Integrated Assessment Methodologies and Tools for Inclusive Green Economy Analysis in Africa

Contents

Acronyms and abbreviations

AUC	African Union Commission
ECA	Economic Commission for Africa
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross domestic product
GEM	Green economy model
GSI-IF	Global Subsidies Initiative Integrated Fiscal model
Ha	Hectare
I/O	Input output
IGE	Inclusive green economy
IM-CLIMA	Integrated model for climate mitigation and adaptation
IM-SLEP	Integrated model for sustainable land and economic planning
IMF	International Monetary Fund
InVEST	Integrated valuation of environmental services and trade-offs
IPCC	Intergovernmental Panel on Climate Change
Kt	Kilo ton
LEAP	Long-range Energy Alternative Planning system
MARKAL	Market Allocation Modelling Framework
Mt	Million tons
NGO	Non-governmental organization
NPV	Net present value
OECD	Organization for Economic Cooperation and Development
REDD+	Reducing emissions from deforestation and forest degradation
RIM	Regional Implementation Meeting
SADC	Southern African Development Community
SAM	Social Accounting Matrix
SaS	Story and simulation
SCI	Statistical Capacity Indicator
SDI	Sustainable development indicator
SDRA	Sustainable Development Report on Africa
SEA	Strategic environmental assessment
SEEA	System of Environmental-Economic Accounting
SNA	System of National Accounts

TEEB	The economics of ecosystems and biodiversity
TVET	Technical and vocational education and training
UNCED	United Nations Conference on Environment and Development
UNCEEA	Committee of Experts on Environmental-Economic Accounting
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
WAVES	Wealth accounting and valuation of ecosystem services
WCED	World Commission on Environment and Development ("Brundtland Commission")

Executive summary

The inclusive green economy has gained considerable attention in past years as an action-oriented approach and one of the tools for realizing sustainable development. The main contribution of this approach has been identified as integrating economic, social and environmental dimensions of development policies in a coherent, cross-sectoral framework of analysis. This supports human well-being, equity and social inclusion while minimizing depletion of natural resources and environmental degradation, among other benefits.

As governments begin to develop and implement inclusive green-economy strategies, more attention is being given to research into the use of methodologies and tools to identify social, economic and environmental trends, and the evaluation of the likely outcomes of implementing inclusive green economy policy. The Africa Regional Implementation Meeting for the follow-up processes to the United Nations Conference for Sustainable Development, held in 2012, produced an outcome document that calls on the Economic Commission for Africa (ECA) and partners to adopt or enhance the use and application of approaches and tools, including integrated assessments, to promote the balanced integration of the three dimensions of sustainable development.

The present report provides an assessment of tools and methodologies deemed appropriate for analysing inclusive green economy policies (whether sectoral or integrated) in Africa. It assesses how to identify the most suitable tools and methodologies (based on regional and country contexts) to be used for capacity-building and advocacy activities on integrated assessments for an inclusive green economy. Specifically, this report: (1) describes selected methodological frameworks and tools for inclusive green economy assessment, (2) assesses tools and methodologies against a variety of criteria that were specifically selected to evaluate their capacity to support one or more stages of the integrated policymaking cycle for inclusive green economy; and (3) compares the tools and methodologies to identify those that would better support inclusive green economy policymaking in Africa.

Inclusive green economy tools and methodologies are assessed for their relevance to the African context and also for their capability to inform the policy cycle (for the development of sectoral and integrated plans). The starting point is the identification of the key priority areas for inclusive green economy policymaking in Africa, namely: institutional framework for integration, coherence and inclusion; appropriate mix of policy instruments; capacity development; and international and regional cooperation (ECA and others, 2015). The second step of the assessment specifically uses the conceptual framework of the integrated policymaking cycle, assessing the contribution of each tool and methodology to the five steps of the cycle: (a) the definition of issues (or agenda-setting), (b) policy formulation, (c) decision-making, (d) implementation and (e) monitoring and evaluation (UNEP, 2009). In addition to their relevance for the different stages of the integrated policymaking cycle, tools and methodologies are assessed against their capacity to support integrated assessments by generating insights for policy outcomes across the three dimensions of sustainable development and across sectors and actors. The assessment also focuses on the required interpretation of the results obtained from the various tools and methodologies and the data they require. Specifically, step 3 takes into account the results of a review of statistical capacity in Africa, which is crucial for the use of quantitative methodologies and tools.

The main results of the analysis are summarized in the following paragraphs, covering a review of tools and methodologies for an inclusive green economy**,** their suitability to the African context**,** and considerations on policy relevance and recommendations.

Review of inclusive green economy tools and methodologies

Support to the policymaking process

From the assessment conducted, it is concluded that no single tool exists that can support decision makers throughout the entire policy cycle. On the other hand, some tools can support two or more steps of the cycle owing to their flexibility and features. For example, certain types of decision-support systems) are designed to integrate multiple data-management and modelling tools, thereby providing support from the problem-identification (e.g. trend analysis) to the monitoring and evaluation phases, with the exclusion of the implementation phase.

Target audience (multi-stakeholder involvement)

The results of the assessment show that specific technical skills are required for developing and using almost all the tools reviewed in this study. As a result, all the tools are shown to be more effective when multiple stakeholders from different disciplines and sectors are involved in their utilization and cross-sectoral tools support communication across several stakeholder groups. More precisely, most tools require technical experts to collaborate with decision makers.

Time horizon of the analysis

The time horizon of the analysis provided by each of the tools and methodologies reviewed varies largely. All tools for assessing policies or projects provide a static analysis. Frameworks such as poverty and social-impact analysis, governance assessments and feasibility studies provide a snapshot of policy impacts. While these may include future developments, their results consist of a single value indicating the performance of a project. Other tools, such as scenario-forecasting models, are very different from each other with respect to the treatment of time. In particular, most of them target long-term trends, apart from computable general equilibrium models, which provide a snapshot and are most often used to assess short- to medium-term impacts of policy implementation.

Complementarity with other methodologies and tools

The majority of the methodologies and tools reviewed can be used in combination with other assessment frameworks and tools. Indeed, depending on the focus of the assessment and the stage of the policymaking cycle, decision makers can use different tools in combination to gain multiple insights and address the problem according to different perspectives. This is very important, as decision makers often need a toolbox, from which specific tools can be employed to obtain policy support (e.g. sectoral tools as compared to integrated tools, for short-term rather than long-term outcomes of policy implementation).

Capacity development requirements

All the tools and methodologies reviewed in this study have been used in one or more African countries to conduct policy-assessment exercises. This means that capacity-building

programmes have already been set up in several countries to improve technical skills for the evaluation of inclusive green economy interventions, or elements of it (e.g. sectoral and thematic analysis rather than integrated assessments). On the other hand, the tools and methodologies analysed require specific expertise in one or more fields, with degrees of technical complexity largely varying depending on the type of tool and the depth of the inclusive green economy assessment.

