2010b). The status and trends in selected natural disasters have been on the increase as summarized below:

Poor people are typically the most affected and need more time to recover because they are more likely to live on the most fragile lands, in unsafe structures and have fewer resources with which to protect themselves (Okuyama and Sahin 2009). Greatly affected are Africa's forests, mountains, biodiversity and other fragile ecosystems. Their resilience is a boost to sustainable development. African livelihoods greatly depend on climate and disaster-sensitive resources like land, mountains, water and forests. The global picture of disaster by type is shown in Figure 48.

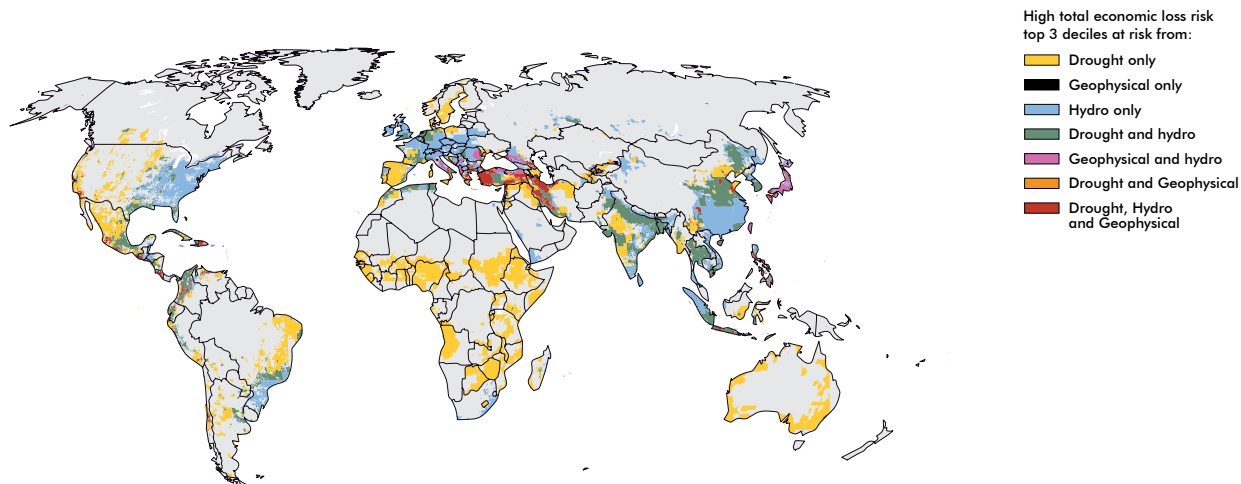
The impact of natural disasters on the environment, economy and society are widely documented (Okuyama and Sahin 2009).

Incidence of disasters

The United Nations-World Bank Joint Assessment on Economics of Disaster Risk Reduction (World Bank and United Nations 2010a) reports that the frequency and economic impacts of disasters are increasing in Africa. More than 90 per cent of natural disaster-related

	Trend in sustainability	Remarks on status and sustainability trends
Natural disasters	↓	The increase in number, severity and frequency of natural disasters is undermining progress towards sustainable development
<i>Incidence of disasters</i>	↓	Sustainable management of natural disasters is a growing challenge as more disasters are recorded
<i>Vulnerability</i>	↓	People and ecosystems are increasingly vulnerable over time

Figure 48: Natural hazard hotspots by risk type



Source: UNEP/GRID-Arendal, Natural hazard hotspots, by risk type, UNEP/GRID-Arendal Maps and Graphics Library, <http://maps.grida.no/go/graphic/natural-hazard-hotspots-by-risk-type> (Accessed 12 September 2011)

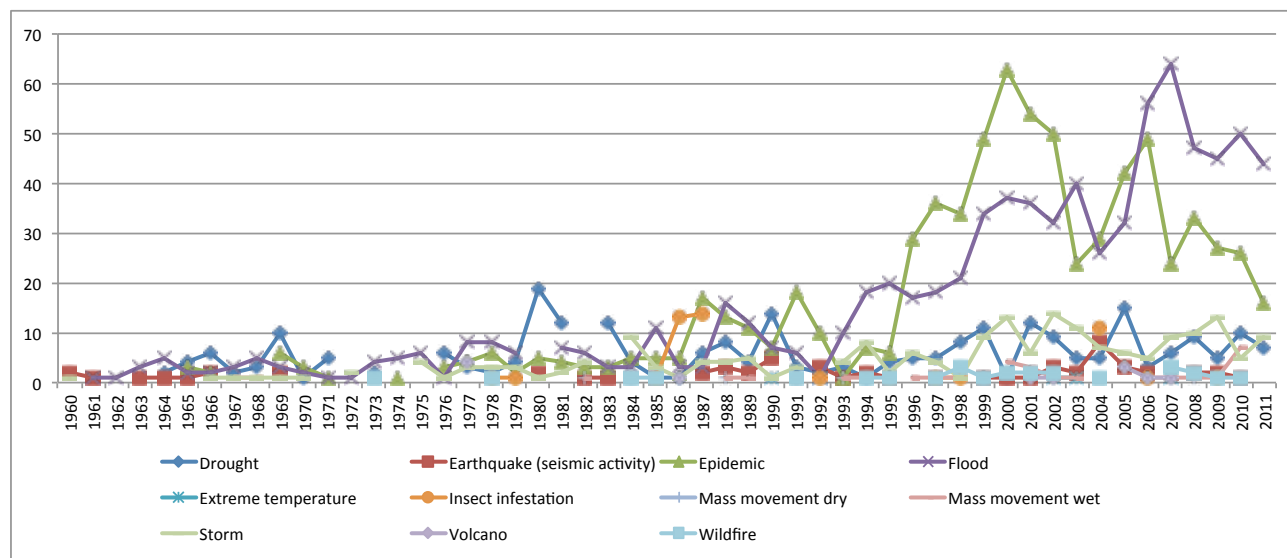
deaths occur in developing countries, including Africa (World Bank and United Nations 2010b). Figure 49 shows the trend in the number of disasters that occurred in Africa between 1960 and 2010, by type.

The total number of disasters in Africa has been fluctuating but on a general upward trend over the years. The number of disasters during 1960-2011 was highest in the Democratic Republic of the Congo (99) followed by Ethiopia (98) and Nigeria (96).

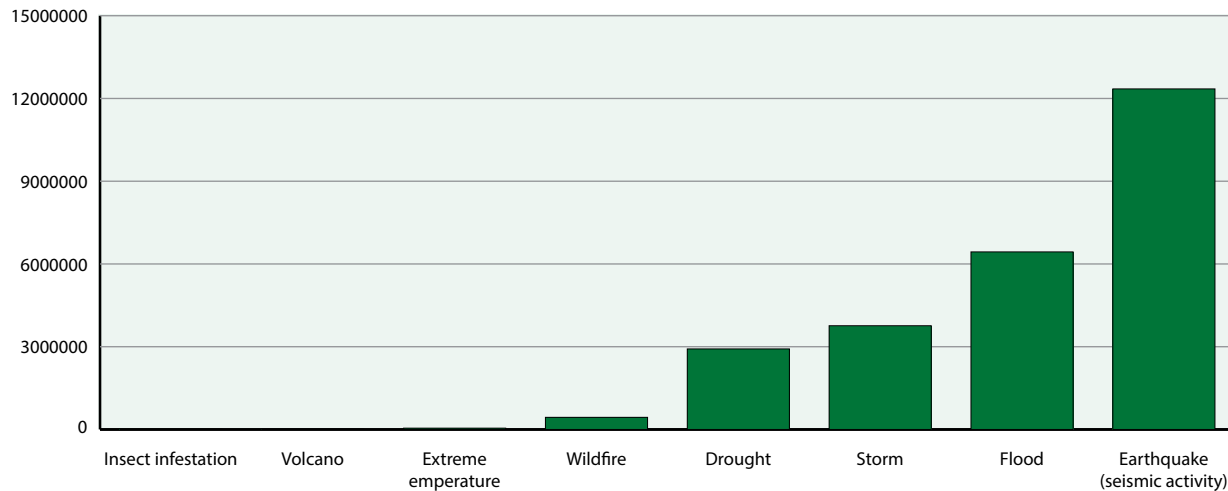
Vulnerability

Hazards and vulnerability are closely linked and influenced by the changing effect on human well-being. They are constantly shaped by dynamic and complex social, economic and ecological processes (Okuyama and Sahin 2009). Systemic ecological and localized environmental degradation is a major contributor. Human and economic loss due to disaster refers mostly to the number of persons deceased, missing and/or injured as a direct result of a disaster involving natural hazards,

Figure 49: Trends in total number of disasters in Africa by type, 1966-2011



Source: ECA (2013), based on data from EM-DAT: The OFDA/CRED International Disaster Database

Figure 50: Total damages due to disaster (\$1,000) by type of disaster

Source: ECA (2013), based on data from EM-DAT: The OFDA/CRED International Disaster Database

and the amount of economic and infrastructure losses incurred as a direct result of the natural disaster (World Bank and United Nations 2010a). The damage due to earthquake was the highest among the various disaster types. Disasters due to epidemic and flood have been the most important in recent years.

Conclusion

There has been an increase in the number, severity and frequency of natural disasters. This is increasingly slowing down or disrupting progress towards sustainable development. More and more people, particularly the poor, and ecosystems are becoming vulnerable over time, unleashing greater economic, social and environmental impacts. Efforts should focus on monitoring, early warning systems and building people's capacity to respond to natural disasters. Transboundary efforts and resilience frameworks are also desirable.

2.2.15 Financing sustainable development

Significant human and financial resources are required to promote poverty eradication and sustainable development in the region. While countries are primarily responsible for their own development, African countries acknowledge that international support is needed to implement and achieve sustainable development. Achieving it is arguably dependent on local, regional and international partnerships. Strategic partnerships enhance and stabilize a country's range of options for development, build upon experiences and models of development from other countries, and increase investment and development assistance options. There have been increased commitments to overall funding for sustainable development, but the gap remains wide.

The eighth MDG, global partnership for development, is pursued through a number of alternatives, including external financing that is measured, inter alia, by net official development assistance as a percentage of gross national income (GNI). From 2012 the financing re-

	Trend in sustainability	Remarks on status and sustainability trends
Financing sustainable development	↑	Steady increase in levels and trends in funding in Africa, increasingly allocated to sustainable development-related sectors and interventions
<i>Domestic resources</i>	↑	There is a positive trend towards local funding for development. However, this progress is yet to be sustained as a steady source of funding
<i>Foreign direct investment</i>	↑	Despite being on the increase, several factors continue to deter investments in Africa
<i>External financing</i>	↓	Official development assistance supports various development themes known to be significant for sustainable development but flows of official development assistance to African countries are declining.

Table 13: Estimated requirements for financing sustainable development in Africa

Sustainable development domain	\$ billion (a year)
Sustainable economic development	101.55
Sustainable social development	50.00
Sustainable environmental development	41.45
Cross-cutting capacity development	5.40
Total financial resource requirement for sustainable development in Africa	198.40

Source: ECA own calculations from existing literature⁷

* Africa Progress Panel (2010); AUC, AfDB and ECA, Seventh African Development Forum, Financing Climate Change Adaptation and Mitigation Actions, Issues Paper No. 7, 15 October 2010; ECA and AUC, Financing of the Programme for Infrastructure Development in Africa, Meeting of the Committee of Experts of the fifth Joint Annual Meeting of the AU Conference of Ministers of Economy and Finance and ECA Conference of African Ministers of Finance, Planning and Economic Development, 22-25 March 2012; AfDB, Agriculture Strategy, 2010-2014, January 2010; Peter C. Gondo, Southern Alliance for Indigenous Resources, Financing of Sustainable Forest Management in Africa: An Overview of the Current Situation and Experiences, August 2010; Africa Partnership Forum, Financial Resources and Investment for Climate Change, Special Session on Climate Change, 3 September 2009; The Costs of Attaining the Millennium Development Goals - Summary of the World Bank Policy Research Working Paper on "Development Goals: History, Prospects and Costs" by Shantayanan Devarajan, Margaret J. Miller and Eric V. (Undated); and NEPAD Agency, CAADP country investment plans.

requirements for sustainable development in Africa over a period of four years is estimated to total \$198.40 billion a year (Table 13).

Domestic resources

African Governments are laying more emphasis on financing development through domestic savings and investment. This is critical to national economies as it provides resources for investment, boosts financial market development, stimulates economic growth and enables

economies to protect the living standards of vulnerable segments of society while reducing over-reliance on external assistance. Table 14 summarizes the trends in domestic revenue, private flows and ODA for financing development in Africa and its subregions.

Recent actions by African countries have focused on improving leadership in coordinating and harmonizing donor activities at the country level and promoting local accountability to domestic constituents to ensure ownership of domestic investments. There have also been

Table 14: Trends in domestic revenue, private flows for Africa between 2002 and 2007

Africa	2002	2003	2004	2005	2006	2007
Domestic revenue	137.6	168	209	267	321	366
Private flows	17.1	20	28.7	45.2	51.5	81
Total	154.7	188	237.7	312.2	372.5	447
North Africa	2002	2003	2004	2005	2006	2007
Domestic revenue	67.2	75.8	87.3	113.2	140.1	165.1
Private flows	7.4	3.3	6.5	15.3	21.1	27.7
Total	74.6	79.1	93.8	128.5	161.2	192.8
Sub-Saharan Africa	2002	2003	2004	2005	2006	2007
Domestic revenue	70.5	92.2	122.5	154.4	181.5	201.8
Private flows	9.7	16.7	22.2	29.2	30.4	53.3
Total	80.2	108.9	144.7	183.6	211.9	255.1

Source: Excerpted from ECA and OECD (2009)

internal programmes aimed at reducing long-term aid dependency. Many African Governments had already made substantial progress in addressing the investment gap even before the global financial crisis by raising domestic financing levels. According to ECA and AUC (2011) the ratio of government revenue to GDP increased from an average of 21 per cent to over 27 per cent from 2001 to 2008 for sub-Saharan Africa, and it exceeded 40 per cent for North Africa in 2008. This figure includes financing from both the public and private sectors. The average ratio, however, fell to 22.7 per cent in 2009 due to the impact of lower commodity prices and more expansionary policies. Collection of domestic revenue through taxes and other sources has expanded for most African countries to over 20 per cent of GDP. The increase is due to significant improvements in tax collection and transparency. The African diaspora, who number over 30 million, also make a significant contribution to national revenue equivalent to approximately \$40 billion a year (IFAD 2009).

Foreign direct investment

Despite the marked improvement of the last few years in investment for sustainable development, there are still many factors deterring investments in Africa: political risk and inadequate human capital, macroeconomic instability, low productivity, exchange rate volatility and

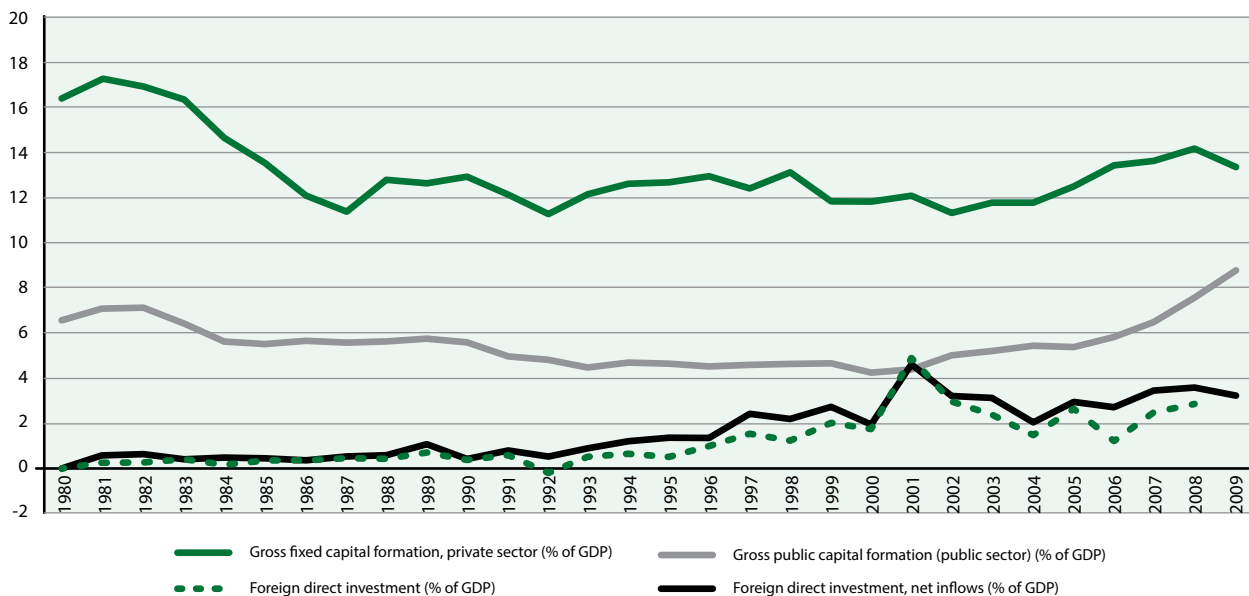
lack of infrastructure. The trends in direct foreign investment are presented in Figure 51.

External financing

Net official development assistance consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Organization for Economic Cooperation and Development's Development Assistance Committee, by multilateral institutions, and by non-Committee countries to promote economic development and welfare in countries and territories in the Development Assistance Committee list of ODA recipients. The change in net ODA received by African countries between 1990 and 2009 was significant. The proportion of the countries' gross national income represented by ODA has increased as shown in Figure 53.

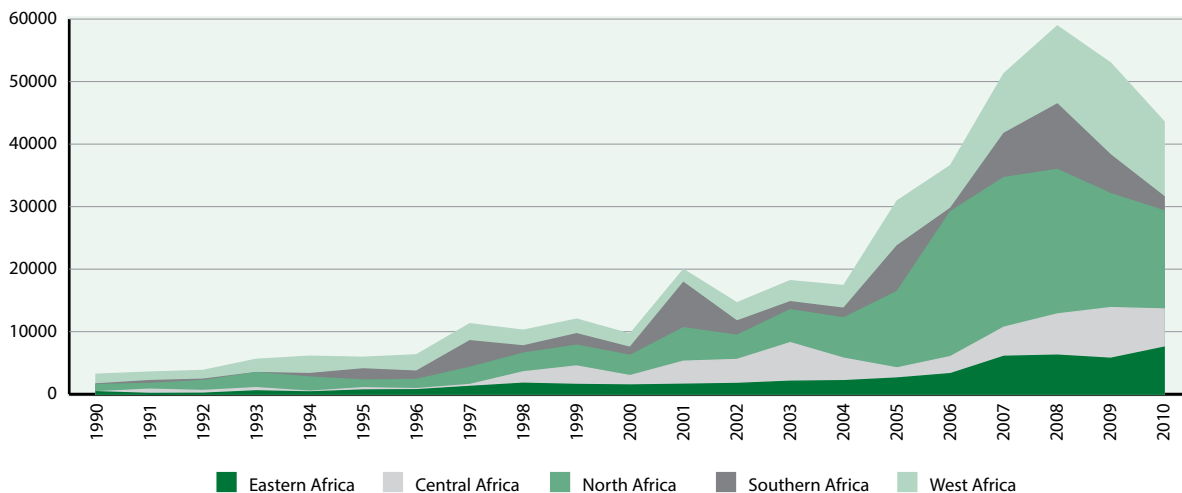
The MDGs envisage enhanced global partnerships that spur synergy in international cooperation. ODA received in African countries in 2009 increased in only 10 countries as a percentage of their GNI, compared to 1990, while it decreased in 35 out of 47 countries with data for 1990 and 2009. The MDG on global partnership for development also envisages an increase in ODA to small island developing States of Africa. However,

Figure 51: Trends in foreign direct investment, private and public investment in sub-Saharan Africa, 1980-2009



Source: African Development Indicators, accessed September 2011

Figure 52: Value of foreign investment flows('000 USD) by subregion between 1990 and 2010



Source: UNCTAD (<http://unctadstat.unctad.org/TableViewer/tableView.aspx?ReportId=88>)

ODA received by these States as a proportion of their GNI has declined since 1990.

Table 15 shows the top 10 recipient countries in 2009 while Figure 52 shows the trends in value of foreign investment flows by subregions between 1990 and 2010.

The 2010 *Africa Economic Outlook* report (AfDB and others 2010) reveals that ODA to Africa is crucial for economic growth and development and has been providing support for the various development themes that

significantly resonate with sustainable development, including developing human capital and entrepreneurship; facilitating international trade through enhanced export capacity and strengthening trade; supporting natural resources management; and improving financial services, governance, infrastructure and policy.

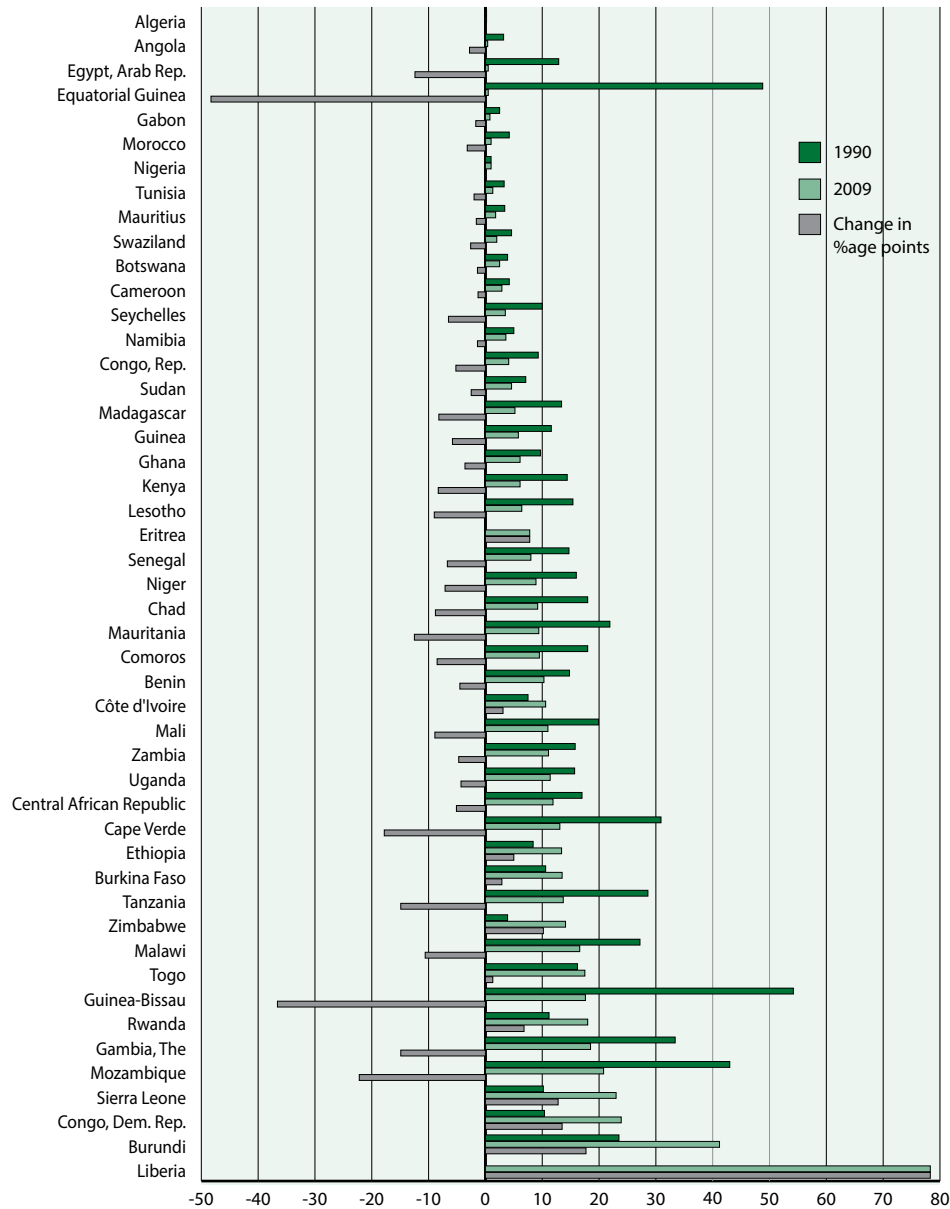
Conclusion

There is a steady rise in the level of funding for sustainable development in Africa, though there remains a con-

Table 15: Top 10 ODA receipts by recipient countries(\$ million, net disbursements in 2009)

Country	ODA	%
Ethiopia	3,820	8%
Tanzania	2,934	6%
Côte d'Ivoire	2,366	5%
DR Congo,	2,354	5%
The Sudan	2,289	5%
Mozambique	2,013	4%
Uganda	1,786	4%
Kenya	1,778	4%
Nigeria	1,659	3%
Ghana	1,583	3%
Other recipients	25,028	25%
Total	47,609	199%

Source: World Bank (2011a)

Figure 53: Net ODA received (% of GNI)

Source: ECA (2013), based on data from World Development Indicators and the World Bank, <http://data.worldbank.org/indicator>

siderable gap in the financing needs for sustainable development. There is an increasing reliance on domestic resources but the progress is yet to be sustained. While foreign direct investment is on the rise, it continues to be hampered by high risks, including governance challenges. Official development assistance to the region is on the decline. The requirements for financing sustainable development in Africa entail the deployment of resources to implement social, economic and environment management programmes, taking into account the MDGs and other internationally agreed development

goals. The estimated cost of these programmes should of necessity be adjusted due to the anticipated cost of responding to the impacts of climate change.

2.2.16 Conclusion

The assessment provides a holistic view of Africa's progress towards sustainable development. It reveals that while countries have made measurable progress on many fronts, much remains to be done if Africa is to

achieve its sustainable development goals, including meeting relevant international commitments.

Progress on governance in Africa remains mixed, but there is evidence of improvements in economic governance. On the poverty front, countries have realized that increase in GDP alone is not a true indicator of economic well-being, and steady progress is being made in reducing income poverty. Although appreciable progress is reported in access to basic services such as safe drinking water, progress in the sanitation sector lags behind. There are also worrying trends in improved access to energy and decent housing. Poverty reduction efforts are not sufficient to meet the MDG target by 2015. Although the overall demographic changes are encouraging, especially with respect to accompanying social and human development policies, sustainable development remains threatened by increasing population growth and unplanned urbanization.

Africa has registered mixed results in macroeconomic performance, value addition and the contribution of tourism to the economy. The region has made steady progress in sustainable production, but significant efforts are still needed in terms of sustainable consumption. Economic growth in Africa is yet to bring about real employment and improved labour productivity for various social groups. Progress is being made in overall empowerment of women, but countries need to step up efforts to meet gender parity objectives. There is evidence of overall positive progress towards education targets, but progress is slow, with indications of inability to meet the 2015 targets, such as for adult literacy. The increased burden of health challenges is slowing progress towards sustainable development on the continent.

Mixed results and trends have been recorded in the agriculture sector. Africa has seen a steady increase in food production, but has registered mixed results towards structural transformation and sustainable agriculture, and challenges in food security and nutrition persist. There is continued depletion and degradation of Africa's natural resource base, with limited value addition, marginal benefits to the people and continued environmental degradation. There is a general stagnation in sustainable energy development, as access to modern energy sources that are affordable, clean, reliable and safe continues to elude Africans.

The negative impacts of climate change are already being felt owing to increasing vulnerabilities and the increased social, economic and environmental cost of adaptation and mitigation. There has been an increase in the number, severity and frequency of natural disasters. This is increasingly slowing down or disrupting progress towards sustainable development. A steady rise in the level of funding for sustainable development in Africa has been registered, with increasing reliance on domestic resources. While foreign direct investment is on the rise, official development assistance is declining.

The foregoing suggests that sustained efforts are needed if Africa is to meet its sustainable development goals and aspirations. A mix of policy measures and instruments are required to reverse declining trends and enhance progress. These have been identified in the various sections of the assessment report. For optimal results, this should be done using an interlinkages approach that identifies the interactions among the various themes with a view to promoting synergies and minimizing overlaps.

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PART II

Contribution of Selected Sectors to Sustainable Growth and Development in Africa

Key Messages

Forests

Forest and wood resources are indispensable for sustaining livelihoods and their sound development and management is crucial for poverty reduction and sustainable development in Africa. The diverse forest and wood resources of the region play multiple roles and provide a variety of goods and services. The livelihoods of millions of people and many national economies in the region are linked to forest and wood resources, which provide up to 80 per cent of energy in some countries, contribute an average of up to 6 per cent of GDP in sub-Saharan Africa and are central to effectively tackling climate change challenges.

There is a need to quicken the pace and widen the scale of implementation of on-the-ground initiatives to reverse the trend of forest area loss and achieve sustainable forest management in the region. Progress has been made through various initiatives, including the development of forest management plans and revision of outdated forest policy and legislation. Other initiatives include: forest planting programmes and the designation of about 14 per cent of the total forest area in Africa for conservation of biological diversity. Regional and subregional cooperation across a broad range of issues such as transboundary natural resources management is critical for sustainable forest management and should be fostered.

The area under forest plantation should be expanded and more natural forest areas set aside as protected areas to meet the growing demand for forest products and environmental services, such as soil erosion control, watershed management and carbon sequestration/mitigation of climate change. In this regard, there is a need to expand planting to riparian areas, urban settlements and cultivated areas, in order to meet the demand for forest and wood products and help combat land degradation and desertification as well as climate change.

There is a need to produce diversified and high value added wood products and encourage long-term investments in local processing. The export of unprocessed roundwood and non-wood forest products is putting Africa at a serious disadvantage in terms of income generation due to the low international market prices for these raw products.

There is a need to mobilize and expand sources of financing for sustainable forest management. In this regard countries should also take advantage of the various opportunities available, including carbon financing mechanisms such as Reducing Emissions from Deforestation and Forest Degradation (REDD), conservation, sustainable management of forests

and enhancement of forest carbon stocks (REDD+) and the Clean Development Mechanism. There is a vast potential for inclusive green growth in the sector which also needs to be explored.

Cross-sectoral coordination and private sector involvement in forest management need to be strengthened. Increased cross-sector consultation and planning should be promoted to achieve integration of forest consideration into national and sectoral policies and plans, enhance broad participation, and mobilize both public and private sector financing and investments in sustainable forest management. The large informal forest sector consisting of small and medium forest enterprises needs to be supported to enable it to acquire and use improved technologies and to manage and develop forest resources sustainably.

Biodiversity

Biodiversity includes people and the environments they help to shape. No matter how far removed people may seem from the “natural” environment, they remain intimately connected with ecosystems and their processes through their diets, use of materials, energy, water, recreational activities and much more.

Africa's rich biodiversity is central to sustaining life, livelihoods, cultural practices, poverty reduction and sustainable development on the continent. African societies, including in urban areas, depend on natural environments for delivering food, medicine and resources that sustain production systems, whether for small-scale or commercial production, and they attach cultural importance to biodiversity.

Effective management, including equitable sharing of benefits from biodiversity resources, should be strengthened to stem biodiversity loss. The absence of effective systems to manage direct and indirect pressures on biodiversity, especially those issues related to poverty and demographic change, is the main cause of land degradation, loss of habitats and species, and erosion of genetic resources.

Management decisions need to be made in the light of their impact on the delivery of ecosystem services as tangible benefits from biodiversity to local residents. The management of ecosystems aimed at maximizing

one ecosystem service at the expense of all others limits the benefits that can be derived from an ecosystem. Substantial benefits for biodiversity and human well-being can accrue when the range of ecosystem services (provisioning, regulating, supporting and cultural) is considered.

There is a need to harmonize national policies and plans across sectors with clear assignment of responsibility. Different policy objectives in various sections of Government or a change of approaches and views over time can result in the coexistence of partially inconsistent or contradictory policies. Policy reform can help to reduce the costs and avoid undesirable outcomes in biodiversity conservation.

Biotechnology

Biotechnology can contribute significantly to better health care and enhanced food security in Africa. This can be achieved through sustainable agricultural practices and more efficient and clean industrial and environmental processes, and can support sustainable approaches for managing and conserving biodiversity. This can be achieved if decisions and actions on the introduction, development and deployment of biotechnology are demand driven and based on scientific evidence and safety of the technology to human and animal health and the environment.

African countries have demonstrated interest and actively invested in research and development as well as commercialization of biotechnology products at various levels and in various fora. Steady progress has been made in the development of policies, laws, regulations and institutional arrangements to govern biotechnology. However, the approach towards development of regulatory frameworks has largely been cautious and sometimes contradictory.

Low public awareness is a major threat to biotechnology uptake in Africa. Public awareness and public engagement in biotechnology is needed at all levels. African Governments should be proactive and lead in promoting and improving the understanding of biotechnology based on science-based evidence for informed decision-making.

There are major capacity gaps in technical, infrastructural, institutional and financial resources that require immediate attention if Africa is to catch up with other biotechnologically advanced countries. Few countries have a critical mass of capacity to develop, regulate, adapt and apply biotechnology on a scale required to cause significant positive changes.

African countries should tap the abundant wealth of knowledge and experience that have been accumulated over the years to steadily develop their biotechnology industry without reinventing the wheel. Countries should also pursue development of efficient, affordable and science-based regulatory regimes that are appropriate for use in Africa by African innovators without compromising biosafety.

Political will and commitment are critical for Africa to effectively use and enhance benefits from existing and emerging biotechnologies. Additionally, the region needs to scale up the level of investments in biotechnology development and deployment and build physical, human and institutional capacities.

Mountains

Mountains form a significant part of the land mass in Africa and play a critical role in Africa's sustainable development. Mountains harbour rich natural resources such as forests, minerals and tourist attractions which, if efficiently harnessed, can propel Africa to sustainable development. They serve as water towers for water supply and clean energy production – key drivers of Africa's socioeconomic development. They provide habitat for biological diversity, and changes in mountain ecosystems act as early indicators of climate change, thus providing insights into adaptation strategies.

Despite their importance, Africa's mountains continue to be susceptible to human-induced threats and degradation. This includes land degradation, especially soil erosion and biodiversity loss through deforestation and other human activities. The ecosystems of mountainous areas are very fragile and may suffer irreversible damage from unsustainable development activities. Without appropriate planning and mitigating measures in place, “conventional” development in mountain areas could result in their irreversible damage.

There are many threats, challenges and opportunities in mountain areas of Africa that should be considered in their sustainable management. These include population dynamics that drive many changes in mountain regions. All over Africa, mountain water resources are under pressure from unsustainable use, climate change and other human-induced and natural forces. Unless the African highland water resources are fairly and sustainably managed, there is a high risk of intolerable strain on relations between highland and lowland communities.

There is an urgent need to develop policies, strategies, programmes and actions (both national and trans-boundary) for integrated and sustainable mountain resource development. This should take into account the specificities of mountain areas, recognizing their fragility and the significant contribution they can make to sustainable development. Such strategies, programmes and actions must be developed in a participatory manner, involving mountain communities.

Tourism

The tourism industry in Africa has recorded phenomenal growth in the last two decades that has seen the industry occupy a significant role in the global economy. Globally, tourism accounts for 5 per cent of total economic activity, generating over US\$1 trillion a year or about \$3 billion per day and employing 6-7 per cent of the total workforce in 2009. In 2010, Africa showed a continued growth in arrivals of 8.8 per cent, receiving about 63 million tourists. Insufficient data capture at the national level in the region may, however, lead to under-reporting. There is a need for countries to put in place comprehensive tourism satellite accounting systems to accurately capture the contribution of the tourism sector to both economic growth and development.

Despite the continent's wealth of natural and cultural attractions and the continued growth in arrivals, the potential of tourism to contribute to sustainable development has not been fully achieved. There are significant differences in the contribution and importance of travel and tourism between North Africa and sub-Saharan Africa. In North Africa, tourism is already the most important generator of economic development and jobs, while sub-Saharan Africa has a long way to go to capitalize fully on its tourism potential. Despite the

significant potential of the tourism industry to contribute to poverty reduction, the focus of tourism development has been on its contribution to economic growth without attempts to harness its social and environmental benefits.

Africa should take advantage of the available options to fast track the capture of benefits of tourism to achieve sustainable development in the region. There is a need to develop domestic and regional tourism by capturing the growing middle class in Africa and relaxing travel requirements. In order for the tourism industry to contribute significantly to poverty reduction, countries need to develop national tourism policies in a participatory manner. Such policies should explicitly incorporate measures aimed at addressing poverty reduction and developing an inclusive tourism economy. African countries should aim at diversifying tourism offers and products to lengthen visitors' stay and promote more international and domestic tourism. New forms of tourism could for instance include conferences, sports and pilgrimage tourism. In line with efforts to diversify the tourism offer, the region should diversify tourism influxes, in particular by promoting and prioritizing domestic and regional tourism through the development of appropriate tourism packages.

Harnessing Interlinkages for Sustainable Development

Africa's natural resource base remains the foundation for growth and for achieving sustainable development. Biodiversity, forests, biotechnology, mountains and tourism have intrinsic interlinkages which offer opportunities that must be harnessed for sustainable development. Our understanding of these interlinkages and their implications for poverty eradication and other sustainable development goals is important and must be reflected in policy coherence and sustainable development practice.

Biodiversity, forests, biotechnology, mountains and tourism can make a distinct, collective and integrated contribution to sustainable development and poverty eradication. Biodiversity in Africa is intrinsically linked

to forests, biotechnology, tourism and mountains. As a powerful tourist attraction, healthy and diverse ecosystems add significantly to the contribution of tourism to poverty eradication and sustainable development. The management of mountain regions, rich in unique biodiversity, forest management and protection, and biotechnology research and development, continue to provide useful tools for biodiversity conservation and enhancement.

Incentives for the conservation of natural resources and cultural attractions are necessary to ensure that Africa's tourism sector continues to generate job opportunities and improve services for local communities. In order to reap the benefits from economic activities in the tourism sector, sustainable tourism principles must be encouraged, to avoid the possible negative impacts such as capital leakage and excessive strain on the environmental and cultural systems on which the tourism experience relies.

Approaches for addressing interlinkages in sustainable development require adaptive governance that promotes flexibility, cooperation, collaboration and learning to cope with the challenges of integrated development and governance requirements. For Africa, adaptive governance approaches offer the opportunity for managing complex interlinkages and hence the uncertainty that pervades the various facets of society, economy and environment. Adaptive management will yield incremental and cost-effective evolution of institutional structures. Coherence in the interventions within and among various sustainable development regimes is achievable through adaptive governance, supported by enhanced knowledge and information infrastructures. Broadening the participation of all actors, including the private sector, will further enhance the ability to harness interlinkages for sustainable development.

The adoption of inclusive green growth principles is promising for sustainable development in Africa. It could contribute to promoting and supporting poverty eradication efforts in the region. Investing in the sustainable development and management of biodiversity, forests, biotechnology, tourism and mountains could present considerable win-win options that can at the same time provide alternative livelihood opportunities and strengthen economic growth.