Suitability to the African context

Thematic focus: Most of the indicators and measurement frameworks reviewed support an integrated, cross-sectoral analysis of inclusive green economy policies and plans. This is consistent with the needs for policymaking in Africa, where social development, economic growth and environmental quality are strongly interconnected. This is due to high dependency on environmental and natural resources for economic and social development.

Ease of customization and use: Inclusive green economy tools and methodologies should be easily adaptable to different country contexts in order to support decision makers fully in their efforts towards an inclusive green economy. The tools and methodologies reviewed have different flexibility and usability features. Some methodologies are extremely easy to modify and adapt to a variety of contexts and inclusive green economy assessment topics, while others require the user to replicate a rigid structure or process.

Data requirements: From the assessment conducted, most tools and methodologies are characterized by intensive data requirements. This is especially true for integrated assessment tools, which should be fed with economic, social and environmental data in order to perform a comprehensive evaluation of inclusive green economy policies and investments. The ease of access to information in the African region was also considered and it emerged that data-collection efforts might be particularly challenging when directed to quantitative environmental information.

Recommendations on the selection of tools and methodologies

The selection of tools and methodologies for inclusive green economy assessments depends on the stage of the policy cycle to be informed and on the type of policies to be assessed. Ideally, methodologies and tools should be combined to carry out an integrated assessment by making use of their respective strengths. As a result, relevant indicators should be integrated in decision-support systems that combine scenario capabilities (creation and forecasting) with policy or project assessment features. With this in mind, it is difficult to identify with confidence the overall most suitable tools for inclusive green economy assessments in Africa. This is because the choice has to be based on the problem to be analysed, the context to be assessed and the preparedness of the team carrying out the study. Nevertheless, the suitability for Africa should take into account several factors, including statistical capacity and data issues. When considering the inclusive green economy definition and its characteristics, integrated models would seem to be the most adequate tool to be used for inclusive green economy assessments in Africa. On the other hand, these are data-intensive and require cross-sectoral stakeholder involvement and interdisciplinary skills. In fact, the results presented in this report indicate that the capacity of most countries in the region remains weak and policymakers make little use of data, despite the ongoing efforts to improve statistical capacity in Africa (by the African statistics community and its partners) over approximately the past 45 years.

Considering the above, a hierarchical approach to the selection and adoption of tools and methodologies for inclusive green economy planning is proposed, as follows:

- Policy planning for sustainable development and inclusive green economy requires capturing the existing interlinkages between economy, society and environment that are dynamic (within a governance framework) over the medium-to-long term. This requires the adoption of integrated (cross-sectoral) tools that can capture the dynamics of systems.
- The design and assessment of specific provisions within larger policy packages require instead a higher level of detail than that offered by integrated tools. For this reason, sectoral tools should be employed to provide more targeted inputs to decision makers.

As a result, it is suggested to consider the use of the following tools and processes:

- Building on the Economic Commission for Africa's sustainable development indicator framework, the green economy indicators of the United Nations Environment Programme (UNEP), the System of Environmental-Economic Accounting (SEEA), and vulnerability indicators to inform each step of the policymaking process with indicators across sectors (considering both historical and future trends, when coupled with other inclusive green economy tools). (For all policy processes.)
- Causal loop diagrams to better understand how several sectors, and the indicators within them, are interconnected with each other. Developing these diagrams is essential as it is a first step to understanding better the systemic nature of our society, economy and environment. (For all policy processes.)
- Medium to long-term development plans including integrated models, such as green economy models and Threshold 21, should be customized and used to ensure coherence of sectoral analysis and obtain results simultaneously across social, economic and environmental indicators. Integrated models are the only quantitative tools that allow analysts to represent coherently the national inclusive green economy, as defined, across sectors, actors and over time.
- Land-use planning and spatial assessments. Geographic information systems modelling, such as Marxan software and integrated valuation of ecosystem services and trade-offs (InVEST) tools, should be employed to evaluate policy impacts on land use and on natural capital (for example for the provision of ecosystem goods and services). Spatial tools can also support the valuation of natural capital, allowing it to be better incorporated in decision-making processes.
- Energy policy, demand and supply. Sectoral optimization models (such as the MARKAL[1] generic model and the long-range energy alternatives planning system, LEAP) are commonly used to determine the best energy-supply mix required to reach stated goals. Sectoral optimization models can provide a high level of detail on the energy sector and inform the preparation of targeted policy and investment packages.
- Fiscal policy analysis. Computable general equilibrium and sectoral optimization models, such as the Global Subsidies Initiative Integrated Fiscal model (GSI-IF)

[1] MARKAL (MARKet ALlocation) is integrated software to model energy systems and analyse energy, economic and environmental issues. It can cover long time frames and model at global, national and municipal levels.

and MARKAL, should be used, especially in conjunction with each other, to provide specific input on the distributional effects of fiscal-policy reforms such as removal of subsidies on fossil fuels. This would allow experts to link economic analysis with assessments of physical flows (e.g. energy and water) and to avoid using inconsistent assumptions and to generate projections that are more informative for policymakers.

Recommendations on required capacity-building efforts

Given the above recommendation that methodologies and tools be used for inclusive green economy assessments, the following priorities were identified for further investigation and in-depth capacity-building by the Economic Commission for Africa (ECA), governments and other development partners:

- Support countries to identify and use adequate tools that would help national planning efforts. This can be done through workshops and technical and policy training programmes and through the preparation of country reports in consultation and partnership with national stakeholders.
- Encourage data collection and the use of inclusive green economy indicator frameworks, which are essential to provide the basis for the analysis of the social and environmental dimensions of sustainable development, alongside other tools for project and policy assessment.
- Promote and showcase the use of system analysis as a foundation to understand better how several sectors - and the indicators within them - are interconnected and support the effective implementation of inclusive green economy interventions.
- Support national stakeholders across sectors to reach out to the main actors shaping national and subnational development planning, effectively harmonizing planning across sectors.
- Support countries (possibly at the regional, national and subnational levels) to develop and adopt economic and environmental vulnerability and resilience indicators in order to highlight the potential contribution of the inclusive green economy approach at the level of setting agendas and to anticipate potential emerging issues.
- Support the development and customization of scenario-forecasting tools to project and assess the cross-sectoral outcomes of desired interventions. Emphasis should be put on spatial-planning tools, on the integration of economic and sectoral tools (e.g. energy-economy) and, most importantly, on integrated tools.

In view of this, capacity should be improved for adapting and using the following tools:

- (1) UNEP green economy indicators, System of Environmental-Economic Accounting (SEEA) and vulnerability indicators which are essential to provide the basis for the analysis of the social and environmental dimension of sustainable development.
- (2) Causal loop diagrams to improve the understanding of the linkages across sectors, make use of synergies and avoid bottlenecks.

- (3) Scenario-forecasting tools, to project and assess the cross-sectoral outcomes of desired interventions:

    - Spatial planning tools (such as integrated valuation of ecosystem services and trade-offs or InVEST) should be developed and employed to evaluate policy impacts on land use and on natural capital, for instance on the provision of ecosystem goods and services. Spatial tools can also support the valuation of natural capital for its improved incorporation into decision-making processes.
    - Sectoral models (such as computable general equilibrium, GSI-IF, MARKAL and LEAP[2]) should continue to be used and capacity-building should be provided on their coupling. This would allow experts to link economic analysis with assessments of physical flows (e.g. energy, water) while avoiding the use of inconsistent assumptions and generating projections that are more informative for policymakers.
    - Integrated models (e.g. green economy models and Threshold 21) should be further developed, customized and used to ensure that sectoral analysis is coherent and to obtain results simultaneously across social, economic and environmental indicators.

Collaboration among experts across domains should be enhanced by means of dedicated training programmes on multi-stakeholder processes, in order to create effective multidimensional analysis. In this context, the establishment of multi-actor institutional platforms and mechanisms should be set as a precondition for any integrated planning effort. Further, collaboration among multiple actors is specifically required for the combined use of integrated assessment methodologies and tools.

[2] See above for explanations of these software platforms.

1. Chapter 1: Introduction

1.1 Origins and definitions of the inclusive green economy and priority areas for policymaking

1.1.1 Origins and definitions: the inclusive green economy

In the 25 years since the term "green economy" appeared in the report *Blueprint for a Green Economy* (Pearce, Markandya and Barbier, 1989) interest in a green transition has evolved and intensified. Calls were made in the global policy arena for a so-called "global green new deal" as a result of the global financial and economic crisis of 2007-2009. This was the focus of a report commissioned by UNEP in 2009 (Barbier, 2010). Implementation of green economy action was described as a long-term strategy for moving national economies out of the crisis. The new deal set out three concrete objectives:

- Economic recovery
- Poverty reduction
- Reduced carbon emissions and ecosystem degradation.

The document proposed a framework for green stimulus programs and supportive domestic and international policies, including support to least developed countries.

Following the report on the new deal, UNEP published a "green economy report" in 2011 (UNEP, 2011). The report elaborates the concept of a green economy, analyses key sectors of a green economy, and identifies global and sectoral recommendations for action. At the visionary level, the report describes the green economy as: an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.

At the operational level, the green economy is seen as one where growth in income and employment is driven by investments that:

- Reduce carbon emissions and pollution
- Enhance energy and resource efficiency
- Prevent the loss of biodiversity and ecosystem services.

These include investments in human and social capital. They recognize the central position of human well-being and social equity as core goals promoted by growth in income and employment. The social pillar of the green economy was highlighted at the United Nations Conference on Sustainable Development, which took place in Rio de Janeiro, Brazil, from 20 to 22 June 2012. There speakers put emphasis on inclusiveness, indicating that the economic and income growth under a green economy has to be equitably distributed across all income classes, and urban and rural populations. As a result, after the Conference, the green economy has most often been referred to as the "inclusive green economy".

Indeed, although the concept of "green economy" encompasses the economy, the environment and the social dimensions of sustainable development, it cannot be presumed that green growth (or green economy) is inclusive per se or that it would automatically foster more equitable societies. As argued by the Nobel laureate economist, Joseph Stiglitz (2013), while

inequality decreases in some countries experiencing growth, it increases in others, implying that policy matters and that inequality is a choice.

Africa remains the second most unequal region of the world, after Latin America. Striking trends were found especially in South Africa, where the Gini coefficient (a measure of inequality) rose from 58 to 67 between 2000 and 2006, and in the Central African Republic, where the Gini coefficient rose from 43 to 56 between 2003 and 2008 (AfDB, 2012b). This demands that policies aiming at greening the economy be carefully designed to maximize benefits and minimize costs for the poor and most vulnerable people (World Bank, 2012). Thus, a broader concept of "inclusive" green economy incorporates fully the social sustainability aspects, in particular enhancing human development and the conditions for poor and vulnerable people (Samans, 2013). An inclusive green economy vision carries the promise of tackling the structural causes of social vulnerability, thereby ensuring that any transformation would be both green and fair and would also lead to a green society, not just a green economy.

The 2011 UNEP report helped solidify knowledge of the trends of environmental degradation and poverty. It also provided valid arguments for a change in the nature of economic growth in the coming decades, which would have to be fundamentally different from the resource-intensive growth of the past. Future growth will need to be assessed more broadly, against the criterion of whether it satisfies demands for higher living standards for a larger global population, while adapting to tightening environmental and natural resource constraints. As a result, the inclusive green economy approach has to take into account climate-change adaptation and mitigation, to ensure that gains made are not eroded by adverse impacts of climate change.

Pointing a way forward, the United Nations Environment Management Group Report (Environment Management Group, 2011) described three new engines of productive and efficient growth:

- Greater efficiency in resource use
- Stronger environmental protection
- A shift in the composition of consumption away from resource-intensive goods and services towards less resource-intensive ones.

Fuelling these engines will require technological progress that boosts not only material and energy efficiency but also labour productivity. For this to happen, two main gaps between developing and developed countries– the technological gap and the productivity gap – will have to narrow:

The argument for closing the technology and labour-productivity gaps as a basis for a green and inclusive economy that would effectively fill the current policy gap is summarized in very broad terms as follows: a sector that has low material and energy intensity and high labour productivity corresponds to the twin criteria of green and inclusive, but a growth model characterized by high use of materials and intense use of energy as well as low labour productivity is not desirable from an economic, an environmental or a social perspective and reflects the situation of many developing countries.

The United Nations Environmental Management Group report (2011) concludes that public policies will need to be used strategically to orient the process of economic growth towards such a sustainable pathway, and issues of fairness in income distribution and social

investment and planning for long-run energy and resource efficiency need to be included in the redefined set of economic policy goals. Further, it is important to consider the principle of common but differentiated responsibility, since the green economy could (and in several cases should) be achieved at the national level both through international cooperation and national action. This approach requires a systemic shift rather than incremental improvements alone.