3. Forests

3.1 Introduction

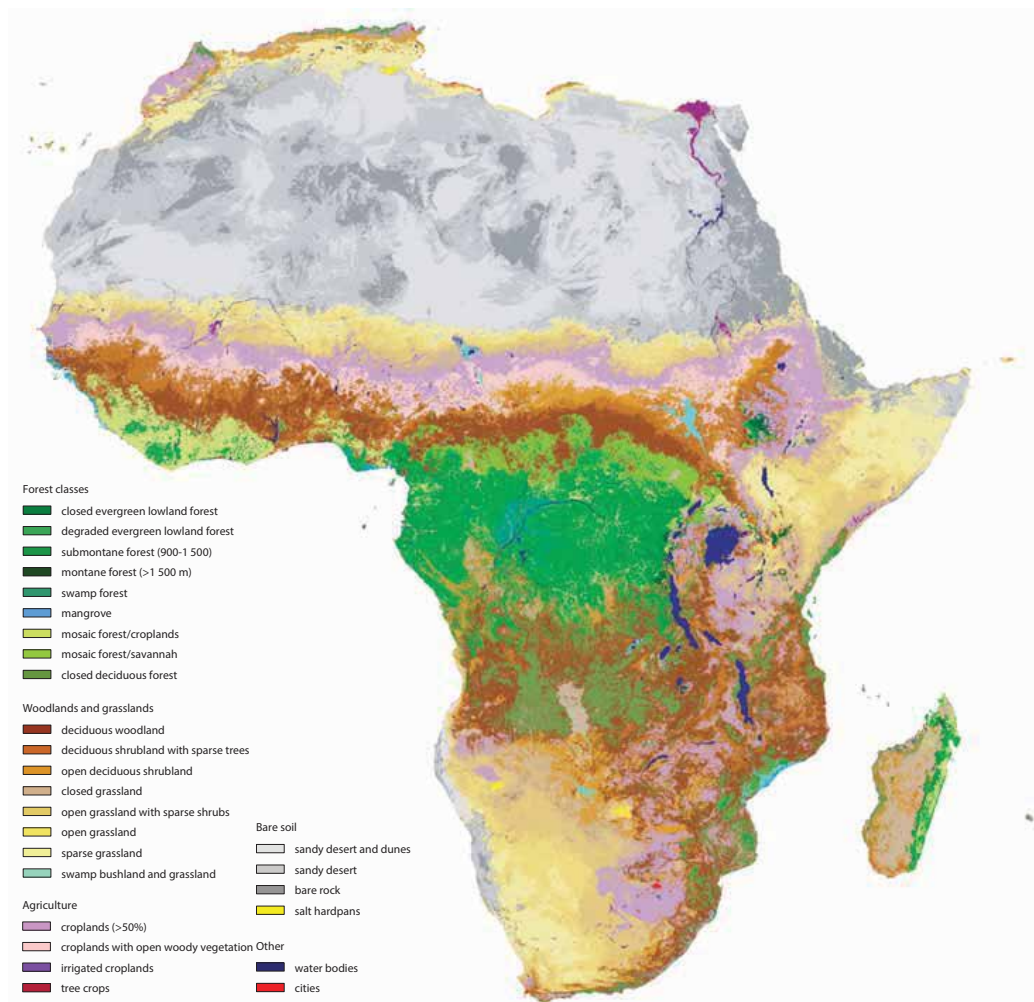
According to FAO (2010a), a forest is land spanning more than 0.5 hectares (ha) with trees higher than 5 meters and a canopy cover of more than 10 per cent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use. There are nine general classifications of Africa's forests and woodlands. These are tropical rain forests, tropical moist forests, tropical dry forests, tropical shrubs, tropical mountain forest, subtropical humid forests, subtropical dry forests, subtropical mountain forests and plantations (FAO 2003). The tropical dry forests are mainly found in the Sahel, Eastern and Southern Africa, while tropical moist forests are found in West Africa and Central Africa. Subtropical forest and woodlands are mostly found in North Africa. Figure 54 shows the main vegetation types in Africa.

Africa has 17 per cent of the world's forests or about 675 million ha, which cover 23 per cent of the land area of the continent (FAO 2010a and 2011). There is however great variation in the distribution of forests among the five subregions of the continent. Nearly half of West African and Central African subregion is forested compared with only 8.6 per cent of North Africa and 27.8 per cent of Eastern Africa and Southern Africa. At the country level, the five countries with the largest forest area, namely; the Democratic Republic of the Congo, the Sudan, Angola, Zambia and Mozambique, together contain more than half the forest area of the continent (55 per cent). Countries reporting the highest percentage of their land area covered by forest were Seychelles (88 per cent), Gabon (85 per cent), Guinea-Bissau (72 per cent), the Democratic Republic of the Congo (68 per cent) and Zambia (67 per cent) (FAO 2011).

3.2 Contribution of forests to Sustainable Growth and Poverty Reduction in Africa

African forests provide firewood, building materials and extensive supplies of non-wood forest products (NWFPs), such as wild foods and medicinal plants to local communities. Wood-fuel is perhaps the most important forest product for many countries and forms the main source of energy (about 90 per cent) for most African households (Alelign and others 2011).

Figure 54: Vegetation types of Africa



Source: UNEP 2006.

A distinctive feature of production and consumption in Africa is the very low share of value-added secondary and tertiary products.

Fuelwood extraction and Trade in timber

Table 16 shows the area of forests primarily designated for production of wood and non-wood forest products during the period 1999-2010. According to FAO, 90 per cent of wood removed from African forests were used as fuelwood and Africa accounted for 33 per cent of global fuelwood removals. Only 10 per cent of the wood removal was for industrial roundwood. (FAO 2011). The value of wood removals (fuelwood and industrial roundwood) increased in the region from \$2.6 billion in 1990 to about \$2.9 billion in 2005.

The value of wood products in the formal economic sector was concentrated in a small number of countries. Five International Tropical Timber Organization (ITTO) countries in the Congo Basin (Cameroon, Central African Republic, the Democratic Republic of the Congo, Republic of Congo and Gabon) accounted for the bulk of the internationally traded tropical timber from ITTO African members. Estimates are: 2.8 million m³ of logs, 1.1 million m³ of sawnwood and 170,000 m³ of panels or 92 per cent, 63 per cent and 61 per cent of African producer tropical log, sawnwood and plywood exports, respectively. East Asia and EU remain the major importing regions (ITTO 2007).

Gabon's tropical log exports increased from 1.8 million m³ in 2006 to 1.9 million in 2007, and it is the third largest exporter of tropical logs (predominantly to China). The Republic of Congo, Côte d'Ivoire and Central

Table 16: Area of forest designated primarily for production in Africa, 1990–2010

Subregion	Area (1 000 ha)			Annual change 1000 ha)		Annual change rate (%)	
	1990	2000	2010	1990-2000	2000-2010	1990-2000–	2000-2010
Central Africa	66 944	66 197	59 844	-75	-635	-0.11	-1.00
Eastern Africa	34 330	31 127	27 957	-320	-317	-0.97	-1.07
North Africa	39 557	36 637	36 819	-292	18	-0.76	0.05
Southern Africa	36 950	34 834	33 199	-212	-163	-0.59	-0.48
West Africa	33 164	33 898	28 208	73	-569	0.22	-1.82
Total Africa	210 944	202 693	186 027	-825	-1 667	-0.40	-0.85
World	1 181 576	1 160 325	1 131 210	-2 125	-2 911	-0.18	-0.25

Source: FAO 2011.

African Republic also exported substantial quantities of logs in 2007 (ITTO 2008). Improving value-added content of Africa's timber exports remains one of the key priorities through down-stream processing and the use of "Lesser Used Species". Minor tropical forest products such as bamboo, rattan and cane continue to gain prominence with the widest application in furniture.

The total production of wood-based panels in Africa was about 3.0 million m³, most of it being produced in West Africa and Southern Africa and to a limited extent in North Africa and Central Africa. West Africa and Central Africa are important exporters. On the other hand, North Africa's production accounts for only 25 per cent of the consumption, making it a major importer (FAO 2011). Only Africa continues to export significant amounts of logs compared to processed primary products, with log exports making up to 18 per cent of log production, and 45 per cent of round log equivalent export value (FAO 2011).

South Africa produced about 20 per cent of Africa's industrial roundwood in 2006, largely from planted forests. Nigeria produced 13 per cent, while North Africa produced less than 6 per cent making the latter more dependent on imports.

In recent years, production of industrial roundwood from natural forests declined in most West African countries and increased in Central African countries (Cameroon, the Democratic Republic of the Congo and Gabon). Several countries have imposed restrictions on

export of logs in order to encourage domestic processing. Most of Africa's wood is produced from natural forests. According to FAO (2009), "there is a shift to the sourcing of wood from planted forests and the exclusion of large tracts of natural forests from wood production, invariably for ecosystem services." Investments in planted forests occurred mainly in countries with relatively low forest cover (Algeria, Morocco, Nigeria, South Africa and the Sudan). Average annual planting in Africa was estimated at about 245,000 ha for the period 2000 - 2010, less than 2 per cent of the global planting rate. With the exception of South Africa, most planted forests are established and managed by public forestry agencies. Currently, the private sector is gearing up for large-scale plantations for profit, realizing the rising global demand for wood products in teak, pine species and several indigenous species (such as "Obeche", "Samba", "Franke", "Limba" and "Okoume").

Contribution to the Gross Domestic Product

Forestry's contribution to GDP is aggregated as part of the agriculture sector. Although research has increasingly been able to quantify the value of forests and to suggest ways to analyse their full contribution to GDP, more information is needed on the value of NWFPs and the ecosystem services that these resources provide. The contribution of Africa's forests to GDP ranges from 2 to 10 per cent. A figure of 6 per cent contribution to GDP is often quoted for the entire SSA (Box 6). In Côte d'Ivoire the sector fetches \$298 million a year, while non-wood products bring an estimated \$6 million

Box 6: Economic importance of the forest industry in sub-Saharan Africa

While a figure of 6 per cent contribution to GDP is often quoted for the entire Sub-Saharan Africa (SSA), such a figure masks the disparities between tropical and non-tropical countries. For example, forests play a major role in the economies of Cameroon, Central African Republic, Congo, the Democratic Republic of the Congo, Equatorial Guinea and Gabon, and in the livelihoods of local people. The forest sector contributes, on average, between 5 and 13 per cent of the GDP of these countries. Up to 60 per cent of export earnings for Gabon are from timber products, while for Central African Republic it is about 50 per cent. Gabon is the biggest exporter of industrial roundwood, exporting nearly 97 per cent of its total production. Export of medicinal plants is a significant foreign exchange earner for Cameroon, amounting to around \$2.9 million a year

Source: Gumbo (2010), UNEP (2011).

into the Niger's economy. In South Africa, the sector's contribution to the economy is estimated at \$4,674 million a year, of which 55 per cent is NWFPs (Table 17).

Food security and poverty reduction

Most African poor communities live in rural areas and depend on forests for their daily subsistence. There is, therefore significant pressure on the forest resources to

obtain construction materials, fuelwood and NWFPs. Many families derive a major part of their cash income from the sale of these products and rely on them for their food security. Examples from Cameroon and other countries highlight the capacity of non-wood forest products to provide employment, income and sustenance in times of crisis – given a suitable legal framework to help safeguard local access and prevent resource depletion.

Table 17: Forests and GDP, economic values of forests

Country	Forests & GDP	Economic Value of forests	Data on households depending on forests
Angola	8% (with agriculture & fishery); FAO –1.8%	<ul style="list-style-type: none"> Value of minor forest products equivalent to 30% of Gross Domestic Product 	<ul style="list-style-type: none"> Sector employs 4,000 (FAO 2004)
West Africa	4.9% of Gross National Product, & 25% of export (Mali); 2.8% of Gross National Product (Benin)	<ul style="list-style-type: none"> Value of fire wood \$94 million (Burkina Faso); Value of wood \$298 Million (Côte d'Ivoire), \$92 million (the Niger), \$15 million (Senegal); Value of Non-Timber Forest Products \$6 million (the Niger), \$3 million (Senegal), \$5.5 million (Burkina Faso); Value of forest products \$140 million (Mali); 	<ul style="list-style-type: none"> 20-60% of household budgets (Mali) Sector employs 6,273 permanent & 60,000 temporary (Burkina Faso); employs 33,662 (Côte d'Ivoire); employs 768 public & 7,710 private (the Niger); employs 12,700 (Senegal) (FAO 2005)
Cameroon	8.9%	<ul style="list-style-type: none"> 56 communities benefit annually from between \$2,840 (low value) to \$45,740 for high value forests. Communities in 30 rural councils were entitled to \$4,500,000 in 2006 	<ul style="list-style-type: none"> Employs 20,000; 75% of household revenue generated by forest in rural areas (2006) (Oyono and others 2007)
Ethiopia	1.8%, but estimates up to 10% Gross Domestic Product from forests	<ul style="list-style-type: none"> Forest industry 2.8% of agriculture sector; 3.7% share of Agricultural Gross Domestic Product (which is 49.7% of Gross Domestic Product). 	<ul style="list-style-type: none"> 59% of forestry sector for fuelwood; 34% for gums & resins, & afforestation. (Bekele 2001; Karanja and others 2002; Mogaka and others 2001)
South Africa	2% (plantations) or 1.7% (FAO figures)	<ul style="list-style-type: none"> \$4,674 million a year of which 55% Non-Timber Forest Products 	<ul style="list-style-type: none"> Direct use values of Non-Timber Forest Products vary \$750 to \$8,500. Medicinal Trade in Kwa Zulu Natal worth \$10 million a year. over 325,000 people employed (Bailey and others 1999)

Source: Barrow and others, 2009.

Table 18: Some NWFPs of high economic value in Cameroon

Product	Part of plant used	Use	Value (US\$)
Edible plants			
Cola acuminata	Seed	Snack, stimulant and aphrodisiac	212 000
Dacryodesedulis	Fruit	Food (vegetable)	244 000
Irvingia spp.	Seed	Condiment	302 000
Ricinodendronheudelotii	Seed	Condiment	460 000
Medicinal plants			
Pausinystalajohimbe	Bark	Aphrodisiac, stimulant and tonic	600 000
Prunusafricana	Bark	Prostate treatment	700 000

Source: Ndoye 1995 (edible plants); CARPE 2001 (medicinal plants).

Trees and other plants growing in forests provide year-round fodder for bees, and in many African cultures, honey is collected from wild colonies and also from hives placed around farms and woodlands. In Zambia, a country with extensive woodlands and dry forest (Miombo woodlands), beekeeping and honey production are an important aspect of rural livelihoods, providing up to 25 per cent of total annual income for tens of thousands of people and supplementing the diets of at least 250,000 households (Kalaba and others 2012).

Bushmeat consumption thrives on the relative availability and abundance of wild animals in forests and fallow areas. In West Africa, the most consumed game species are small rodents, principally grasscutter and cane-rats. The economic value of the bushmeat trade in Central Africa is high, with estimates ranging from \$42 to \$205 million a year. The total harvest of bushmeat in Central Africa amounts to more than 1 million tonnes annually. Hunting provides between 30 per cent and 80 per cent of the overall protein intake of rural households in the subregion (FAO 2011).

Table 19: Raw Gum Arabic Exports (tonnes), 1992-2006

Year	The Sudan	Chad	Nigeria	Africa	Total Africa
1992	17 061	2 450	8 358	3 073	30 942
1993	13 475	3 701	7 042	2 243	26 461
1994	23 341	4 558	9 822	3 751	41 472
1995	18 143	7 001	9 914	2 821	37 879
1996	17 671	7 365	12 164	3 349	40 549
1997	17 342	8 527	10 199	5 301	41 369
1998	25 053	12 584	8 166	2 296	48 099
1999	19 305	11 312	8 598	3 399	42 614
2000	21 916	11 682	8 239	4 009	45 846
2001	26 105	12 881	8 747	2 137	49 870
2002	34 162	10 664	6 556	2 724	54 106
2003	13 217	9 672	50	3 097	26 036
2004	27 444	12 044	15 407	2 393	57 288
2005	33 078	14 186	19 313	3 930	70 507
2006	23 149	17 812	21 231	3 474	65 666

Source: (FAO Guidelines on Sustainable Forest Management in Drylands of SSA 2010b).

FAO (2011) reports that food insecurity is generally related to poverty and limited opportunities for employment or income generation – thus forest resources have a critical role to play in enhancing food security of the local communities. In Senegal, for example, over 150 species of wild fruits and plant foods are consumed. Particularly important species are the baobab (*Adansoniadigitata* and *Balanitesaegyptica*), the leaves and fruits of which provide important forest foods, nutrients and vitamins during the “lean season”. Some households in Mozambique, for example, obtain 30 per cent of their income from unprocessed forest products such as fuelwood, fruits, mushrooms, insects, honey and medicinal plants.

Many Small- and Medium-Scale Forest Enterprises (SMFEs) are based on NWFPs in almost all the ecological zones. In arid and semi-arid areas, the collection and sale of gum Arabic (from *Acacia Senegal* and *Acacia seyal*) in seventeen countries across dryland Africa is an example of how NWFPs are increasingly integrated into global markets. Gum Arabic makes a significant contribution to the local economies of some Sahelian countries as depicted in Table 19.

The shea tree (*Butyrospermumparkii* or *Vitellariapara-doxa*) is found in the Guinea savannah zone, and especially in Africa's Sahel belt, and it is estimated that three million rural African women are involved in the export of shea products (ingredients in skin care), which were valued at \$100 million for 2007–2008 in Burkina Faso (FAO 2009). SMFEs can be engines of development through employment and income generation and through the multiplier effect that occurs in rural economies. Governments and international organizations could create a more positive environment for SMFEs by clarifying natural resource access and tenure rules; by simplifying business registration and export procedures; and by streamlining tax and financial incentive schemes.

Environmental Services from forests

Forests in Africa, like in the rest of the world, provide environmental services such as watershed protection, carbon sequestration for mitigation of climate change, conservation of biodiversity, and landscape beauty for ecotourism (Fisher and others 2010). Forests have an important hydrological role in altering the quantity, quality and stability of water flows. In South Africa, afforestation/reforestation is regarded as a stream-flow reduction activity requiring payment of water charges for obtaining a permit for afforestation. The UNEP Af-

rica Water Atlas (UNEP 2010) also draws attention to Africa's “water towers”, which are sources for many of Africa's transboundary rivers and contribute immensely to the total stream flow of African major rivers. These supply life-giving resources and services in downstream areas such as water for hydropower, wildlife and tourism, small- and large-scale agriculture, municipalities and ecosystem services.

The Water Atlas shows that most of these water towers, from the Middle Atlas Range in Morocco through to the Lesotho Highlands in Southern Africa, are under extreme pressure as a result of deforestation and encroachment. The current population pressure on forests, wetlands, rangelands and marginal agricultural lands, as well as inappropriate cultivation practices, forest removal and high grazing intensities, have led to unwanted sediment and stream flow changes that affect the downstream communities. This has led to unprecedented levels of soil erosion and consequent siltation of dams.

Forests and human health

Medicinal plants are widely used by all sections of the human population, either directly as folk medicine or indirectly in the preparation of modern pharmaceuticals. Examples of plant medicines used in Africa are shown in Box 7.

3.3 Good Practices in Sustainable Forest Management Across the Region

A wide range of initiatives are under way to promote sustainable forest management and enhance the contribution of forest to poverty reduction and sustainable development. These initiatives range from policy and institutional developments to concrete on-the-ground actions that address the challenges and contribute to sustainable forest management. The following sections provide highlights of some of these interventions and initiatives.

Box 7: Plant medicines used in Africa

Plant medicines are used for, among other things, fractures, obstetrical cases, infections, aches and pains, heart conditions, blood pressure, rheumatism, arboritificants, jaundice, kwashiorkor, sterility and impotence. Medicinal plants may also help to correct micro-nutrient deficiency and contribute to animal health. Many household treatments are both preventive and curative.

Irvin (1961) reported that not less than 755 woody plants were used for medicinal purposes. A list of the most commonly used medicinal plants featured 187 specimens used in one way or the other against more than 300 different pathological symptoms (Ayensu 1978). The fruits of *Tetrapleuratetraptera* (prekese in Ghana) are used as flavouring in soups and, at the same time, serve to stabilize blood pressure.

In Mozambique, the five petalled Rosy Periwinkle (Madagascar periwinkle), *Cathranthusroseus*, has been used in traditional medicine for treatment of coughs, as tranquillizers, heart tonics and treatment of fever and high blood pressure. The African *Prunus* (*Prunus africana*) is an effective medicine for prostate treatment.

African villagers know hundreds of medicinal plant applications based on rain forest flora as well as the secondary growth on fallowed fields. By 1978, both Ghana and Cameroon had each 3,400 registered traditional healers. In countries such as Senegal, Kenya, Ghana and Zimbabwe, some "non-traditional" clinicians are referring patients - especially those with psychotic problems - to traditional healers.

In Sierra Leone, it was found that traditional cures are often used before resorting to western medicine. Several African Ministries of Health have set up Centres for Scientific Research into Plant Medicine and traditional healing practices. In Ghana, sellers of traditional medicine commonly sell their wares aboard inter-city buses. It has been estimated that nearly 90 per cent of the rural people and 60 per cent of the urban dwellers in Ghana rely on traditional medicine as a major source of medical care.

Source: Tufuor (1999)

Institutional development and decentralization

A number of Governments have recently launched public sector reform programmes that devolve to central Government departments, including forestry, authority to lower-level local government, traditional institutions and local communities. Some Governments are starting to formalize wider devolution arrangements, such as joint forest management agreements in Tanzania, ownership or control of village forest reserves by rural communities in Ghana, and complete transfer of forest resources to communities, as in the Gambia. In Tanzania, control of forests has been partly devolved to village-level authorities, following the 'villagization' process promoted during the 1970s and 1980s. Village forest reserves now cover more than 19 million hectares. Following revision of the Tanzania forest policy in 1998, local communities have been encouraged to co-manage forest reserves with the Government through joint forest management (JFM) agreements (Fisher and others 2011). Despite these efforts, decentralization and devolution of power and responsibility for Community-based Forest Management (CBFM) continue to evade local institutions. Participation rather than devolution is still the norm in the implementation of CBFM.

Forest management and certification

The area of forest with a management plan increased rapidly over the last ten years. There was a net increase of more than 4 million hectares annually (FAO, 2010a). Together, the national forest policy, national forest plan and the legal framework as related to forests constitute the basis for Sustainable Forest Management (SFM). About 65 per cent of forest area was covered by national forest plans in Africa by 2008. At least 39 countries in Africa are recorded to have national forest plans; 40 countries have forest policies and 43 have specific forest laws. Several forest laws are incorporated in other sector laws (FAO 2010a).

Through the National Forestry Programme Facility (NFP Facility) it hosts, FAO provides leadership and support to international and national policy dialogue. Thirty five countries in Sub-Saharan Africa have so far been partners in the NFP-Facility. Starting in 2002, the Facility supported Nigeria in reviving its NFP process and embarked on revising outdated forest policy and formulating a related legal framework. The National NFP committee organized several stakeholder meetings to draft the new National Forest Policy and Forestry Act, which were officially adopted by Parliament in 2006. The NFP facility supported the Tanzania Chamber of Commerce, Industry and Agriculture to conduct

Box 8: Successful implementation of NFP in Liberia

Liberia came out of a long and very destructive civil war, and the role of forestry and wildlife sector for the recovery of Liberia's economy was prominent. It represented 95 per cent of export earnings in 1999 and contribution to the country's food security, with bush-meat accounting for 70-80 per cent of the total meat consumed in Liberia.

At the request of the Liberian Government, the FAO/Liberia technical cooperation project started from 2001-2005. The outputs of the project included: a rehabilitated information base for the forestry and wildlife sector; a reconstruction plan for the Forestry Development Authority (FDA); a National Forest Programme formulated as a coherent framework for sustainable development of Liberia's forest and wildlife resources, ensuring a technical basis and a wide participation of major stakeholders.

In June 2005, a comprehensive forest policy draft was discussed at a national consultative workshop with inputs provided by some of Liberia's development partners, different ministries, NGOs and individual communities. It was a genuinely participatory process. The Liberia Forest Policy and Implementation proposals were subsequently approved by the country's legislature.

Source: FAO: Strengthening the Forestry Development Authority and developing a National Forest Programme (NFP)-TCP/LIR/3001 <http://www.fao.org/forestry/51839/en/lbr/>

UN News Centre, <http://www.un.org/apps/news/story.asp?NewsID=20146&Cr=liberia&Cr1>

a survey of community-based organizations (CBOs) and private organizations involved in the NFP process and develop online database to enable stakeholders to access information. The Facility helps to develop sustainable institutional mechanisms for more consultative and collaborative planning, implementation and monitoring processes.

Forest certification ensures that a forestry operation meets specified standards. Forest operations are evaluated according to previously defined environmental, social and economic standards and certified as complying with these standards by a qualified independent auditor. Wood products from these forests may then be labelled so that consumers can identify products from well-managed sources. Of the 306 million ha of certified forests in the world by June 2007, Africa accounted for about 3 million ha, about one per cent. Most of Africa's certified forests are planted forests, and about half are in South Africa (ITTO 2010, FAO 2009). Various standards and certification schemes have provided a sound basis for practising sustainable forest management, but their widespread uptake requires a strong mandate and consistent policies and markets.

Integration of forest plans into national development frameworks

A number of African countries have set up national development plans and strategies with poverty reduction as the overarching objective. These plans and strategies

were developed within the context of the Poverty Reduction Strategy Process initiated by the World Bank. Some countries – including Ghana, the Gambia and Uganda – have identified forestry as one of the key drivers of socio-economic growth, and have integrated forest management into the national poverty reduction strategies. Key national forest policy and planning instruments in these countries recognize a diversity of stakeholders in the forest sector, and have moved towards a more people-centred approach and adopted Community-based Forest Management as one of the major options for stimulating development, especially in rural areas.

Forest law enforcement, governance and trade (FLEGT) Initiative

The issue of illegal logging and timber trade has become increasingly prominent in the international policy agenda. Cameroon, Gabon, Ghana, Liberia and the Democratic Republic of the Congo are receiving technical assistance provided by the European Union (EU) to help the ministries responsible for forestry to review current forest law enforcement procedures and improve them, and train staff to that effect (EU/FAO 2010). This is done through Voluntary Partnership Agreement (VPA) between the recipient country and the EU and focuses on Forest Law enforcement, Governance and Trade Practices. The first VPAs with Cameroon, Ghana and the Democratic Republic of the Congo came into effect in 2009.

Box 9: Community Forestry and Joint Forest Park Management in the Gambia

In the Gambia the State remains the principal owner of forests and maintains tenure-ship over 90 per cent of the total forest area. The remaining 6 per cent and 4 per cent are managed through Community Forestry and Joint Forest Park Management initiatives, respectively. These numbers, however, are shifting as more local communities become aware of the importance of securing the rights over their forests through Community Forestry.

By now, approximately 30,000 ha of natural forest have been transferred to 450 rural communities nationwide and the Forestry Department's Participatory Forest Management approach has catalyzed many village development initiatives. A sample studied in 2005 indicated that these initiatives involved 26 villages with 72 community-based enterprises. These community-based enterprises had 484 interest group members harvesting 11 products: fuelwood, logs/timber, honey, netto (Parkiabilglobosa), palm oil, tree-nursery, kembo (Prosopis Africana) posts, handicrafts, Rhun palm splits to ecotourism and forest walks (Thomas and Camara 2005).

Community-based forest management (CBFM)

One or another form of community forest management was under way in over 35 countries in Africa by 2002. The sustainability of CBFM is closely linked to enabling arrangements that facilitate the generation and equitable sharing of benefits from forests. Without legal recognition of rights over forest products, however, local people have neither the interest nor the courage to protect and develop forests. Box 9 and Box 10 illustrate the success stories in community forest management in the Gambia and Namibia.

Agro-forestry

Agro-forestry refers to the positive linkage between forestry and agriculture. Agro-forestry is well established in various forms in Africa. Box 11 on agro-forestry in Guinea provides an interesting case of multiple cropping systems which offer livelihoods and meet conservation needs.

Regional and subregional cooperation for sustainable forest management

Transboundary Natural Resource Management is growing rapidly in Africa and is an important new tool in the broad landscape of approaches to increase effectiveness of attaining sustainable natural resource management

and biodiversity conservation goals. It is a way to integrate transboundary community-based natural resource management and transboundary protected areas management in regional development. The Africa Forests and Wildlife Commission within the UN System has played a catalytic role in promoting regional and subregional cooperation for SFM.

One of the major subregional initiatives is the establishment of Central Africa Forests Commission (COMIFAC). The COMIFAC Treaty (2005) was ratified by member States (Cameroon, Central African Republic, Republic of Congo, the Democratic Republic of the Congo, Equatorial Guinea, Chad and Burundi) for subregional cooperation and development of Partnerships. A Convergence Plan for Conservation and Sustainable Management of Forest Ecosystems in Central Africa has been concluded. The United Nations Development Programme (UNDP) and the Global Environment Facility (GEF) are working with policymakers to develop the Tri-National Dja-Odzala Minkelle landscape of about 147,000 km², a transboundary complex of nine protected areas and a central interzone that spans the borders of Cameroon, the Democratic Republic of the Congo and Gabon in Central Africa. The master land use plan will establish conservation areas, corridors, separate zones for permanent forest extractive industries, rural development and community forests, and wildlife management. This project will go a long way in reinforcing institutional and sustainable financing framework of

Box 10: A Success Story from Namibia

In 1996, the Government of Namibia granted local communities the right to create and manage their own Protected Areas. With the support of NGOs, the concept of Communal Conservancies blossomed - with 59 legalized conservancies, totalling more than 130,000 km², and equivalent to 16 per cent of the national territory. The 29 joint ventures with tourism operators created 1,000 full-time jobs in the Region and have been instrumental in the reduction of poverty.

Source: Castro (2010)

Box 11: Agro-forestry in Guinea

In the southern part of Guinée forestière (Guinea shfz), village territories are typically shaped in concentric rings, with the village in the middle. Around the village are the vegetable gardens, then stands of permanent agro-forests, and further afield, agricultural lands for shifting cultivation, with fallows, rice fields and cassava fields.

The main crops from the agro-forest stands are coffee, palm oil, kola trees and high-value natural forest trees such as *Albiziazygia*, *Chlorophoraexcelsa*, *Terminaliaivorensis*, *Terminaliasuperba*, *Ceibapentandra* and *Piptadeniastrunafricanus*. According to Correia (2008), agro-forests cover about 5 per cent of Guinée forestière territory (200,000 ha) and are expanding in area. This study compared the structure and diversity of agro-forests and neighbouring natural forests (in forests zones). Agro-forests differ significantly from natural forests by their (lower) species diversity and density of cover. Nevertheless, as noted above, several natural trees of economic interest can be found in the agro-forests, and the seedlings show an important richness. These agro-forests play a key role in the conservation of regional forest tree diversity. The level of cover of the remaining forest trees determines the level of intensification of the coffee crop. High forest cover implies a low level of intensification; this gives low yields but is labour saving, as upkeep of the plantation (mainly weeding) is less demanding because of the high levels of shade. Conversely, low forest cover allows for better crop yields, but is much more time consuming, as weeds proliferate, and this demands high labour inputs. In terms of local development, coffee land units with an intermediate tree cover offer the best compromise between conservation of tree diversity, coffee yield, effort for the farmer and other associated forms of production. The diversity of products is also an important element of food security.

Source: World Bank (2011).

Box 12: The Great Green Wall for the Sahara and the Sahel Initiative (GGWSSI)

The Great Green Wall for the Sahara and the Sahel Initiative is an initiative of the African Union. It focuses on livelihood systems that will result in soil conservation, such as tree planting. The initiative concerns more than 20 countries, although current activities are focused on 11 countries, extending from Dakar to Djibouti across a stretch of 7,000 km long and 15 km wide, south of the Sahara. The GGWSSI is a holistic and integrative vision of recuperation and protection of degraded silvo-pastoral ecosystems. It represents a major commitment and technical response to desertification, hunger, poverty and climate change, which affects millions of people living in dryland Sub-Saharan Africa.

Since 2008, Senegal has volunteered to pioneer this initiative using its own resources. It created a National Agency, and has planted more than 10,000 ha of trees of economic, food, fodder and environmental value.

Source: UNEP/WCMC Portal - http://www.unep-wcmc.org/unep-support-to-the-great-green-wall-for-the-sahara-and-the-sahel-initiative_862.html

SFM in the region compatible with their master Convergence Plan. Another important programme is the Great Green Wall for the Sahara and Sahel Initiative,

which provides an opportunity to increase the area of planted forest and trees (Box 12).

3.4 Challenges and Opportunities for Sustainable Forest Management

The following are the main threats and challenges in the sustainable development and management of forests.

Challenges

Climate change: Climate change has a major impact on forests, since the distribution of various tree species and ecosystems depend greatly on prevailing climatic conditions (precipitation, soil/moisture, frequency of extreme climatic events, temperature and duration of the growing season). Mangroves, island and relic forests, Afro-Montane forests, dryland and high tropical forests are all at risk of degradation and death from either lack of water or too much water resulting from climatic extremes. Among the projected impacts of climate change on forests are reduced forest diversity (tree species richness; genetic diversity) and reduction in forest density and resilience which will alter the environment and livelihood services of forests, undermining livelihood security (Fisher and others 2010).

Biofuel development: In the face of a volatile oil market, many African countries are pursuing alternative renewable energy sources, including biofuel systems. There is however a major challenge for the sustainable development of biofuels in the region. One of the main concerns is that bioenergy development is associated with social and environmental concerns such as deforestation, monocultures and crowding out of small farmers by big commercial plantations. Additionally, many countries in the region lack the necessary policies and regulatory frameworks to guide and manage the rather aggressive biofuels investors who more often than not, rush for tropical and pristine forest areas or grab arable lands for the development of bioenergy. These concerns and shortcomings need to be addressed in order to ensure the sustainable development of the biofuels energy sector in Africa. This will enable African countries to achieve energy security while, at the same time, ensuring food security and environmental sustainability, including SFM.

Forestry-agriculture interface: Clearing forest to meet the needs of a rapidly expanding agricultural population for additional space for cultivation is a major cause of deforestation in Africa. The countries are faced with the difficult challenge to reconcile the demand for increased food production and forest protection and development. This brings to the fore the need to promote agro-forestry and for a continuous policy dialogue between the two sectors to formulate and implement coherent policies, plans and programmes for their mutual development.

Natural forest management in the tropical high forest of Sub-Saharan Africa: The large-scale commercial logging concessions in most natural forests of Africa have so far not been managed on the basis of “sustainable” annual allowable cuts. The least elements of standard forest management practices are not being observed. Harvesting codes are yet to find wide application, and post-harvest silvicultural regeneration is minimal. Impoverished forests are subjected to cycles of selective exploitation aggravating loss of productivity, deforestation and loss of biological diversity.

Downstream processing: The export of unprocessed roundwood and non-wood forest products is putting Africa at a serious disadvantage in terms of income generation due to the low international market prices for these raw products. In addition, the practice does not favour the development of the industrial base, including the upscaling of small- and medium-scale enterprises that could make significant direct contribution to poverty reduction. There is therefore the need to produce diversified and high value-added wood products. There is also the need to encourage long-term investments in local processing; linking producers, their cooperatives and associations along the supply chain to strengthen market access and market information; investment in research and development by private and public sectors.

Support for development of small- and medium-forest enterprises: The SMFE sub-sector engages many more people than the formal forestry sector and directly benefits local people. They can therefore serve as an important vehicle for poverty reduction in Africa. The enterprises in this category are however affected by many challenges, including poor organization and lack of clear policies regarding access, use and commercialization of products. Most sector policies, programmes and analyses have often focused on the formal large-scale forest industries thereby neglecting SMFEs. Thus, despite the large potential of the SMFE sub-sector to contribute to

local poverty reduction and sustainable forest resource management, it remains unharnessed.

Governance, cooperation and participation in forest management: There are complex relationships between the various governance levels - global, regional/subregional, national and local and among the multi-sector agents, which affect forests and forestry. Forests have multiple functions, and there are considerable overlaps among agricultural, pastoral, energy, environment and non-sector agencies such as ministries of local government, finance and planning in Africa. This requires integrated and multiple forest-use management. Ensuring appropriate governance while maintaining synergetic cooperation amongst the various levels and actors remains a challenge for Governments. Over the last few decades, various forms of community forestry have increasingly gained popularity in the region. However, appropriate policy and legal frameworks for their successful implementation are lacking in many countries. Many local communities lack secure access or ownership of forest resources. Moreover, local people do not have the skills to manage resources sustainably. These among other things create disincentives to engage and invest in long-term sustainable forest management.

With respect to gender and forest management, women and youth have not been widely involved in decision-making regarding forest management in Africa. In order to achieve their full potential as agents and beneficiaries of sustainable forest management, these categories of society need to influence policies and decisions and have control over forest resources.

Forestry awareness and training: Creating an educated and well-informed population is key to raising consciousness regarding sound ecological development. African countries are faced with a formidable task to change people's 'negative' attitudes and behaviour towards natural resources management, many of which are counterproductive to sustainable forestry development. Furthermore, forestry education and training at professional and technical levels needs to be strengthened. Forestry training is currently very much centred on technical skills and law enforcement despite a concerted shift toward participatory forest management, which requires a thorough knowledge and understanding of the social aspects of forestry.

Research, data and information: Reliable data and information on the extent, status and changes in forest size

remain fragmented, unreliable and generally unavailable to those who need them most. While forest resources assessment may be expensive for many African countries, it remains an absolute necessity if appropriate policies and management plans are to be developed and implemented. Research in many aspects of forestry remain few if any in areas such land-use (agro-forestry), landscape restoration, profitability of commercial plantations, and on the socio-economic and political aspects of consumption and management of forest resources under growing demands of large and growing populations.

Funding and investment in sustainable forest management in Africa: Forest management is capital intensive and a long-term investment. Due to increased awareness, international conventions and globalization of markets, most countries want to manage their forests more sustainably than they did in the past. But SFM is constrained by a lack of adequate, predictable and sustainable financing. Government budget allocations in Africa are not adequate to enable forest agencies to fulfil their mandates. Many countries currently take an ad hoc approach to financing, using a small number of mechanisms such as bilateral and multilateral loans, grants, and subsidies that often cover only a few activities. Compared with other productive sectors such as agriculture, benefits of sustainable forest management often take years to accrue. It requires long-term investment. The challenge is therefore to establish incentives that attract long-term private sector investments in the sector.

Opportunities

Climate Change: While climate change can negatively affect sustainable forest management, deforestation and forest degradation significantly contribute to greenhouse gas emissions. On a global scale, deforestation contributes to 15-17 per cent of greenhouse gas (GHG) emissions, which is more than the entire transport sector (FAO/ITTO 2009). The REDD+⁹ mechanism developed under the United Nations Framework Convention on Climate Change (UNFCCC) presents an opportunity for financing SFM to contribute to the forest-based carbon sequestration and storage. The REDD+ can particularly lead to significant co-benefits through rehabilitation of degraded forest lands and soils, in-

⁹ REDD+ refers to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.

Box 13: Forest Project in Ethiopia

The Humbo Assisted Natural Regeneration Project is Africa's first large-scale World Bank forestry project to be registered under the Clean Development Mechanism of the Kyoto Protocol. It will bring both economic and social benefits to impoverished highland communities in Ethiopia as well as environmental benefits as the project will cut an estimated 880,000 metric tonnes of carbon dioxide from the atmosphere over the next 30 years. The sale of carbon credits under the BioCarbon Fund will provide an income stream of more than \$700,000 to the local communities over a minimum of ten years. Further revenue will be available to the community from the sale of carbon credits not purchased by the World Bank, as well as from the sale of timber products from designated woodlots in the Project.

Source: World Bank (2010).

creasing productivity of agricultural landscapes and expanding capacity of restoring natural habitats through afforestation and agro-forestry (Blom and others 2010).

Beyond their key role in climate change mitigation of land-based emissions, forests can also help in adaptation to climate change. Selection, improvement and development of species adapted to the different anticipated climatic scenarios will ensure the continuity of social, economic and ecosystem services, and thus the protection of livelihoods. Forests in Africa, especially in Central Africa, offer an opportunity to benefit from the current financing mechanisms in place or under development through the UNFCCC. Already there are a few projects being supported within the framework of the Clean Development Mechanism (Box 13).