1.1.2 Priority areas for policymaking in Africa

The outcome document of the Africa regional consultative meeting on the sustainable development goals outlined Africa's key priorities in sustainable development. These include:

(1) To underpin sustained, inclusive and equitable economic growth

(2) To harness the demographic dividend for high and sustained economic growth that ensures full and productive decent employment for all, in particular, the youth and women

(3) To fully integrate environmental concerns into national development plans to address effectively challenges posed by climate change, desertification and land degradation, drought, floods, loss of biodiversity, management of waste and chemicals, coastal erosion, marine pollution and rising sea levels

(4) To build on political gains and reform global economic governance to make national and international institutions responsive to the development needs of African States.

(Source: ECA, AUC and AfDB, 2013).

Furthermore, the fifth edition of the *Sustainable Development Report on Africa* notes that inclusive green growth policies and strategies are likely to reduce poverty and inequality within the framework of growth that is environmentally sustainable, especially in the crop, livestock and agroforestry subsectors. Therefore, an inclusive green growth approach may encourage an equitable and sustainable transformation in Africa, including through commodity-based industrialization driven by the principles of inclusiveness and environmental integrity (ECA and others, 2015). Inclusive green growth policies and strategies should therefore be designed and implemented in order to address key development challenges, including natural capital depletion, poverty and inequality, and climate change impacts on the economy, society and environment. In particular, a set of priorities can be identified across key sectors, including (ECA and others, 2015):

- Agriculture: although the agricultural sector of the economy (as measured by gross domestic product, or GDP) has been growing at an annual average of 3.3 per cent, food security remains a key challenge for most Africans. This is mainly due to soil degradation, loss of vegetation cover and unsustainable agriculture, livestock and fishing practices leading to the depletion of stocks of natural resources. Inclusive green economy policies should promote sustainable and inclusive agriculture principles and practices in order to improve food security across Africa.

- Ecosystem goods and services: African countries are endowed with abundant biodiversity and natural resources that are being rapidly exhausted due to unsustainable consumption and production. The inclusion of natural capital and ecosystems in national accounting frameworks is an essential priority, as investing in the sustainable exploitation of ecosystem goods and services is likely to support

the livelihoods of the poor and to drive a green economy transition in most African countries.

- Energy: inclusive green economy policies can contribute to addressing the challenges of energy insecurity and access by reducing energy intensity and enhancing the clean-energy mix. A balanced mix of investments, incentives and disincentives should be designed to enhance renewable energy development and improve energy efficiency across African countries. Further, adequate measures should be put in place to mitigate potential negative impacts of sustainable energy policies on the poor, and promote equitable access to clean energy and employment.

- Industry: African countries should transform their industrial sectors to increase manufacturing value-added and promote value-chain development. The adoption of inclusive green economy policy instruments for responsible production and processing is likely to contribute to transforming African economies from being agrarian and resource-based to become more industrialized and lead the continent towards a sustainable development pathway.

- Trade: although African countries are endowed with abundant resources, most of them continue to accrue trade deficits. Trade has the potential to drive a green economy transition in Africa, if comparative advantages in sustainably produced goods and services are exploited. Investing in sustainable transport infrastructure (such as railways), eliminating trade-distorting tariffs and taxes, and reforming unproductive subsidies are measures needed to boost sustainable trade in Africa.

Beyond these sector-focused analyses, African governments should conduct integrated assessments to identify synergies and complementarities between inclusive green economy policies and to highlight the interconnection between economic, social and environmental goals. Integrated assessment should have the final goal of identifying the most suitable policy interventions that are likely to create the enabling conditions for building an inclusive green economy. In particular, the fifth *Sustainable Development Report on Africa* identified four key priority areas for inclusive green economy policymaking in Africa, namely (ECA and others, 2015):

- **Institutional framework for integration, coherence and inclusion**. There is need for high-level political commitment that supports the engagement of all levels of government in the joint elaboration of inclusive green economy policies and strategies in order to ensure policy coherence across sectors and, at the same time, take into account the cross-sectoral issues of gender, climate change, employment creation and innovation.

- **Appropriate mix of policy instruments.** Both market instruments and instruments that are not based on markets are needed to boost sustainable and equitable economic growth and transition. Importantly, policies and instruments should complement each other and be customized to national contexts, capacities and circumstances. The main types of policy instruments that should be effectively combined include:

a. Market-based instruments correcting market failures (for example environmental fiscal reforms, cost-reflective tariffs, feed-in tariffs and payments for ecosystem services)

b. Policy measures complementing market-based instruments (for example regulations, local content, sustainable public procurement and voluntary approaches)

c. Targeted public spending, investments and interventions in key or priority sectors (for example agriculture, energy, water and waste management),

- **Capacity development.** The development of employable skills in the green jobs labour market requires investments in capacity-building programmes. Capacity development should support effective policy formulation, planning and implementation, technology innovation and transfer, as well as green financing, investment and trade.

- **International and regional cooperation.** International coordination and cooperation is essential to address inequities between developed and developing countries (for example regarding greenhouse gas emissions). International institutional frameworks should be strengthened and established where needed in order to support African countries to invest in environmental sustainability while pursuing their development rights to grow in a rapid and sustainable manner.

1.2 Justification and objectives

In the run-up to the United Nations Conference for Sustainable Development, one area of research that received considerable attention was the development of methodologies and tools for the identification of worrying economic, social and environmental trends, and the evaluation of potential interventions through the analysis of alternative future scenarios (United Nations, 2012; UNEP, 2012; Kumar, 2010; OECD, 2011). In fact, the main contribution of an inclusive green economy approach has been identified as being the integration of economic, social and environmental dimensions of development policies in a coherent, cross-sectoral framework of analysis to support equity and social inclusion while minimizing natural resource depletion and environmental degradation, among other objectives.

In relation to integrated assessment tools, the resolutions of the Conference called on organizations of the United Nations system and other international organizations to assist countries in their inclusive green economy transition, including by methodologies, toolboxes and models for evaluating and applying inclusive green economy policies in the context of sustainable development and poverty eradication. The Africa Consensus Statement to the United Nations Conference for Sustainable Development calls for support to African countries to evaluate the costs and benefits associated with a green economy transition, and to formulate and implement relevant policies accordingly. The outcome document of the Africa Regional Implementation Meeting (RIM) for the follow-up processes after the Conference calls on the Economic Commission for Africa (ECA) and partners to adopt or enhance the use and application of approaches and tools, including integrated assessments, to promote the balanced integration of the three dimensions of sustainable development. The outcome document of the Africa Regional Consultative Meeting on the Sustainable Development Goals notes that data should be systematically and regularly collected, disaggregated and analysed.

Therefore, the transition towards an inclusive green economy in African countries is also expected to be guided by indicators and analytical tools capable of projecting and evaluating the impacts of current consumption and production patterns on the economy, society and environment, thereby facilitating the understanding of complex dynamics and the identification of possible alternative scenarios for more sustainable futures. On the other hand, while it is clear that new global challenges require concerted efforts, national realities remain the central elements in the formulation of development policies. In this respect, policy assessment tools and methodologies for the inclusive green economy should be adaptable to the specificities of African countries, and reflect national development vision and priorities.