Forests and inclusive green growth: The major push to inclusive green growth presents an opportunity for SFM and enhancement and sustained provision of benefits derived from forests, including among others carbon management/climate regulation, water resource management, energy provision, conservation of biodiversity and ecotourism. The application of inclusive green growth principles in the forestry sector could help ensure the sustainable provision of timber and meeting critical livelihood needs of local communities by continuing to provide a stream of fuelwood, construction materials, food sources and medicinal plants.

Notwithstanding the potential of the forestry sector to contribute to inclusive green growth, a number of factors need to be taken into consideration if this is to be achieved. African Governments need to ensure effective local participation in the management of forests in order to guarantee access and benefit sharing. Markets, including for ecosystem services need to be promoted so as to ensure greater economic incentives for forest development and management. These incentives could

emerge from a robust and fair international system that ensures that forest-related public goods, notably carbon storage and biodiversity conservation, are transferred between nations. Forests would also attract private sector investments for plantation development.

Payment for ecosystem services: Payment for ecosystem services (PES) is an environmental policy tool that is becoming increasingly important in developing and developed countries, and that addresses environmental problems through positive incentives to land managers. PES is one type of economic incentive for those that manage ecosystems to improve the flow of ecosystem services that they provide. Well managed forests can provide a wide range of ecosystem services, including carbon management, climate regulation, water resource management, energy provision and conservation of biodiversity for ecotourism and other benefits. The major challenge in adopting PES in Africa remains developing the appropriate regulatory framework which provides for it, creates the incentives and ensures proper tenure regimes and the sustainable supply of the services.

3.5 Conclusion and Recommendations

Conclusion

Forests play a vital and significant role in the livelihoods and economies in the region. As such, they are crucial for Africa's sustainable development. The continuing loss of forest cover in Africa remains a cause for concern. Expansion of agriculture and settlements, illegal logging, extraction of wood for firewood and charcoal, and uncontrolled bush fires pose serious threats to forests. Recent policy, legal, institutional, technical and economic constraints also impede efforts for SFM.

However, significant paradigm shift is underway with many success stories in sustainable forest management. These are aimed at reversing the trend of forest area loss and achieving sustainable forest management in the region. There is need to scale up these initiatives which include afforestation programmes, expansion of planting in riparian areas, urban settlements and cultivated areas and forest area protection.

Recommendations

The following are some of the recommendations and the way forward for achieving sustainable forest management and development while at the same time enhancing the role and contribution to poverty reduction and overall sustainable development.

Research, assessment and monitoring of forests and development. Governments should improve national capacity for and institutionalize regular forest assessment and inventory to acquire comprehensive knowledge and information on the forestry sector, and to inform policies and plans for sustainable forest management. Research and systematic inquiry should therefore be fully mainstreamed in development planning and policymaking. Major areas requiring research and assessment include agro-forestry, landscape restoration, profitability of commercial plantations, and the socio-economic and political aspects of consumption, management and development of forest resources under the growing demands from the large and growing population.

Education, training, particularly training of forest managers and technicians in identification, recording and measurement of progress towards SFM and research and development in agro-forestry should be strengthened in the continent.

It is important to make investments in the necessary analytical capacities to support forestry knowledge management. Data on the contribution of the forestry sector to the economy is required to inform decision-making, policy and incentive mechanisms required to raise the profile of the sector.

Forests and national development. Recognition of the full contribution of the forest sector is fundamental for strengthening the profile of forestry in national

development policies and plans and therefore attracting increased financing and investment in the sector. Forest agencies and national statistical bureaus need to strengthen, enhance and promote effective assessment, recording and dissemination of data and information on the contribution of forests and trees to societal and economic well-being and sustainable development at all levels.

Integration of forests into national and other sectoral policies and plans should be strengthened. In this connection, it is important that forestry be part of comprehensive and sustainable land-use planning and management. Moreover, cooperation between forest and other sectors such as agriculture, energy and infrastructure should be improved and strengthened and appropriate policies and implementation mechanisms established.

The National Forest Programme process should be strengthened in conformity with local needs, stakeholder interests, national priorities, internationally defined criteria and best available information.

Value-added or downstream processing should be encouraged through appropriate policies and incentives schemes to ensure high value wood and diversified products for the export market.

Forestry in inclusive green growth should also provide economic benefits and meet critical livelihood needs of local communities while providing a wide range of forest goods and services, including: climate regulation, water resources protection and conservation of biodiversity for ecotourism.

Since SMFEs increasingly depend on NWFPs as their main inputs, improved NWFP management, supported by appropriate policies and adequate legislation and incentive schemes, is required to ensure these enterprises continue to develop and to have a sound resource basis and impact on local economies. There is also the need to enhance the technical and business capabilities of stakeholders involved in the NWFPs value chain and to share experiences.

Plantation programmes in many African countries are relatively small and innovative approaches, including public private partnerships and private sector investments in plantations need to be explored on a larger

scale. Modern technologies such as tree biotechnology could also be supported as part of the policy incentives to scale up plantation programmes.

Governance and wider stakeholder participation.

Governments in Africa need to look into the issue of forest governance and establish appropriate policy and legal instruments that will ensure communities' long-term engagement in forest resource management.

Given the important role played by women and indigenous people in forest management and development, countries need to integrate and enforce gender and indigenous communities considerations in national forest policies, legislations and programmes to ensure their security of tenure and access rights to forest resources; effective participation in the design and implementation of forestry development programmes; and guarantee equal opportunity for forestry benefits, including rewarding employment.

Concrete approaches to engaging the private sector in capital and technology support is crucial. This is because forestry investment opportunities are opening up in Africa and financial institutions and industry can play an important role in facilitating this process.

Financing sustainable forest management in Africa.

African Governments should increase budget allocations in support of SFM in order to enhance its effective contribution to poverty reduction, the rehabilitation of degraded lands and climate change adaptation and mitigation among others. Private sector investment and financing in forestry, including forest plantation business ventures and related job creation should be facilitated by reviewing relevant legislation and strengthening institutional capacity to address issues affecting investment in the sector.

The capacity of African countries to participate in and take advantage of SFM financing and investment opportunities offered by the existing and emerging UNFCCC mechanisms such as CDM and REDD+ should be strengthened. In this connection support is needed to enhance technical competence and achieve conformity of national institutions, policies and legislation with the requirements under these mechanisms.

Regional cooperation

Regional and subregional cooperation amongst the countries should be reinforced for sustainable trans-boundary forest management. Greater cooperation among countries, such as through agreed convergent approaches for the management of shared forest resources, should be fostered.

Regional and subregional trade policies should be harmonized and geographical information and forest inventory data shared for policymaking and trade facilitation. This should be supported by institutional capacity building to strengthen and ensure policy coherence at the regional and subregional levels.

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4. Biodiversity

4.1 Introduction

Biodiversity is defined by the Convention on Biological Diversity (CBD) as “the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems” (United Nations 1992). Human beings are part of biodiversity being intimately connected with ecosystems and their processes through diets, use of materials, energy, water, recreational activities and much more. Cultural diversity also has close links with the diversity of other species and landscapes, through human choices about crops and livestock, dietary preferences and through traditional knowledge and beliefs regarding the properties and spiritual significance of plants, animals and landscapes.

The 54 countries of Africa, with a combined terrestrial area of about 30 million square kilometers, cover a large variety of unique ecosystems. These ecosystems are characterized by extremes in temperature and physical features, ranging from deserts to tropical rainforests. Some environments are naturally poor in species despite being large in size while some small areas are highly diverse. For example, the Cape Floristic of South Africa, measuring approximately 90,000 km² or less than half the size of Senegal, has more than 9,000 species of plants, 70 per cent of which are found nowhere else on Earth (Cowling and others 2002). Furthermore, some areas, such as deserts and mountains, with comparatively few species, may nonetheless harbour highly adapted organisms which are found nowhere else on the planet. For example, *Welwitschia mirabilis*, a drought-tolerant plant considered a living fossil as it can live upwards of 1,000 years is found only in the Namib Desert. Africa contains eight of the world's 34 biodiversity hotspots, 140 Alliance for Zero Extinction sites and more than 1,200 Important Bird Areas (Bird Life International 2011); UNEP 2007; AZE 2010; CBD Secretariat 2010). In 2010, 15.7 per cent of terrestrial and 4.9 per cent of marine areas were designated as protected areas.

4.2 Contribution of Biodiversity to Growth, Poverty Reduction and Sustainable Development

Biodiversity is a major contributor to human well-being throughout Africa and its loss has profound implications for livelihood systems across the continent. In all countries, including those with comparatively few species, biodiversity underpins a wide range of ecosystem services on which human societies depend, although their importance has often been greatly undervalued or ignored.

In general, the services provided by biodiversity can be divided into four categories (MEA 2005):

- **Provisioning services** or the supply of goods of direct benefit to people, and often with a clear monetary value, such as timber from forests, medicinal plants and fish from the oceans, rivers and lakes.
- **Regulating services**, the range of vital functions carried out by ecosystems which are rarely given a monetary value in conventional markets. They include regulation of climate through the storing of carbon and control of local rainfall, the removal of pollutants by filtering the air and water and protection from disasters such as landslides and coastal storms.
- **Cultural services**, not providing direct material benefits, but contributing to wider needs and desires of society and, therefore, to people's willingness to pay for conservation. They include the spiritual value attached to particular ecosystems such as sacred groves, and the aesthetic beauty of landscapes or coastal formations that attract tourists.
- **Supporting services**, not of direct benefit to people but essential to the functioning of ecosystems and, therefore, indirectly responsible for all other services. Examples are the formation of soils and the processes of plant growth.

The basic goods and services offered by the African biodiversity are crucial to the reduction of poverty and processes involved in the pursuit of sustainable development. The myriad food, fibre and medicinal products as well as the other ecosystem services provided, including soil formation, air quality and climate regulation, the regulation of water supply and quality and the cultural and aesthetic value of certain plants and species contribute immensely to these processes (CBD 2010).

The following are examples of the importance of biodiversity achieving poverty reduction and sustainable development in the region.

Food security: The region's biodiversity is crucial for nutrition and achieving food security. About three quarters of the recorded protein consumption in Africa is derived from plant sources (UNEP and others 2009). Fisheries, bushmeat and livestock grazed in the wild provide much of the animal protein. For example, fish makes up 60 per cent of the total animal protein consumed annually in hyper-arid Mali; and in Central Africa and West Africa Bushmeat (wild animals and birds) is a major source of animal protein, making up more than 80 per cent of consumption in some areas (UNEP and others 2009). Additionally, during periods of stress such as drought, ill-health and economic change, food harvested from the wild play an important role.

Health: Biodiversity is important to human health as it provides food, a consistent supply of clean drinking water and tools to fight and control diseases. Moreover, natural ecosystems provide a wide variety of plants and animals that are important for traditional medicines and modern pharmaceutical products. Up to 80 per cent of people make some use of traditional medicine from a wide variety of indigenous plants and animals. Important modern pharmaceutical products are derived from certain plants. For example, the Namibian devil's claw (*Harpagophytum procumbens*) is used locally for digestive problems, arthritis and low back pain, and supports lucrative trade. The bark of the afro-montane tree *Prunus africana* is the source of a commercial prostrate remedy (UNEP and others 2009). The World Health Organization has estimated that 60 per cent of children suffering from fever in Ghana, Mali, Nigeria and Zambia are treated at home with herbal medicines (WHO 2002).

Energy: Forests and woodlands provide fuelwood. In some countries in the region more than 80 per cent of energy needs are fulfilled with combustible renewable

resources, such as biomass and animal waste, while on a regional basis 59 per cent of total energy needs are supplied through such means (UNECA and others 2011).

Economic activities and employment creation: Biodiversity is also the basis for many economic activities. According to the 2010 Global Forest Resources Assessment almost half a million people in Africa were employed in the primary production of forest goods. The forest sector also accounts for six per cent of GDP in Africa (UNECA and others 2011). Biodiversity is also a basis for agriculture as an important economic activity, providing 57 per cent of employment in Sub-Saharan Africa and 17 per cent of the GDP (UNECA and others 2011). Coffee (*Coffea arabica* and *Coffea robusta*), for instance, originate in Ethiopia and rank among the five most valuable agricultural exports from developing nations, employing about 25 million people worldwide. In

addition, a significant number of species derived from Africa constitute an important share of the world's ornamental flower market (UNEP and others 2009).

Fisheries: Aquatic biodiversity underpins the fisheries sector in Africa. For example the region is endowed with a wide range of fish species. Additionally, coastal mangrove forests which are highly-productive ecosystems in the inter-tidal zones of many tropical coastlines and other swamp ecosystems act as nursery areas for a wide range of commercially-valuable fish and crustacean stocks. There was an increase in the amount of marine fish captured in Africa between 1990 and 2009. The amount of fish captured peaked in 2004 at just under 50 million tonnes (FAO 2011). Aquaculture production also increased in Africa by 12.6 per cent between 1970 and 2008. In addition, 14,700 tonnes of farmed seaweeds were harvested in 2008. The leading producers

Box 14: Biodiversity contribution to livelihoods and sustainable development in South Africa

In South Africa, terrestrial, freshwater and marine ecosystems and their associated biodiversity are widely used for commercial, semi-commercial and subsistence purposes, through both formal and informal markets. Biodiversity provides the basis for employment in industries such as fisheries, game and livestock farming and the wildflower industry, and the formal conservation sector is also a significant employer. In addition, many rural communities depend on subsistence use of wild biodiversity and natural resources for their livelihoods, even if this does not create formal employment. Sound natural resource management, particularly the maintenance of healthy wetlands and river systems, underpins many other economic sectors and the employment that these provide. Public works programmes that enhance natural capital and secure water supplies provide many work opportunities to poor, rural and marginalized communities; they also enhance the natural resilience of ecosystems to the impacts of climate change and protect livelihoods in sectors such as agriculture that depend on the ecosystem services provided by healthy ecosystems. Biodiversity supports sustainable livelihoods in South Africa in multiple ways:

Direct creation of livelihoods

- Formal conservation employing many people in a wide range of technical and management posts. In 2007/8 there were 65,000 public sector jobs in diverse fields related to biodiversity conservation, such as conservation scientists (botanists, zoologists and marine biologists), climate change scientists, protected area managers, field rangers, forestry advisors, agricultural extension officers, biodiversity stewardship officers, conservation planners, GIS technicians, project managers and environmental educators.
- Game farming which depends heavily on biodiversity for both the game animals and their habitats. The sale of wild game has grown substantially in the last two decades and in 2007 the hunting industry was estimated to employ some 70,000 people.
- Tourism: South Africa's biodiversity, scenic beauty, mild climate and cultural diversity have made it one of the world's fastest-growing tourist destinations, with over 9 million foreigners visiting the country in 2007. The tourism industry is fast growing and accounts for approximately 7 per cent of employment in South Africa, contributing approximately 8.5 per cent to GDP.
- Fisheries: About 600,000 tonnes of marine resources worth over R2.5 billion (about \$325 million), are harvested annually by 27,000 fishermen and women.
- Harvesting of natural resources: In many rural economies, where the cash economy is very limited, biodiversity and ecosystems contribute significantly to people's daily consumption needs (through the provision of food, water, fuelwood and building material) and income generation (through activities such as the selling of reed mats, baskets and medicinal plants). The number of people using non-timber forest resources is in the millions, including rural and urban populations, and the direct use of forest resources amounts to about R8 billion a year (about \$1 billion).

Biodiversity's contribution to the economy and sustainable livelihoods is summarized in the table below.

	Ecosystem service	Value in millions of South African rands per year	Value in millions of US dollars per year (US\$1= R7.7)
Goods (Provisioning)	Grazing	18,094	2,349
	Natural resources	4,895	635
	Bioprospecting	178	23
Services (Regulations)	Carbon sequestration	8,649	1,123
	Pollination	5,684	738
	Erosion control	8,319	1,080
	Regulation of water flows	440	57
	Water treatment	202	26
	Blackfly control	77	10
	Crop pest control	4,380	568
	Nursery value of estuaries	976	127
	Attributes	Ecotourism	21,000
Scientific value		15	2
	Total value of selected ecosystem services	73,000	9,465

Figures from Turpe, and others, 2009

of farmed seaweed in Africa are the United Republic of Tanzania, South Africa and Madagascar. The extraction of marine resources is a major source of income for many people in Africa. Of the world's 44.9 million people engaged in fisheries, 9.3 per cent are in Africa. Moreover, there are millions of rural people who are involved in seasonal or occasional fishing activities (FAO 2010a).

Tourism: Biodiversity, through the conservation of natural landscapes and wildlife, underpins nature-based tourism which is one of the fastest-growing tourism sectors worldwide and in Africa. Nature-based tourism makes up approximately half of the total tourism market.

Flood control and storm protection: Coastal mangrove forests and other wetland ecosystems are also vital barriers that protect low-lying coastal communities from floods and offshore storms. Box 14 provides highlights demonstrating the multiple ways in which biodiversity contributes to livelihoods and sustainable development in South Africa.

4.3 Good Practices in the Conservation and Sustainable Use of Biodiversity

Although biodiversity continues to deteriorate throughout the continent and the threats confronting it continue to mount, many positive actions have been initiated. These have had important impacts on biodiversity and the state of biodiversity would certainly be worse if they had not been taken. In particular there has been significant progress in developing the institutions, policies and legislation required to bring biodiversity loss under control.

Development and implementation of National Biodiversity Strategies and Action Plans

A majority of countries in Africa have established national biodiversity strategies and action plans (NBSAPs). NBSAPs codify the approach countries plan to take to protect the biodiversity within their own ter-

Box 15: Gorongosa National Park , Mozambique

Gorongosa National Park is located in central Mozambique and includes the southern part of the Rift Valley. It was declared a conservation area in 1960, and currently covers an area of approximately 3,770 km². In the 1960s and 1970s, Gorongosa was one of the most famous game parks in Africa. The park is home to a number of endemic plant species and is rich in migrant and endemic bird species. However, the outbreak of civil war in the mid-1970s resulted in many animals being killed for food, sport and trophies as well as forced the people working in the park to flee. Since the end of the civil war a number of initiatives have been established by the Government and private originations to restore the park, including infrastructure development, the recruitment of specialized staff and the reintroduction of certain species.

Source: Adapted from Mozambique's fourth national report to the Convention on Biological Diversity. <https://www.cbd.int/doc/world/mz/mz-nr-04-en.pdf>

ritory. In many countries, the preparation of strategies has stimulated the development of additional laws and programmes and spurred action on a broad range of issues. As such NBSAPs serve as a framework for implementing the Convention on Biological Diversity at the national level. Fifty-three African countries have completed their NBSAPs¹⁰. Of these countries eight have revised NBSAPs and five are currently in the process of doing so. Revising an NBSAP is important as it allows countries to identify and meet new challenges and to respond to recent guidance from the Conference of the Parties to the Convention on Biological Diversity, in particular to incorporate national targets based on the Strategic Plan for Biodiversity 2011-2020.

According to the national reports provided to the CBD there have also been many policies in support of biodiversity which were introduced over the last five years throughout Africa. Most African countries, over 85 per cent, have developed new legislation related to biodiversity since their third National Reports submitted to the CBD in 2005. Examples of these include a law adopted in 2009 on marine protected areas in Tunisia as well as a decision by Algeria in 2009 to expand its list of species whose conservation is of national interest (Republic of Tunisia and others 2009; Republic of Algeria and others 2009). Nearly all African countries have also undertaken actions on education and public awareness about biodiversity and the environment. While some of these actions are part of strategic communication, education and public awareness campaigns others are more general.

¹⁰ A list of countries with National Biodiversity Strategies and Actions Plans is available from: <https://www.cbd.int/doc/nbsap/nbsap-status.doc>

Expansion of protected areas

In recent years there has been a continued increase in the coverage of protected areas for nature conservation in Africa. In 1990 protected areas covered 14.4 per cent of terrestrial areas and 2.3 per cent of marine areas. By 2010 the size of the protected area estate had increased to 15.7 per cent for terrestrial and 4.9 per cent for marine areas (IUCN, UNEP and WCMC, 2010). Furthermore, the amount of forest area designated specifically for the conservation of biodiversity has been increasing. In 1990 the amount of forest designated for biodiversity conservation was slightly less than 500,000 square kilometers. By 2010 this had increased to more than 540,000 square kilometers, or slightly less than 14 per cent of Africa's total forest area (FAO 2010c).

While the size and number of protected areas in Africa are increasing, management effectiveness remains an issue. An analysis which considered data from 439 protected areas assessments found that protected areas management effectiveness in Africa was amongst the lowest. On a scale from 0 to 1, where 0 refers to no management in place and 1 refers to management reaching highest standards, Africa had an overall mean score of 0.44. This suggests that protected areas management fulfills basic management requirements but has significant deficiencies and as a result compromises the effectiveness of protected areas. Of the protected areas assessments considered about 27 per cent had management effectiveness that was considered unacceptable while 9 per cent indicated sound management (Leverington and others 2008).

Increased community participation

There has also been a growing recognition of the need to involve local people in decisions regarding the loca-

Box 16: Togo– A pragmatic approach to protected areas management

From 1960 to 1980, protected areas, classified forests, national parks and animal reserves in Togo were managed with little consideration of local socio-economic conditions and with limited participation from local communities. Population growth, expanding agriculture and socio-political problems in the 1990s led the local population to question the value of the protected areas, and as a result many degraded as they were no longer being respected by the communities which surrounded them.

A programme was begun in 1999 to rehabilitate Togo's protected areas, recognizing the complexity of establishing and managing them and the need for local participation. A key element was the greater involvement of local communities in protected areas management. Through negotiation with communities it was agreed that the size of some protected areas would be reduced and that the released land would be available for the use of local people. In return, the communities agreed to respect the protected areas which remained. As part of the consultation process, 60 village associations (Associations Villageoises de Gestion Participative des Aires Protégées), located around priority protected areas, were formed, and have been in turn grouped under eight participatory management unions (Unions d'Associations Villageoises de Gestion Participative des Aires Protégées). The purpose of the associations is to facilitate communication between local communities and the Government and to encourage the implementation of joint activities.

Source: Adapted from Togo's fourth national report to the Convention on Biological Diversity. <https://www.cbd.int/doc/world/tg/tg-nr-04-fr.pdf>

tion and management of protected areas (see Box 15 and Box 16).

Sustainable use of biodiversity

Important actions have also been taken to address the unsustainable use of biodiversity. Currently, almost 17 per cent of Africa's total forest area has management plans and the percentage has been increasing since 1990 (FAO 2010c). Furthermore, more than 76,000 square kilometers of forest in Africa have been given FSC certification (FSC 2011). This represents more than 1 per cent of all of Africa's forest estate. However, certified forests are concentrated in only a few countries.

Countries are also adopting innovative approaches for sustainable use and management of biodiversity. A case in point is South Africa, which has committed to creating a prosperous and equitable society living in harmony with natural resources and protecting the country's rich biodiversity heritage for the benefit of all its citizens. Among the actions taken to achieve this are the following:

- Strengthening institutional arrangements for biodiversity conservation. The main conservation authorities in the country are the National statutory organizations such as the South African National Parks and the South African National Biodiversity Institute;

Box 17: South Africa - Biodiversity and wine initiative

South Africa is the world's eighth largest wine producer, with some 90 per cent of the production taking place in the Cape Floristic Region, which is part of the highly threatened fynbos biome. The expansion of grape vines, which increased as export markets grew, raised concerns that areas important to biodiversity could be lost. As a result, in 2004, the wine industry and biodiversity sector formed a partnership and created the Biodiversity and Wine Initiative (BWI), which develops biodiversity guidelines for the wine industry. The BWI aims to prevent further loss of habitat in critical sites and increase the area of natural habitat in protected areas. Farmers are assisted with assessing the biodiversity value of their land, implementing biodiversity guidelines and identifying unique marketing elements. Farming practices that enhance the suitability of vineyards and surrounding areas to biodiversity are also promoted. Currently more than 110,000 hectares of natural areas have been conserved through the BWI. This is an area larger than the amount of area devoted to wine production. As part of the programme a logo was also developed to allow consumer to identify BWI wines.

Source: Adopted from the Convention on Biological Diversity-South Africa's fourth national report. (Accessed on 15 December 2012 from <http://www.cbd.int/doc/world/za/za-nr-04-en.pdf>)

- Putting in place key policy tools for biodiversity management within the framework of the national environment management act;
- Adopting an ecosystem focus for systematic biodiversity planning with special emphasis on threatened ecosystems and areas that are important for ecosystem-based adaptation to climate change, rather than on individual species to increase both the effectiveness and efficiency of conservation;
- Identifying critical biodiversity areas to meet biodiversity targets and ecological support areas for maintaining ecosystem services;
- Considering explicitly climate change design principles placing importance on aligning critical biodiversity areas and ecological support areas with corridors and other areas that are essential for maintaining landscape-scale ecological functions and the ecosystem services they provide.

There has also been a variety of novel approaches to reduce or avoid the adverse impacts of economic activities on biodiversity in South Africa as contained Box 17.

4.4 Threats and challenges to sustainable biodiversity management habitat loss

Habitat loss is the major cause of ecosystem and biodiversity decline generally. While the causes and patterns of land use change vary from country to country, the results are generally the same (Foley and others 2005). When natural and semi-natural areas are lost the species which they contain are disrupted as are the ecosystem services which they provide. In terrestrial ecosystems the conversion of natural areas into crop land is the dominant form of habitat loss. However, other causes include clearing land for infrastructure development. For inland water ecosystems, habitat loss and degradation is largely accounted for by unsustainable water use and drainage for conversion to other land uses, such as agriculture and settlements.

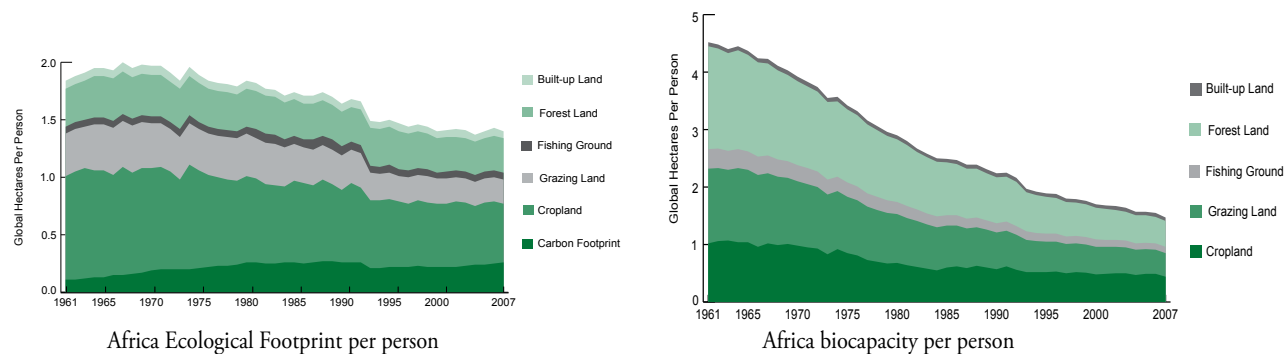
Invasive alien species

Another major threat to biodiversity in Africa is invasive alien species - species which have been introduced into an area outside their traditional habitat and which threaten the biodiversity found there. Invasive alien species affect native biodiversity by for instance, competing with them for food, preying on them, spreading diseases, causing genetic changes through inter-breeding and disrupting various aspects of the food web and physical environment. One iconic example of the impact of invasive alien species is the Nile perch (*Lates niloticus*), a large predatory fish which was intentionally introduced into Lake Victoria in 1954 (Goudswaard and others 2006). The introduction of the Nile perch has been attributed to extinction and near-extinction of several species, including the lake's endemic species of cichlids. The impacts of the Nile perch were further compounded by the introduction of another invasive species, water hyacinth, a free-floating perennial aquatic plant which can, among other things, reduce the amount of oxygen available in water and reduce nutrient availability. Globalization and the ever-increasing rate and speed of world travel have intensified the spread of invasive alien species and estimates suggest that at no other time in human history has the rate of introduction of invasive alien species been as great (Reaser and others 2007).

Pollution

Pollution from nutrients (nitrogen and phosphorous) and other sources is a continuing and growing threat to biodiversity in terrestrial, inland water and coastal ecosystems. Many nutrients, such as nitrogen and phosphorus are found naturally throughout the environment. However, when present in too large quantities, nutrients can damage biodiversity and the ecosystem services which it provides. A major source of this pollution is excessive fertilizer use and runoff. Given escalating food demands, FAO estimates that the use of fertilizer will grow globally by approximately 1 per cent from 1997 to 2030. Countries in the developing world, including in Africa, are anticipated to experience the greatest increase in the rate of fertilizer consumption (FAO 2000). Nutrient loading is a significant problem in many freshwater and coastal ecosystems where it can lead to eutrophication and the development of "dead zones" - areas where water oxygen levels have dropped too low to support most aquatic life. Nitrogen deposition can also affect animal biodiversity by changing the composition of available food.

Figure 55: The Ecological Footprint Trends



Source: Ewing and others (2010).

Unsustainable resource use

Over exploitation, or the use of biological resources beyond a level at which the Earth can sustainably provide them, is at the heart of the threats being imposed on the world's biodiversity and ecosystems. The ecological footprint, which measures the magnitude of the combined pressures being placed on biodiversity and ecosystems, is one method of determining how sustainable our consumption patterns are. The ecological footprint calculates the area of biologically-productive land and water needed to provide the resources we use and to absorb our waste. Africa's per person ecological footprint in 2007 was 1.4 global hectares, significantly less than the world average of 2.7 global hectares. However, between 1961 and 2007, Africa's per capita ecological footprint declined by 22 per cent. Over the same time period the region's population increased by 230 per cent (Figure 55). As a result, though Africa's per capita footprint has declined, at the regional level it has increased, though it remains below the region's total bio capacity (Ewing and others 2010). Box 18 describes the impacts from a range of economic activities in coastal Namibia.

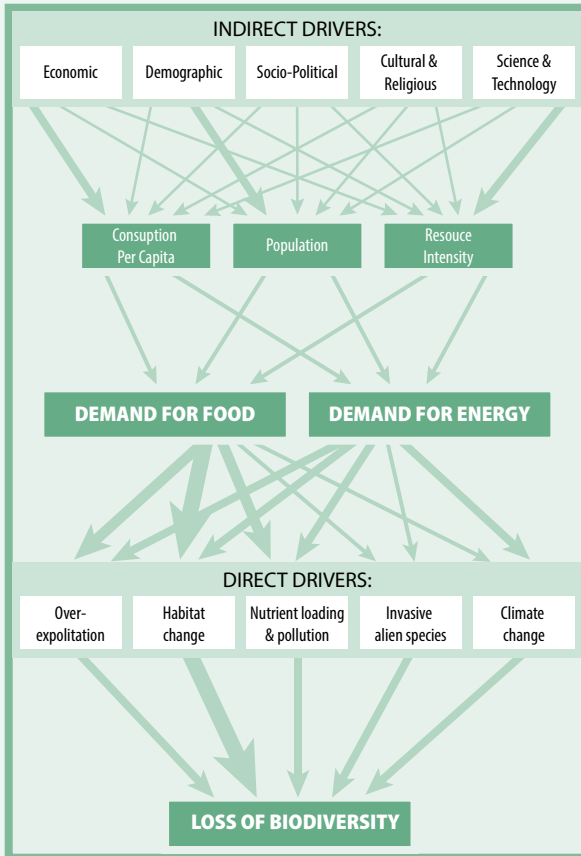
Climate change

Climate change is contributing to the loss of biodiversity and the failure of ecological systems (UNDP 2007). The effects of climate change are widespread but it primarily affects biodiversity by altering the habitats in which they have evolved and live. Modest climatic changes have already resulted in the movement of a range of species. The specific impacts of climate change on biodiversity will largely depend on the ability of species to migrate and cope with more extreme climatic conditions. Many species are expected to be unable to keep up with these changes and as a result will be at an increased risk of extinction. Moreover, many species may be unable to move as natural barriers, such as oceans and mountains, or anthropogenic barriers, such as roads and dams, prevent them from doing so. In this regard, the impacts of climate change may be compounded by the other drivers of biodiversity loss such as land use change. Climate change mitigation efforts, such as the production of biofuels, can also lead to land use change through displacement effects. Climate change also alters the timing of important ecosystem events, such as species emergence, the flowering of plants and migration. These types of changes can, also, alter food chains and precipitate a variety of changes in ecosystems.

Box 18: Namibia – Impacts of economic activities on coastal biodiversity*

The Namibian coast is sparsely populated due to the harsh Namib desert; nonetheless there are several ongoing activities which are negatively affecting Namibia's marine and coastal environment. Nature-based tourism, extractive industries (oil and gas exploration and off-shore mining of minerals) and commercial fishing and aquaculture are having a cumulative impact on the coastal environment resulting in its steady degradation with impacts on human well-being. For example, diamond mining activities requires that large amounts of sand are moved in order to extract the diamonds and generally require substantial infrastructure. The impacts of mining operations on the coast have led to habitat degradation and groundwater pollution amongst other things.

* www.me.govna

Box 19: Links between indirect drivers, direct drivers and biodiversity loss

Indirect drivers of biodiversity loss affect consumption patterns, the way in which resources are used as well as demographic patterns. These in turn affect the overall demand for food and for energy as well as other resources which affects the magnitude of direct drivers of biodiversity. The width of the arrows gives a broad and approximate illustration of the importance of the economic sectors in driving biodiversity loss (CBD Secretariat 2006).

Underlying causes of biodiversity loss

The above threats are the direct pressures on biodiversity but there are several indirect pressures which determine society's overall impact on biodiversity by influencing how much resources are used by human societies (see Box 19). These underlying causes of biodiversity loss include demographic change, economic activity, levels of international trade, per capita consumption patterns, cultural and religious factors and scientific and technological change.

4.5 Conclusion and Recommendations

Conclusion

Biodiversity is important and its continued loss has serious implications for development throughout the region. Continuing with "business as usual" will jeopardize the future of all human societies, and none more so

than the poorest that depend directly on biodiversity for a particularly high proportion of their basic needs.

The loss of biodiversity represents not only a diminishing resource base for the region but also a reduction in opportunities for addressing many of the development challenges facing Africa. Continued failure to slow current trends has potential consequences even more serious than previously anticipated and future generations may pay dearly in the form of ecosystems incapable of meeting the basic needs of humanity.

Conservation and sustainable use of biodiversity and stemming its continued loss can therefore no longer be regarded as issues distinct from the core concerns of society – namely, to tackle poverty, to improve the health, prosperity and security of populations and to deal with climate change. Each of these objectives is undermined by current trends in the state of the ecosystems, and each will be greatly strengthened if biodiversity is accorded the priority that it deserves. The overarching challenge for Africa in the coming decades will be find-

ing an appropriate balance between development and the conservation and sustainable use of biodiversity.

Recommendations

Research, assessments and collection and dissemination of biodiversity-related information should be enhanced to inform the formulation and implementation of development policies and plans: While the activities of environmental departments and agencies in tackling specific threats to species and expanding protected areas, have been and continue to be extremely important, they are easily undermined by decisions from other ministries that fail to apply strategic thinking on policies and actions that affect ecosystems and other components of biodiversity. Trade-offs between conservation and development are inevitable, and it is important that decisions are informed by the best available information and that the trade-offs are clearly recognized up-front, evaluated against their medium- and long-term impact and that win-win alternatives are explored.

Sustainable use and equitable sharing of biodiversity benefits should be enhanced: A proactive approach to create sustainable use and income options for the rural and urban populations can be the concept of Access and Benefit Sharing (ABS) as globally defined in the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their use to the Convention on Biological Diversity. Business enabling ABS legislations should create clear and easily implementable conditions for bio-prospectors (potential developers and users of genetic resources for research and commercialization) and the resource providers, be it indigenous communities or the State as such. As the States have the mandate to facilitate ABS agreements between developers and providers, sustainable use can be ensured in creating long-term business relationships. Resulting value chains should be governed and managed in a way which serves the objectives of conservation and benefit generation at the same time. One appropriate approach for this is the concept of bio-trade¹¹.

The mainstreaming of biodiversity across the whole Government system and across economic sectors must be increased. This will be crucial as without such efforts it will be difficult, if not impossible, to appropriately address the underlying causes of biodiversity loss.

Countries therefore need to enhance their capacity in the development and application of integration tools such as Strategic Environmental Assessment (SEA) to integrate environmental, including biodiversity considerations into all relevant plans, programmes and projects.

Direct pressures on biodiversity must continue to be addressed, and actions to improve the state of biodiversity maintained, although on a much larger scale. Where multiple drivers are combining to weaken ecosystems, aggressive action to reduce those more amenable to rapid interventions can be prioritized, while longer-term efforts continue to moderate more intractable drivers, such as climate change. The availability and use of the best available data and information is critical in making such decisions. Through a global network of countries and organizations, the Global Biodiversity Information Facility promotes and facilitates the mobilization, access, discovery and use of biodiversity information. In addition to tools and protocols on data sharing, the greater application of existing guidelines, such as the Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity; the ecosystem approach; economic valuation of ecosystem services; strategic and environmental impact assessment; and access and benefit sharing, can also help.

Supporting and ensuring effective implementation of the Strategic Plan for Biodiversity 2011-2020 at all levels: The adoption of the Strategic Plan for Biodiversity 2011-2020 during the tenth meeting of the Conference of the Parties to the Convention on Biological Diversity in Nagoya Japan offers an opportunity to refocus efforts on biodiversity. This global strategy aims to ensure a society living in harmony with nature and represents a blueprint for action. The overarching purpose of the plan is to inspire broad-based action by all countries and stakeholders in support of biodiversity with a view to promoting coherent and effective implementation of the objectives of the Convention. As part of the Strategic Plan countries have committed to establishing national biodiversity targets in support of the long-term vision set out in the plan. In addition, countries have also committed to revising their national biodiversity strategies and action plans and to implementing them as policy instruments.

11 See: <http://www.biotrade.org>

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5. Biotechnology

5.1 Introduction

The nexus between biotechnology and sustainable development has been articulated repeatedly in global development goals and priorities. Chapter 16 of Agenda 21, the action plan for sustainable development that was adopted at the Rio Summit in 1992, states that biotechnology has the potential to address many environment and development problems, including “better health care, enhanced food security, interventions in the area of forestry and more efficient industrial applications and processes”. The Convention on Biological Diversity defines biotechnology as any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use. Traditional applications of biotechnology include production of wine, beer and bread using fermentation. Modern biotechnology involves deliberate but scientifically controlled moving of genes among organisms, related or unrelated and their insertion into other organisms to acquire desired traits and outcomes. Genetic modification (GM) or genetic engineering is the fastest growing field of modern biotechnology.

Modern biotechnology has dominated debates and public policy discourse in the recent past. One of the concerns at the top of agenda has been the issue of safety. In response to the growing public anxiety, credible international bodies, including the World Health Organization (WHO) have affirmed their positions on the safety of the technology. The report of the study safety of genetically modified organisms (GMOs) - “A Decade of EU-funded GMO Research (2001-2010)” concluded that biotechnology, and in particular GMOs, are not per se more risky than conventional plant breeding technologies as safety assessments are fully integrated in the conception, experimentation and development of related research (EU 2010).

Although adoption of biotechnology in Africa lags behind other regions, there is an impetus towards its application in different aspects of development. A publication of AU-NEPAD (Juma and Serageldin 2007) recommends that biotechnology and biosafety should adopt the “co-evolutionary” approach involving regulatory frameworks to safeguard human health and the environment. Adoption of genetic engineering (GE) techniques have been faster in few countries in Africa with the commercialization recorded in South Africa, Egypt and Burkina Faso in such crops and traits as insect-resistant cotton and maize as well as herbicide-resistant soybean. Work has been most notable in agricultural applications with significant bioscientific research focusing on insect resistance, virus and bacterial resistance, drought tolerance and fungal resistance as well as improvement of nutritional quality.

While biotechnology is diverse and cross-cutting, advancements in the field of agricultural biotechnology are the most dominant and documented in Africa and the world over. Biotechnology offers promising health solutions for the treatment and diagnosis of HIV/AIDS, tuberculosis and malaria, all of which are major diseases that mainly affect the poor. Biotechnology however is not a silver bullet and will not by itself solve the problems of the poor. Some aspects of modern biotechnology, particularly the socio-economic impacts, need to be carefully addressed.

5.2 Contribution of Biotechnology to Poverty Reduction and Sustainable Development

Biotechnology applications are diverse and pervasive in several fields, including agriculture, industry, environment and health. Agricultural biotechnology has been successfully used to develop crops that are high-yielding, resilient to pests and diseases, herbicide-tolerant, tolerant to environmental stress and with high nutritional content. The impacts of these benefits include increased productivity, reduced chemical usage, lower input and production costs and reduced negative impact on human health and the environment. Industrial biotechnology applies the techniques of modern molecular biology to improve the efficiency and reduce the environmental impacts of industrial processes like textile, paper and pulp, food processing and chemical manufacturing. Some agricultural crops, such as corn, can be used in place of petroleum to produce chemicals and biofuels. Biotechnology applications are now used to produce many proteins for pharmaceutical and other specialized purposes. New genetic therapies are being developed to treat diseases such as cystic fibrosis, AIDS and cancer.

Modern biotechnology continues to acquire increased significance in terms of the role it can play in the economic transformation and sustainable development of Africa. There have been, in support of this role, rapid scientific and technological advances, increasing commercialization of genetically engineered foods and better formulation of national regulatory frameworks and policies. Increasing food insecurity and food prices have also spurred advances in the field. With most applications in the agriculture, nutrition and medical realms, the following are some of the more compelling cases:

- Biodiversity conserving through land-saving technology that help preclude deforestation and protecting biodiversity in forests and other in-situ biodiversity sanctuaries;
- Increasing crop productivity;
- Increasing stability of productivity and production to lessen suffering during famines due to biotic and abiotic stresses, particularly drought which is the major constraint to increased productivity on arable land in the continent;
- Mitigating climate change and reducing greenhouse gases by using biotech applications for well-adapted germplasm for changing climatic conditions and optimizing the sequestering of CO₂;
- Reducing the environmental footprint of agriculture through more efficient use of external inputs.

African countries are at various stages of biotechnology development and use as Table 20 below shows

Most of the biotechnology activities have focused on enhancing agricultural productivity but other forms of biotechnology such as environmental, industrial and human and animal health biotechnology have also gained ground in the recent past. In agricultural biotechnology,

Table 20: Examples of countries at various stages of biotechnology development and use

Countries generating and commercializing biotechnology products and services using third generation techniques of genetic engineering	Countries engaged in third generation biotechnology R&D but have not developed products and/or processes yet	Countries engaged in second-generation biotechnology (mainly tissue culture)
Egypt, Zimbabwe South Africa	Kenya Uganda Ghana	Tanzania Zambia

even though research is intensifying, genetically modified crops are still only cultivated commercially in three African countries namely: South Africa, Burkina Faso and Egypt.

There are several specific examples of a wide range of biotechnology tools and products that are contributing meaningfully to poverty reduction and sustainable development in Africa. The following technologies and their application in generation of products have been selected to showcase the impact of biotechnology on poverty reduction and sustainable development in Africa.

Tissue culture technologies

Tissue culture (TC) technologies are routinely applied in crop improvement and forestry clonal propagation in many African countries covering a wide range of crops, trees and ornamental plants. While there are very limited documented cases of TC impact on poverty reduction and sustainable development in the continent, where impact studies have been done, it is evident that its contribution could be quite substantial. For instance, clonal propagation has been used to develop high-yielding and disease-free bananas in Eastern Africa with significant impacts at the household level. One of the problems af-



Tissue culture banana plantlets ready for farmers at the AGT screenhouse in Buloba

(Photo courtesy of Mr. Erostat Nsubuga)

fecting the production of banana as a potentially reliable food and commercial crop is the high incidence of pests and diseases. Through traditional practices of exchanging planting materials, farmers transmit most of the banana pests and diseases from one plant to another. The spread of pests and diseases through this practice can reduce banana yields by up to 90 per cent.

Tissue culture technology has been widely applied in Africa for the conservation and sustainable use of forest resources, and successfully used to mitigate the loss of yields and enhance farmers' access to clean planting materials. As a biotechnological tool for multiplying disease-free planting material, tissue culture does not involve genetic modification. In this regard, TC bananas are excluded from the category of genetically modified crops.

Bt technologies

Insect pests are a major problem for African agriculture, compounded by warm temperatures and higher humidity. Pests impact on yields, reduce farmers' profits and worsen food insecurity in the region. Economic losses from pests run into millions at the national level and billions globally (Oerke 2005). De Groote and others (2003) estimate the economic losses from insect pest in Kenya to be as high as \$90 million a year for maize. For smallholders, losses associated with pests can jeopardize food security.

Pest control systems based on chemical inputs are becoming increasingly less effective, with bioengineered crops offering an alternative pest control practice (Huesing and Englis 2004). In particular, transgenic technologies such as Bt maize and Bt cotton (insect resistant varieties, where the transferred gene from the soil bacterium *Bacillus thuringiensis* produces insecticides that kill certain chewing insects) have also contributed significantly to poverty reduction and sustainable development in Africa

Plant transformation technologies

The use of plant transformation technologies in crop improvement in Africa has increased tremendously in the recent past but there are not many cases where the technology has been applied successfully to reduce poverty and contribute to sustainable development in Africa. This is mostly due to institutional and policy issues on risk assessment. In South Africa, however, this technol-

ogy has been applied with high levels of success. In the country, genetically modified varieties dominate maize cultivation, 80 per cent of the white maize is genetically modified and it is mostly used as food. In 2009/2010, the total acreage under GM maize was 1.9 m hectares.

Biofertilizers

Usage of fertilizers in Africa is very low compared to any other regions in the world. It is estimated that on average Africa applies 125 gm/ha of fertilizers compared to the world average of 1,020 gm/ha (UNECA 2009). This has been compounded by the high and increasing cost which is unaffordable to most small-scale farmers. Biological nitrogen fixation is a technology that has been adopted by many African countries to address this challenge. The technology induces the multiplication of microbes in plant roots, known as biofertilizers which help the plant to fix nitrogen from the atmosphere. Use of biofertilizers has been reported in many countries for instance Kenya, Tanzania, Zambia, Zimbabwe, Tunisia and Senegal (Juma and Serageldin 2007).

Biotechnology and nutrition

Despite the importance of agriculture in Africa, 16 of the 18 most undernourished countries in the world are in SSA, and it remains the only region where per-capita food production continues to worsen year by year (James 2008). Besides combating poverty and food insecurity in Africa through enhanced productivity and reduced costs, special attention has been paid to the development of technologies that can contribute towards nutritionally enhanced foods using tools of modern biotechnology. Emphasis is on reduction in the rates of malnutrition in the continent. This has mainly focused on Africa's priority pro-poor staple crops such as cassava and sorghum.

Human and animal health biotechnology

Advances in health biotechnology are making a major contribution in disease diagnosis, treatment and drug development. Cutting edge developments in genomics and bioinformatics have made it possible for diagnosis and early treatment of many diseases and disorders. An outstanding example is diabetes which was once considered a rare disease in Sub-Saharan Africa. But in 2010, over 12 million people in SSA were estimated to have diabetes. Over the next 20 years, it is predicted

that Sub-Saharan Africa will have the highest growth in the number of people with diabetes of any region in the world – the 2010 estimated number is predicted to almost double in 20 years, reaching 23.9 million by 2030 (Motala and Ramaiya 2010). Human insulin for the treatment of diabetes, one of the first genetically engineered products to become commercially available, was commercialized in 1982. It is an important drug that has been and will continue to be crucial in the management of diabetes.

Conventional live, attenuated vaccines which contain a version of the living microbe that has been weakened in the laboratory have been used widely against diseases such as measles, mumps and chickenpox. Despite their advantages, there are some downsides. The remote possibility exists that an attenuated microbe in the vaccine could mutate, revert to a virulent one and cause disease. Through research into the development of recombinant (genetically modified) DNA, better, cheaper and safer vaccines are being sought. Through the use of monoclonal antibodies and recombinant DNA technologies, it is now possible to genetically modify vaccines more rapidly.

Professionals in the field of animal sciences are using biotechnology discoveries to improve animal health and production. Genetically engineered vaccines, monoclonal antibody technology and growth hormones are some of the developments in this area. However, questions concerning food safety, economic impacts and animal health issues have been raised by the opponents of biotechnology and have made their use controversial.

Industrial and environmental biotechnology applications

Biotechnology is being used to convert renewable raw materials as a substitute for fossil fuels. In Ghana, the Government is keen on the development and commercialization of biofuels as a potential substitute for petrol and diesel. This is being encouraged through favourable tax regimes to attract companies to develop alternatives to fossil fuels (Elbehri and others 2013). Micro-organisms are used in fermented foods to enhance flavour and keeping quality often under conditions of little or no refrigeration. By increasing product shelf life they contribute to food safety and food security. The CSIR-Food Research Institute (FRI) of Ghana has developed a purified bacterial culture medium to enhance the quality

of a fermented corn-dough product, known traditionally as *Gakenkey* (Amoa-Awua and others 2004).

5.3 Good Practices to Promote Biotechnology Development and Adoption in Africa

Policy initiatives and regulatory frameworks

The contribution of biotechnology in Africa's quest for sustainable development has been shaped and influenced by international conventions, regional policy agreements and country-specific policy, institutional and legal arrangements. Progress made by various countries in integrating biotechnology into the sustainable development agenda is often linked with the policy/political landscape and the nature of legislation put in place to govern the technology.

There are several intergovernmental mechanisms that govern the application of modern biotechnology in which African countries actively participate. Key among them: the International Plant Protection Convention (IPPC), the Codex Alimentarius Commission and the Cartagena Protocol on Biosafety to the Convention on Biological Diversity, the Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress and the World Trade Organization (WTO) agreements. Typically, the policy areas covered under these international frameworks have the following features: (i) they seek

to protect the environment and human health without unduly hindering international trade (ii) they aim to be transparent and to be in harmony with international regulations for trade so that their application does not amount to being artificial trade barriers in themselves and (iii) they are developed on the basis of the best scientific knowledge available.

In particular, the adoption of the Nagoya-Kuala Lumpur Supplementary Protocol on Liability and Redress on 15 October 2010 was a key development as far as environmentally sound application of biotechnology is concerned. The Protocol will create further confidence and enabling environment for African countries to derive maximum benefits from biotechnology while minimizing possible risks to biodiversity and to human health. It gives flexibility to countries in developing or implementing legislative, administrative or judicial rules or procedures relevant to liability and redress. Parties are expected to provide, in their domestic law, for rules and procedures that address damage. This requirement does not necessarily entail the enactment of a new law. It can be fulfilled by applying existing domestic law. The Protocol defines "damage" as an adverse effect on the conservation and sustainable use of biological diversity that is measurable and significant. It should be noted that most African countries may need technical assistance and guidance in establishing and operationalizing liability and redress regimes that are practical, fair and balanced in terms of addressing potential/perceived risks and harnessing potential benefits.

Table 21 summarizes the status of development of functional National Biosafety Frameworks (NBFs) in Africa as of 2009.

Table 21: Status of African Countries with regard to the development of National Biosafety Framework as of June 2009

Status of BNS development	Countries	Number of Countries
Functional BNF	Algeria, Egypt, the Sudan, Burkina Faso, Mali, Mauritius, Kenya, Zimbabwe, South Africa, Togo and Tunisia	11
Interim BNF	Senegal, Ghana, Nigeria, Namibia, Zambia, Tanzania, Mozambique, Ethiopia, Uganda, Madagascar, Rwanda and Malawi	12
Work in Progress	Botswana, Burundi, DR Congo, Congo, Gabon, Cameroon, Central African Republic, Benin, Côte d'Ivoire, Sierra Leone, Liberia, Guinea Bissau, Mauritania, the Niger, Libya, Eritrea, Djibouti, Burundi, Swaziland, Lesotho, Guinea, the Gambia, Madagascar and Seychelles	24
No Action yet	Angola, Somalia, Equatorial Guinea, Chad, Guinea Bissau, Western Sahara and Morocco	7

Source: Makinde (2012).

Biosecurity: Biosecurity is emerging as a key area in the development and implementation of regulatory frameworks for food, agriculture, fisheries and forestry. Biosecurity has direct relevance to food safety, the conservation of the environment (including biodiversity), and sustainability of agriculture. Biosecurity in broader terms encompasses all policy and regulatory frameworks (including instruments and activities) to manage risks associated with food and agriculture (including relevant environmental risks), including fisheries and forestry. It is composed of three sectors, namely food safety, plant life and health, and animal life and health. These sectors include food production in relation to food safety, the introduction of plant pests, animal pests and diseases, and zoonoses, the introduction and release of GMOs and their products, and the introduction and safe management of invasive alien species and genotypes.

Biosecurity provisions, particularly those touching on food and agriculture, are contained in a number of international instruments. The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) of the World Trade Organization, the Codex Alimentarius Commission, the International Plant Protection Convention and the Office international des épizooties (OIE) provide international standards for food safety, plant health, and animal health, respectively. The majority of the African countries have acceded to the aforementioned international instruments and different line Ministries and Government agencies are responsible for their implementation and enforcement.

Regional biosafety initiatives: The contribution of biotechnology to sustainable development is not just an international or national issue but a regional priority because of the inevitable transboundary nature of modern biotechnology products and also the degree of interdependency among countries. A number of regional biosafety initiatives have emerged in response to the fact that biosafety issues transcend national boundaries and if not well managed at the regional level, can disrupt trade or make the borders susceptible to transboundary movements of GMOs.

Regional Economic Communities (RECs), including the Common Market for Eastern and Southern Africa (COMESA), Southern Africa Development Community (SADC) and the Economic Community of West African States (ECOWAS) have launched initiatives dedicated to regional harmonization of biosafety policies. These efforts are expected to foster inter-country

cooperation through sharing of knowledge, expertise, experiences and resources.

National policy environment: The extent to which modern biotechnology can make meaningful contribution to sustainable development depends on an enabling environment to support its development and deployment. In particular national biotechnology policies and legislation supported by appropriate institutional arrangements are key determinants in enabling or hindering the level of progress that a country can make towards embracing the technology. South Africa's early entry and success story in biotechnology is largely attributed to an enabling policy environment and a national biotechnology strategy that supported and stimulated innovations. South Africa has a GMO Act of 1997 which was amended in 2006. The policy and legal environment has enabled commercialization and facilitated trials of GM crops. South Africa is one of the countries in the world with accumulated evidence on the benefits of GM crops.

Egypt has the second most advanced biotechnology industry and biosafety system after South Africa. However, Egypt lacks a stand-alone policy or law but sectoral laws on registration and release of crop varieties and seeds have been applied to facilitate trials leading to commercialization of the first GM crop. The Egyptian case is a typical example of a country that has made significant progress in biotechnology R&D by applying existing pieces of legislation and decrees as opposed to promulgating new laws. This has been made possible by a conducive and supportive political environment. The Ministry of Agriculture guides development of agricultural biotechnology in the country.

In Uganda, the national biotechnology policy provides for promotion of safe application of biotechnology as its vision is to "make Uganda a country fully and safely using biotechnology in national economic growth and transformation". The mission is to promote and facilitate the development and judicious application of biotechnology for sustainable national development (Government of Uganda 2008). The country has emerged as a regional leader in Eastern Africa and a role model in conducting confined field trials using existing legislation. The trials that have been undertaken include transgenic cotton, cassava, maize and banana. The Uganda experience has also demonstrated that whether or not a country has enabling legislation explicit or implicit capacity building is a precondition for biotechnology

R&D activities to thrive. Capacity for environmental risk assessment and risk management, regulatory compliance and inspection needs to be strengthened.

Kenya's example of inclusiveness and participatory nature in developing its policy (2006), legislation (2009) and institutional mechanisms (2011) for governing biotechnology can also serve as a model for other African countries. The country is fully compliant with the international obligations on biotechnology and biosafety as defined by the Cartagena Protocol on Biosafety. In some African countries, the framing of biosafety legislation has hindered any meaningful developments in biotechnology. Strict liability clauses and socio-economic

Considerations in biosafety laws have discouraged/halted efforts around development and deployment of modern biotechnology products. Tanzania, Ethiopia, Zambia and Malawi are examples of countries with approved biosafety legislation, but where the introduction of GMOs for confined field trials has not yet been approved by the relevant authorities.

Sectoral application of biotechnology in Africa

Agriculture, food security and nutrition: Biotechnology has been extensively used in agriculture in the region. For instance, impact assessment studies conducted in Kenya indicate that the growing of disease-free tissue culture bananas has primarily benefited small-scale resource-challenged farmers, with substantial reduction of yield losses caused by pests and diseases. The technology has made it possible for more than 10,000 farmers to access large quantities of superior clean planting with early maturity traits (12-16 months compared to the conventional banana of 2-3 years), bigger bunch weights (30-45 kg compared to the 10-15kg from conventional material) and higher annual yield per unit of land (40-60 tonnes per hectare against 15-20 tonnes previously achieved with conventional material).

Livelihoods of rural communities were significantly transformed in Kenya (Wambugu and Kiome 2001). Although investing in the TC banana production is relatively more capital intensive than non-TC banana production (about 70 per cent fixed costs for TC banana versus about 49 per cent fixed costs for non-TC banana), the financial returns are much higher (Mboh and others 2003). Household incomes of participating farmers rose by about 38 per cent from banana

sales, resulting in decreased poverty levels and enhanced socio-economic welfare. This has also contributed to the empowerment of women and children, with access and control of income from banana sales 85 per cent controlled by women. The multiplier effect of the project has been enormous, with new business and employment opportunities along the banana value-chain, particularly at the levels of production, distribution and post-harvest (value-addition) (Karembu 2007; Nguthi 2009).

Another case in point is the development of the New Rice for Africa ("NERICA"), a new variety of hybrid rice developed by the Africa Rice Centre (Africa Rice) by crossing Asian rice and African cultivated rice varieties using conventional biotechnology approaches, including tissue culture. Although 240 million people in West Africa rely on rice as the primary source of food energy and protein in their diet, the majority of this rice is imported, at a cost of over \$1 billion. The development of NERICA has contributed towards self-sufficiency in rice production and improved food security. NERICA varieties have now been introduced in more than 30 countries in SSA. As a result, 17 upland NERICA varieties have been adopted and/or certified in SSA and 11 lowland NERICA varieties have been adopted as of 2007. Currently, it is estimated that there is about 700,000 ha under NERICA varieties in Sub-Saharan Africa, covering an estimated 5 per cent of upland rice growing areas of the continent (Diagne 2009). A recent study (Diagne 2009) on adoption in SSA countries estimated the actual rates of adoption of NERICA varieties to be between 19 per cent and 40 per cent in various African countries. Kijima and others (2008) found that the percentage of households that grow NERICA varieties in Uganda increased from 0.9 per cent in 2002 to 2.9 per cent in 2003 and reached 16.5 per cent in 2004.

Several studies show that, in general, NERICA increases household income and contributes to better income distribution within African rice growers' households in Uganda, the Gambia Ghana and Benin (Kijima and others 2008; Glove 2009; Dibba 2010; Dibba and Fialor 2010; Sogbossi 2008; and Dontsop and Diagne 2010).

In Burkina Faso the approval and commercialization of Bt cotton by the National Bio-Security Agency has yielded commendable results. The yield advantage of Bollgard®II over conventional varieties was 18.9 per cent; the yield increase plus labour and insecticide savings (2 rather than 6 sprays) resulted in a gain of \$65.57 per hectare compared with conventional cotton translating

to a 206 per cent increase in cotton income (Vitale and others 2010). The main benefit of Bollgard®II derives from the increase in yield whereas the reduction of production costs associated with four less insecticide sprays offsets the high cost of the seed; the national benefits to farmers in 2009 were estimated at \$35 million representing 53 per cent of total benefits with the balance accruing to the developers of the technology. In 2008, approximately 4,500 Burkina Faso farmers successfully produced 1,600 tons of Bt cotton seed on a total of 6,800 farmer fields; the first 8,500 hectares of commercial Bt cotton was planted in the country in 2008. In 2009, approximately 115,000 hectares of Bt cotton were planted for commercialization in the country. It is estimated that Bt cotton has the potential to generate an economic benefit of up to \$100 million a year for Burkina Faso, based on yield increases of up to 30 per cent, plus a two-thirds reduction in insecticides sprays, from a total of 6 sprays required for conventional cotton, to only 2 for Bt cotton (Korves 2008). Adoption of Bt cotton is thus inspired by the need to improve productivity, raise farmers' incomes and reduce pesticide use. Other examples where Bt technology has been successfully applied to combat poverty and enhance sustainable development is Bt maize in Egypt (ISAAA 2009). The potential for Bt maize is growing in Kenya as well (De Groot and others 2011).

Maize streak viruses (MSV), geminiviruses that can destroy most of a maize crop, are endemic to Sub-Saharan Africa and adjacent Indian Ocean islands where they are transmitted by leafhoppers in the genus *Cicadulina*. Scientists at the University of Cape Town, South Africa, along with colleagues at the South African seed company, PANNAR Pty Ltd, have developed a resistant variety of maize that is expected to alleviate food shortages as well as promote the reputation of genetically engineered foods in Africa. The transgenic maize variety developed successfully by scientists at the University of Cape Town has proven consistently resistant to MSV and the trait can be reliably passed on to the next generation and in crosses with other varieties. Field trials are scheduled to begin soon, not only to test the effectiveness of the technology in the field but also to ensure that the GE maize variety has no unintended effects on beneficial organisms that may feed on it. The resistant maize will also be tested to ensure that the viral protein is digestible and non-allergenic. The MSV-resistant maize is the first GE crop developed and tested solely by Africans.

The nutritional content of food can also be improved through biotechnology. The African Biofortified Sorghum project seeks to develop a more nutritious and easily digestible sorghum variety that contains increased levels of essential amino acids, especially lysine, increased levels of Vitamins A and more available iron and zinc. This project is expected to improve the health of a target 300 million people who depend on sorghum as a staple food in Africa. It is a north-west

Multi-partnership leveraging the best of academic, public and private R&D institutions. The sorghum nutritional improvement project will permit greater levels of zinc and iron availability, improved protein digestibility and increased pro-vitamin A levels. The development of cassava with increased pro-Vitamin A, iron and protein is another major project in Africa. This work is being undertaken under the aegis of the BioCassava Plus (BC Plus) project. Cassava is a staple crop consumed by more than 250 million people in Sub-Saharan Africa. Increasing the nutritional content of the crop will tremendously reinforce the campaign to reduce malnutrition. BC Plus will be available to farmers royalty-free.¹²

Forestry: Clonal forestry, a technology developed in South Africa, has contributed to the conservation and sustainable use of forest resources. The Tree Biotechnology Project Trust (TBPT) in Kenya is a good example of this use of biotechnology in the region (Oeba and others 2009). TBPT is the single largest forest tree clonal nursery in Eastern Africa and Central Africa capable of producing high quality tree hybrid clones and pure selected seedlings for wood and non-wood products (Wakhusama and Kanyi 2002). TBPT has helped to supplement the limited supply and use of improved seeds, seedlings, wildings, scions; enhance mass production of plant material at a relatively low cost; provide fast growing plant material to cut down the time involved in raising; establish uniform crops for specific purposes; supply plant material that are pest and disease resistant thereby contributing to wealth creation through the fast-maturing and high-quality trees with good wood characteristics and immensely increases the forest cover.

Moreover, according to Oeba and others (2009) and Ngamau and others (2004), clonal propagation technology has made several successes, including: capacity building and training of Kenyan scientists in clonal forestry propagation and commercial plantations; estab-

12 For details about the project visit http://www.danforthcenter.org/science/programs/international_programs/bcp/

lishment of twenty-two clonal screening and adaptability trials countrywide; establishment of a clonal forestry nursery at Kenya forest service headquarters in Karura that has produced over 19 million improved seedlings and clones. The facility has an annual production capacity of over 4 million and the development of a nationwide distribution and delivery network for seedlings and clones to target groups that is now operational through cooperation with public extension agents, NGOs, the private sector, learning institutions and direct delivery to individual growers.

Human and animal health: clinical trials and efforts to develop HIV/AIDS vaccines using recombinant DNA techniques (modern biotechnology) in Africa and other regions of the world are at various stages of progress. Other developments include application of molecular markers for mapping disease resistance in the malaria parasite. This is being carried out at the Ifakara health and research development centre. This is a collaborative research programme between six countries (Ghana, Nigeria, Malawi, Mali, Tanzania and Uganda) and is jointly coordinated by UNDP, World Bank and WHO. Kenya has developed affordable and diagnostic testing kit for Hepatitis B under the leadership of Kenya Medical Research Institute (KEMRI) with support from the Japan International Cooperation Agency (JICA). The kit called Hepcell is now in use in all district and provincial hospitals.

In Uganda, recombinant vaccines for East Coast fever and new castle diseases have been developed. In particular East Coast fever kills a million cattle every year in East, Central and Southern Africa, and is responsible for up to 50 per cent of all calf deaths in pastoral and agro-pastoral communities negatively affecting livelihoods (Agfax 2010). A number of research organizations, including the International Livestock Research Institute (ILRI) based in Nairobi, Kenya have applied biotechnology to develop vaccines and techniques for livestock disease management.

Industry: In 1992 the world's first and only commercial biobleach plant was established in Uganda with the goal of producing high quality cobalt metal using biotechnology in a most cost effective and environmentally sustainable way. Cobalt metal is used in the production of super alloys for the aerospace industry and industrial gas turbines. It is also used as a pigment in many commercial and industrial applications. Applying biobleach technology which uses naturally occurring bacteria in

the area, Kasese Cobalt company is processing a stockpile of approximately 11, 300 tonnes of cobalt from existing cobalt-rich pyrite stockpiles at Kasese left from activities of an old copper mine in the area, Kilembe Mines Ltd. The plant has employed over 300 people and additional local contractors who provide goods and services.¹³

The agro-processing industry in Africa produces large amounts of waste, which contribute to environmental pollution. Projects supported by the former Swedish-funded Eastern African Regional Programme and Research Network for Biotechnology, Biosafety and Biotechnology Policy Development (BIO-EARN), now BioInnovate, have demonstrated that waste is a resource that could be used to generate bioenergy and value-added chemical products. Waste from sisal and fish processing can offer a great deal in this regard. The waste has the potential to generate considerable revenue and can be turned into a commercially viable business. It can be used in the production of fish oils, fish protein hydrolysates, enzymes and bio-energy. Using biotechnology, processes for biogas production and recovery of valuable products from Nile perch waste have been developed. This has attracted industrial partners from the Eastern Africa region to cooperate on commercializing fish waste processing technologies. Improved and scaled-up integrated processes for biogas production from sisal waste have also been successfully developed. The commercial viability of these more efficient biogas bioreactor systems has been demonstrated. As a consequence, cooperation with the sisal industry has been established with the aim of producing biogas more effectively from sisal processing waste (Forsman and others 2010).

R&D initiatives in Africa

Biotechnology R&D in African countries is largely undertaken by departments at universities and national agricultural research bodies. Some of the universities have established units or programmes that are now dedicated to biotechnology R&D. For instance, in cooperation with the Agricultural Research Council, the University of Cape Town, Department of Microbiology in 1997 developed and released for field-testing the first transgenic potato in the country. The potato has been engineered with CP genes that confirm resistance to potato virus Y and leaf roll virus. In addition, the Department's research efforts have generated tobacco that is resistant to cucumber mosaic and tobacco necrosis vi-

13 For details about the project visit <http://www.kccl.co.ug/about.htm>

ruses, via expression of both CP and CP gene antisense Ribonucleic acid.

Technology transfer initiatives in Africa

According to the United Nations Conference on Trade and Development (UNCTAD), technology transfer is the “transfer of systematic knowledge for the manufacture of a product, for the application of a process or for the rendering of a service”. Usually, transfer is said to have occurred when a technology is successfully tested and adapted for everyday use. The following initiatives have been established to foster regional technology co-operation and adaptation in Sub-Saharan Africa.

African Agricultural Technology Foundation: The African Agricultural Technology Foundation (AATF) was established in 2002 as a responsible party to serve as a platform for brokering access to and transfer of proprietary technologies to improve Africa's food security prospects. The work of the AATF rests on the twin approach of negotiating, on a humanitarian basis, access to proprietary agricultural technologies from anywhere in the world and forming public-private partnerships involving various institutions to ensure sustainable delivery of products made from such technologies. Over the past seven years, AATF has attracted support and recognition from development partners, corporate and non-profit organizations as well as from regional and national institutions, and are collectively at advanced stages of several crop-based technology transfer efforts across SSA.

International Service for the Acquisition of Agri-biotech Applications: The International Service for the Acquisition of Agri-biotech Applications (ISAAA) is a not-for-profit international organization that shares benefits of crop biotechnology to various stakeholders, particularly resource-poor farmers, through knowledge sharing initiatives as well as transfer of proven biotechnology applications. The activities of ISAAA in Africa are coordinated through the ISAAA-Afri-Centre, located in Nairobi, Kenya, from where notable accomplishment of technology transfer projects have been successfully implemented during the last 15 years. Two key examples are the successful testing and transfer of tissue-culture technology to mitigate disease pathogen load in bananas in order to reverse the declining trends in farm-productivity and enhance farmers' access to clean planting materials in Eastern Africa; and, the clonal forestry programme in Eastern Africa, where farmers have

been able to access hybrid fast-growing multipurpose tree seedlings to meet basic fuelwood needs as well as for commercial application.

Agricultural Biotechnology Support Programme: The Agricultural Biotechnology Support Programme (ABSP) is a USAID-funded consortium of public and private sector institutions that supports scientists, regulators, extension workers, farmers and the general public in developing countries to make informed decisions about agricultural biotechnology. ABSP-led efforts in Africa comprise work on developing disease-resistant banana in Uganda as well as the development of insect-resistant potatoes in South Africa and Egypt. Progress in this endeavour however has been slow and fraught with regulatory and public acceptance obstacles.

UNEP-GEF Technology Transfer Network: This is an intergovernmental mechanism jointly supported by the World Bank and the United Nations Development Programme. It provides financial mechanisms for incremental implementation costs in recipient countries and also facilitates removal of barriers for clean technology transfer. In a recent review, this initiative, although carried out successfully and with key deliverables, was found to have had an excessive time-overrun due to a questionable choice of the global partner institution and management issues. Limited progress in the transfer of biotechnologies in Africa is partly attributed to challenges such as protection of Intellectual Property Rights and inadequate capacities.

Capacity building

The development and adoption and, therefore, contribution of biotechnology to sustainable development and poverty alleviation is influenced by the level of existing capacities from institutional, physical and human resources. A number of capacity-building initiatives have therefore been undertaken to strengthen capacity for biotechnology development and application in Africa. The support provided under these initiatives contributed to enhancing safety in the use of biotechnology and fostered international mechanisms of cooperation as advocated for in Agenda 21. The support also fulfilled commitment under the programme for further implementation of Agenda 21 on the provision of new and additional financial resources for the implementation of the Protocol under the CBD.

The AU-NEPAD Planning and Coordinating Agency (NPCA)/African Biosciences Initiative (NEPAD Agency/ABI). This initiative focuses on building and strengthening human capacity in biosciences in Africa; promoting access to affordable, state-of-the-art research facilities within Africa in order to sustainably address the continent's challenges in agriculture, health and environment. The initiative adopted the regional networking approach whereby institutions make their resources available to address common challenges. In this regard, four regional networks were established on the continent, namely: the Southern African Network for Biosciences (SANBio) covering Southern African countries, the Biosciences eastern and central Africa Network (BecANet) covering countries in Eastern and Central Africa, the West African Biosciences Network (WABNet) covering Economic Community of West African States (ECOWAS) countries and the North African Biosciences Network (NABNet).

UNEP- Global Environment Facility (GEF) Biotechnology initiatives. These UNEP-GEF initiatives have contributed significantly to strengthening the capacities of countries to engage in biotechnology R&D. Among these initiatives are the UNEP-GEF pilot biosafety enabling activity project, which was implemented in 18 countries from 1997 until 2000. It benefited 10 countries from Africa namely Cameroon, Egypt, Kenya, Malawi, Mauritania, Mauritius, Namibia, Tunisia, Uganda and Zambia. In 2004, GEF approved additional funding for more countries to be supported, bringing the total number of beneficiary African countries to 41. This was followed by the UNEP-GEF project on implementation of NBFs. Another contribution by UNEP-GEF was the Biosafety Clearing House (BCH) capacity-building project pertaining to information exchange. The project also provides some relevant equipment and software necessary for running the BCH.

Other capacity-building initiatives: A number of international agencies, institutions and donor organizations have initiated programmes dedicated to building the capacity of African countries in biotechnology and biosafety. The International Centre for Genetic Engineering and Biotechnology (ICGEB) has a Sub-Saharan Africa-wide capacity strengthening project on biosafety. The International Food Policy Research Institute (IFPRI) managed Programme for Biosafety Systems (PBS) supports African countries in the responsible development and use of biotechnology. PBS efforts aim at facilitating the development and implementation of sci-

ence-based functional biosafety systems. BIO-EARN provided enormous support in developing human and infrastructural support for biotechnology R&D in Kenya, Uganda, Tanzania and Ethiopia. For instance, the programme has supported the training of 30 PhD and 30 MSc students during the period 1999-2010 (Forsman and others 2010). Furthermore, most African Universities have initiated various courses on biotechnology and biosafety aimed at developing local capacities. The Project on Strengthening Capacity for Safe Biotechnology Management in Sub-Saharan Africa (SABIMA) managed by the Forum for Agricultural Research in Africa (FARA) specifically addresses aspects of biotechnology stewardship and product integrity.

Public participation and outreach in biotechnology

In biotechnology, public participation is recognized as an important component of the international agreement that governs the international trade ("transboundary movement") of Living Modified Organisms (LMOs), the Cartagena Protocol on Biosafety. Under Article 23 of the Biosafety Protocol, Parties are expected to promote and facilitate public awareness, education and participation concerning the safe transfer, handling and use of living modified organisms in relation to the conservation and sustainable use of biological diversity, taking also into account risks to human health. In so doing, Parties shall cooperate, as appropriate, with other States and international bodies.

Various efforts in public participation and dialogue on biosafety issues linked explicitly to Article 23 have been initiated and carried out by Governments or official agencies in various countries and at the international level. One example is the UNEP-GEF Project on Development of National Biosafety Frameworks, which aims to assist developing and transition countries to implement their national regulatory frameworks for GMOs-in-transit.

In the development of national Biosafety frameworks, countries have been encouraged to include public awareness, education and participation in different ways, depending on each country's particular social, political and economic situation. In those countries that have completed formulating their NBFs, public consultation on GMO is included in all their activities. These activities not only include applications for permits for environmental release or importation, but can also in-

volve public participation in biotechnology research. In many countries, the public is invited to make submissions on applications at an early stage of the decision-making process (UNEP/GEF 2006).

Kenya, South Africa and Uganda have initiated Government-led public participation mechanisms to promote understanding of the potential of biotechnology and to ensure broad public awareness, dialogue and debate on its current and potential future applications. The initiatives are: the BioAWARE (Kenya), Public Understanding of Biotechnology (PUB in South Africa) and the Uganda Biotechnology and Biosafety Consortium.

In addition there are several other private initiatives by NGOs such as the ISAAA-AfriCenter, African Biotechnology Stakeholders Forum (ABSF), African Agricultural Technology Foundation's Open Forum on Agricultural Biotechnology (OFAB), Africa Harvest, AfricaBio, Scifode and the Centre for Bioinformatics and Biotechnology (CEBIB) at the University of Nairobi. The mass media in Africa have also played a major role in raising biotechnology as a public agenda item.

5.4 Challenges and Lessons Learnt

The challenges hindering optimal harnessing of modern biotechnology for sustainable development in Africa *inter alia* encompass: priority setting oversight, funding limitations, human and infrastructural capacity constraints and IPR challenge as elaborated below.

- i) Many countries have not clearly articulated national priorities and goals on biotechnology development and application. Therefore a majority of African countries have not integrated the biotechnology agenda into national development policies. This has resulted in lack of clear priorities and investment strategies, which impedes informed and long-term policy formulation for biotechnology development and use.
- ii) Modern biotechnology R&D is knowledge and capital intensive with hefty financial implications. Short-term erratic and low level financing of biotechnology R&D is a major constraint across the continent. The main chal-

lenge for public biotechnology R&D in Africa is increasingly how to find investment capital to sustain basic research and to bring laboratory findings to commercial use. Although there has been significant growth in the level of funding to agricultural biotechnology R&D in most countries, the available financial resources are still comparatively low to allow the countries to engage effectively in cutting-edge activities. Most of the current biotechnology R&D programmes are donor-funded although coordinated and managed by public research institutions. Low level private sector participation in biotechnology R&D is another challenge. In some cases, linkages with the local private sector are either weak or non-existent.

- iii) Scientific and technological infrastructure to conduct modern biotechnology R&D work is only available in a few countries. Lack of a critical mass of scientists in advanced areas of modern biotechnology such as genomics, bioinformatics and molecular biology is another acute challenge in most countries. Low level of knowledge on indigenous genetic resources hinders or slows down biotech product development.
- iv) The role of intellectual property protection and its impact on the acquisition, development and diffusion of biotechnology is an important challenge. In most African countries, institutions for administering industrial property rights (particularly patents) are still in their infancy. While a good number of countries have established patent offices, the usefulness of these as sources of scientific and technological information has not been adequately exploited. There is also a growing debate on the impact of intellectual property protection on the transfer of modern biotechnology to African countries. Concern on this issue is largely based on the view that intellectual property protection is a barrier to transfer of technology.
- v) Misinformation remains one of the key factors that have hindered the adoption of biotechnology in Africa. Negative public perceptions impede biotechnology uptake while lack of a living database on biotechnology in Africa hinders sharing of information, knowledge and

experiences. This drawback is compounded by misconceptions and lack of knowledge about the use of biotechnology in general, and about GMOs in agriculture as well as very few commercial crops, with farmers.

- vi) African countries have ratified and acceded to numerous international regimes. Domesticating the instruments, coordinating complex institutional arrangements and harmonizing overlapping and conflicting mandates remain formidable challenges.

5.5 Conclusion and Recommendations

Conclusion

Biotechnology has contributed and holds an enormous potential in contributing towards the sustainable development agenda in Africa. Applications in traditional, new and emerging biotechnologies provide opportunities for poverty alleviation, enhanced food security, industrial competitiveness and the promotion of sustainable use of natural resources. African countries are encouraged to adopt proactive strategies that will optimize harnessing of the economic, health, environmental and industrial benefits from biotechnology and management of potential challenges, risks and tradeoffs associated with the adoption, development and deployment of the technology. There is need for policy decisions and actions at the national and regional levels to be informed by science-based evidence taking into account domestic realities and challenges.