In short, the inclusive green economy represents an approach that can be supported by suitable tools and methodologies to guide countries through the achievements of key sustainable development objectives such as poverty eradication, inclusive economic growth and environmental conservation. In this context, given that no single approach exists for sustainable development, policymakers need support through studies and analyses to help them better identify and understand upcoming challenges and opportunities, and to design, choose and implement policy interventions. The voluntary action plan Agenda 21, developed at the Earth Summit, or United Nations Conference on Environment and Development, in Rio de Janeiro in 1992, indicates that the main goal of strategy and planning exercises for inclusive green economy is to inform and influence the policymaking cycle so as to progress effectively towards sustainable development (UNCED, 1992).

Research on tools and methodologies for green economy policy and planning is timely in response to the needs that African countries have expressed to ECA and its partners.

In light of the foregoing and in order to respond to the requests of African countries, this report builds on the international work stream on measurement frameworks, tools and methodologies to effectively inform inclusive green economy policymaking in Africa.

The report provides an assessment of tools and methodologies deemed appropriate for analysing inclusive green economy policies (whether sectoral or integrated) in Africa, taking into account the region's specificities. It also identifies the most suitable tools and methodologies (based on regional and country contexts) that could be used for capacity-building and advocacy activities. A country case study on Ethiopia has permitted an assessment of practical application of integrated tools and methodologies in the development and implementation of inclusive green economy related strategy.

1.3 Conceptual framework

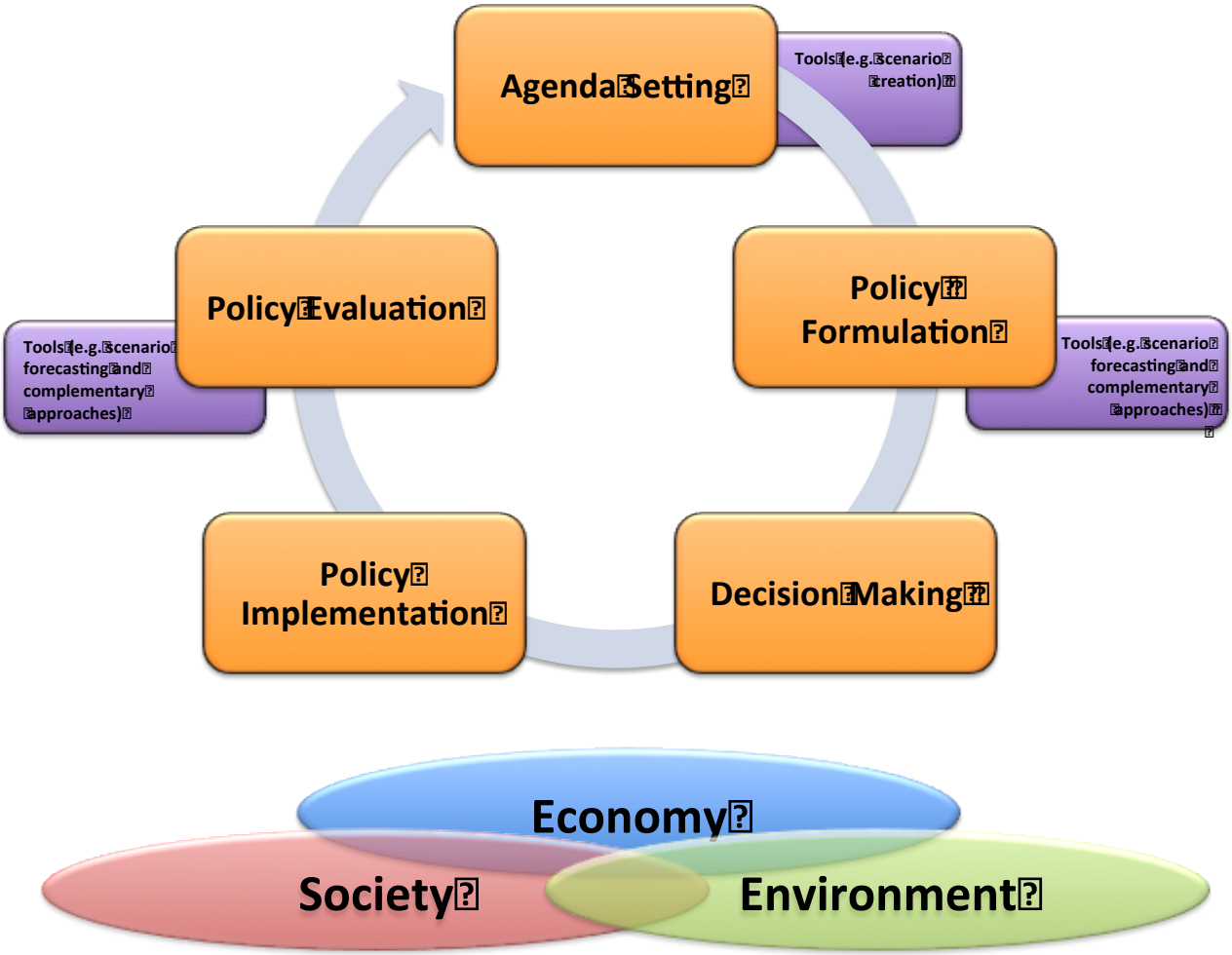
The methodology utilized for the analysis of the suitability of tools and methodologies for inclusive green economy assessments in Africa starts from the definition of the inclusive green economy (what needs to be measured and analysed), and provides (1) a framework for the review and selection of methodologies and models and (2) information on what tools are available to governments and are currently being used to support the analysis of green economy strategies at the national and sectoral levels.

This report offers a critical review of the strengths and weaknesses of various methodologies and tools, including indicators and measurement frameworks, and of their adequacy to help countries to assess their economies and develop green economy strategies in the African context. In order to do this, various criteria are proposed for the review and

assessment of tools and methodologies with a particular focus on the concerns and needs of African countries.

The review of tools and methodologies for the assessment of inclusive green economy policies is done following the conceptual framework of the integrated policymaking (IP) cycle (UNEP, 2009). This cycle represents a framework that provides guidance to decision makers for the prioritization of sustainable development issues and the formulation, monitoring and evaluation of policies aimed at solving the problems identified. The five steps of the cycle are: (1) the definition of issues (or agenda setting), (2) policy formulation, (3) decision-making, (4) implementation and (5) monitoring and evaluation, as depicted in figure 1.