The main constraints on biotechnology promotion in most African countries include inadequate human resource and infrastructure capacity, lack of supportive policies and regulatory frameworks, inadequate funding, lack of public and private investments at levels that can make a difference, and absence of systems for the delivery of technologies to potential users, as well as inadequate awareness and understanding leading to misconceptions about the potential of, and risks posed by, biotechnology (Juma and Serageldin 2007).

Recommendations

In order for African countries to be able to benefit from the potential offered by biotechnology, the following recommendations are made:

Priority setting and goals definition for biotechnology development and investments. There is a need for better priority setting to enable agricultural biotechnologies to meet national needs regarding food security and poverty alleviation. This is critical in identifying areas of focus where interventions in agricultural biotechnologies could have maximum impact, as well as identifying key agricultural biotechnology innovations that could improve the income and food security status of the rural poor.

There is the need to strengthen institutions and facilities for genetic resources management. Priority should be given to establishment and/or strengthening of genetic resources management agencies or facilities. Institutional, policy and legal frameworks for the management and sharing of benefits arising from genetic resources should be strengthened.

National and regional science-based regulatory frameworks for biotechnology and biosafety should be put in place and into operation. Lack of effective and functional biosafety systems hinders the capacity of African countries to maximize the benefits of biotechnology and minimize potential risks. It is important to support the establishment of science-based regulatory systems at both the national and institutional levels. Countries should be encouraged to put in place stewardship programmes for biotechnology, e.g. refugia, to manage insect resistance to sustain product integrity. Elements of biosecurity should be adequately addressed in biosafety regulatory frameworks and synergies among regulatory agencies fostered. Realistic liability and redress provisions are necessary for responsible development and deployment of GM products. However, countries need to carefully consider the implications of strict liability provisions, which could slow down advancements in biotechnology R&D.

Intellectual property systems in the regions need to be developed. African countries should strengthen the capacity of intellectual property systems that reconcile the need to reward inventors and promotion of freedom to innovate.

Understanding and appreciation of the benefits and dangers of biotechnology should be enhanced. African Governments should take lead responsibility in promoting and improving the understanding of biotechnology based on science-based evidence for informed decision-making and public participation. Well-coordinated credible communication strategies and programmes to enhance public awareness and engagement are crucial in building public confidence, trust and acceptance. A living database on biotechnology R&D should be established and regularly updated and coordinated by a regional body like FARA.

Capacity building in the development and application of biotechnology should be coordinated. Appropriate linkages and coordination mechanisms among existing and planned biosecurity capacity-building initiatives should be established to enhance complementarity and avoid duplication of efforts. Moreover, there is the need to ensure that capacity building is directed at country and regional priorities.

There is the need to promote private sector participation in biotechnology development. As stipulated in the Comprehensive Africa Agriculture Development Programme (CAADP), Governments should formulate

policies to attract and encourage private sector participation in biotech R&D, support formation of incubation hubs in public universities and help foster linkages with the private sector for commercialization.

Funding for biotechnology development and application should be increased. Governments should adopt policies to stimulate venture capital, contract research, partnerships with the corporate sector and other forms of financing. Research is needed to identify specific policies on alternative/innovative financial mechanisms for biotechnology R&D. Both public and private national investment in agricultural research, including biotechnologies, need to be increased. In order to attract and expand such investments, there is the need for recognition of the contribution of biotechnology to development. This should be reflected in national development plans.

There is need to strengthen regional cooperation. Regional cooperation and integration efforts in biotechnology and biosafety should be promoted as a mechanism for harnessing and leveraging national and regional expertise, financial resources and facilities for biotechnology R&D.

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6. Mountains

6.1 Introduction

Mountains account for about a fifth of the world's terrestrial land area, and provide the direct support base for about a tenth of its population. For example, mountains provide indispensable ingredients such as half of the world's fresh water, for a viable world system. Additionally, they possess many positive attributes, including biological and cultural diversity, rich untapped natural resources, as well as the spirituality and inspiration which have been experienced since time immemorial. Despite these valuable attributes, mountain ecosystems continue to receive sub-optimal attention, especially in terms of investment in ecosystem conservation and well-being of mountain communities.

There is also a world-wide linking process of highland-lowland interaction that cannot be ignored without direct consequences. Mismanagement of land has potential serious consequences on the lowlands, such as hydrological disruption, flood, siltation and landslides. These invariably result in mass migration of impoverished people who will further add to the pressures of the lowlands, leading to social conflicts (Price and others 2011). Politico-military and social conflicts have also characterised mountain societies and, together with natural disasters, often augment the spread of malnutrition and infectious diseases.

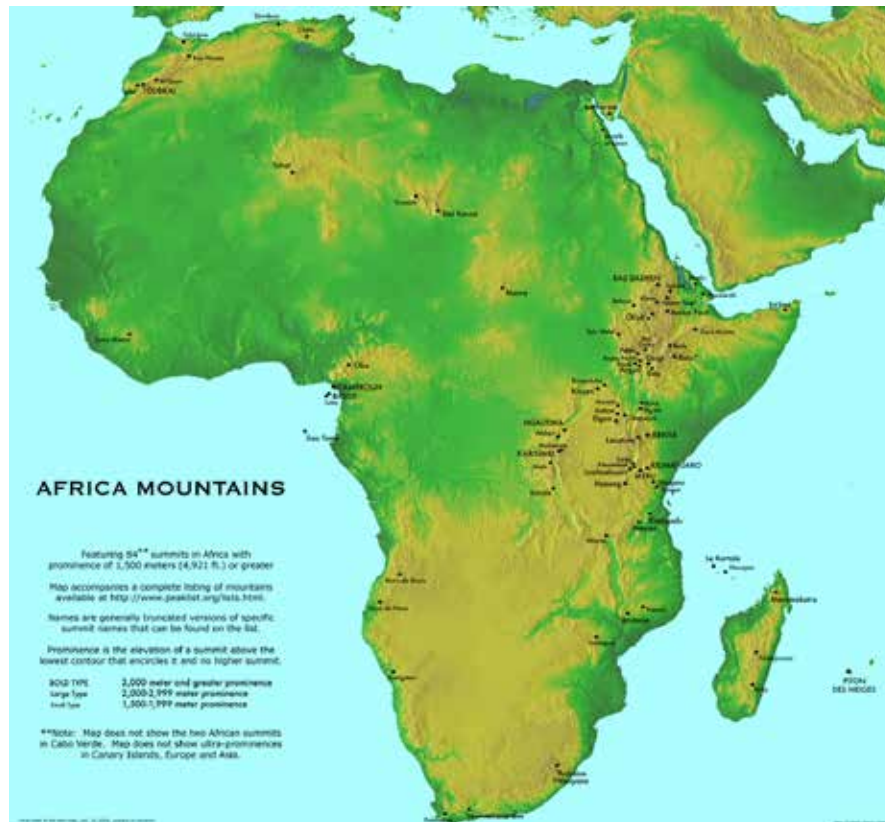
Africa, the second largest continent, is a huge landmass, of about 30 million km² that is 1/5 or 20 per cent of the world's land surface and has the third largest population. About 50 per cent of the countries in Africa contain mountains or have steep land; and about 10 per cent (3 million km²) of Africa's surface area is highlands, mountains or steep sloping areas (Fig-

Table 22: List of mountainous countries of Africa by subregion

Subregion	Mountainous countries
North Africa	Algeria, Libya, Mauritania, Morocco, Tunisia,
East Africa	Ethiopia, Eritrea, the Sudan, Kenya, Tanzania, Uganda, Madagascar, Rwanda, Burundi,
Central Africa	Democratic Republic of the Congo, Cameroon, Chad.
Southern Africa	Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe.
West Africa	Guinea, Mali, the Niger, Nigeria, Sierra Leone.

Source: <http://www.mountainpeople.org/en/organization/presidence.php> - (Modified).

Figure 56: Africa's Mountains



ure 56). Furthermore, 20 per cent of Africa's population (approximately 160 million) is affected by mountain problems, while a further 30 per cent depends on water resources originating in mountains.

Large mountains in Africa are limited to the north-western and eastern parts, while isolated and relatively smaller mountains are found in scattered locations of the continent, with the predominance of flat surfaces (the African Surface) (Figure 56). Deeply incised valleys or escarpments with mountain-like slopes are also features of special interest in Africa (Church and others 1977). Mountains of high prominence are found in Eastern Africa, for example, in Tanzania Mount Kilimanjaro (5,895m), a vast volcanic mountain is the highest in Africa and rises 4,000m above the surrounding plains; and the spectacular Atlas chain of mountains in North Africa (Table 22).

6.2 Contribution of mountains to poverty reduction and sustainable development

Whereas there are no mountain ranges in Africa comparable to the Himalayas in Asia or the Andes in South America, the mountains and sloping areas are nevertheless of the greatest importance for sustainable development of many African countries. This is especially so in the tropical and sub-tropical regions, where mountain ecosystems have more favourable environmental conditions and greater resource potential. This includes fertile and productive agricultural land, forests, wildlife and biodiversity, water sources and minerals; and unique and spectacular landscapes for tourism and recreation. As a result, African mountains and highlands have or could have intensive land use and dense populations as well as brisk economic and development activities. Thus, Africa's mountainous areas should be sustainably managed in order to harness their contribution to sustainable development, both in mountain areas themselves and in the lowlands.

Box 20: Contribution of African mountains to sustainable development and human well-being

- a. Mountain ranges in many parts of the continent act to form the frontiers between countries, and there is often value in maintaining them as transboundary protected areas or lightly inhabited buffer zones (e.g. Mount Nimba Nature Reserve in Guinea and Côte d'Ivoire, Mount Elgon National Park in Uganda and Kenya).
- b. Mountain regions often harbour a wealth of human tradition, and protected areas can provide a mechanism whereby the alliance between conservation and local cultures can be strengthened (e.g. Bwindilmpenetrable National Park in Uganda).
- c. Mountains act as focal points for those seeking aesthetic and recreational benefits and many cultures have reverence for certain peaks considered 'sacred' (e.g. Rwenzori Mountains and Masaba Peak on Mount Elgon in Uganda).
- d. Mountains are fragile high energy environments where regulatory controls over potentially disturbing human activities are often needed (e.g. Simien and Bale Mountains National Park in Ethiopia).
- e. Mountains are particularly sensitive indicators of global climate change and are ideal settings for research on the impact of global change on species, ecosystems and hydrology (e.g. Rwenzori Mountains in Uganda and the Democratic Republic of the Congo (Grab 2008; ICIMOD 2011)).
- f. Mountains have immense downstream values in terms of soil erosion control and watershed protection. In this respect, nature reserves are a useful measure in establishing upland resource use (e.g. Kasungu National Park in Malawi).
- g. Mountains often harbour many endemic and, threatened species, and genetic resources, and are nature's last stronghold for those species that have been extirpated in adjacent lowlands (e.g. Virunga National Park in the Democratic Republic of the Congo).

Box 20 provides a synopsis of the contribution of African mountains to sustainable development and human well-being.

Mountains and water resources

The particular form and structure of mountain areas provide most of them with important hydrological attributes valuable for water supplies and hydroelectricity generation:

- a) Regulation of the hydrological cycle and climate.
- b) Temporary storage in the form of snow and ice that brings about a delay in runoff, thereby propagating ground water recharge and perennial flow of rivers.
- c) Natural lakes such as Lake Tana in Ethiopia, and the numerous glacier and crater lakes, as well as man-made storage reservoirs that exist in different mountain areas of Africa are useful for a number of development purposes, but especially for water supply, irrigation, power generation and flood control.

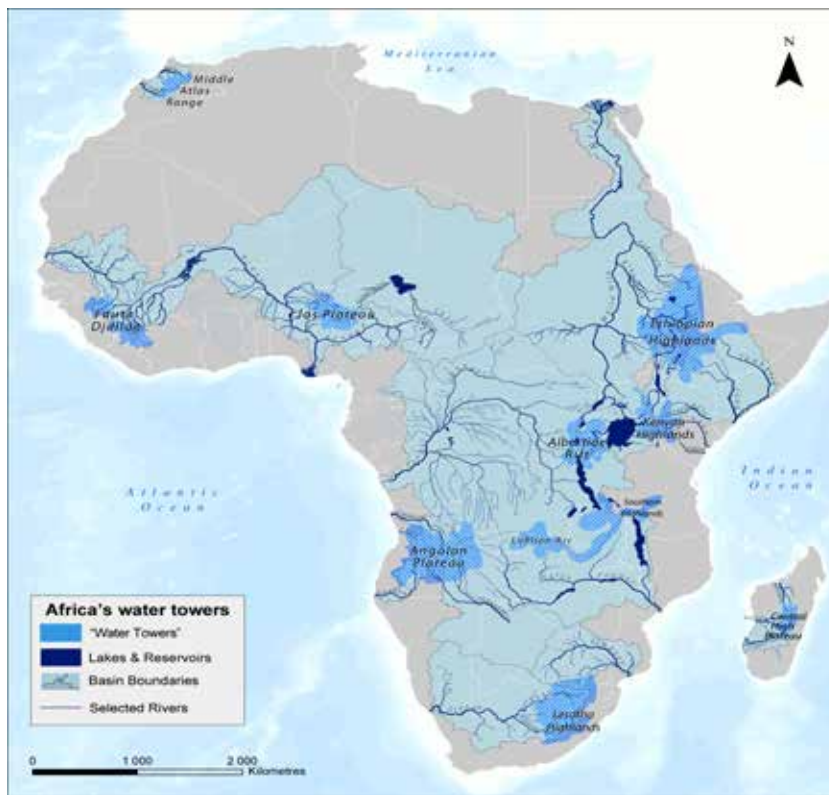
- d) Potential energy that can be used to generate hydroelectricity. Both small- and medium-scale hydro-power production is suitable at numerous sites in the mountains with falls and rapids along streams and rivers, and a number of African countries have moved in to harness this clean energy resource potential, but by far, the bulk of these sites still remain untapped.

The hydrological cycle

Mountains are central to the hydrological cycle in terms of weather making, which is a primary component of water resources; and act as early indicators of climate change (Grab 2008; Kohler and others 2009; ICIMOD, 2011). Being a key indicator of climate change, mountains are central to predictions of future trends and management of Africa's water and other natural resources, for sustainable development.

Like in the rest of the world, all the major streams and rivers in Africa have their headwaters in mountains and highlands, for example: the mighty River Nile has its head waters from the Eastern African mountains in Ethiopia (the Blue Nile and Atbara rivers), while the distributaries of upper White Nile tributary originate from Rwenzori Mountains (River Semuliki), Mount Elgon, Kenya highlands and the Central African Moun-

Figure 57: African water towers



Source: UNEP – Africa Water Atlas (<http://na.unep.net/atlas/africaWater/images/maps/pngs/WaterTowersMap.png>).

tains (Malaba and Trans-Nzoia and the Kagera river systems, respectively, which empty into Lake Victoria); the headwaters of the Congo River rise from Central African highlands; the Orange River system, which is the heart of southern African drainage system, has its headwaters in the Drakensberg Mountains; likewise the headwaters of the Zambezi River rise from the Central African highlands, while the Niger and Volta, the Gambia and Senegal Rivers have their headwaters from the West African Mountains of Cameroon and the West Guinea Highlands, respectively.

Mountains, therefore, represent the main ‘water supply towers’ for a greater part of the continental areas of Africa (Figure 57). This is of vital importance, in particular in some arid and semi-arid areas of the continent, where water resources supply depends by large on the river flow which may be fed to more than 90 per cent from precipitation in mountain source areas of such rivers. A key example is the Nile River, and particularly, the tributaries from the Ethiopian high mountain regions.

The importance that mountain areas enjoy, in terms of water resources, derives principally from the enhanced

precipitation, part of which falls as snow at higher altitudes, at locations where conditions favour the process of firnification. The resultant glaciers (e.g. Kilimanjaro, Kenya and Rwenzori) and ice sheets (e.g. Ethiopia, Atlas and Drakensburg) are important tourist attractions. Mountains, therefore, have critical influence on climate, while climate is a key resource for livelihoods and development; for example, by acting as a critical source of water, and supporting agriculture, biodiversity and tourism, and promoting a disease-free and healthy environment.

Water supply services

Mountains in Africa are the most vital sources of fresh water supplies for drinking, domestic use, irrigation, industry and transport, within and beyond the mountain regions, and beyond national boundaries. Mountain water generates hydroelectricity, facilitates industrial processes, and is critical in irrigated agriculture. As the continent’s population continues to increase dramatically, the demand on fresh water supplies will rise for domestic consumption (especially urban areas), industry



View of Kilimanjaro (left) and Drakensberg (right) Mountains

and irrigation agriculture. Already, hundreds of millions are facing chronic shortages in fresh water supplies.

Africa's population is growing rapidly, and it is projected to more than double by 2050, with almost all of the net increase in population already occurring in the urban areas where the number of people living in poverty is rising (Balk and others 2009; Hermann and Khan 2008). Moreover, increased industrialization will spur development, implying additional water demand. There is a genuine concern that increasing water shortage is a real challenge and will seriously hamper Africa's development efforts, and may lead to stiff competition for water with a risk of escalating conflicts. African mountains have a central role in meeting these impending challenges. However, on account of changing land-use patterns, diversion systems, dams and climate change, Africa faces the increasing challenge of maintaining the reliability and predictability of water supplies from these mountains.

Hydroelectric power generation

In addition to supplying water for drinking, domestic use, irrigation, industry and transport, water stored in mountain lakes, reservoirs and rivers is a potential source of hydroelectric power for an increasingly urban-

ized and industrialized Africa. The use of flowing water to generate power for local use in mountain areas is as old as mankind. Water wheels have been used for centuries mainly for milling grain. Today most countries of Africa use hydroelectric power generated from the numerous rivers whose headwater originates from mountains and highlands.

All the major African rivers such as the Congo, the Nile, the Volta, the Niger, the Zambezi and the Orange, have been harnessed for supply of hydro-power generated at various sites located along the rivers; and moreover, estimates indicate that the potential of African rivers is higher than the current exploitation levels, and numerous sites, especially high in the mountains, remain untapped. For instance, the Congo River has huge potential for hydroelectric power generation. The Inga Hydroelectric Facility on the river could play an important role in providing power to Central, Northern and Southern Africa, and even to Southern Europe. The current generation capacity of 1,115 MW is proposed for expansion to 39,000 MW (UNEP 2006), which would be huge amounts of power generated, enough to meet the extensive export ambition mentioned. For some mountainous regions or countries such as Lesotho, water and its hydroelectric power is a key marketable resource (see Box 21).

Box 21: Water resources in Lesotho

Lesotho is the only country in the world with all of its territory 1,000 meters above sea level or more, and it is also one of the poorest. The Lesotho Mountains, however, form southern Africa's most important watershed and billions of dollars worth of water projects investment have been undertaken based on the water supply from the mountains; for example, a water project which diverts water from the country's Senqu/Orange river, via tunnels and dams, to South Africa's industrial heartland (Panos Institute 2002). Although utilization of this renewable water power is essentially environmentally benign, there are some constraints that have to be taken into account. This is so because over exploitation of mountain water resources can affect fisheries, energy potential and induce disasters.

Water for irrigated agriculture

Water from mountain-related rivers and lakes provide a great opportunity for expansion of irrigated agriculture, which still stands at very low capacity levels in most countries. For example, the Congo River alone covers a catchment area of 3.7 million km² with a total annual discharge of 1,269 km³. The irrigation potential of countries like the Democratic Republic of the Congo, Central African Republic, the Congo and Cameroon, through which the river drains, is estimated to be 8,685,000 ha. In the West African subregion, there are six major internationally shared river basins, all with headwaters from mountains and highlands, and of which the Niger, Volta and Senegal are the largest. The waters of these rivers provide great opportunity for expansion of irrigated agriculture. Box 22 presents an example of the Niger River.

Mountain ecosystems and biodiversity

Due to the altitudinal zonation, mountains contain wholesome, rich and diverse ecosystems, ranging from savannah to alpine forests, making them very different from surrounding lowland ecosystems and key areas of global biodiversity. The vertical dimension and the rise in elevation in mountain areas produce altitudinal zones of different climate, soil and terrain, sometimes over very short distances; and different varieties of flora and fauna adapt to each of these environments. For instance, the tropical and subtropical mountains of Africa have the highest number of vascular plants per unit area, and they are globally unique with respect to biodiversity. Mountains are often referred to as 'islands' of biodiversity rising above 'seas' of lowland landscapes that have been transformed by centuries of human use (Panos Institute 2002). For example, the mountains of Central Africa in Rwanda and Uganda (Virunga-Mgahinga-Bwindi Impenetrable National Parks) are the only home of the about 600 remaining world mountain gorillas.

The mountains of Eastern Africa and Cameroon in Central Africa are among the world's most important biodiversity areas. The high biodiversity of these areas is due to extremely steep geo-ecological gradients. Within a few tens of kilometres, the geo-ecological belts may range from low elevation, warm and humid conditions to high elevation and cold environments. On the highest tropical mountains, which reach altitudes of 6,000-7,000 m, almost all combinations of temperature and precipitation as a function of altitude are found over a short horizontal distance. Compared to lowlands, such a broad variety of ecotopes would span from the tropical rainforest to the arctic tundra, with a horizontal distance of several thousands of kilometres. Superimposed on this large-scale pattern is a small-scale mosaic deriving from the local topography, geology, and microclimates, further increasing the biodiversity richness. Many tropical mountains, particularly the volcanoes (e.g. Mount Cameroon, Mount Kilimanjaro and Mount Kenya) are isolated and the upper vegetation belts, in particular, are sensitive centres of endemism (Fox 1997). Therefore, the mountain regions of Africa are genetic store houses, containing many threatened wildlife species and a vast range of plant species, including crops and medicinal plants.

Mountain forest resources

Mountain forests are capable of providing society with a wide range of goods and services. The values of these various outputs are frequently not fully captured by the market place and, as a result, policy interventions are often required to protect indirect and non-tangible values. The immense wealth forests hold that is potential and central for Africa's development include, among others: genetic diversity, game, hazard protection, landscape, recreation, water quality, water quantity, wilderness and wood (Hamilton and others 1997). In the tropical mountains, loss of forest cover is a serious challenge. In Africa, montane forests continue to be cleared for agriculture at significant rates in Uganda, Ethiopia, Tanzania, Malawi and Zambia, among others. Despite the

Box 22: The Niger river's potential for irrigation

The Niger River which is Africa's second longest river (4,100 km), with a large basin covering 1,471,000 km², has estimated potential irrigable land standing at 1,036,000 ha, in the countries of Guinea, Côte d'Ivoire, Mali, Burkina Faso, Benin and the Niger and out of this only 136,850 ha (13.2 per cent) is currently under irrigation; and this indicates a great potential for increased irrigated agricultural production in these countries. However, sustainability will entirely depend on conservation and land management systems and practices in the major water catchments of the river, the mountains and highlands, as well as the use of water efficient technologies in agriculture.

negative trends, there are many examples of positive developments in the sustainable management of mountain forest resources, such as numerous tree planting initiatives (afforestation, reforestation and agro-forestry).

In many of the mountain areas, there seems to be a shift from economic production functions to social/ecological functions where environmental services (such as carbon fixation and watershed protection), scenic resources and cultural heritage values are increasing in importance. Some of these develop economic functions through tourism, improved water quality and carbon sequestering offsets and these values often outweigh the direct product values.

In mountain areas where certain social and institutional conditions are met, including conducive tenure arrangement, farmers have been able to develop quite sophisticated agro-forestry systems with little input from outside agents, and the practice is playing a number of vital roles: diversified land-use, soil erosion control and soil fertility enhancement, provision of fodder and on-farm crop and animal shade and provision of fuel and other wood products. All these products and services play a major role in supporting the delicate and often highly complex economies of the mountains. Sustainable fuelwood production is increasingly being practiced. This is usually done as a stand improvement to enhance the value of the forest for subsequent commercial logging and can have little adverse impact on the other forest environmental services. Mountain forests provide rural people with a wide range of non-wood forest products, including fruits, vegetable, nuts, mushrooms, roots, sap, cane, resins, gums, spices, fibre, dyes, medicinal plants, cultural activities and fodder. Although individual non-timber products are usually less economically significant than timber, as a group they provide more regular income and can sometimes contribute more to domestic and international economies on a per hectare basis than timber.

The different slopes, exposures and vegetation belts of mountains produce a variety of habitats and, therefore, a high diversity in fauna. Among the most interesting and rare species are the mountain gorillas of the Virungas in the Democratic Republic of the Congo, Rwanda and Uganda. Mountain forests are often the last wild refuge of hitherto wide-ranging species, especially top carnivores. In the tropical mountains, where forests are still being cleared for agriculture or grazing, the resulting shrinkage and fragmentation of habitat is taking a

serious toll of wild animal populations. On most of the mountain slopes of Africa and, especially, high mountains, the uppermost parts have been designated conservation areas and are particularly protected as water catchments. And in some cases where a higher protection status was found warranting, the conservation areas were upgraded to National Parks, for example on Mount Elgon in both Uganda and Kenya and Rwenzori Mountains in Uganda.

Agricultural potential of mountains

Whereas mountains of Africa are generally perceived as areas where the conditions of human life are difficult, they have been very attractive for human land-use, particularly for agriculture and settlements. The mountains of Africa represent some of the most productive agricultural areas of the continent, mainly due to their mode of formation, thereby influencing soil types; and location and altitude, that influence proximity and orientation to rain bearing winds and air cooling for rain formation. Mountains of volcanic origin such as Mount Kenya, Mount Elgon, Ethiopian mountains and Mount Cameroon are known to possess some of the most fertile and productive soils, attracting heavy population densities and high intensities of agricultural practices. These are based on both cash crops (dominated by coffee and tea) and food crops largely for home consumption and sale of limited surplus to meet domestic cash income needs.

Even in the non-volcanic mountain areas such as Rwenzori Mountains, where soils may possess low fertility limitations, high rainfall and crop moisture reliability make them agriculturally productive as long as extreme gradients and rooting depth of soil do not cause additional limitations. In the Atlas Mountains, farming communities use indigenous irrigation technologies on vibrant small-scale farms dominated by fruits and vegetables, which are sold to the urbanized population markets in the lowland, and some exported to Europe. This makes the mountain areas of Africa very important for agricultural production. Hence, mountain areas greatly contribute to the development of the continent, given the dominant role of the agricultural sector in the economies of most African countries.

These sound and innovative land management practices have not only promoted conservation of the basic natural resource in a very fragile environment, but have also promoted development, and increased the land carrying capacity of population – for example, in Gedo Dis-

trict in Southern Ethiopia, and Mount Elgon slopes in Uganda, where high population densities of up to 1,300 people per sq. km. are to be found.

Mountain attractions and tourism development

Due to their attractive and adventurous landscapes, mountain regions are among the major tourist destinations. The altitudinal zonation and spectacular landscapes in mountain areas provide prime and unique attractions which promote tourism, a key industry in most national economies. The attraction is also true for sporting, pilgrimages and sacred sites in mountains that frequently draw tourists and trekkers seeking colourful sights and interesting and spiritual experiences.

Wildlife tours in mountains of Africa offer a way in which some monetary value can accrue to mountain people. For instance, the Parque National des Volcans earns about \$1 million in entrance fees and \$2-3 million in other services, which makes the wildlife resource-based activity a major part of the country's foreign exchange earnings. Where wildlife values are high, forest harvesting has often been modified, restricted severely, or even banned. Mountain tourism is also propelled by the rich biodiversity within short distances. Tourism in mountain areas, therefore, is a potential long-term source of income for Africa and, if well and wisely managed, can create positive effects that can be channelled towards both conservation and benefit sharing. Different countries are already implementing projects in mountain regions that comprise components on promotion of sustainable tourism. The economic, social and cultural impacts of mountain tourism, is an issue of focus when considering the role of this industry in sustainable development.

Minerals in Mountains

The association between mining and mountains is generic; the same natural forces which have raised mountains have also helped concentrate assemblages of minerals useful to human society. Economic minerals such as copper, cobalt limestone, gypsum and marble have been discovered in mountains, and are key resources for national development. Specific examples include copper and cobalt in the Rwenzori Mountains and tin and wolfram in the Kigezi mountain region in Uganda. It is for this reason that the world's great metallogenic zones are all related to past mountain building, whether the

mountains are still standing or have long been reduced to lowlands by denudation processes to form the African surface.

There is no doubt about the valuable role played by the mining industry in Africa's development, including poverty reduction at community level through provision of employment, both direct and indirect. However, mining in mountains is presently at a much lower scale compared to other mountain regions of the world, such as the Andes in South America. The bulk of African mountain regions have not been explored for minerals, although the explorations have increased in recent years. Mineral discoveries could drive the development agenda in the mountain regions.

Mining, however, has to be undertaken with care due to the high sensitivity of mountain environments. Whereas exploration may have only limited effect and adverse changes can be fairly easily controlled and reversed, extraction brings with it the environmental challenges associated with the disposal of large quantities of mine waste – overburden, tailings and minewater.

Indigenous knowledge, social-cultural values and practices

Both indigenous knowledge and social-cultural values and practices have indirect but significant contribution to development, especially among the mountain communities. This is achieved through various ways, including fostering social discipline and cohesion, innovations in sustainable natural resource management practices and tourist attractions. In Kenya, for example, traditional Kikuyu revere Mount Kenya (or Kere-Nyaga) as the seat of a divine power, or the resting place in this world of Ngai or God. In times of drought, modern day Kikuyu tribe still fall back on pre-Christian traditions and face Mount Kenya or Kere-Nyaga to ask Ngai or God for rain (Bernbaum 1997). The mountain sacredness acted as an inspiration to the Mau Mau Movement to put up a spirited and protracted fight for independence from British colonial rule.

Due to the vertical distribution of different environments and the seasonal variation in conditions at each level, resources are stratified and require a staggered schedule for their effective exploitation. Nomadic pastoralism, transhumance and mixed forms of grazing and farming cultures that include different uses for various altitudes have prevailed as basic human responses



Settlement springing up at the foot of Atlas Mountains, Morocco

Photo Credit: London Lamington - http://londonlamington.files.wordpress.com/2012/07/img_0243.jpg

to these conditions in African mountains, particularly in sub-tropical Africa. The Darfur in Western Sudan provides a good example: until very recently the mainly Arab pastoralists, the Dars, and the sedentary Fur farmers were interlocked in a complex solidarity relationship. Both groups have depended heavily on the region's natural capital: the Arab pastoralists on the pastures in the arid and semi-arid Sahel, the Fur on the agricultural resources of the humid Jebel Marra mountain massif. This kind of co-existence between societies and communities provides an invaluable ingredient for sustainable development in Africa, particularly the mountain regions. Furthermore, migrations into the plains historically have been a means of coping with the surplus population which could not be sustained by these various forms of altitudinal conditioned resources and indigenous knowledge aided adaptation.

Highlands-lowlands interaction

The driving economic forces of interdependence between highlands and lowlands stem mostly from better knowledge of and better access to the rich natural resources in mountains, such as hydro-power, minerals timber or even rich agricultural soils and tourism. The roads have now become a catalyst to unprecedented mass extraction of these resources. An extra level of exploitation in some cases may involve seasonal movement of cheap human resources from the mountains to work in the lowlands, which is quickly facilitated by

the new and improved transportation systems. Thus, in many areas of the continent the relationship between the mountains and lowlands has, for a long time, been characterized by unequal terms of development opportunities and priorities, and by enhanced dependence of the mountain communities on the market in the lowland. The new socio-economic marginalization of the mountain areas is the result of their unequal economic integration into the larger economy of the lowlands.

All over Africa, towns and cities growth and development have some linkage to the products and interactions with the mountains, particularly those located at or near the foothills of the mountains. The Uluguru Mountains in Tanzania, for example, are renowned for biodiversity conservation and water supply to the capital, Dar es Salaam whose population is estimated at 3-4 million people (Misana and others 2012). In addition, more than 100,000 of the Uluguru people live on the mountains and grow cash crops throughout much of the year, including temperate vegetables. Their produce is sold to urban residents in the lowlands. In Uganda, Mbale one of the largest towns in the country owes its growth partly to the sale of cash crops, particularly Arabic coffee one of the world's finest products, which is grown on the mountain slopes. The River Manafa which descends from the mountain provides water supplies to the town. In the western part of the country, the rapid growth of Kasese town on the foothills of Mount Rwenzori is greatly owed initially to the past

copper mineral mining from the mountain and later to continued exchange of agricultural products and human resources from the mountains.

6.3 Opportunities and good practices for the sustainable management of mountains

Mountain farming techniques:

Through centuries of occupation, local communities in mountain regions have evolved and applied best natural and socio-cultural resources management technologies and practices that are well or better adapted to mountain conditions and challenges; and of recent, they are gradually being integrated into the so-called modern technologies and practices introduced from outside, normally by Government sectoral institutions.

The following are some of the key examples:

- a) *Terracing*: for example, the Konso terracing practiced in Ethiopia; fanya juu terracing in Machakos, Kenya; and contour-bunding and terracing in Tigray in Ethiopian highlands and Kigezi region in south-western Uganda. Terracing steep slopes in order to use marginal land without substantially degrading it; terracing catchment areas of small dams that serve a village without jeopardizing water use of downstream users (e.g. in Eritrea);
- b) *Agro-forestry (both indigenous and modern), intercropping and post-harvest management*: Agro-forestry has been used for conservation, soil fertility and soil and water conservation in general, provision of shade to crops like coffee (e.g. in Mount Elgon, Uganda), and provision of miscellaneous other services such as timber, wood-fuel, building materials, fodder and windbreaks;
- c) *Mixed farming systems, intercropping and post-harvest management*: which have been practiced to promote diversified farm income and land husbandry; maximize productivity per unit area, as well as for soil erosion control and nutrient management; and to improve food security, marketing opportunities and enhancement of household, regional and national incomes;
- d) *Transhumance*: which is still widely practiced in some mountain regions although in others, it is on the downward trend; it is a good example of efficient spatial use of land resources practiced by mountain people, and is dictated by altitudinal and climate or seasonal changes and variations;
- e) *Construction of furrows and irrigation channels*: in order to manage and distribute water for crop production and domestic use; for example, the Tuareg community in the Atlas Mountains in North Africa, where ingenious management of water resources in the otherwise relatively dry mountains, has enabled productive agricultural system based on a variety of crops, including fruits and vegetables.
- f) *Local and regional marketing of agricultural products*: is taking place in the production systems of many mountain areas, encouraged by potential markets in the surrounding lowlands. This opens up development opportunities to the largely isolated and marginalized mountain economies;
- g) *Planting of drought-resistant food crops and cash crops*: for more food security and for accumulating some cash such as is beginning to take place in Tanzania;
- h) *Shifting from range grazing to stall-fed cattle (zero grazing)*: where grazing land is scarce or where the land tenure systems favour dairying and mixed farming, for example, what is happening in most mountains of Eastern Africa and Central Africa, including, among others, Mount Elgon in eastern Uganda, the Kigezi highland in south-western Uganda and in Rwanda;
- i) *Electrification of mountain areas*: to promote crafts and small-scale industries for landless people, mainly young men and women; diversifying the production base of an area from farming alone, by developing labour-intensive manufacturing and handicrafts, cottage industries, with the purpose of absorbing both surplus peasant labour and produce, and the live-

stock herders to cope with the ‘too many people doing the same thing’ syndrome. This practice is just beginning to take place in some African mountain regions, like is the case in Uganda, and may in the long-run, be of significant solution;

- j) *Land reform initiatives*: to return land to its original owners, where the originally dispossessed, and land consolidation in densely populated areas where land fragmentation is a problem, for example the Benet community (formerly forest dwellers) in the Mount Elgon of Uganda. This is normally followed by comprehensive land-use plans which take into account competing land-use and land-tenure systems.

Restoration of degraded forests

Many mountain areas are under heavy population pressures, which have resulted in inappropriate clearance of vegetation cover and associated land degradation. The African highlands are among key examples of large-scale deforestation; however, efforts have been made to restore the forest cover in many areas on the mountain slopes, driven by two forces. One has been the desire to restore on-site productivity for the benefit of local communities; the other has been a perception that restored forests will provide downstream benefits of improved stream flow and reduced sedimentation; and of recent, it provides the best adaptation insurance against impacts of climate change. There is no doubt about the local benefit derived from restoration, through an increase in the availability of forest products and improved on-site productivity. This is achieved by decreasing slope erosion and restoring nutrient cycles through re-establishment of a fully functional ecosystem. However, large-scale reduction of downstream flooding and river sedimentation as a result of reforestation of small mountain watersheds is less likely, and the limited efforts that have been undertaken confirm this conclusion.

Collaborative management of protected ecosystems

Conservation has to achieve a balance between local and wider needs, if it is to succeed; this is increasingly about seeing people as an integral part of a mountain ecosystem rather than excluding them from certain protected areas. The more traditional approach does not always recognize the reliance of local populations on a

protected area, either for forest products or grazing. A good example of collaborative approach is the recently introduced biosphere reserves management, which is used in some mountain areas of Africa such as the Rwenzori Mountains and recognizes the key role of people in areas of high biodiversity. They consist of core, buffer and transition zones that meet the need for various levels of protection as well as for human activity in each zone. Therefore, good practices in mountain ecosystem conservation in modern times ensure that people do not have to make difficult choices between their own survival and that of mountain ecosystems. In this regard, conservation has to be materially beneficial for them, for example, through a rights and royalties system; tourism and trophy hunting; and cultivation and sale of medicinal plants. Presently, in Uganda and a number of other mountain countries of Africa, the approach is being given much emphasis, as the only means of involving the people to cultivate the spirit of ownership and responsibility for conservation, for the sake of sustainability and; the approach is steadily gaining favour, both in the responsible Government institutions and the affected communities.

Designation of some mountain areas as World Heritage sites

In an effort to conserve biodiversity, selected mountain parks of the world are given added prominence through their participation in the UNESCO Biosphere Reserve Programme, inscription on the “World Heritage List”, or because they are in a trans-frontier location. Virunga and Kahuzi-Biega National Parks in the Democratic Republic of the Congo, Rwenzori Mountains National Park in Uganda and Mount Kilimanjaro National Park in Tanzania, are examples of Mountain World Heritage sites. Other sites under consideration include Imatonga Park in the Sudan and Atlas Mountains Park in Morocco (for flora and watershed). Many of the mountain parks on the World Heritage List receive substantial benefits such as increased funding and strengthened protection.

Subregional cooperation and transboundary resource management

Transboundary natural resources management is a relatively new approach and considered to be most ideal, given the transboundary nature of natural resources. Ecosystems such as forests, wildlife, watersheds for streams and rivers, among others, are all transbound-

ary in nature, normally transcending regional and national boundaries. Mountain ecosystems are particularly transboundary and, in many cases, they form boundaries between two or more regions and countries. Transboundary management approach not only respects the integrated nature of the ecosystems regardless of the administrative boundaries, but also provides for cooperation and harmonization of policies and management practices between various communities, regions and countries, and hence the approach is considered one of the best mountain resources management practices.

The Eastern African Community (EAC) and the Nile Basin Initiative (NBI) are some of the subregional examples where transboundary mountain resources management approach is being adopted. Under Article 51 of the Eastern African Community Protocol on Environment and Natural Resources Management, member countries in 1999 signed a memorandum of Understanding for cooperation in Environmental Management provided for under Subparagraph (a) of paragraph 1 of Article 142 of the Treaty. Article 20 of the protocol entails management of Mountain Ecosystems, and paragraph 3 (b) emphasizes the promotion of regional cooperation and exchange of data and information on transboundary mountain ecosystems. Partner States are argued to develop and harmonize common policies, laws and strategies for ensuring sustainable development of mountain ecosystems: “partner States shall protect mountain ecosystems such as critical water catchments, conservation and heritage areas and other areas of common strategic interest at the local national, regional and international levels”, the Article states.

6.4 Threats and challenges in sustainable mountain area development

Population demographics

Despite being difficult environments, mountain regions of Africa are not always sparsely populated. While overall densities tend to be low compared to the densities found in lowlands, the habitable parts of the mountains can be very densely populated, particularly where the agricultural potential is greater than in the plains. Some mountain areas in Africa have the world's highest rural population densities, for example the Virunga volcano

region of Rwanda has a population density of 400 people per km², and in southern Ethiopian mountains and Mount Elgon slopes population densities reach 1,300 people per km². This presents a major challenge of balancing resource use capacity and population demands; as such densities have put tremendous pressure on natural resources. This factor is largely responsible for the increasing ecosystem degradation, resource use conflicts and out-migration in the mountain regions, hampering resource productivity and sustainable development efforts.

At the same time, mountains remain more isolated than lowlands and, in some areas, access is difficult. This makes them less attractive to investments compared to lowlands, further exacerbating marginalization and under-development. Because of the fragile and difficult terrain, transport and communications infrastructure in the mountains require high investment costs for construction and maintenance. Partly because of the low investment level and economic opportunities, out-migration, particularly of young people in African mountains, continues. One of the primary reasons for out-migration is the search for better and wider employment opportunities. While mountain communities have long functioned as reserve of labour for the lowlands, today more people leave mountain areas for lowlands, and more temporary or seasonal migration is turning into permanent migration. Education is another cause of out-migration from the mountain regions in Africa, where many and better places of higher education are in lowlands. Other reasons causing migratory flows away from mountains include the desire to live in a more central location where decisions are taken and more opportunities exist, but also a desire to enjoy better social and modern amenities in the capital and towns.

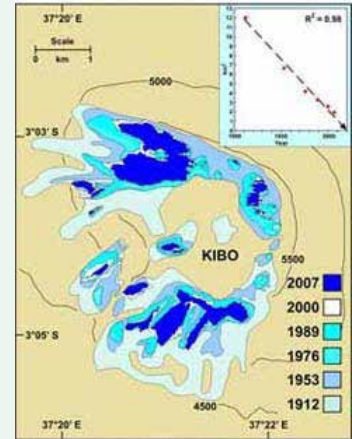
Mountain water resources under pressure

Mountain water resources are increasingly coming under pressure, with serious implications for both mountain and lowland areas. Lowlands regions, which today heavily depend on mountain water resources, might be adversely affected by altered discharge patterns from mountains and increasing demands for water for food production. Increasing demand on river water coupled with increased population pressure and land degradation (especially in the headwaters) are a looming threat to sustainability of the water resources and use, both upstream and downstream. This situation presents a

Box 23: Changing ice and snow cover on Mount Kilimanjaro

Since at least the 1880s, the ice on Mount Kilimanjaro has been retreating both in thickness and in area, with the latter's decline most dramatic (Campbell 2008). Compared to 1800 when ice covered about 20 km², by 2003, the area had shrunk to about 2.51 km² (Cullen and others 2006). An estimated 82 per cent of the ice cap that crowned the mountain when it was first thoroughly surveyed in 1912 is now gone, and the remaining ice is thinning as well – by as much as a metre a year in one area. According to some projections, if recession continues at the present rate, the majority of the remaining glaciers on Kilimanjaro could vanish in the next decade (UNEP 2005).

The ice cover on Kilimanjaro's Kibo glacier has been mapped intermittently since 1912 (see adjacent figure). Since then, research by Thompson and others (2009) shows that 85 per cent have disappeared and 26 per cent of the ice that remained in 2000 was gone by 2009. Between 2000 and 2009, the Furtwängler Glacier thinned by about half at the research site, and ice volume on two ice fields thinned or shrank by nearly the same volume between 2000 and 2007 (Frömming 2009, Thompson and others 2009).



Source: UNEP GEAS (<https://www.ihdp.unu.edu/file/get/7727>) and UNEP (2007).

special challenge with respect to managing shared water resources. For example, over two million people rely on water supplies from Mount Kenya. In recent years, farmers in the highlands around the mountain are using more and more water for crop irrigation, which has significantly reduced downstream water flow, thus, having a negative impact on those whose survival depends on lowland pastures, cattle ranching and tourism in wildlife parks. The pressure is also noticeable in changes in ice and snow cover on Mount Kilimanjaro and other mountains of Eastern Africa (Hastenrath 2010).

Natural resources degradation

The rich natural resources that abound in mountains have attracted an array of users, with a consequent increase in pressures. In most mountain areas, there are already intense pressures from human activity, leading to severe degradation of the resource base. This is expected to worsen with increasing population density, resulting from both natural increase and mobility from outside in search for natural resource extraction, tourism and recreation. Furthermore, today migration to mountain areas is facilitated by recent developments in communication infrastructure, which is gradually reducing the obstacle of inaccessibility. Clearing of forests for road construction, agriculture, settlements, tourism and recreation facilities are on the increase in mountain areas of Africa as Governments attempt to open the areas and to foster development. These processes are causing unprecedented degradation pressures on mountain ecosystems,

and have obvious consequences for their sustainability. Managing mountain resources sustainably and for poverty reduction is thus one of the key challenges.

Mountain hazards and disasters

Mountain hazards and disasters are mainly caused by the fragility of the mountain environment, mainly in the form of rugged and steep slopes, largely covered by unconsolidated earth materials, which are prone to soil erosion, landslides and related phenomena. Like elsewhere in the world, records are available to suggest that mountain peoples in Africa face hazards and disasters that stem from both natural causes such as earthquakes and volcanoes, and those that are caused or triggered by human activities such as soil erosion, floods, landslides, fires and conflicts. Volcanic eruption-related disasters are limited to a few active volcanoes such as Nyamulagira and Nyiragongo in Central African Mountains of the Democratic Republic of the Congo, which most recently have erupted several times causing extensive damages. Whereas volcanic eruption cannot be prevented, the associated disaster risks such as the number of victims and the damage incurred can be reduced through better planning and preparedness.

On the other hand, many African mountains such as the Atlas in North Africa and Rwenzoris in Eastern Africa are prone to earthquakes that often trigger other disasters such as landslides. Disasters are exacerbated by high rainfall, steep slopes and unstable or unconsoli-



Landslides on the slopes of Mt Elgon, Uganda 2012 caused human and socio-economic losses

dated materials in mountains. Steep mountain slopes trigger rapid movement of rocks and soil as well as large amounts of water and snow, causing avalanches, floods and landslides. For example, the mountain regions of Uganda, and especially Mt. Elgon slopes, in 2010 and 2012 experienced severe and extensive landslides and flooding, largely as a consequence of deforestation, intensification of farming steep slopes and unusually heavy and prolonged rainfall. A collaborative approach to managing the entire ecosystem has been proven to help address such disasters (Scott 1997).

6.5 Conclusion and Recommendations

Conclusion

There is substantial value in African mountain areas and their conservation is critical to sustainable development. The sustainable use of fragile mountain resources is possible, provided good management systems, technologies and practices are used during implementation of relevant and well developed programmes, projects and activities. A deeper understanding and appreciation of the benefits of ecosystem conservation accompanied by availability of alternative sources of livelihood, and involvement of the indigenous people and local communities in the management of mountain ecosystems has been shown to help reduce resource-use conflict and promote sustainable development in mountain regions. There are pertinent interlinkages between the various components of mountain ecosystems and resources and the use or management systems subjected to them. Our understanding of these interdependencies may foster synergized implementation of initiatives to achieve sustainable development in the mountain regions of Africa.

Recommendations

Recognizing the diverse benefits of mountain ecosystems. It has been amply demonstrated that mountain regions contribute to sustaining and enhancing livelihoods, and to sustainable development in Africa. There is therefore a need to recognize the benefits from mountain ecosystems in guiding the design of policies for regional, transboundary, national and local actions in support of sustainable mountain development.

Enhancing mountain resources governance: For sustainable management of mountain regions, appropriate financial, environmental and economic incentives for mountain communities should be promoted to protect the ecosystem. Stronger governance at all levels will facilitate putting in place policies, strategies and instruments for sustainable management and investment in mountain areas, including broad-based participation in conservation and to attract other actors such as the private sector to finance conservation.

Targeted institutional strengthening and capacity building: This should target mountain inhabitants and other actors in the mountain resource value chain, and encompass holistic approaches, a long-term plan to strengthen the capacities and capabilities of national, regional, and global institutions. Political leaders and policymakers should be sensitized and mobilized to appreciate research and investment in mountain regions, among national and subregional priorities, and to use the resulting information to make informed decisions on mountain ecosystems management and development.

Good management practices: There is an urgent need to upscale and replicate good management practices, technologies and success stories. New management ap-

proaches such as collaborative management and other forms of community involvement in ecosystem management should be out-scaled to consolidate sustainable development efforts.

Improving transboundary cooperation in the management of mountain regions: Because many mountain regions traverse national borders, their conservation and management must incorporate approaches to deal with challenges and harness opportunities in using regional cooperation. This would demand strengthening networks and regional conventions and enhancing coordination of activities. The efforts should also involve regional efforts in legislation and support for systematic research, capacity building and the generation and use of mountain-specific data and knowledge bases.

Specific action points/options:

- Adopting mountain-specific strategies in national poverty reduction and sustainable development plans and programmes to ensure a dual-purpose of achieving mountain conservation and poverty eradication.
 - Developing and promoting local and international markets for mountain ecosystem services, as well as encourages the private sector through appropriate policy and regulatory tools
- to support investments in sustainable mountain management that would unlock their potential in advancing inclusive and broad-based growth for sustainable supply of energy, water and high-quality mountain agricultural products.
 - In order to determine the levels of investments in mountain areas, as well as to identify the likely impact of such investment on mountain areas, it is critical that Governments are able to provide disaggregated information regarding programmes, projects and activities for investment at the national and subregional levels. The identification of investments requirements and knowledge of the contribution of these regions to development would help to identify the funding gap and prioritize investments.
 - Incorporate value (cost & benefits) of mountain resources in national wealth accounting, resource allocation and sustainable development plans.
 - There is an urgent need for more rigorous and innovative resource mobilization for implementation of initiatives to promote productive ecosystems in mountain regions and secure sustainable development of communities.

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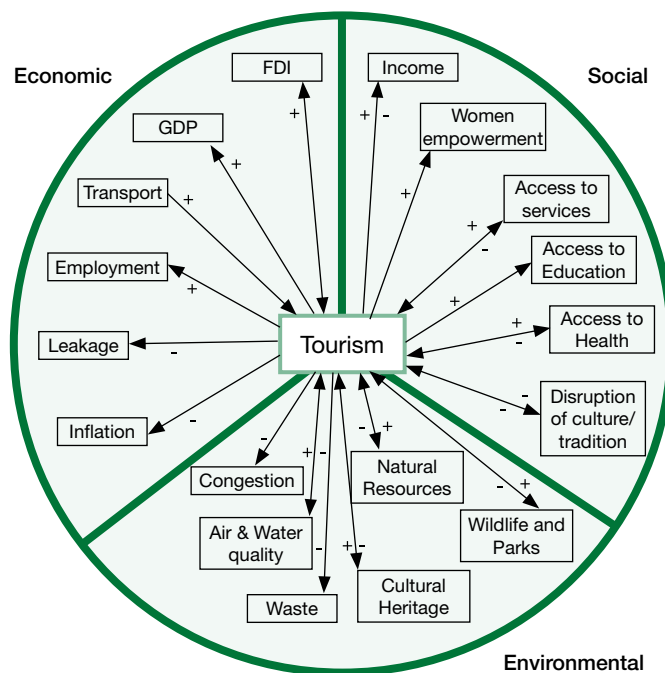
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7. Tourism

7.1 Introduction

The emergence of tourism as a major industry is a remarkable opportunity to take advantage of this sizeable, complex industry that is governed by the laws of supply and demand. Historically, mass tourism was promoted with little regard for the general impact on the environment and social and economic structures of the locations where the tourism activities took place. With a growing awareness of the links between the quality of the environment on which a large percentage of tourism activities in Africa depend and the economic value accruing from the product as well as the potential social benefits for local communities, there has been a concerted shift towards protecting natural resources and addressing the concerns of local communities. Tourism can affect sustainable development in a variety of manners, as shown in Figure 58.

Figure 58: Linkages between tourism and sustainable development



Key: + indicates positive influences, - indicates negative influences.

The magnitude and direction of the impacts depend on the type of tourism and the prevailing social, economic and environmental milieu of the area concerned. Increased tourism may have positive impacts on poverty reduction through higher employment opportunities and rising income levels, positive environmental changes and access to services such as water supply and sanitation, transport, health care facilities, that may be developed to boost the tourism sector.

However, tourism may also drive prices up, effectively eroding the purchasing power of local communities. Increasing demand on water and sanitation services may put excessive strain on the infrastructure, reducing water availability for local communities. Unregulated tourism may have significant negative impacts on natural resources, including conservation areas. Moreover, unregulated tourism development may lead to strong inflationary pressures due to tourist demand, higher costs of infrastructure development and leakage to international investors or corporations. Unregulated tourism can also pose significant threats for environmental quality: tourist attractions are often in environmentally sensitive areas; excessive use of resources such as water and generation of waste and wastewater, which may become problematic during significant peak periods, are a high risk, especially in developing countries; unregu-

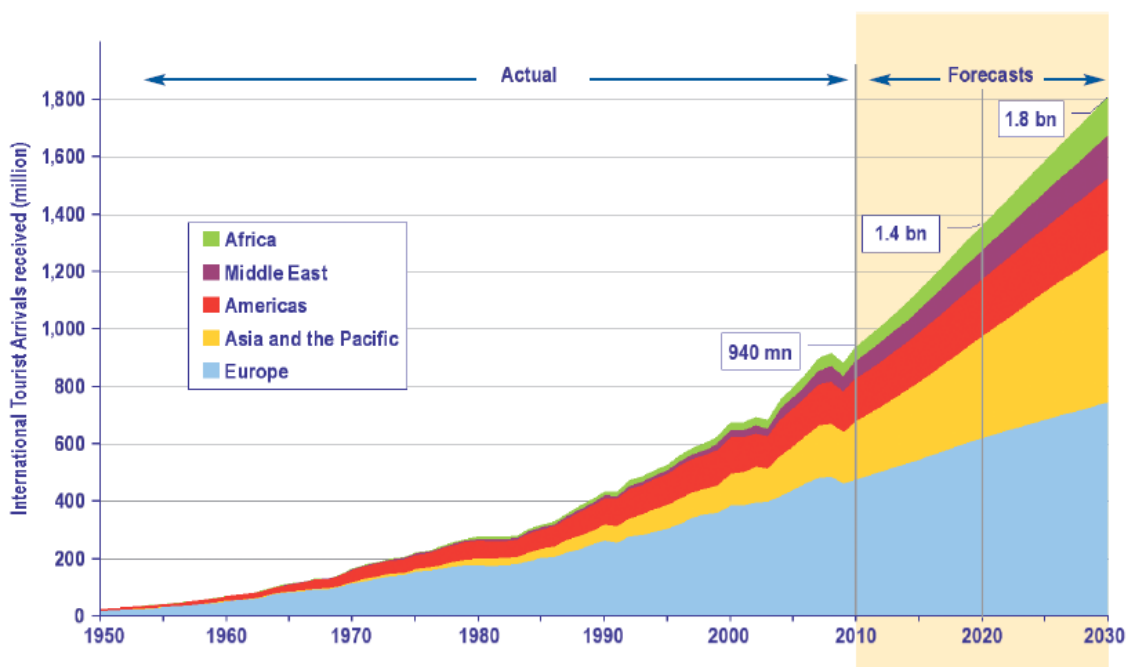
lated tourism may also lead to congestion – both for locals and the tourists, thus decreasing the attractiveness of the destination in the case of the latter.

The challenge in implementing sustainable tourism programmes remains bridging the gap between economic benefits and tangible poverty reduction. The potential for tourism to contribute significantly to poverty reduction is considerable, yet in many countries this potential remains largely untapped. This calls into play the strength of the policies adopted by individual countries and regional blocks.

7.2 Contribution of tourism to poverty reduction and sustainable development

In the last two decades, the tourism industry has experienced phenomenal growth that has seen it occupy a significant role in the global economy. The industry today ranks fourth in the export category worldwide after fuels, chemicals and automotives, accounting for 30 per cent of total commercial services exports. Furthermore, the global tourism industry now accounts for 5 per cent

Figure 59: Actual (1950 – 2010) and forecasts (2010 – 2030) international arrivals



Source: UNWTO (2011).

of total economic activity, generating over \$1 trillion a year – equivalent to about \$3 billion per day – and employing 6-7 per cent of the total workforce in 2009. In the same period, the industry contributed about 9.4 per cent of the global Gross Domestic Product (GDP) and employed over 235 million people worldwide (WEF 2011). During the period 2005–2007, Africa recorded an exceptional growth in tourism receipts (9–11 per cent a year) compared to a global average of just 5 per cent. Only Asia recorded higher growth during the period. Figure 59 shows the UNWTO trends and projections in global growth in tourism of Africa in relation to other regions.

In 2009, Africa was the only region to show growth in tourist arrivals. According to UNWTO (2010b), a continued growth trend was observed in the region for 2010, with an 8.8 per cent increase in arrivals. In the same year, Africa received 63 million tourists. Significant events contributed to boosting tourism arrivals. For instance, the 2010 FIFA World Cup proved very successful as South Africa's arrivals increased by 15 per cent in that year with more than 309,000 visitors arriving to attend the sporting event. If past and current trends continue, the tourism sector is expected to continue playing a significant role in the global economy. UNWTO (2010b) estimates that by 2020 there will be 1.6 billion international tourism arrivals.

However tourism receipts in Africa declined by about 2 per cent between 2007 and 2008 (UNWTO 2010b) (see Table 23). Although regions such as Central Africa and West Africa have shown a rapid increase in tourism receipt, starting from a very low base, the magnitude of receipts remains low, particularly in Central Africa.

Key countries dominating Africa's tourism landscape are Egypt, South Africa, Morocco and Tunisia. Other main destinations are Mauritius, Tanzania, Kenya and Ghana. In the region, North Africa outperformed Sub-Saharan Africa by a wide margin. In the global rank-

ings of 2010 Travel and Tourism Competitive Index (TTCI), Tunisia was the top-ranked African country at 47th position, followed closely by Mauritius at 53rd. Tunisia and Mauritius are joined in the top half of the overall rankings by only one other African country, South Africa. Tunisia, Mauritius and South Africa thus clearly set themselves apart as the top African performers in travel and tourism competitiveness.

The meagre global share and skewed geographical distribution of tourism within the continent still poses a concern as to the extent of the industry's contribution to sustainable development in Africa as a continent. Countries that have a strong economy seem to fair better in tourism circles. This could be due to the dependence of the tourism industry on a well-planned and efficient infrastructure on which it can operate. This would include good roads, well trained personnel, supportive policies, efficient communication systems and security. The regional share of tourism receipts for 2008 is illustrated in Figure 60.

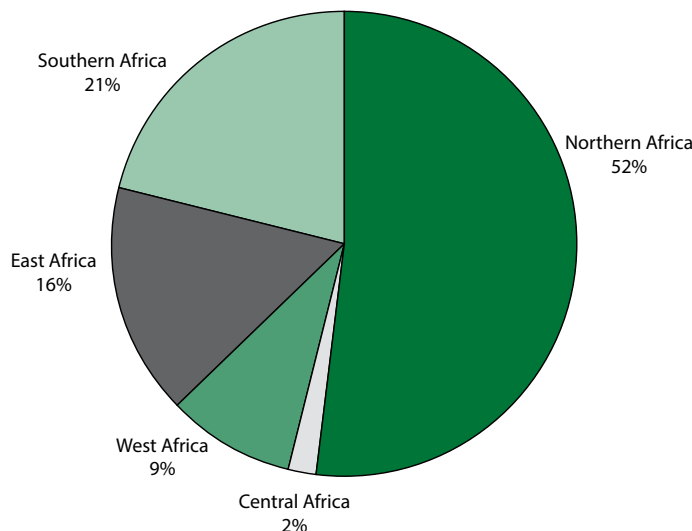
According to UNWTO projections, Africa's tourism growth trend is expected to continue, reaching a 77 million arrivals mark by year 2020 (UNWTO 2011). Tourism development in Africa differs between the North and South, with North Africa attracting more than half of all tourism receipts to the continent. In North Africa tourism is already the most important generator of economic development and jobs, while Sub-Saharan Africa has a long way to go to capitalize fully on the continent's tourism potential. Whereas North Africa's Travel and Tourism Sector has the biggest relative impact on the overall GDP and employment creation of all the 13 world regions, Sub-Saharan Africa's relative contribution ranks low in terms of its real size and overall impact (Table 24).

Africa's limited share of the 3.2 per cent of international tourism receipts accounted for approximately \$30 billion in 2008. In the same year, however, Africa's tourism

Table 23: International tourist arrivals and receipts

	International Tourist Arrivals (millions)					International Tourism Receipts (US\$)		
	2008	2009	2010	Global market	Average Annual Growth rate	2009	2010	Global share (%)
South Africa	44.4	46.0	49.4	5.2	6.4	28.8	32.6	3.4
North Africa	17.1	17.6	18.7	2.0	6.2	9.9	10	1.1
Sub-Saharan Africa	27.2	28.4	30.7	3.3	6.6	18.9	21.6	2.4

Figure 60: Regional share of Africa's tourism receipts, 2008



Source: UNWTO (2009).

share of GDP was only 1.1 per cent – indicating high economic leakages and imports in the sector and, thus, limiting the positive impacts of the industry on national economies.

Tourism is an important sector for employment in the region – though its absolute and relative importance varies considerably across subregions (Table 24 and Table 25). North Africa dominates on this front with the highest number of individuals directly employed. Island States like Mauritius on the other hand show that a large section of their economy is driven by tourism.

In recent years, the role of tourism has become more recognized in the context of the sustainable use of natural resources and the sector's potential contribution to

the country's economic growth. The UNWTO Vision 2020 for Africa forecasts a growth in Africa's share of global tourism arrivals from 3.6 per cent in 1995 to 5 per cent in 2020. This growth represents the potential for various impacts on the respective countries involved.

There has been considerable improvement in Africa's participation in industrial and technology intensive sectors in the global economy, but there are still many countries in the continent that struggle to compete globally. The potential for tourism to contribute significantly to poverty reduction is considerable. Tourism provides several opportunities for economic growth and job creation for many of these economies, through a variety of channels, as shown in Figure 61.

Table 24: Tourism's contribution to Africa's GDP

2009	North Africa	Sub-Saharan Africa	Total Africa	World
T&T industry as % of GDP	5.3	2.2	3.3	2.3
T&T economy as % of GDP	11.3	6.7	8.3	9.5
T&T industry as % of employment	5.8	1.7	2.5	2.7
T&T industry	11.2	4.6	5.0	7.6
T&T industry (direct) employment size ('000 jobs)	2,810	3,338	6,148	77,276

Source: WTTC 2009 T&T relative size to regional GDP and employment – ranking of 13 World regions*

T&T – Travel and Tourism, GDP – Gross Domestic Product

*Regions are: The Caribbean, Central and Eastern Europe, European Union, Latin America, Middle East, North Africa, North America, Northeast Asia, Oceania, Other Western Europe, South Asia, Southeast Asia, Sub-Saharan Africa.

Table 25: Tourism Employment as Percentage of Total Employment (2010)

Country	% of Total Employment	Direct Employment
Seychelles	22.1	8600
Mauritius	12.7	70,300
Cape Verde	12.6	14,400
Tunisia	7.7	247,800
Morocco	7.6	862,400

Source: WTTC (2011).

Box 24: Botswana bounces back – moving beyond mining

With a stunning scenery, including the unique Okavango Delta, gradually improving infrastructure and a relatively safe travelling environment, Botswana is well placed to attract tourists from South Africa and also the northern hemisphere.

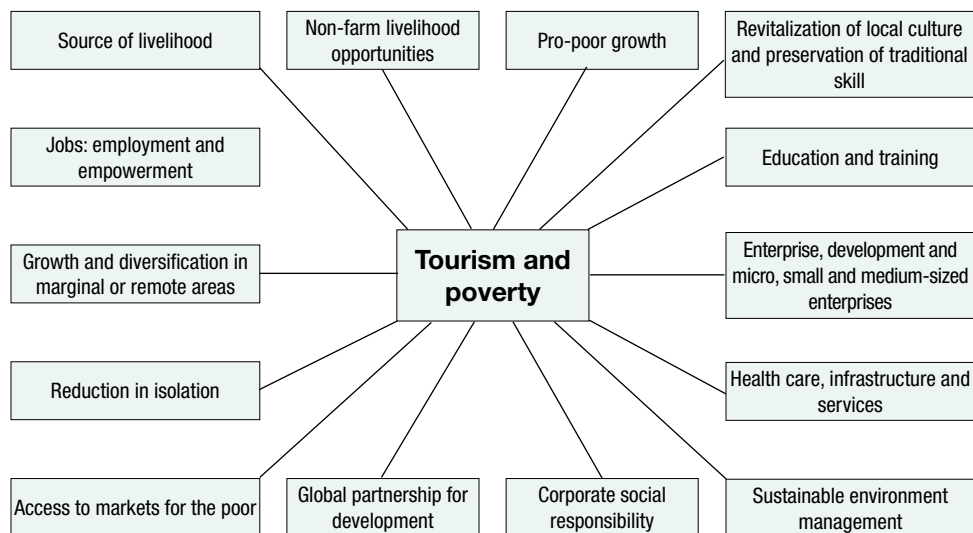
According to a recent report on the country by the World Travel and Tourism Council (WTTC), tourism was the only significant sector not affected by the global economic crisis. This resilience makes the sector an obvious area of focus in addition to the mining sector that the country is known for.

Source: African Business, No. 379, October 2011, pp 91.

In most countries, many development plans accept that tourism contributes significantly to economic growth. However, economic growth does not necessarily lead to less poverty. Equally, while many small-scale projects have been developed to link tourism with poverty reduction, large-scale poverty reduction from tourism depends upon clear strategies consulted, articulated and monitored through national poverty reduction strategy plans. The potential benefits from the tourism sector include:

- Barriers to entry into tourism are less prohibitive than for technologically driven industries such as manufacturing and mining.
- Employment generation. The sector is labour intensive and it employs semi-skilled to skilled workers and everyone in between. In this regard, tourism has also the potential to empower women, as the sector is a particularly important employer of women, with the percentage of

Figure 61: Linkages between tourism and poverty



Source: UNWTO (2004).

women working in this sector normally higher than that in other economic sectors. Employment in the tourism sector is also an excellent entry point for developing generic (transferable) and specialized service skills.

- Increased access to foreign direct investment provided the country has the right conducive environment. A developed tourism sector can also provide a wide range of income-generating opportunities along the value-chain involving youth women and facilitating small entrepreneurs to gain market access.
- Increased foreign exchange earnings and “invisible export sector”, with high revenue earnings from hotels, restaurants and tourism-related service providers.
- Increased GDP, both direct and as a result of the multiplier effects of tourism sectors through, for instance, increased earnings from agriculture and transportation. Typical figures are in the range of 2 to 3 – i.e. each dollar spent by a tourist creates between 2 and 3 dollars of output in

an economy with surplus resources (Markandya and others, undated).

- Revenues from under-exploited natural resources and possibilities for differential taxation of tourists.
- Tourism may also generate resources to preserve the environment.

Several strategies have been formulated towards alleviating poverty through tourism. The UNWTO for instance identified several principles which it recommends to Governments in connection with tourism and poverty reduction (Box 25).

The eleven points outlined in Box 25 are meant to act as guidelines. Each implementing country then domesticates the guidelines to suit its specific situations. Aware of the potential contribution tourism can make to poverty reduction, UNWTO launched the ST-EP (Sustainable Tourism – Eliminating Poverty) Initiative at the Johannesburg World Summit on Sustainable Development in 2002, which aims at reducing poverty levels through developing and promoting sustainable

Box 25: Strategies for poverty reduction through tourism

The following principles have been adopted by UNWTO and recommended to Governments in connection with Tourism and Poverty Reduction:

1. *Mainstreaming*: ensure that sustainable tourism development is included in general poverty elimination programmes. Include poverty elimination measures within overall strategies for the sustainable development of tourism;
2. *Partnerships*: develop partnerships between international, Government, non-governmental and private sector bodies, with a common aim of poverty reduction through tourism;
3. *Integration*: adopt an integrated approach with other sectors and avoid over dependence on tourism;
4. *Equitable distribution*: ensure that tourism development strategies focus on more equitable distribution of wealth and services - growth alone is not enough;
5. *Acting locally*: focus action at a local/destination level, within the context of supportive national policies;
6. *Retention*: reduce leakages from the local economy and build linkages within it, focusing on the supply chain;
7. *Viability*: maintain sound financial discipline and assess viability of all actions taken;
8. *Empowerment*: create conditions which empower and enable the poor to have access to information and to influence and take decisions;
9. *Human rights*: remove all forms of discrimination against people working or seeking to work in tourism and eliminate any exploitation, particularly against women and children;
10. *Commitment*: plan action and apply resources for the long term; and
11. *Monitoring*: develop simple indicators and systems to measure the impact of tourism on poverty.

Source: UNWTO (2010a).

forms of tourism (UNDESA 2005). UNWTO research activities have identified seven different ST-EP mechanisms through which the poor can benefit directly and indirectly from tourism:

- a) Employment of the poor in tourism enterprises;
- b) Supply of goods and services to tourism enterprises by the poor or by enterprises employing the poor;
- c) Direct sales of goods and services to visitors by the poor (informal economy);
- d) Establishment and running of tourism enterprises by the poor – e.g. micro, small- and medium-sized enterprises or community-based enterprises (formal economy);
- e) Tax or levy on tourism income or profits with proceeds benefiting the poor;
- f) Voluntary giving/support by tourism enterprises and tourists; and
- g) Investment in infrastructure stimulated by tourism also benefiting the poor in the locality, directly or through support to other sectors.

In order to raise awareness and build capacities among public officials, the private sector, civil society and communities, UNWTO has organized 14 national and regional ST-EP seminars in Africa. With support from various donors, more than 50 ST-EP projects have been implemented in various countries in sub-Saharan Africa, aiming to create tangible examples of how sustainable forms of tourism can contribute to poverty reduction. The ST-EP projects focus on a wide range of activities, always addressing one or more of the ST-EP mechanisms. It includes projects at the local level that for instance focus on training of guides and local hotel employees, and on facilitating the involvement of the local people in tourism development around natural and cultural heritage sites; projects at district level focusing on establishing business linkages between poor producers and tourism enterprises in an area; projects at the national level aiming to provide business and financial services to small-, medium- and community-based tourism enterprises; and projects at the regional level focusing on the joint marketing of community-based tourism initiatives.

7.3 Good practices in the tourism sector

Although the uptake has overall been slow, key landmarks have been witnessed in the efforts to develop the tourism industry for poverty reduction and sustainable development. First and foremost, realizing the challenges and opportunities the tourism industry presents to Africa, a number of African countries (including South Africa, Nigeria, Tanzania, Uganda, Rwanda and Botswana) have developed Tourism Master Plans with the assistance of the UNWTO and development partners. In addition to national-level efforts, regional and subregional initiatives to foster the sustainable development of tourism can be identified in Africa. These efforts towards enhancing sustainable development precepts in Africa were driven by the need to search for a solution to the unique challenges facing African countries. Past efforts of regional integration in Africa are indicative of a wider need to overcome fragmentation, marginalization and improve the continent's position in the global political-economic arena. The most important of these efforts are the Abuja Treaty establishing the African Economic Community and the more recent Constitutive Act of the African Union.

Regional actions

Through the “*Tourism Action Plan for African Union/ New Partnership for Africa's Development (AU/NEPAD)*” which was adopted under the guidance of the African Ministers of Tourism in 2004, tourism in Africa is being advocated for as an engine and a catalyst for economic development and growth in the region. This is being done through the establishment of a conducive environment, regional cooperation, advocacy and stakeholder participation. The Action Plan focuses on the issues that are best implemented at the subregional and continental levels, with clear linkages to ongoing national activities. The challenge facing African countries is ensuring effective implementation of the Action Plan by building on existing initiatives. The successful implementation of the Action Plan will largely depend on the extent to which tourism activities, being multi-faceted economic activities, are linked to other sectors of NEPAD, such as infrastructure.

Sustainable tourism development has acquired cross-country significance. For instance, the AU/NEPAD Strategic Focus on Tourism as outlined in the “Tourism

Action Plan for the AU/NEPAD” aims at establishing tourism as a key instrument in Africa’s transformation and development. NEPAD has identified tourism as an important vehicle to address the current development challenges facing the African continent. The 41st meeting of UNWTO Commission for Africa (CAF), in 2004, approved the NEPAD Tourism Action Plan. A main objective of the Plan was to provide an engine for growth and integration, and to contribute to poverty eradication. Most African Governments have now included tourism in their national development strategies (UNWTO 2006).

Subregional initiatives towards sustainable tourism development

Despite the immense tourism resources, including cultural heritage, tourism has not received significance as a tool for sustainable development. However, attempts are being made to overcome this challenge. For instance, Article 11 of the Southern Africa Development Committee (SADC) protocol on Tourism states that the Southern African States introduced the Transfrontier Conservation Area (TFCA) straddling two or more international borders where the natural and cultural resources are collaboratively managed by the Governments/authorities involved. This mode of transboundary resource governance aimed at promoting sustainable regional tourism and growth in cross-border tourism.

Other initiatives of the TFCA are the promotion of community-based tourism. Furthermore, the Sustainable Tourism Network Southern Africa (STNSA)¹⁴ was launched in the region, with the aim of establishing an integrated, regional approach to sustainable tourism development in SADC member countries and to provide a channel for all SADC countries to exchange experiences and good practices regarding sustainable tourism policy and practice throughout the region.

In West Africa, private companies are attempting to develop a marketing strategy around responsible tourism (Box 26).

National initiatives towards sustainable development – ecotourism and community-based tourism

Ecotourism is the fastest-growing tourism product in the world and Africa, for its natural endowments, constitute an obvious destination. In countries such as Uganda, Rwanda, Tanzania and Kenya, tourism has become an agent for environmental preservation efforts (Box 28). In addition to ecotourism, the region is seeing a growing effort towards community-based tourism development, with the double benefit of ensuring protection of natural and cultural heritage, and providing local communities with alternative livelihood opportunities (Box 27).

Box 26: Responsible/Sustainable tourism development to create benefits for local communities

“In the past 10 years, the term Responsible Tourism has been growing in popularity not only because it has been thought to be a unique selling point for already established businesses to gain competitive advantage, but also and most importantly, if managed properly, can be used as a means to provide benefits to local communities in destinations, such as sustainable local economic growth, empowerment through entrepreneurial opportunities and sustainable community development, but at the same time emphasises on the wealth of the local natural, cultural, social and historical heritages if preserved from destruction.

The concept is still new in most countries in West Africa. The Gambia is at the forefront, with a Government-backed organization called ASSET (Association of Small-Scale Enterprises in Tourism) whose mission is to link small-scale community-owned sustainable tourism projects together, in order to provide global opportunities for growth and for the development of community development projects.

“At *West Africa Discovery*, we have set ourselves an ambitious project to play a role in the development of the responsible tourism concept in West Africa and have started linking people together in order to create a network of like-minded people who can work together towards their similar goals. We have also decided to create an extensive database of responsible/sustainable tourism projects for marketing opportunities for the small-scale to medium-scale tourism projects which have already been implemented or are being implemented in line with the criteria and policies outlined in the Cape Town, Kerala and Belize declarations on Responsible Tourism in destinations.”

West Africa Discovery (March 29, 2010)

14 For more information, see <http://www.sustainabletourismnetwork.co.za/about-stnsa>

Box 27: Community-based tourism development in Namibia

Two thirds of Namibia's 1.7 million people live in impoverished rural areas and depend on natural resources for their economic well-being. Severe droughts and heavy poaching in the country caused wildlife numbers to drop dramatically in the 1980s, with adverse consequences for tourism enterprises and ecosystem stability. In 1993, with USAID and World Wildlife Fund assistance, newly enacted legislation allowed communities to have rights over wildlife if community members could meet the standards to register as a conservancy (a type of community-based management institution).

Once conservancies were established, the community received assistance in adopting effective game management practices, negotiating with the private sector and benefiting from tourism revenues. As a result, wildlife numbers have increased significantly and many communities derive income from handicraft sales, trophy hunting contracts and game meat distributions. Some 31 communal area conservancies now exist, with an additional 10 approaching registration and 40 more in the process of formation. These activities were undertaken under Namibia's Living in a Finite Environment (LIFE) project.

Box 28: Ecotourism ventures in Eastern Africa: The case of Kenya and Tanzania

The Eastern Africa subregion has demonstrated mixed results as far as sustainable tourism development is concerned. In Kenya for instance, over development with attendant negative environmental impacts has predominated in parts of the coast, and despite the importance of wildlife tourism to the national economy, the link between tourism and conservation has often failed to materialize. For example, despite the tremendous economic value of the Maasai Mara National Reserve in southern Kenya, conservation is struggling, with resident large mammal populations declining as wheat farming in the lands surrounding the Mara rise (Nelson 2007). This is largely due to the fact that economic benefits from tourism do not sufficiently translate into local incentives to conserve wildlife on private and communal lands. On the other hand, Laikipia and Samburu Districts, in the central part of Kenya, north of Mount Kenya, give a more positive example of how well-designed tourism investments can lead to major conservation gains. In this area, tourism investments have been structured as jointly owned ventures, in the form of lodges or tented camps, between private investors and the local land-owning communities. Over 400,000 ha of land have been set aside since the late 1990s by local communities for conservation and ecotourism developments in locally-managed "conservancies".* Tourism development has been the main rationale for these land-use decisions, and facilitation and leadership from private sector and NGO actors have played key roles.**

In the savannahs of northern Tanzania, effective models for community-based ecotourism have also emerged as a result of private sector leadership and engagement at the local level, notably, the contractual model. This has seen a range of tour operators lease community lands for either permanent lodges or non-permanent campsites in at least two dozen different villages in the northern part of the country, mostly areas near or adjacent to Serengeti and Tarangire National Parks where community lands offer high-quality tourism products. This contractual model integrates tourism with indigenous pastoralist land-use patterns and provides payments directly to elected village governments, which are corporate entities capable of entering into contracts and managing financial resources on behalf of their constituent community.

* A good example of these is the Il Ngwesi Lodge on Il Ngwesi Group Ranch, started in 1996. This model was also applied in the Shompole lodge on Shompole Group Ranch in southern Kajiado District. For more information on the north-central Kenyan conservancies refer to the Northern Rangelands Trust web site: www.nrt-kenya.org

** These include the Laikipia Wildlife Forum and Lewa Wildlife Conservancy. The Kenya Wildlife Service also provided strong support to development of these ventures.

Where it exists, the success of ecotourism ventures can be attributed to visionary and committed private sector leadership, local institutional capacity and effective NGO facilitation both in terms of forging private-community partnerships and building local capacity for tourism management can be invaluable. While the promotion of ecotourism clearly represents a growth and development opportunity in the region, there is danger that too much will be expected from this source. This needs to be avoided by careful assessment of what can be achieved.