Figure 1
The main steps of the policy cycle, taking into account social, economic and environmental factors for an inclusive green economy and being supported by integrated assessment tools and methodologies



The present report identifies, discusses and assesses tools and methodologies that will give effective support to decision makers in the different phases of the integrated policymaking cycle for inclusive green economy in Africa, taking into account the region's specificities, and particularly issues with statistics and data. The phases include:

- **Problem identification and agenda setting:** in the context of public policy, an agenda is a list of issues or problems (including potential opportunities, which may be missed without policy interventions) that are receiving serious attention at any given time from government officials and people outside of the government closely associated with those officials. Indicators, scenario creation and forecasting tools and methodologies, depending on their technical specificities, can facilitate the identification of worrying trends that might threaten sustainable development in a given country or area.

- **Policy formulation:** it is intended as a process of generating policy options in response to a problem established on the agenda. In this phase, tools and methodologies can be used to support the identification of key entry points for intervention. In particular, priority should be given to the identification of synergies and complementarities between policies, and the capacity of interventions to address the economic, social and environmental aspects of development.

- **Decision-making: "**Decision-making" is not synonymous with "policymaking". In public-policy sciences, "decision-making" is described as a stage where a government decision maker or an official decision-making body selects a course of action or non-action among a small set of policy options identified at the policy formulation stage with a view towards policy implementation (UNEP, 2009). Methodologies and tools can also be used in the decision-making phase through analysis of their results and especially in relation to the overall assessment of performance, particularly in integrating social, economic and environmental dimensions.

- **Policy implementation:** Implementation is the stage at which a selected policy option must be translated into action. Institutional and technical capacities are crucial at this stage of the policymaking cycle. As in the case of decision-making, green-economy tools and methodologies are not generally used to inform implementation, which is when institutional arrangements, roles and responsibilities are assigned. On the other hand, indicators, including input indicators, also called "policy formulation indicators" (UNEP, 2014a), governance assessments and decision-trees can effectively contribute to implementation stage.

- **Policy monitoring and evaluation:** this phase refers to the effort of monitoring and determining how a policy has performed during implementation. The use of tools and methodologies can provide relevant support in this phase. In particular, tools can be used to monitor the actual impact of policies on a variety of economic, social and environmental indicators, and estimate potential future developments. With the help of indicators, relevant tools and methodologies, decision makers are able to identify gaps and potential unintended consequences and side effects of policy interventions, and plan alternative or compensatory policies to ensure the achievement of initial desired goals.

In addition to their relevance for the different stages of the integrated policymaking cycle, tools and methodologies are assessed against their capacity for supporting integrated assessments. By evaluating the integrated dimension of each tool, the present report supports the identification of those that are most suitable for assessing economic, social and environmental aspects of inclusive green economy policies, and overarching issues such as good governance and technological feasibility. The integrated policymaking cycle is only effective in supporting sustainable development if it simultaneously addresses social, economic

and environmental outcomes of policy implementation. In particular, tools and methodologies are evaluated based on three components:

- **Economic assessment**: the capacity of evaluating the impact of inclusive green economy policies on economic growth, including the assessment of returns on investments in green sectors and technologies

- **Social assessment:** the capacity of estimating the impact of inclusive green economy policies on key indicators of inclusiveness and social well-being, such as access to resources, poverty level and vulnerability to climate change.

- **Environmental assessment:** the capacity of measuring inclusive green economy policy impacts on production and human activity more in general on natural capital, and on the state of the environment (e.g. ecosystem services).

The assessment also focuses on the required interpretation of the results obtained from the various tools and methodologies, and the data required. In particular, tools and methodologies are assessed against their capacity to support the analysis of a given system, for instance through the dynamic interplay between social, economic and environmental indicators, and to evaluate policy options based on the structure of the system and on a variety of possible scenarios. Policies are "shocks" to the system, which in turn responds to these changes. Hence, the system itself should be analysed focusing on feedbacks and causal relations across key sectors (for example the nexus between water, energy and food), with a specific interest on the medium- to longer-term impacts, which go beyond the implementation delays of policies.

To summarize, the format for the presentation of the tools will focus on the following items:

- **Definition**: a general description is provided of each tool and methodology, focusing on the relevance for inclusive green economy policymaking, with an analysis of strengths and weaknesses of the tool or methodology.

- **Assessment of the suitability to the African context**: an evaluation is carried out, with the aim of providing an overview of the performance of various tools and methodologies against a variety of criteria: sectoral and thematic focus, ease of customization and use, data requirements and data availability, and capacity-building requirements.

1.4 Structure of the report

The report follows the conceptual framework outlined in the previous section in order to provide a thorough evaluation of tools and methodologies that can effectively support African decision makers in the assessment of inclusive green economy policies and strategies at the local, national and regional levels.

Chapter 2 describes selected methodological frameworks and tools for assessing an inclusive green economy. The methodological frameworks are categorized based on their sectoral focuses, including (1) economic, (2) social, (3) environmental, (4) governance and (5) integrated assessments. The tools analysed are subdivided into four main categories, namely: indicators, assessment tools, scenario-creation tools and scenario-forecasting tools.

Starting from this general description, methodologies and tools are then assessed against a variety of criteria that were specifically selected to evaluate their capacity to support one or more stages of the integrated policymaking cycle, and to identify their strengths and weaknesses in relation to inclusive green economy policymaking in the African context. Key assessment criteria include: the target audience, the time horizon of analysis, complementarity with other methodologies and tools, sectoral versus thematic focus, ease of customization and use, data requirements and data availability, and capacity-building requirements.

The analysis conducted in Chapter 3 seeks to compare the methodologies and tools presented in Chapter 2 in order to identify those that would better support policymaking in Africa for inclusive green economies. Firstly, a general appraisal of methodologies and tools is provided, together with a summary table that facilitates the comparison of tools across key criteria and features. Subsequently, methodologies and tools are analysed in relation to what they can deliver in the context of inclusive green economy analysis in African countries. The suitability to Africa is determined based on current and upcoming issues, the policy cycle to be influenced, characteristics and features of the tools, data availability and quality, and available capacity at the country level.

Chapter 4 assesses the statistical capacity of African countries, at the national and sectoral levels, to evaluate adequately what methodologies and tools might be used to support inclusive green economy analyses. Building on this, Chapter 5 presents the case study of Ethiopia's climate-resilient green economy strategy. In particular, the analysis centres on the processes and methodologies and tools used for elaborating the strategy, along with respective strengths and weaknesses. Based on the outcomes of questionnaires completed by national stakeholders, potential opportunities are identified for the use of tools and methodologies in the forthcoming implementation phase and for replication of the strategy in other countries.