7.4 Threats, challenges and lessons learnt

The African Steering Committee of Ministers of Tourism has identified and categorized the constraints that impinge on the successful development of a vibrant tourism sector into four classes, namely: generic, structural, tourism supply assets and tourism sustainability. Many of these constraints are related to the special situation, such as HIV/AIDS, international debt bur-

den, regional wars and conflicts. In addition, despite the immense economic potential of the sector, there is still inadequate appreciation in some African countries of the economic importance of tourism for their countries.

Image and security perception

As a destination, Africa suffers from a poor security and quality image. This is of significance noting that tourism is mostly an international commercial undertaking. Whereas developing countries are blessed with numerous tourist resorts and attractions, the foregoing benefits have largely eluded the region due to the poor state of the industry and ensuing low patronage, and inadequate government attention.

The brand credibility of Africa's tourist offers and services is low. Moreover, there are incorrect portrayals of the actual situation on the ground in several of African countries, due to lack of awareness and knowledge of the varied tourism resource offers in Africa. International tourism coverage is generally limited and the continent's share of positive international media voice is limited. Moreover, self-marketing by many African countries is limited. Advertising and publicity are often not allocated sufficient budgets for a significant impact to be made internationally.

Political conflict and strife covered extensively by international media sometimes fail to give a picture of which countries are safe and which ones are not, particularly if they are located adjacent to each other. For instance, in early 2008, election-related violence threatened to bring Kenya to a halt. Tourism arrivals dwindled to a near standstill; there were several cancellations and some diversions to neighbouring countries. Although the violence was localised the perception was grim and tourists stayed away. The year 2009 was a slow year for tourism in Kenya but this picked up and recovered with 2010 recording the highest receipts ever.

Furthermore, negative historical occurrences tend to stick to some destinations. Countries like Uganda, Rwanda, the Democratic Republic of the Congo, Burundi and the Sudan have experienced genocide and violent dictatorships in years past. Even though they are experiencing a new prosperous, more stable dispensation, are safe for travel and have some unique products to offer, some travellers still tend to keep away.

The effects of climate change on tourism do cause changes in the ecosystems and natural resources needed to sustain the tourism economy. Climate change impacts that affect tourism in African countries include: beach erosion, saline intrusion, droughts, flash floods and landslides, coral-reef bleaching, less productive fisheries, agricultural systems and changes in the preferences of tourists.

Relatively low industry standards and weak support services

The tourism industry throughout Africa operates below international competitive standards and, thus, is characterized by typically seasonal, low-wage work and inadequate service. There occurs significant leakage of tourism-generated revenues. The Tourism Action Plan for AU/NEPAD is a move to correct this. However, no specific priority projects or programmes have been identified to be included in the current Action Plan (2010-2015). Support services to the industry are key to the development of tourism in Africa. The availability of a rich variety of resources places it in good stead to offer exceptional experiences to visitors that can compete with what other destinations have to offer globally. Besides, the quality of a product offering can only be as good as the services that support it.

In Africa, the high end of the tourism spectrum is relatively highly rated. A gap however exists in the middle range, business value accommodation. This targets the budget traveller who often finds that two and three star

Box 29: The impacts of social unrest on tourism: the case of Egypt

In early 2011, tourism in North Africa suffered from the shocks of political change. A number of countries issued travel warnings for North Africa; tour operators rerouted their customers and cancelled pre-booked trips. In 2010, Egypt had received 14 million visitors. Tourism was also the second largest revenue source for the country, generating \$12.5 billion in 2010. Yet, in January 2011, occupancy levels in hotels in major tourism areas dropped to single digits, leaving small tourism entrepreneurs with little to no income. Approximately 210,000 tourists had left the country in the last week of January, costing the country \$178 million, according to Egypt's statistics bureau. While it will take time for Egypt's tourism sector to reach its former volume, there is a belief among many tourism stakeholders that Egypt's past popularity as a historical and cultural destination will continue to be what drives tourists to visit the "new Egypt".

professionally managed facilities are usually limited and have low value for money. In areas where known brand name facilities are not operational, the accommodation standards tend to be quite low and lacking in a functional grading system. Countries like Morocco, Tunisia, Kenya, Uganda, Tanzania, South Africa and Botswana have functional market-based hotel grading systems. Those that do not have them tend to have high leakages and repatriation of tourism profits. Efforts to improve and standardize quality of accommodation in the hospitality sector have been made in Eastern Africa and Southern Africa.

Degradation of social and natural wealth of a community

A major problem for the development of a strong tourism sector in Africa is the lack of a common understanding of what sustainable tourism or “ecotourism” means. This ambiguity leads to violations of environmental regulations and standards. Hence, the environmental problems evolving from tourism are manifold. First of all, the tourism industry is very resource and land intensive. Consequently, the interest of the tourism sector will often be in conflict with local resource- and land-use practices. The introduction of tourism creates stress on resources available. An influx of tourists into an area often leads to a competition for resources. Employees working at the tourist sites compound this competition. Almost as a rule, tourists are supplied at the expense of the local population.

Tourist activities imply an intensified use of vulnerable habitats. Investors and tourists do not necessarily possess awareness on how to use natural resources sustainably, and subsequently this use often leads to a degradation of resources. Tourism is also a major generator of wastes. In most tourist regions of developing countries, sewage, wastewater and solid waste disposal are not properly managed or planned. Lastly, tourism is also responsible for a considerable proportion of increased volumes and mileage in global transport and hence the associated environmentally damaging pollutant emissions. These tourism-related changes are particularly deleterious when local residents rely on those natural areas for their sustenance. Resulting economic losses can encourage socially deleterious economic activities such as prostitution, crime and migrant and child labour. In addition to this, restricted access to natural resources for the local residents as well as environmental degradation is persistent. The tourism industry has not shown sufficient

willingness to (internalize or) compensate the cost of conservation of bio-diversity in, for instance, protected areas, even though they can profit from it.

Tourism activities can also degrade the social wealth of a community. The intrusion of large numbers of uninformed foreigners into local social systems can undermine pre-existing social relationships and values. This is particularly a problem where tourism business is centred in traditional social systems, such as isolated communities or indigenous peoples. In various regions of the continent, there has been a tendency to erode traditions and local culture and in some instances abuse human rights and dignity. Tourism is a powerful agent of change. There is a need for an increased awareness of the consequences that establishment of new hotels and other facilities will have on the society and the people who live in it.

Delicate balance of promoting cultural tourism

Integrating cultural heritage with tourism remains a bottleneck. The development of cultural tourism is linked with the growth of the “culture” of tourism. It is recognized as a resource that can alleviate poverty. The challenge is to put in place effective and practical strategies that would make this potential commodity marketable. Once these cultural resources become real commodities, appropriate strategies are then necessary to ensure their management for poverty alleviation among the communities nearby. This would require taking into consideration proper management of the resource, marketing and impact of cultural tourism or people’s economy and preserved cultural heritage.

In this respect, the primary barrier to sustainable development through tourism is an over-reliance on market mechanisms to guide tourism development and consumption decisions. The market, which treats cultural and environmental wealth as free, “public goods” and which responds to degradation of this wealth as a “free rider”, provides instruments to guide development, but is insensitive to many requirements of sustainable tourism. Furthermore, in a global market such as tourism, there is the problem of “leakage”, whereby the economic benefits of local tourism activity flow out of the local community and country back to a foreign corporate headquarters, is another indication of the inadequacy of simple market-driven approaches.

Access and infrastructure

In terms of infrastructure, transport is a key sector in facilitating the development of tourism. Access to sites of particular historical, cultural or natural interest clearly has a significant impact on the development of the tourism sector. Air transport is also critical, in particular for some countries in Africa, and so is restriction on visas.

Limited and expensive air access in an era of low cost airlines, visitor time constraints and last minute travel decisions, is one of the most challenging tourism growth areas in Africa. Many destinations in Africa are at the beginning of their tourism life cycles with limited investment and choice in the hospitality and amenities. This puts pressure on prices. When you add fluctuating demands in each season, you get inflated prices and poor value for money. Emigration procedures and requirements have improved in many African countries in the past five years. Many destinations offer visa-on-arrival services and visa costs and turnaround times are becoming more realistic. This has increasingly become less of a problem area. The only challenge comes with regional travel when multiple visas need to be purchased. This increases the cost and transfer time of travel.

Air and ground transportation are both limited and expensive. Much needs to be done in most African countries to improve the ground transport infrastructure. Road infrastructure outside of major cities often remains a challenge. This is a key issue as many of the unique tourism sites and conservation areas are in rural areas. With some only accessible by 4-wheel-drive cars, or by air this limits the possibility of more people accessing the site affordably – while at the same time increasing the price premium of “exclusive” destinations and limiting the influx of tourists to fragile social and environmental systems.

Availability of health facilities and trained doctors and nurses may also have a strong implication on the travel choices of potential tourists. The availability and quality of physicians and hospital infrastructure are still critical challenges. Many African countries are ill-equipped to deal with the potential impact of major health threats on the travel industry. The outbreak of H1N1 virus threat highlighted the vulnerability and limited capacity of countries to cope in the event of an epidemic. Travellers are primarily concerned with their welfare and health while they travel and how emergencies would be handled. Uncertainty about this can significantly affect the decision a tourist makes on where to travel to.

Other services to the tourism industry

The fast-growing trend of social networking has transformed the tourism landscape considerably. The internet is becoming a key tool for potential travellers seeking value for money travel experiences, with much of the planning and booking of trips done primarily through the internet. Smaller scale products or new destinations face technology challenges like limited internet connectivity, bandwidth and IT skills. Limitations in information technology systems and bandwidth reduce business efficiency and visitor access to communication. This however is changing and the scenario will be vastly different in the next 5 – 10 years. Development of a vibrant ICT sector, for instance, will enable tourism operators to make their products visible to the international market on a competitive platform. Africa is growing its telecommunication base particularly as pertains to mobile telephony and this with the addition of commerce potential has made the possibilities endless.

Fixed telecommunications have limited networks in many African countries due in part to cable vandalism and damage due to weather coupled with a slow maintenance response time. The situation has been improved remarkably by cell-phone penetration and network expansion. An innovative entry of mobile banking has opened up the possibilities for access to funds even in very remote areas with strong impact on tourism services. Foreign exchange and international banking function well in most tourism countries. Credit card usage and technology are limited in many areas and visitors can be ill-advised on the pitfalls associated with cash availability and exchange. The challenge remains to correctly portray the in-country realities of the financial services available within each country.

7.5 Conclusion and recommendations

Conclusion

With developments in the travel and tourism industry, Africa has the opportunity to capitalize on its advantages which include price competitiveness, a strong affinity for tourism and rich natural and cultural resources supported by efforts towards environmental sustainability. However, a number of obstacles remain to develop the sector, notably improving safety and security, upgrading health and hygiene levels, developing infrastructure and

access to African sites and fostering the region's human capital. Improvements in these areas would help to harness the sector's potential to contribute to sustainable development in the region.

The vast potentials of the tourism industry to contribute positively to the future of African economies cannot be overstated. It however will need to be given the prominence it deserves and will involve the concerted efforts of various stakeholders using relevant evidence and data to promote its development.

Recommendations

Capacity development: enhanced support for sustainable tourism activities and related capacity development is required to fully harness the potential of the sector to contribute to poverty eradication in the context of sustainable development. Awareness and understanding of natural resources conservation issues need to be improved among local communities and tourists alike, as well as national Government officials and lender/donor agencies. Awareness-raising, training, and human-resource development are necessary steps to the implementation of strategies for conserving biodiversity. Field training should also be an integral component of tourism human resource development. Within conventional conservation organizations (e.g. wildlife departments and national parks systems) substantial reorientation and retraining is needed to ensure that sufficient attention is paid to all taxes and all elements of the landscape rather than concentrating upon megafauna and protected areas. Moreover, countries need to strengthen tourism-related data collection and management. Tourism policies should be based on country-specific evidence to identify priorities and develop arguments to engage effectively in the policy process. International support is needed to complement domestic efforts.

Cross-sectoral coordination: the increasing importance of tourism and its potential role in contributing positively to development in Africa can only be attained if efforts are made to mainstream the interlinkages between the tourism sector and poverty reduction into Government processes and institutions. Greater cross-sectoral understanding and coordination is vital. Cross-sectoral policies aimed at encouraging tourism development include those aimed at enhancing public health and safety, air policy, human resources development, institutional capacity and environmental protection.

Investment-friendly enabling environment: An appropriate legal framework to support tourism is needed in the region, which attracts FDI while, at the same time, ensuring equity in tourism benefits sharing between communities, investors and Governments, within a framework of social, economic and environmental sustainability. The Governments of many African countries include tourism under general investment incentive schemes such as exemption of import taxes and tax holidays. However, few countries have suitable, dedicated incentive schemes aimed at tourism capital investment and geared at reducing the risks associated with slow and difficult market entry. In this context, forging private-public sector partnerships for tourism development may prove a win-win approach, and further expand tourism entrepreneurial initiatives and investment opportunities. Tourism-based partnerships and strategic alliances are an important and growing aspect of the tourism industry's future development and need to be addressed in policy and planning discussions. A form of partnership well suited to tourism is competition which merges healthy competition and cooperation towards a common united goal.

Marketing: The importance of marketing instruments and tools needs to be better understood by African actors. Marketing and promotion are often overlooked when countries establish a tourism sector, yet establishing regional and international credibility and branding is a critical component of generating demand for the product in sufficient quantity for it to be viable. Empirical evidence suggests that marketing of a country internationally should be a joint public-private sector activity. Building the image of a destination through unique marketing and promotional campaigns (including branding) should therefore be an integral part of a national tourism development strategy.

National tourism development strategies: Well-conceived, properly articulated and realistic tourism policy objectives should be developed. This should be a multi-year, multi-stakeholder process, involving social, economic and environmental sectors. Policies should be developed with a strong input of local communities, and should foster local involvement and control over tourism development. Tourism development policies must contribute to raising gender awareness and enhance women's participation in and contribution to the tourism sector.

Pro-poor policies: National tourism development strategies must be clearly pro-poor. In this regard, they should include local communities in planning and decision-making when tourist facilities are being developed; ensure a high level of local inputs in service provision to tourists and minimize leakage, while ensuring the required quality standards of services for the tourists are met; and ensure that an alternative livelihood is provided where tourism development leads to reduced access to local common resources for the local population.

Regional cooperation: Regional cooperation remains the key opportunity for addressing the challenges in tourism development in Africa since most countries in the region often face similar problems and could benefit from cross-pollination of ideas and resources towards dealing with issues of sustainable tourism management. Regional tourism cooperation and integration between

countries, trading blocks and other jurisdictions do not only promote existing products, but also help to identify innovative approaches to highlight new opportunities.

Natural resource conservation strategies: Each country should formulate and adopt a national strategy for conserving its natural resources to go along with sustainable tourism management. Furthermore, biodiversity conservation efforts should extend beyond national parks and protected areas. Appropriate incentives and disincentives are needed to encourage all participants to become involved in conservation.

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8. Harnessing Interlinkages for Sustainable Development

8.1 Introduction

Interlinkages approach for sustainable development outcomes

The interlinkages approach promotes greater connectivity between sector-based actions by recognizing the systemic nature of societies, ecosystems and economies at all levels. The World Summit on Sustainable Development (WSSD) recognized the three pillars of sustainable development as interconnected and mutually reinforcing. By adopting an interlinkages approach, policy could maximize the opportunities across a number of domains. Comprehensive and integrated policies and plans provide better opportunities for addressing multiple, related challenges and for developing effective solutions (UNECA 2008). According to UNEP (2006), the success of interventions arising from plans for the attainment of MDGs and other Millennium Ecosystem Assessments (MEAs) is dependent on the level of maximization of synergies across sectors, plans and actions. The challenges of sustainable development, especially those linked to natural resource use have often not been fully addressed by governance structures mainly due to delayed response and inability to appreciate the interconnectedness of the challenges and cross-impacts of the responses.

Box 30: Interlinkages Synergies and trade-offs

Interlinkages

Van Herwijnen (2008) defined interlinkages for the evaluation of the different methods and indicators as “a qualitative or quantitative relationship between two or more SD indicators that can be based on statistical analysis or on the results of formal or applied methods or models of political, socio-economic and environmental interactions.

Interlinkages exist if a change in one indicator causes changes in one or more other indicators, either directly or indirectly through third variables. Interlinkages also exist if two or more indicators are positively or negatively influenced by the same policy actions.

Synergies and trade-offs

Van Drunen and others (2009) defined *synergy*, or positive feedback, as a development favouring sustainable development in one dimension (or key challenge) that also leads to positive outcomes in terms of sustainability with regard to another dimension (or key challenge). A *trade-off* or negative feedback means that the opposite is true. Synergies and trade-offs can be identified within the pillars or between the pillars of SD, or the key challenges of SD.

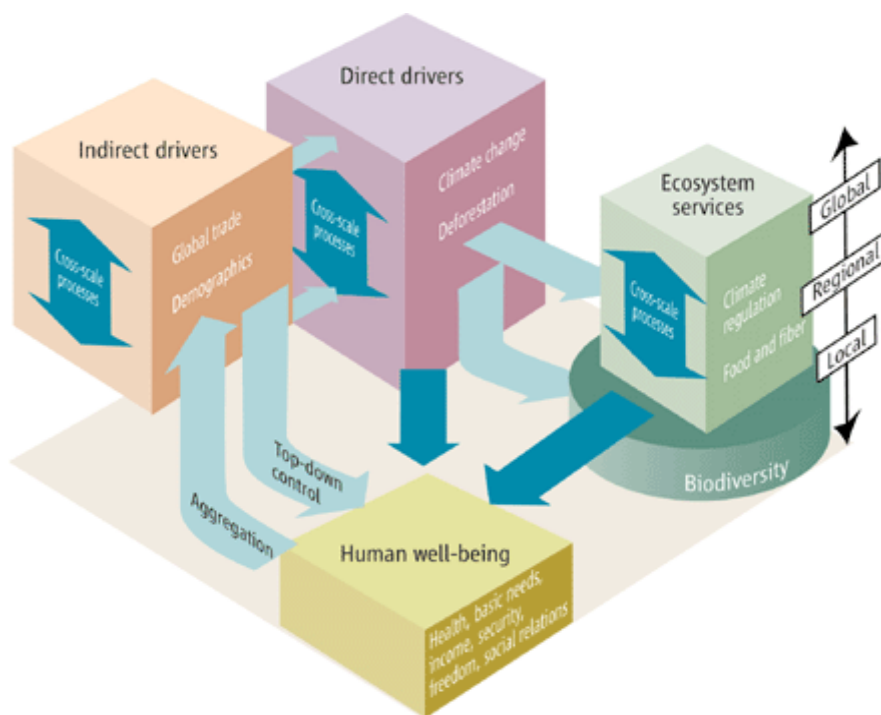
Previous chapters of this report have assessed progress towards sustainable development in Africa and demonstrated how the various themes, their pressures, responses, effect and mitigation measures interact. The assessment has demonstrated that there are inherent and complex interlinkages within and between demography, economic development, agricultural production, climate change and other aspects of sustainable development. Changes in development themes are linked across scales and between nations, subregions and even globally through intricate biophysical and socio-economic processes. Africa is evolving in a world increasingly characterized by globalization in which there occurs increasing flows of goods, services, capital, technologies, information, ideas and labour at the global level, driven by liberalization policies and technological change (AfDB 2011). These are also interconnected in ways that determine sustainable development outcomes and efforts to eradicate poverty through management of natural resources. Previous reports have indicated how development challenges are often linked (UNECA 2008; UNEP 2006 and 2007; MEA 2005).

This chapter illustrates how African development sectors, their drivers and other human, ecological and economic processes are interlinked through specific cause-and-effect relationships and contribute to sustainable

development goals collectively. The focus is on the interlinkages among the five thematic areas - forests, biodiversity, biotechnology, tourism and mountains. Although, as previous parts of this report have indicated, trends in some sectors such as biodiversity loss or conservation, tend to have linear cause-effect interactions, there are inherent interlinkages, which if fully understood, could reveal solutions to chronic development challenges. There is a need to unearth these interlinkages and address them systematically and in an integrated and coherent manner across scales and themes.

The chapter uses insights from several approaches, methodologies and conceptual frameworks that are linkage-based in demonstrating that the Pressure – Response – Effect – Mitigation (PREM) framework can be used to understand interlinkages and achieve equitable sustainable development. The PREM framework is elaborated in Part I of this report. Such linkage-based frameworks have been successfully applied for sustainability assessment in various disciplines such as health sector, agriculture and mining (Singh and others 2009). They can help understand the complexities and overcome some of the limitations related to conventional and causal unidirectional links (Waheed and others 2009). Figure 62 illustrates a cross-scale analytical framework for exploring the underlying interlinkages

Figure 62: Conceptual framework with cross-scale interlinkages and policy opportunities



Source: Carpenter and others 2006.

and related policy opportunities. The role of natural resources through ecosystem services in sustaining human well-being via provisioning for health, basic needs, incomes, security, freedom and social relations is critical to sustainable management of biodiversity, forests, tourism and mountains in Africa. By integrating a combination of top-down and bottom-up governance (aggregation) approaches, the analytical framework allows identification of opportunities for consolidating ongoing sustainable development initiatives and introducing others through institutional processes across scales.

Why adopt the interlinkages approach

There is a need to coherently and systematically address development challenges affecting diverse partners in different themes. A fragmented approach to development planning may lead to the omission of important development needs and failure to realize efficiencies and even synergies arising from the potential links between goals. By targeting, for instance, mainly primary education (as in MDG 2) many African countries have paid little attention to secondary and tertiary education, for which opportunities to create substantial improvements in incomes, wealth, employment, environmental conservation and even health are by far greatest. Secondary and tertiary educational levels also generate more skilled human resource that are needed to promote and service the non-education MDGs - in health, agriculture, water and sanitation, and environmental sustainability - and also teachers for the achievement of MDG 2. The interlinkages approach necessitates the consideration of multiple connections between and among the natural resources, economic processes, social systems and human well-being (Carpenter and others 2006). Although progress is evident in the area of integrating sustainable development as a paradigm in national and regional planning, a lot remains to be done in collaborative efforts as well as policy integration since these require long-term, systematic and sustained effort by various institutions. Maintaining and enhancing the beneficial services provided by biodiversity of African forests and mountain ecosystems with the goal of securing livelihoods, food, water and health security while reducing vulnerability to climate change and promoting capacity to sequester carbon, and avoid greenhouse gas emissions is an important objective of the interlinkages approach.

8.2 Interlinkages across the thematic issues/areas

Overview of the interlinkages

Sustainable development outcomes in Africa largely depend on the use of key natural resources in ways that ensure continued and equitable benefits. The thematic issues of biodiversity, forests, biotechnology, mountains and tourism are interconnected in ways that predicate outcomes of poverty reduction and human well-being attainment. They present opportunities and challenges with implications on how African societies achieve sustainable development and eradicate poverty. By analysing the interlinkages, this chapter presents cases and options for strengthening the capacity of African countries to develop and implement policies, strategies and programmes to achieve sustainable development through an integrated approach with regard to the five thematic areas, thereby harnessing the synergies therein. Table 26 summarizes some of the potential synergies and trade-offs that have been tracked and show-cased in the subsequent sections of this chapter. As illustrated in the table, there are both positive and negative interlinkages which stem from direct and indirect implications of processes, actions and policies in various sectors.

Table 26: Interlinkages between biodiversity, biotechnology, forests, tourism and mountains

Biodiversity	Biotechnology	Forests	Tourism	Mountains
<ul style="list-style-type: none"> • Threats to biodiversity by introduction of dominant genes through unintended transgenics • Bioethics and biosafety trade-offs if local biodiversity custodians are not recognized in use of biodiversity resources for biotechnology • Loss of biodiversity reduces opportunities for biotechnology development; and inappropriate biotechnology developments may adversely affect biodiversity reserves. 	<ul style="list-style-type: none"> • Gene diversity/pool for biotechnology RD for sustainability sectors (such as food production, health, forests and livestock). • Raw materials for biotechnology • Tools and techniques for conserving biodiversity, reforestation and rehabilitation of denuded natural habitats to re-establish ecological balance needed for the survival of fauna, flora and micro-organisms. • R&D and support for capacity and technology development for biodiversity conservation 	<ul style="list-style-type: none"> • SustainableForest management policies and practices conserve biodiversity as they maintain habitats to biodiversity • Forests protect fragile ecosystems such as wetlands and mountains important for biodiversity conservation • Forests are often planted to protect sensitive sites acting as riparian buffer zones, galleries, barriers, shelterbelts, windbreaks to ecosystems and their functions 	<ul style="list-style-type: none"> • Improvement of biodiversity for nature tourism (ecotourism) • Biodiversity conservation supports protection of threatened wild-life species that are great tourist attractions • Joint promotion of biodiversity conservation and threatened species. • National parks/reserves natural channels for biodiversity conservation • Tourism is a source of financing for biodiversity conservation and acts as an impetus for private biodiversity conservation efforts 	<ul style="list-style-type: none"> • Mountain ecosystems have one of the most diverse flora and fauna and thus a significant potential for conservation of vast species of plants and animals • Equity in benefits of biodiversity with (among others) mountain communities • Biodiversity conservation/protected area conservation in mountains • Mountain ecosystems form sanctuary for threatened species and as germplasm for biotechnology input
<p>Biotechnology</p>		<ul style="list-style-type: none"> • Technologies for forest species improvement through disease resistance and infusion of climate change resistant genes • Restoration/rehabilitation of forests and natural habitats contributes significantly to climate change mitigation and ecosystems resilience. • Forests are habitats for special species useful in biotechnology use in restoring denuded environments. • Research for biotechnology solutions to key crop production, livestock, human health and pests 	<ul style="list-style-type: none"> • Biotechnology-based tourism including conferences - Africa has hosted many international and regional biotechnology conferences that also propel tourism and travel • Tools for conservation of flora and fauna for tourism • Rehabilitated ecosystems/natural habitats contribute to enhancement of tourism from restored natural landscapes and the diversity of fauna and flora. 	<ul style="list-style-type: none"> • Mountains conserve genetic diversity and resources from which biotechnology developments may draw or depend. Denuded mountain ecosystems conserved through biotechnology • Clonal propagation for restoration and vegetation replenishment of denuded mountains • Mountains harbour many endemic and threatened species, genetic resources, and are nature's last stronghold for those species that have been extirpated in adjacent lowlands

	Biodiversity	Biotechnology	Forests	Tourism	Mountains
Forests	<ul style="list-style-type: none"> • Forest monocultures lead to threats to biodiversity • Forest harvesting threatens biodiversity • Need to maintain biological diversity may threaten forest monocultures and lumbering industry thereby affect livelihoods of communities 	<ul style="list-style-type: none"> • Potential for introduction of invasive alien species through biotechnology 		<ul style="list-style-type: none"> • Forests are key tourist attractions and habitats for major wildlife and unique scenarios popular with tourists to Africa. • Tourism is a source of financing for forest conservation • Economic alternatives for local people to reduce overexploitation of wild land and wildlife resources on protected areas; 	<ul style="list-style-type: none"> • Mountains have diversity of forestry species and resources. • Vulnerability of mountain communities to tourism effects on forest establishment and services • Forest reserves mainly linked with African mountain areas and key water towers for major basins. • Forests protect fragile ecosystems including mountains and hill sanctuaries
Tourism	<ul style="list-style-type: none"> • Destruction of biodiversity through infrastructure (hotels, roads, airports, and others). • Increased tourism pressures may lead to loss of biodiversity and lead to ecosystem and general landscape degradation; which, in turn, reduces the intrinsic value of the tourist attractions. 	<ul style="list-style-type: none"> • Erosion of culture and germplasm through exploitation of IPR and biotechnology resources by science-tourists/conferences and exportation of raw materials and technology 	<ul style="list-style-type: none"> • The tourism sector poses threat to forest reserves as infrastructural (such as roads and hotels), are expanded to accommodate more visitors and reach new destinations • Inundation of mountain ecosystems through tourism infrastructure and waste 	<ul style="list-style-type: none"> • Conservation of mountains threatened by unsustainable tourism investments in key mountain areas • Mountains are specific tourist attractions as parks and for sports (snow-capped mountains, volcanic mountains and special nature reserves), due to their attractive and adventurous landscapes. These activities put pressure on mountains. 	<ul style="list-style-type: none"> • Mountains are prime and unique environments for tourism • Ecotourism promotes sustainable mountain management • Income from tourism and related services improves the well-being of mountain communities (employment and provision of social services) • Economic alternatives for mountain dwellers to reduce pressure on mountain resources
Mountains	<ul style="list-style-type: none"> • Attractions of mountains and population pressures lead to biodiversity loss due to unsustainable activities and climate change; and these, in turn, affect people's livelihoods 	<ul style="list-style-type: none"> • Potential for introduction of invasive alien species that cause imbalances in mountain ecosystems 	<ul style="list-style-type: none"> • Mountains are fragile, there is high risk hazards arising from degradation such as deforestation and other inappropriate practices • Activities in forest products and non-forest product extraction threaten mountain ecosystems, including water flows and habitat loss 		

KEY TO NATURE OF THEMATIC INTERLINKAGES

- Positive (synergistic) interlinkages between themes
- Negative (trade-offs) interlinkages between themes

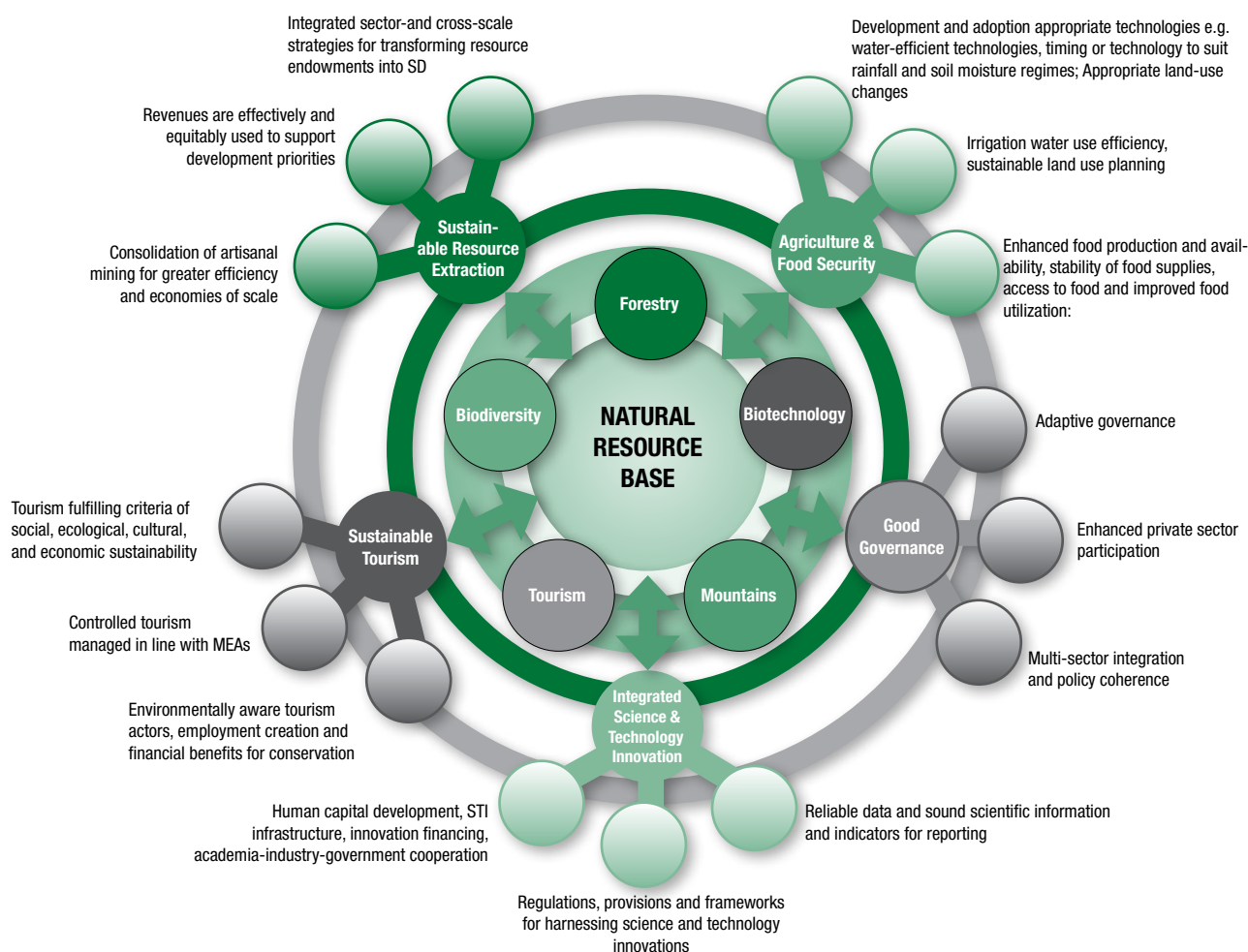
The capacity of African countries and economies to manage their natural resources in line with their own priorities and needs is pegged on existence of sound policies for integrated management. Figure 63 is an illustration of the inherent interlinkages emanating from the sustainable use of biodiversity, forests, biotechnology, tourism and mountains.

Actions in anyone sector often have negative and/or positive implications for other sectors. The implication may reflect the extent to which sustainable management of natural resources for meeting poverty reduction goals are effective and influence other social, economic and environmental outcomes. The interlinkages approach helps understand the relationships between various natural resource processes and development goals and also the expected and unanticipated effects of policy in diverse sectors. The following sections highlight the key

interlinkages among the priority themes summarized in Table 26.

The five themes presented in this report have separate, collective and integrated contribution to poverty eradication and sustainable development goals, as illustrated in previous chapters. The inherent interlinkages (taking both positive and negative dimensions) between the themes are important to consider when planning and designing sustainable development policies and interventions. The design of effective policies depends on the understanding and demystification of the interlinkages between economic, social and environmental trends. Such policies are best suited for harnessing the synergies between different policy outcomes and to best balance the trade-offs between the achievements of different policy goals (UNEP 2006 and 2007).

Figure 63: Summary of inherent interlinkages between biodiversity, forestry, biotechnology, mountains and tourism as a basis for sustainable development



8.2.1 Biodiversity and other themes

Biodiversity is known to provide the requisite genetic diversity and pool for biotechnology research and development for various sustainable development sectors, including food production, health, forests, livestock, tourism and other economic activities. In this regard, biodiversity provides the raw material for biotechnology and other related science and technology innovations that improve forests, tourism and mountain ecosystems and products. Conversely, biotechnology also offers specific and appropriate tools and techniques for conserving biodiversity, reforestation and rehabilitation of denuded natural habitats to re-establish the ecological balance needed for the survival of fauna, flora and micro-organisms. These support conservation efforts in forests and mountains alike. The various national and cross national forest conversion and protection policies and practices implicitly address conservation of biodiversity as they focus on maintaining habitats to biodiversity and protection of fragile ecosystems such as wetlands that are important for biodiversity. In Madagascar, for instance, biodiversity is integral to many aspects of the country's development in especially global change processes (Box 31).

Improvement of biodiversity directly impinges on tourism, especially through nature tourism (ecotourism). Biodiversity conservation supports protection of threatened wild-life species that are great tourist attractions while supporting efforts to conserve fragile ecosystems like mountains that are prone to denudation through degradation of land, water and vegetation.

Actions in various sectors target national goals such as food security. Most food insecure populations live in vulnerable ecosystems such as mountains and degraded/deforested land. According to Scherr and McNeely (2007), food insecurity threatens incomes and biodiversity when it leads to over exploitation of wild plants and animals while poverty threatens food security and biodiversity as poor farmers are unable to invest in farm improvements to raise yields sustainably. Some food security solutions increase poverty and biodiversity loss, especially those that promote intensification of production through high agrochemical input use which may, if inappropriately used, result in pollution of freshwater and threaten aquatic biodiversity. Conversely, some poverty solutions increase food insecurity and biodiversity loss especially agricultural commercialization strategies that encourage landscape conversion to monocultures.

Box 31: Development, biodiversity conservation and global change in Madagascar

Although Madagascar's biodiversity has exceptionally high species richness and a remarkable rate of endemism, it is threatened by population growth and non-sustainable use of natural resources. Majority of the rural and poor population depends on natural resources and the economy to a great extent is reliant on exported ecosystem goods such as seafood and spices, and increasingly on derived minerals. The high geodiversity of the island contributed to the evolution of diverse ecosystems. The Masoala Peninsula in the North-east harbours the highest proportion of undisturbed lowland humid evergreen forests while the Eastern and South-eastern rainforest patches are smaller, more degraded and often disconnected. There exist strong interdependencies of biodiversity and human development in Madagascar, regarding economic development, social and cultural aspects and the integrity of biodiversity and its conservation status. These provide a potential to growing the nascent tourism industry.

There is a close connection of humans and biodiversity in Madagascar through:

- Cultural diversity, biodiversity and natural resource use with biocultural considerations influencing the local management of biodiversity, especially in rural areas;
- Dependency of socio-economic strata on biodiversity;
- Forest landscapes used as natural heritage and managed as protected areas and visited by international tourists. According to Madagascar National Parks, the state protected area authority, about 130,000 persons visited sites within their protected area network in 2008;
- Timber derived from species-rich forests that is commercialized and transformed outside the country;
- Importance of trade of ecosystem services for economy and human well-being.

There is a close link between Madagascar's biodiversity and global change through climate change impacts related to extreme weather events such as abnormal precipitation, floods, storms, droughts, heat waves and sea level rise. Other global socio-economic changes like the investment of foreign enterprises may lead to complex international dependencies through loss of medicinal plants and traditional knowledge

Source: Kiefer and others (2010) in Ibisich and others (2010).

There are also several negative interlinkages between biodiversity and the other themes. These negative interlinkages constitute entry-points for addressing inherent trade-offs between cross-sector actions and policies. Although the CBD COP6 decision VI/26 committed Parties to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national levels as a contribution to poverty reduction and to the benefit of all life on earth, threats to biodiversity in Africa persist and this may compromise the sustainable development agenda. Some of these threats emanate from processes, policies and activities in biotechnology, forests, tourism and mountains.

The loss of biodiversity reduces opportunities for biotechnology development; and inappropriate biotechnology developments may adversely affect biodiversity reserves. The Global Biodiversity Outlook (CBD Secretariat 2010) and AEO-2 (UNEP 2006) paint a bleak picture of the unprecedented and continuing loss of our natural capital in ways that could not only undermine sustainable developmental effort but also threaten the people's survival. The loss is occurring in prime forest and mountain ecosystems in the continent (UNEP 2010). AMCEN in adopting an integrated policy approach is advocating for application of core biodiversity principles, namely, conservation of biodiversity, sustainable use, restoration and enhancement of ecosystems, mitigation of threats, prevention of extinctions mainly from human-induced causes, halting the loss of biodiversity and most importantly sharing the associated benefits that directly contribute to human well-being and poverty eradication.

8.2.2 Forests and other themes

Forests and woodlands occupy 675 million ha, or 23 per cent of Africa's land area (FAO 2010), forming an integral part of the African landscape. Forests are key habitats of biodiversity, hosting many endemic species in the continent.

The importance of forests is also seen in the strong interlinkages between forestry, mountains, biodiversity and tourism and other sustainable development goals and natural resources. Forest conversion and protection policies and practices conserve biodiversity. Approximately 14 per cent of the total forest area in Africa was designated for conservation of biological diversity and only about 3 per cent of the forest area was designated primarily for protection of soil and water, compared

with 8 per cent at the global level (FAO 2010). There has been a decline in the extent of forests designated for production of wood and non-wood forest products (NWFPs). The value of wood removals (fuelwood and industrial roundwood) increased in the region from \$2.6 billion in 1990 to about \$2.9 billion in 2005.

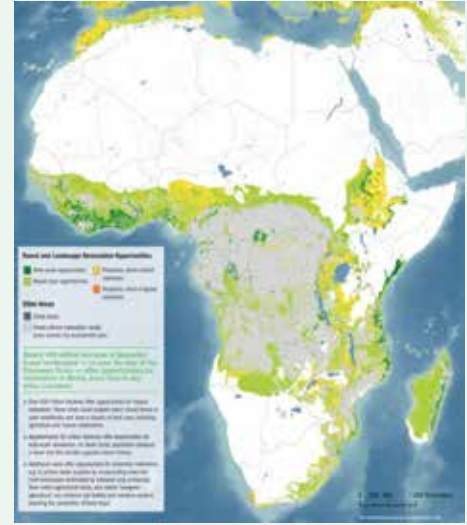
Forests protect fragile ecosystems such as mountains and wetlands important for biodiversity and are often planted to protect sensitive sites acting as riparian buffer zones, galleries, barriers, shelterbelts and windbreaks to ecosystems (Gobez and others 2009). The Congo Basin, the second largest contiguous expanse of tropical rainforest in the world, accounts for 65 per cent of Sub-Saharan Africa's biodiversity (Gondo 2010). The resultant biodiversity in forests provides key ingredients and raw materials or germplasm for biotechnology while also presenting suitable ecosystems for nature tourism. Forests are key tourist attractions and habitats for major wildlife and unique sceneries popular with tourists to Africa. Limited data is available in Africa at various levels on how forests promote different dimensions of sustainable development, including a wide range of economic, environmental, social and cultural benefits. Data on such dimensions are either sketchy or not available. This has led to low appreciation of the contribution of African forests to development, poverty eradication and enhancement of food security. There are however several cases providing evidence for these contributions backed by effective forest management practices and policies at various levels as seen in the contribution to tourism and mountain ecosystem conservation. African forests are gaining new attention because of their increasing potential role in mitigating climate change and poverty eradication (IPCCC 2007). Many countries already have strategies to provide guidelines for this. Secure forest tenure also guarantees their sustainable management and hence increased contribution to sustainable development (Romano and Reeb 2006; Elson 2010). Strategies at all levels must facilitate the generation and equitable sharing of benefits from forests.

Forests are vital for ecosystem conservation through prevention of soil erosion, preservation of water quality, shading crops and livestock, absorbing carbon as a climate change mitigation process and conserving biodiversity through provision of habitats for many species of plants and animals many of which form the basis for tourism industry thriving in such ecosystems. The interlinkages are more pronounced in specific natural resources such as mountains and biodiversity hotspots.

Box 32: Opportunity to African forests

An analysis carried out by the World Resources Institute (WRI) and South Dakota State University, in partnership with IUCN and the Global Partnership on Forest Landscape Restoration, found that about 450 million hectares of degraded land in Africa have excellent opportunities for forest restoration. Opportunity is provided by the vast sparsely populated areas and even the intensively used areas. Recent experience from West Africa shows that this is being implemented in the Niger where over five million hectares have been restored into productive farmed woodland. In Eastern Africa, Rwanda has committed itself to a nationwide effort to restore forests as a means of improving livelihoods, enhancing food security and safeguarding water supplies and biodiversity. Most of these forest protected areas are in mountain areas and provide opportunities for investment in tourism.

Many challenges however remain including increased pressure as resources become scarcer, economies grow and demand expands for timber, palm oil, soya beans and other forest products. Efforts to combat deforestation in Africa will continue to depend on political leadership in support of national strategies and integration of forest conservation in different investments. The efforts must be combined with strategies to benefit from and achieve goals of preserving biodiversity, sustainable tourism and mountain resource conservation. Biotechnology offers technological solutions for conservation of forest species and preserving biodiversity but could also introduce alien species that may interfere with such ecosystems.



Source: Minnemeyer and others (2011).

Some of the interlinkages relate to key challenges of sustainable development such as climate change (Timko 2011) or negative effects of forests on other themes. For instance, forest monocultures may lead to biodiversity threats and restrictions of ecosystem services from mountains. Uncontrolled forest harvesting threatens biodiversity and the integrity of mountain ecosystems thereby jeopardizing tourism objectives.

8.2.3 Biotechnology and other themes

The interlinkages between biotechnology and the other thematic issues reviewed in this report are immense. Biotechnology, for instance, can be used as a tool for adding value to biodiversity, forestry, mountain ecosystems and other natural resource conservation processes. Through biotechnology opportunities exist for acquiring scientific knowledge or for intervening directly in plant and animal improvement/alteration for increased production or survival. Biodiversity on the other hand has provided biotechnology with the requisite raw materials, including plants and animal components, bacteria and micro-organisms such as the revolutionary polymerase chain reaction (PCR) technology that relies on thermo-resistant bacteria and also *Bacillus thuringiensis* (Bt) that has been extensively used in plant transforma-

tion and development of transgenic plants (Juma and Serageldin 2007). Other technologies that showcase the interface between biotechnology and biodiversity include molecular marker assisted breeding which is instrumental in disease resistance and resistance to environmental conditions such as drought (Karembu and others 2009). Furthermore, biotechnology applications such as tissue culture techniques have added significant value to biodiversity through disease elimination using meristem culture and micro-propagation of elite cultivars. Biotechnology applications are used in conservation variously: germplasm conservation in gene banks using cryopreservation and *in vitro* slow growth techniques; use of molecular techniques for diversity studies to determine conservation hotspots and priorities and micro-propagation of unique and endangered species.

Biotechnology applications continue to be used extensively in Africa to rehabilitate denuded natural habitats such as forests and mountains through micro-propagation and replanting of forestry species (Mataruka 2009). South Africa presents cases of these developments. Through tissue culture techniques, species that are difficult to propagate using seeds and vegetation are restored in the natural habitats and forests through clonal propagation. The reforestation of the forests and natural habi-

tats re-establishes the ecological balance needed for the survival of fauna, flora and micro-organisms. Denuded mountains are also restored through reforestation and vegetation replenishment using clonal propagation. Restoration of forests and rehabilitation of mountain ecosystems and natural habitats contribute significantly to climate change mitigation and ecosystems resilience (Nyenje and others 2011). This intrinsically contributes to enhancement of tourism as it largely depends on natural aesthetics of the mountain landscapes and the diversity of fauna and flora.

There are, however some negative interlinkages between biotechnology and the other themes, notably:

- Threats to biodiversity due to accidental or intentional introduction of dominant genes through transgenics;
- Underlying bioethics and biosafety trade-offs if local biodiversity custodians are not recognized in use of biodiversity resources for biotechnology;
- Loss of biodiversity reduces opportunities for biotechnology development and inappropriate biotechnology developments may adversely affect biodiversity reserves;
- Potential for introduction of invasive alien species that may cause imbalances in mountain and forest ecosystems thereby affecting biodiversity in various ways; and
- Erosion of culture and germplasm through exploitation of IPR and biotechnology resources by science-tourists/conferences and exportation of raw materials and technology.

8.2.4. Tourism and other themes

African tourism continues to burgeon while supporting developments in many different sectors. There are both positive and negative interlinkages with biodiversity, biotechnology, forests and mountains that make tourism management integral to sustainable development in Africa. The many national parks and reserves that dot the continent are natural channels for biodiversity, forests and mountain conservation. As gazetted ecosystems they are protected from uncontrolled extraction of both flora and fauna. Tourism is an important source

of financing for biodiversity conservation and acts as an impetus for private biodiversity conservation efforts as seen in contractual parks of South Africa. There are many economic alternatives presented to local people through tourism that help reduce overexploitation of wild land and wildlife resources in protected areas.

While tourism provides economic hope for many African countries, it brings with it critical challenges, including strain on natural resources and the environment. In many countries the over-use of natural resources often results in loss of biological diversity and disruption of local social and cultural structures. In order to make a positive contribution to sustainable development, tourism must fulfil the criteria of social, ecological, cultural and economic sustainability (Olorunfemi and Raheem 2008). This therefore calls for controlled tourism and ensuring that tourism benefits are equitably shared through financing of social facilities or conservation of biodiversity and mountains. Tourism should also be managed alongside the implementation of key MEAs such as the international convention on biological diversity and recent protocols (including the Nagoya Protocol on Access and Benefit Sharing). Understanding the links between tourism and biodiversity and incorporating these into an international and national programme on the development of sustainable tourism will be important.

8.2.5 Mountains and other themes

The interlinkages between African mountains and the other themes of biodiversity, tourism, biotechnology and forestry are related to endowment of mountain ecosystems with diverse flora and fauna, water, arable land and other nature-based resources. Mountain ecosystems form sanctuaries for threatened species and serve as sources of germplasm for biotechnology input. Mountains conserve genetic diversity and resources from which biotechnology developments may draw or depend. Denuded mountain ecosystems are generally conserved through biotechnology. Mountains harbour many endemic and threatened species, genetic resources and are nature's last stronghold for those species that are threatened or totally extinguished from adjacent lowlands. Mountains have diverse forestry species and resources. African mountains are prime and unique environments for tourism, including attractions of snow-capped mountains and for sports such as mountain climbing, prominent in Mt Kilimanjaro, Mt Kenya and

the Table Mountains of South Africa among others (Ojany 1998).

Most biodiversity hotspots and tourism destinations are associated with important mountain ecosystems. The constraints and opportunities to sustainable management of African mountains for MDGs include environmental quality, economic development and social equity. Mountains are important sources of other natural resources and development capital in Africa namely water, minerals, agricultural products, forests, energy and biological diversity. Mountain inhabitants also remain among the poorest populations on the continent. Pressure put on the mountain ecosystems degrades local resources but also affects ecosystems and communities downstream. Sustainable management of mountains is therefore of broader importance to wider natural resource base and ex-situ communities.

Conversely, mountain conservation policies and practices may exclude livelihood goals of local communities while the attractions of mountains and population pressures lead to biodiversity loss due to unsustainable activities which in turn, affect people's livelihoods. Mountains are fragile and there is a high risk of hazards arising from degradation such as deforestation and other inappropriate practices, including those linked to tourism expansion and forest exploitation through infrastructural development.

8.3 Harnessing synergies for sustainable growth and development

Africa's natural resource base endowments must continue to be managed through integrated approaches. It is clear that sustainable development is multi-scaled, diverse and extends into various governance regimes and scales. This is exemplified by the interface between forests, biodiversity, biotechnology, tourism and mountains. There is an indistinct line between institutional systems and natural resource management around these sectors. Understanding and effective management of this link is critical to addressing the various interlinkages in sustainable development which interact across spatial as well as temporal scales and boundaries (Young 2006; van Drunen and others 2009). The extent or magnitude of the interconnectedness between development

goals and key sectors does not mean, however, that policymakers are only faced with the choice of "doing everything at once in the name of integrated approaches or doing nothing in the face of complexity" (Young 2006). The underlying interlinkages offer opportunities for more effective responses at the national, subregional, regional and sectoral levels. Such actions will demand better institutional regimes through policy harmonization and monitoring; increased understanding of the interlinkages through integration and policy coherence; broad-based participation; adaptive governance; and science, technology and innovation.

8.3.1 Multi-sector integration and coherence: promoting policy coherence

Strengthening governance systems for sustainable development remains pivotal to achieving goals at all levels, where goals, sectors and processes are inextricably linked and mutually interdependent. These should build on developments in the Johannesburg Plan of Implementation by ensuring coherence and policy integration in the economic, social and environmental pillars, while strengthening implementation, monitoring and accountability. In so doing, it would limit conflicts, overlaps and potential duplication of activities aimed at strengthening management for forests, biodiversity and mountains and also in advancements in biotechnology and tourism. National capacities for sustainable development should also be strengthened in order to benefit from the resulting enhanced stakeholder participation. As a basis to this, Governments should ensure coherence and consistency in policy formulation and implementation, promote transparency and effective involvement of all relevant stakeholders and strengthen institutional mechanisms in support of sustainable development.

At the regional level, AUC jointly with ECA and AfDB in cooperation with other regional agencies and regional economic communities such as ECOWAS, COMESA, IGAD, EAC SADC, ECCAS and AMU should continue to support African countries to achieve sustainable development. This must be followed by improved intra-Africa regional coordination and cooperation on sustainable development with Governments and other agencies. Notable successes can be found from the OECD (2011) study of policy coherence in the fisheries sector in seven West African countries (Cape Verde, the Gambia, Guinea, Guinea-Bissau, Mauritania, Senegal and Sierra Leone) in partnership with the Sahel and West Africa Club (SWAC) and ENDA Diapol/

REPAO¹⁵. The study recommended areas for action by international, regional and local partners, including the need for a multi-stakeholder dialogue on policy coherence as a priority-setting exercise and prerequisite for sustainable development.

The interdependence between forests, biodiversity, biotechnology, tourism and mountains calls for coherence in policies (in the regional, global, domestic and foreign policy sense) – such as trade, investment, agriculture and fisheries, taxation, security, innovation, migration, climate and environment (OECD 2011). Even development cooperation efforts should be supported by mutually reinforcing policies across a wide range of economic, social and environmental issues to ensure greater results and impact (World Bank 2010). Enhancing policy coherence for sustainable development requires a comprehensive approach to development across all sectors and subregions thus ensuring increased cooperation and knowledge sharing; and enhanced partnerships. This should be boosted by evidence-based analyses of the costs of incoherent policies in contrast to benefits of more coherent policies, a comprehensive assessment and monitoring of the impact of policy in all themes in order to sufficiently ensure coherent and consistent policy advice; and identifying more holistic policy options, including any trade-offs or synergies between them. This should also include the setting, monitoring and harmonization of international and national goals and targets.

The adoption of inclusive green growth principles could help to ensure that the continent's biodiversity, forests, tourism and mountains are managed through strategies and policies that foster an integrated approach and prevent over exploitation. It could also allow the application of biotechnology to the sustainable management of the broader natural resources. Through inclusive green growth interlinkages across sectors could be adequately addressed and exploited.

8.3.2 Broad-based governance

Broad-based governance remains a key avenue to achieving sustainable development. In order to benefit from all opportunities presented by biodiversity, biotechnology, forests, mountains and tourism, multi-stakeholder processes that build on the interlinkages perspectives will

remain significant. This would support Africa's efforts to attain sustainable management of these sectors that contributes to social, economic and infrastructure development. These efforts must be geared towards strengthening domestic accountability mechanisms that address transparency, regulation and decentralized resource management.

The success of sustainable development depends on well-structured but flexible consultation by engaging stakeholders in economic, environmental and social development processes. Consultation processes need to judiciously target the responsible actors in the various sectors who are affected by the policies and actions captured by the interlinkages. Constructive working relationships must be built among stakeholders in order to set a broader, more inclusive, and continuous process between Governments, local communities, the private sector, civil society and other development partners key to sustainable development through their roles in biodiversity, biotechnology, forests, tourism and mountains. In line with recommendations of the United Nations Commission on Private Sector and Development, many African countries have put in place plans for private sector engagement.

The United Nations Commission 2004 report, entitled *Unleashing Entrepreneurship: Making Business Work for the Poor*¹⁶, called for identification of best practices, domestic policies, enabling reforms and strategic partnerships that promote national, international public and the private sector's involvement in development. UNDP initiatives in this regard, records experiences of partnerships between government, business, and civil society organizations to stimulate entrepreneurship within countries and between neighbouring countries to fast-track sustainable development and reduce poverty. Experiences show that creation of structures and pro-poor policies whereby Government and the private sector actively participate in innovation for development promote cross-sector integration. These have variously targeted:

- Creation and implementation of pro-poor policies, mainly in agriculture, water and health sectors, investment, trade and small-scale enterprises with the aim of stimulating equitable socio-economic growth and achievement of the MDGs;

¹⁵ ENDA, Prospective et dialogues politiques; RECAO - Réseau des chambres d'agriculture de l'Afrique de l'Ouest (network of West African Chambers of Agriculture).

¹⁶ <http://www.undp.org/cpsd/report/index.html>

- Expanding and implementing pro-poor trade policies and partnerships with neighbouring countries that would lead to equitable economic growth particularly in Africa's economic blocks;
- Brokering of multi-stakeholder development partnerships, between Government, the private sector and civil society; and
- Strengthening social responsibility, ethical business practices and sustainable entrepreneurship by implementing Global Compact principles.

8.3.3 Adaptive governance

Dealing with the interlinkages among forests, biodiversity, biotechnology, tourism and mountains requires redress of underlying challenges of complexity, fragmentation, uncertainty and change. Galaz and others (2006) noted that problems of complexity, uncertainty, change and fragmentation easily result in governance disjuncture. There are also limited opportunities to transform underperforming governance processes and structures to more responsive interlinked ones. This is complicated by uncertainties and conflicting national, sub-regional and institutional interests. Olsson and others (2006) recommend adaptive management to this end. Application of adaptive governance is necessitated by the existence of multiple actors and sectors in the sustainable development continuum. Adaptive governance may be institutionalized relying heavily on polycentric institutional arrangements. Such multiple, flexible yet dynamic systems require nested and quasi-autonomous decision-making and sustainable development practice units at multiple scales (Olsson and others 2006). It enables stakeholders to share in the management of and responsibility over natural resources for sustainable development. This will benefit from the accruing outcomes of effective cooperation, collaboration, flexibility and learning-based issue management (Olsson and others 2006).

This, in the African context, is more realistic and can help harness synergies between forests, biodiversity, biotechnology, tourism and mountains. This way, optimal use and control of natural resource degradation may be achieved. An advantage of this approach is that sustainable development interventions in biodiversity, forestry, water, agriculture and food security, tourism, mountains and other thematic aspects starts with existing organizations, and endeavours to reach out to other relevant

entities and stakeholders through cascading and responsibility sharing. This inherently has a democratic appeal for multi-stakeholder engagement and inclusive governance structures and will significantly broaden the knowledge base for sustainable development. Specifically, this approach would enhance the application of social coordination through networks instead of forming new institutions. Changes in the African development context tracked in this report can be addressed through more flexible and responsive management arrangements (see Box 33 on forest management in Mali and Burkina Faso).

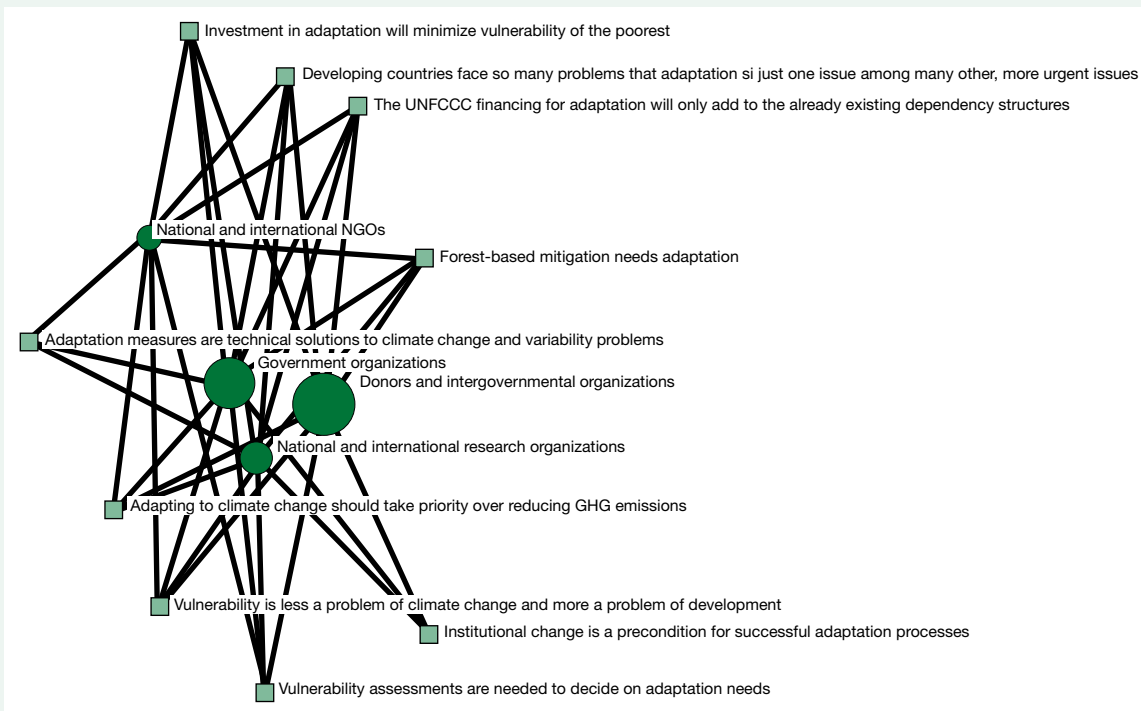
By practicing adaptive management policymakers can more effectively integrate fresh insights, technologies and knowledge to manage sustainable development change processes. The approach promotes diffuse and multi-actor techniques that stem from effective leadership and partnerships (Olsson and others 2006). Appropriate interfaces can thus be designed to harness the opportunities presented by science, research, policy and local practice. Folke and others (2005) assert that this would reduce the cost of sustainable development transactions and thus identify appropriate avenues for future efforts to address key sustainable development interlinkages without interrupting ongoing development processes. For Africa, the following guidelines and principles are important in implementing adaptive management of natural resource base for sustainable development.

- Effective dialogue among relevant and interested actors in forests, biodiversity, biotechnology, tourism and mountains;
- Nesting of the complex, layered and connected institutions for solution-oriented processes that are embedded in several spatial and institutional layers of governance in order to entrench sustainable development;
- Promoting integration of a mix of institutional types that facilitate experimentation, learning and change for sustainable development.

Application of adaptive management in the limited cases that exist in Africa has built knowledge, created networks between different players and fostered effective leadership. Cundill (2010) illustrates three case studies from South Africa involving monitoring of social learning in Machubeni, Nqabara and Riemvasmaak aimed

Box 33: Adaptive governance of forests in Mali and Burkina Faso

In most regions in West Africa, livelihoods depend heavily on forest ecosystem goods and services, often in interplay with agricultural and livestock production systems. This is however threatened by a myriad of economic, ecological, social and political challenges for the governance of forest commons. Adaptive governance provides a framework for formulating, financing and implementing integrated and multilayer strategies in a context of decentralisation and co-management. Actors, institutions, networks and their interlinkages are considered core elements of adaptive governance of natural resources (Armitage 2008; Biermann and others 2010). Brockhaus and others (2012) have shown how governance and adaptive capacity in Mali and Burkina Faso forest systems exemplify this. The primary focus in adaptive governance is an integrated view of actors, perceptions and individual and organizational understandings. In the two country cases, policy decisions and governance structures at multiple levels affect local realities. The adaptation arena spans all levels – local to global – and in both countries as shown in the actor network diagram.



Source: Brockhaus and others (2012).

at creating partnerships and knowledge networks and provide training and capacity building in various aspects of co-management, conflict management and monitoring and evaluation.

Addressing interlinkages at the regional, subregional, national and local levels can be done using various tools and approaches. The tools can be applied in policy and development project/programme design, implementation and monitoring guided by appropriate policy frameworks. Some tools and approaches will help manage the trade-offs among forests, biodiversity, biotechnology, tourism and mountain systems, while others will help to maximize and harness the synergies. Addressing interlinkages will also demand certain environmental fiscal reforms (EFR), including institutionalization of

international governance structures for resource efficiency such as for strengthening biodiversity conservation, mountain and forest protection and minerals and metals extraction. Such structures should also enforce the reinvestment of resource rents in economic diversification and resource-efficient infrastructure; build credibility of monitoring and enforcement agencies; dialogue and advocacy on transparency of extractive industries and create win-wins among interlinked sectors.

8.3.4 Integrated Science, Technology and Innovation

Sustainable development is reliant on integrated data and sound scientific information on interlinkages between sectors as key ingredients. Specifically, poverty

eradication efforts should take full advantage of science, technology and innovation. Investments must continue on science and technology infrastructure and capacities for development knowledge and information with focus on cross-thematic knowledge management and information needs. There are a number of successful collaborative initiatives in Africa for monitoring, observing, networking, managing data, developing indicators, carrying out assessments and providing early warnings of emerging and future sustainable development challenges at the local, national, subregional, regional and global scales. The African Union has a consolidated science and technology plan which puts emphasis on developing an African system of research and technological innovation. The AU has initiated an award to promote excellence in science and innovation (Box 34).

Already many countries are using science, technology and innovation (STI) to meet their healthcare needs, develop industries and overcome other social, economic and environmental challenges. South Africa, for instance, is on course to becoming one of the top producers of pharmaceuticals in the world. According to UNESCO and others (2011), political leadership in promoting the initiatives, domestic investment in the programmes and resource availability to facilitate innovation and entrepreneurship is important to harnessing STI for sustainable development and African countries should learn from the experience of other regions and countries to meet their food, health, energy, housing and transport needs by developing a sound technological and industrial base.

Many countries in Africa have legislative or other provisions for harnessing science and technology for integrated development. Science and technology innovation can contribute to achieving sustainable development through their contribution to human welfare and human development challenges that are prevalent in Africa such as HIV & AIDS. STI also contributes to specific sectors such as forestry, energy, water and agriculture in the generation and use of technologies for strategic sustainable development policy interest as well as the revolutions in ICT and biotechnology. These continue to create new opportunities and put new pressures on skill sets and organizational practices within enterprises, universities and other R&D and economic development institutions. Innovation is now recognized as the main driver of economic growth in developed countries and is regarded as a key pillar for competitiveness in trade, and any country seeking to unleash the power of entrepreneurship and innovation has to put the right policies, support measures and mechanisms in place, including appropriate intellectual property rights (IPR) regulations, youth development programmes, resources and partnerships (UNESCO and others 2011). UNESCO and others (2011) highlights strategies for harnessing STI for sustainable development in Africa given the interlinkages (Box 35), including specific actions in promoting human capital development, STI infrastructure, innovation financing, academia-industry-Government cooperation, legal and regulatory framework, promotion of technology innovators and entrepreneurs and international cooperation.

Box 34: The African Union Scientific Award Programme

“The African Union Commission (AUC) is committed to ensuring that science and technology contribute to sustainable development efforts. The Constitutive Act, establishing the African Union, recognizes the need to advance the development of Africa by promoting research in all fields, and in science and technology in particular. The Commission, through its Department of Human Resources, Science and Technology implements a strategic science and technology development programme, aimed at contributing to the well-being and improved quality of life for the African citizens. In January 2007, the AU Heads of State and Government “declared 2007 as the launching year for building constituencies and champions for science, technology and innovation in Africa”.

As a holistic and deliberate measure to maintain science and technology to support development, cooperation and political agenda, the AUC continues to urge the Member States to popularize science among African citizens, empower them, celebrate their achievements and promote all efforts to transform scientific research into sustainable development. In 2008, the commission launched the African Union Scientific Award Programme. The programme is implemented at the national level for young researchers, regional level for women scientists and continental level open to all scientists with the objective of recognizing top African scientists for their scientific achievements and valuable discoveries and findings. The programme has been renamed “African Union Kwame Nkrumah Scientific Awards” to underscore a success story and the critical role of science and technology in the development and integration of Africa.

Source: AU Commission: <http://www.africa-union.org/root/AR/index/award.html>.

Box 35: Strategies for promoting the role of science and technology innovation for sustainable development

- *Human capital development:* Africa needs to develop science and engineering talent, technology entrepreneurs and science and technology (S&T) managers to ensure that the limited human, financial and institutional resources are efficiently mobilized and allocated and research outputs are well protected and exploited to obtain their full potential benefits.
- *STI infrastructure:* Hard and soft STI infrastructure is critical to meeting this agenda. Soft infrastructure, such as networks and information technology, could provide access to management, intellectual and R&D resources. Adequate infrastructure can reduce the costs for innovators and entrepreneurs.
- *Innovation financing:* Through mainly offering special grants, loans and guarantees for start-ups and new firms as well as subsidies and tax incentives for research and development.
- *Academia-industry-Government cooperation:* Empowering the private sector which is still relatively small and is largely unsophisticated technologically, for example, small and medium enterprises (SMEs). Promoting cooperation through joint projects and programmes of mutual interest to R&D centres, SMEs and large firms could promote innovation and entrepreneurship. Governments could also require ministries to reserve a fraction of their budget for promoting STI joint initiatives between their R&D centres and SMEs.
- *Legal and regulatory framework:* The legal and regulatory framework can be used effectively to encourage fair competition, promote innovative firms, attract foreign innovative investors and remove administrative entry barriers. Countries also need to develop clear technology commercialization rules.
- *Promotion of technology innovators and entrepreneurs:* African scientists continue to play a key role in developing the seeds that feed the continent and offer complex but life-saving medical procedures under difficult conditions. As such, STI promotion of technology entrepreneurs, appreciation and recognition of technological achievements and the many career and business opportunities that science and technology offers could help attract students, especially girls, to pursue the sciences and science careers, and to help produce the next generation of innovative entrepreneurs.
- *International cooperation: Global, regional, subregional and national:* International cooperation allow and facilitate knowledge acquisition and learning, especially in multidisciplinary fields such as information technology and biotechnology. African S&T diplomacy has to be stepped up as very few African countries have formal R&D or S&T technology agreements with leading and emerging technology producers.

Source: UNESCO and others (2011).

Science and technology innovation through promotion of R&D for sustainable management of forests, mountains, biodiversity and forests offers unique opportunities for employment creation, especially for the youth. Investment in agricultural and natural resources management research and infrastructure, for instance, is important for economic growth in Africa. “The increasing investments in agricultural research for development (AR4D) could bring the much-awaited agricultural transformation to Africa and help address the rising wave of youth unemployment and its attendant poverty” (FAO 2010). This research could be improved through innovations in biotechnology, agrobiodiversity, forestry and other sectors. This investment has a trickle-down effect on the youth by way of generating improved technologies that could attract them to agriculture and also build their capacities in solving both present and future challenges to food security. Currently, every dollar invested in agricultural research, yields a \$9 return on

investments in Sub-Saharan Africa. This figure can be enhanced with such efforts.

8.4 Conclusion

By navigating evidence-based interlinkages between various development priorities in Africa, this chapter has illustrated how poverty, natural resources and development goals interact and how the resulting social, economic and environmental challenges are interlinked through interwoven, dynamic biophysical, social and economic processes. Interlinkages prevail at different scales occasioning the need for integrated approaches to governance for sustainable development. Recognizing and addressing these interlinkages offer an opportunity for more effective responses at all levels of decision-making and sustainable development practice.

The objective of understanding these interlinkages is to unearth their form, interpret their inherent causality relations and ultimately facilitate a transition towards a more sustainable society with poverty eradication and other development goals in sight. As indicated in the chapter, addressing interlinkages requires cooperation across the existing governance regimes, institutions, countries, subregions, international partners in more flexible, broad and adaptive ways.

Africa occupies an increasingly central position in the global political economy because of its natural resources, in terms both of minerals and other land-based resources, and has now an unprecedented opportunity for transformation and sustained growth. Addressing the sustainable development needs of the continent by harnessing the inherent interlinkages presents both opportunities and challenges. Even as the interlinkages become apparent and necessary to integrate, resource productivity will become a key driver for economic development in the continent. However, there is a huge disparity between this natural wealth base and the benefits accruing to African countries.

Governance systems reforms with interlinkages perspectives at all levels, including local resource management can improve the protection and restoration of habitats, forests, mountains and other natural resources and watersheds through effective coordination and planning. The various approaches for addressing interlinkages in sustainable development require adaptive governance that promotes flexibility, policy cohesion, cooperation and learning to cope with the challenges of integrated development and governance requirements.

The adoption of inclusive green growth principles could help promote and support poverty eradication in the region, with the majority of the population depending on natural resources and sectors offering significant green growth opportunities in the short and medium terms. Investing in the sustainable development and management of biodiversity, forests, biotechnology, tourism and mountains could present considerable win-win options that can at the same time provide alternative livelihood opportunities while strengthening economic growth.

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Annex I: Sustainable development indicators by theme and sub-theme

Theme	Sub-themes	Core Indicator(s)	Other Indicators
Governance	Political and economic governance	<ul style="list-style-type: none"> African Governance Index 	<ul style="list-style-type: none"> Country Policy and Institutional Assessment (CPIA) Corruption control index
	Peace and Security	<ul style="list-style-type: none"> Number of conflicts 	<ul style="list-style-type: none"> Global Fragility Index
Poverty	Income poverty	<ul style="list-style-type: none"> Proportion of population living below national poverty line 	<ul style="list-style-type: none"> Poverty gap ratio at \$1 a day (PPP), percentage
	Access to decent housing	<ul style="list-style-type: none"> % of households with decent housing 	
	Drinking water	<ul style="list-style-type: none"> % of population with access to improved water sources (total, urban, rural) 	
	Sanitation	<ul style="list-style-type: none"> % of population with access to improved sanitation facilities 	
	Access to energy	<ul style="list-style-type: none"> % of the population with access to electricity (total, urban, rural) 	<ul style="list-style-type: none"> % of population using biomass
Demographic changes	Population growth	<ul style="list-style-type: none"> Population growth rate (annual %) 	
	Urbanization	<ul style="list-style-type: none"> Rate of urbanization (%) 	<ul style="list-style-type: none"> % of population residing in urban areas
State of the economy	Wealth and Macroeconomic performance	<ul style="list-style-type: none"> GDP per capita (PPP, constant 2005 international dollars, annual % change) 	<ul style="list-style-type: none"> Adjusted net savings as % of GNI
	Value-addition	<ul style="list-style-type: none"> Manufacturing value-added 	
	Tourism and Travel	<ul style="list-style-type: none"> Travel and Tourism contribution to Employment (%) 	<ul style="list-style-type: none"> Travel and tourism contribution to GDP (%) Trends in tourism arrivals
Sustainable consumption and production	Sustainable consumption	<ul style="list-style-type: none"> Municipal wastes collected (1000 tonnes) 	<ul style="list-style-type: none"> Land-filled municipal waste
	Sustainable production	<ul style="list-style-type: none"> Establishment of clean production centres 	
Social equity and opportunities	Income inequality	<ul style="list-style-type: none"> Gini Index 	<ul style="list-style-type: none"> Poorest quintile's share in national income or consumption, percentage
	Empowerment of women	<ul style="list-style-type: none"> Share of women in paid employment in non-agricultural sector (% of total non-agricultural employment) 	<ul style="list-style-type: none"> Proportion of seats held by women in national parliaments
	Youth employment	<ul style="list-style-type: none"> Unemployment rate of the youth (%) 	
Education	Enrolment level and coverage	<ul style="list-style-type: none"> Net enrolment ratio in primary education Gender parity index in primary education enrolment 	<ul style="list-style-type: none"> Completion rates for basic education by sex
	Adult Literacy	<ul style="list-style-type: none"> Adult literacy rate, total, male, female (% of people aged 15 and above) 	
Health	Maternal and infant mortality	<ul style="list-style-type: none"> Maternal mortality ratio Under-five mortality rate 	
	Morbidity	<ul style="list-style-type: none"> Prevalence of HIV total (% of pop age 15-49) 	<ul style="list-style-type: none"> Prevalence of malaria (% of population)
Agriculture and food security and nutrition	Food production	<ul style="list-style-type: none"> Food production index 	
	Agricultural transformation	<ul style="list-style-type: none"> Agriculture value-added 	<ul style="list-style-type: none"> Value of agricultural imports Value of agricultural exports
	Sustainability of agricultural practices	<ul style="list-style-type: none"> Fertilizer use intensity 	
	Nutrition	<ul style="list-style-type: none"> Prevalence of stunting 	<ul style="list-style-type: none"> Proportion of people undernourished Prevalence of obesity and other forms of malnutrition

Theme	Sub-themes	Core Indicator(s)	Other Indicators
The natural resource base	Forests	<ul style="list-style-type: none"> Proportion of land area covered by forest, percentage 	<ul style="list-style-type: none"> Areas of forest designated for conservation of biodiversity
	Water	<ul style="list-style-type: none"> % of population living in water-stressed environment 	
	Land	<ul style="list-style-type: none"> % of population living on degraded land 	<ul style="list-style-type: none"> Land tenure
	Biodiversity	<ul style="list-style-type: none"> Conservation status of threatened species in Africa 	
	Mineral resources	<ul style="list-style-type: none"> Key mineral resources in Africa, % of world production and % of world reserves 	
Energy	Energy supply	<ul style="list-style-type: none"> Wood removals in Africa 	<ul style="list-style-type: none"> Renewable energy potential
	Energy security	<ul style="list-style-type: none"> Net energy imports 	
	Energy intensity of the economy	<ul style="list-style-type: none"> Energy use intensity per \$1,000 (PPP) GDP (kg oil equivalent) 	
Climate change	Adaptation	<ul style="list-style-type: none"> Cost of adaptation 	
	Mitigation	<ul style="list-style-type: none"> CO₂ emissions per capita 	<ul style="list-style-type: none"> Number of CDM/REDD projects
	Climate change finance	<ul style="list-style-type: none"> Resource available from climate change funds and programmes 	
Natural disasters	Incidence of disasters	<ul style="list-style-type: none"> Total number of natural disasters 	
	Vulnerability	<ul style="list-style-type: none"> Human and economic losses due to disasters 	
Financing sustainable development	Domestic financing	<ul style="list-style-type: none"> Trends in domestic revenue and private flows in Africa 	
	Foreign direct investment	<ul style="list-style-type: none"> Trends in Foreign Direct Investment 	<ul style="list-style-type: none"> Value of Foreign Direct Investment
	External financing	<ul style="list-style-type: none"> Net official Development assistance (ODA) as % of GNI 	

Annex II: Classification of selected SD indicators and degree of link to themes

SD Indicator	Governance	Poverty	Demographic Changes	Economic Transformation and Macro-economy	Sustainable Consumption and Production	Social Equity	Education, Training and Culture	Health and Nutrition	Food Security and Agriculture	The Natural Resource Base	Energy	Climate Change	Natural and Man-made Disasters	Funding for sustainable development
African Governance Index (AGI)														
Poverty gap ratio at \$1.25 a day (PPP) - %														
% of population living below national poverty line														
Poorest quintile's share in national income														
% of population with access to improved water sources														
% of the population with access to electricity														
% of population with access to improved sanitation														
Population growth rate														
Rate of urbanization (%)														
Adjusted net savings as % of GNI														
Manufacturing value-added														
Travel and Tourism contribution to Employment (%)														
Municipal wastes collected (1000 tonnes)														
Share of women in paid employment in non-agricultural sector														
Total employment disaggregated by gender														
Net enrolment ratio in primary education, both sexes														
Adult literacy rate														
Mortality rate														
Prevalence of HIV total														
Prevalence of stunting														
Food production index														
Fertilizer use intensity														
Proportion of land area covered by forest														
Threatened species														
Land tenure														

SD Indicator	Governance	Poverty	Demographic Changes	Economic Transformation and Macro-economy	Sustainable Consumption and Production	Social Equity	Education, Training and Culture	Health and Nutrition	Food Security and Agriculture	The Natural Resource Base	Energy	Climate Change	Natural and Man-made Disasters	Funding for sustainable development
Energy use intensity														
Cost of adaptation														
Human and economic losses due to disasters														
Net official Development assistance (ODA) as % of GNI														

Key to Colour Schemes

PREM category	Link to SD Theme		
	Primary	Secondary	Tertiary
Pressure Indicators			
Response Indicator			
Effect Indicator			
Mitigation Indicator			

NOTE: The colour schemes show the category of indicator (PREM) while the colour shades indicator level of application to the specific theme with dark colour shades showing primary indicators under a theme. Lighter shades show clear and possibly secondary link to the theme. For instance the AGI is a primary response indicator of governance but also a mitigation tertiary indicator of poverty and economic transformation.