Finally, Chapter 6 summarizes lessons learned and provides recommendations on conducting effective assessments of inclusive green economies with the support of selected tools and methodologies. In particular, potential future challenges and opportunities are analysed in the African context, including regional and national development priorities, data availability and reliability, and the current and expected levels of technical and institutional capacity.

2 Chapter 2: Inclusive green economy methodologies and tools

Development planning aims at influencing future trends. However there may be competing visions about how things should develop in a country and different ways of achieving a particular goal. Also, in a world of uncertainty, there are many factors that will affect future policy outcomes, and this uncertainty needs to be considered and managed. A number of methodological frameworks and tools support policymakers as they analyse these issues by assessing competing approaches and the outcomes of different possible policy options. They also help policymakers to consider uncertainties about how external factors will affect the country and how that can be managed.

The types of methodologies and tools considered in this report span sectoral and integrated assessment at different stages of the policy cycle because an inclusive green economy incorporates social, economic and environmental factors. This chapter starts with the description of overarching methodological frameworks, which are broad assessment approaches that are carried out with the help of one or more tools. Subsequently, the review

focuses on specific tools that are commonly used, either in isolation or in combination, to conduct integrated assessments of policies, strategies and projects. These include: indicators, assessment tools, scenario-creation tools and scenario-forecasting tools. A general description is provided for each methodology and tool, followed by an analysis of the support provided to decision makers for conducting inclusive green economy assessments and an example of potential applications to the African context.

2.1 Description of methodological frameworks

The methodological frameworks reviewed hereafter consist of methodological approaches for the assessment of policies, strategies and plans under different perspectives. Such frameworks use one or more tools to provide guidance to decision makers for assessing environmental, social and economic implications of their choices, and to evaluate gaps in the current governance and policy structures and identify potential entry points for action. The methodological frameworks reviewed are subdivided into five broad categories, namely:

- **Economic assessment**: these are assessment frameworks designed to support the analysis of policies, projects and investments with respect to their expected economic outcomes. An example of this type of framework is the methodology for conducting feasibility studies.

- **Social assessment**: these frameworks provide guidance to decision makers on how to evaluate policy impacts on different social groups, thereby ensuring inclusiveness-, and to review and monitor key governance indicators in relation to policy objectives as a means to identify gaps and needs for capacity-building. A widely used methodology for conducting social assessments is poverty and social impact analysis, which facilitates the assessment of policy inclusiveness and whether it has pro-poor orientation.

- **Environmental assessment**: this category includes methodological frameworks that combine tools for the evaluation of the environmental impacts of development strategies, policies, projects (for example, audits) and investments. They include: strategic environmental assessment, environmental impact assessment and environmental audits.

- **Governance assessment:** the formulation, implementation, monitoring and evaluation of integrated policies for inclusive green economies require efficient and transparent institutional frameworks and processes at both the national and local levels. In order to conduct governance assessments, decision makers can adopt specific methodological frameworks, such as the governance assessment framework of the United Nations Development Programme.

- **Integrated assessment:** the methodological frameworks listed above allow the assessment of different dimensions of inclusive green economy. On the other hand, approaches exist to conduct a more comprehensive (or integrated) assessment of an inclusive green economy. As an example, decision-support systems integrate multiple data and tools in a unique assessment framework and provide valuable guidance to decision makers for the integrated evaluation of inclusive green economy policies.

2.1.1 Economic assessment

Feasibility studies

Sectoral or integrated	*Sectoral*
Data needs	*Medium (investments, costs, technology)*
Capacity-building	*Economics (e.g. project evaluation, cost-benefit analysis, estimation of net present value)*
Step of the policy cycle	*2*
Time horizon	*Snapshot*

Description

A "Feasibility study" refers to an evaluation of the likelihood that a given policy, project, investment or business achieves certain stated objectives. These studies are commonly used to assess the economic soundness of projects or policies by quantifying the expected return on investment. Feasibility studies are conducted using a variety of methodologies and tools, including cost-benefit analysis, life-cycle analysis and simulation models.

Support to the policymaking cycle

Feasibility studies are designed to support the formulation and assessment phases of a policy or project. In particular, the combination of qualitative tools such as stakeholder discussions and quantitative tools such as dynamic modelling is commonly used to inform the evaluation of specific green-economy policy interventions (UNEP, 2014b). The final objective of feasibility studies is to analyse data and generate knowledge to inform the decision-making process.

Practical application to inclusive green economy planning in Africa

Feasibility studies[3] are widely used in African countries to assess the viability of policies, projects and investments against a number of criteria related to a green economy, including: technological innovation, law, operational issues, economics, technical issues, schedule, culture, resources and market.

Contribution to inclusive green economy assessments

Strengths: Transitioning to a green economy requires the reallocation of investments from sectors that are resource-intensive to green, efficient sectors, including changes in production technologies and processes. In this sense, feasibility studies can be used to assess the viability of innovative technologies and projects against several criteria such as economic, cultural and technical criteria. The outcomes of feasibility studies are key to guiding private and public actors in the selection of the most effective policies and investments.

Weaknesses: Feasibility studies provide insights on the viability of a given project or investment at a specific moment. As such, the analysis might underestimate potential delays and unintended consequences that may occur during implementation. Furthermore, feasibility studies are generally used to support only one phase of the policy or project cycle, namely policy or project formulation, and they rely heavily on assumptions about future developments.

[3] In some cases, feasibility studies can also be applied to social, culture and environment assessments.

Impact analysis

Description

Sectoral or integrated	*Sectoral*
Data needs	*Medium (investments, wages, production inputs and outputs)*
Capacity-building	*Economics (e.g. use of input/output models, macro and microeconomic effects)*
Step of the policy cycle	*2, 5*
Time horizon	*Snapshot or continuous*

Impact analysis is a widely used methodology that allows the user to estimate the effects of implementing a policy or project on socioeconomic indicators for a given location. Key indicators for an impact assessment may include employment, wages, revenues and profits. Two types of tools are generally used to conduct impact-analysis studies: input-output (I/O) models, which provide a static representation of estimated changes in material flows, or simulation models, which project impacts of a policy, investment or project over a given time period, also considering external factors such as demographic changes.

Support to the policymaking cycle

Impact analysis supports policymakers in the initial stages of the decision-making process, when the economic, social, or environmental impact of interventions needs to be assessed in order to select the options that maximize benefits while avoiding potential unintended consequences. The key steps addressed include policy formulation and policy assessment. Further, impact analysis studies can be used in the monitoring and evaluation phase to compare actual and expected impacts of the selected policies.

Practical application to inclusive green economy planning in Africa

Several authors have adopted the impact-analysis methodology to evaluate the socioeconomic impacts of inclusive green economy policies in African countries. In particular, recent studies are focused on the impacts of rural electrification projects (Bernard, 2012), the introduction of innovative agriculture technologies (de Janvry, Dustan and Sadoulet, 2011), and the implementation of national agriculture policies (de Janvry and Sadoulet, 2010).

Contribution to inclusive green economy assessments

Strengths: The analysis of socioeconomic or environmental impacts resulting from the implementation of inclusive green economy policies is an essential component of inclusive green economy assessments. The impact analysis methodology provides a useful framework for approaching the evaluation of alternative policy interventions to achieve inclusive green economies. On the other hand, decision makers may consider the combination of economic impact analysis studies with other tools and methodologies that explicitly analyse the interrelation between economic, social and environmental indicators.

Weaknesses: The impact analysis methodology aims to assess the impact of policies and investment using a rather rigid set of methodological steps. Such an approach makes it difficult to customize the methodology fully to the specific needs of each inclusive green economy assessment.

2.1.2 Social assessment

Poverty and social impact analysis

Description

Sectoral or integrated	*Integrated*
Data needs	*High (income, equity, access)*
Capacity-building	*Sociology, political science, economics*
Step of the policy cycle	*2, 5*
Time horizon	*Snapshot*

Poverty and social impact analysis is an approach proposed by the World Bank to assess the distributional impacts of public policies, with particular emphasis on the poor and vulnerable[4]. This approach includes ex-ante analysis of the likely impacts of specific reforms, analysis during reform implementation, and ex-post analysis of completed reforms. It uses several tools, including partial equilibrium and general equilibrium models. Outputs can take many forms, including stand-alone reports, policy notes or inputs into larger assessment studies. Although the analysis should be adapted to the country context and policy priorities on a case-by-case basis, some general steps can be identified: asking the right questions, understanding transmission channels, identifying stakeholders, assessing institutions, gathering data and information, analysing impacts, contemplating enhancement and compensation measures, assessing risk, monitoring and evaluating impacts, and fostering policy debate and feeding back into policy choice.

Support to the policymaking cycle

Poverty and social impact analyses are generally conducted prior to the policy implementation phase so as to inform policy dialogue and guide the decision-making process towards the selection of the most inclusive policy options. In the context of an inclusive green economy analysis, poverty and social impact analyses are particularly effective for evaluating the degree of social inclusiveness of green economy policies. Decision makers gain insights from the results of the analyses and are provided with the necessary information to reformulate or adjust policies that would have unbalanced effects on social groups.

Practical application to inclusive green economy planning in Africa

Since goals of poverty reduction and social inclusiveness are prioritized in the development visions and plans of most African countries, poverty and social impact analysis represents an essential tool for assessing the impact of green economy policies on improving the well-being of the population. Also, poverty and social impact analyses can be used to detect potential negative impacts of policy interventions on the most vulnerable sections of society and to design adequate compensatory measures. An example is the analysis conducted by the World Bank to assess the distributional effects of reform of the fossil-fuel subsidy in Indonesia, which led to the implementation of an unconditional cash transfer programme to compensate the negative impact of subsidy removal on the poorest households[5].

[4] For more, see http://www.worldbank.org/psia.
[5] For more, see http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/0,,contentMDK:20479154~pagePK:210058~piPK:210062~theSitePK:336992,00.html

Contribution to inclusive green economy assessments

Strengths: Green economy policies should be pro-poor and socially inclusive. Poverty and social impact analysis represents an effective methodological framework to assess the inclusiveness of inclusive green economy interventions as it allows decision makers to identify and analyse key indicators of direct and indirect poverty and social impacts, for instance on food security, prices, employment, access to goods and services, assets, transfers and taxes. The analysis facilitates the prompt design of compensatory measures, in cases where potential adverse effects are identified if inclusive green economy policies were to be implemented.

Weaknesses: poverty and social impact analysis is a data-intensive methodology and it requires the analysts to collect information on a number of indicators that may not be available across all countries and contexts. Furthermore, poverty and social impact analysis provides a static assessment of social impacts, without fully considering alternative future scenarios and dynamic relationships across sectors.

2.1.3 Environmental assessment

Strategic environmental assessment

Description

Sectoral or integrated	*Sectoral*
Data needs	*High (natural resources including land use, emissions, natural capital)*
Capacity-building	*Environmental science*[6]
Step of the policy cycle	*1, 2, 5*
Time horizon	*Continuous (short, medium, long)*

Strategic environmental assessment (SEA) is defined as "a range of analytical and participatory approaches that aim to integrate environmental considerations into policies, plans and programmes, and evaluate the interlinkages with economic and social considerations" (OECD, 2006). There is no single tool or approach associated with these assessments, but rather a family of tools from which analysts should select on a case-by-case basis.

Support to the policymaking cycle

Strategic environmental assessment is applied at the initial stages of the decision-making cycle, when the impacts of alternative policy options are to be assessed to inform choices and decisions on alternative sustainable development paths.

Practical application to inclusive green economy planning in Africa

In the African context, strategic environmental assessments are increasingly used to inform the development-planning processes at the national and local levels. In particular, South Africa has adopted this assessment tool in a variety of sectors. For example, the South African Department of Environmental Affairs is conducting a strategic environmental assessment in order to identify the most suitable areas for the roll-out of large wind and solar energy projects[7].

[6] This includes natural resource data management, assessment of natural resources demand and supply, natural resource valuation, ecosystem services, geography and spatial models.

[7] From http://eadp.westerncape.gov.za/news/national-strategic-environmental-assessment-sea.

Contribution to inclusive green economy assessments

Strengths: A key challenge for conducting inclusive green economy assessments is the analysis of environmental impacts of national development plans. Strategic environmental assessments are designed to support decision makers in establishing a link between economic growth and environmental protection, highlighting trade-offs and synergies for the prioritization of sustainable, integrated policy instruments. The flexibility of the assessment process makes it ideal for inclusive green economy assessments, which should be adapted to national specificities and development priorities.

Weaknesses: The effectiveness of a strategic environmental assessment is strictly related to the availability of updated and reliable environmental data, for example on land use, emissions and the state of natural capital and ecosystems, and to the correct understanding of the drivers and effects of environmental trends.

Environmental impact assessment

Description

Sectoral or integrated	*Sectoral*
Data needs	*High (land use, emissions, natural capital)*
Capacity-building	*Environmental science*[8]
Step of the policy cycle	*1, 2, 5*
Time horizon	*Snapshot (short, medium, long)*

The objective of an environmental impact assessment is to estimate the likely environmental impacts of implementing a project or policy before decisions are made. While this assessment provides a holistic framework for the integration of environmental considerations into development planning processes, environmental impact assessments mostly aim to assess the environmental impacts of specific projects or actions[9]. In particular, environmental impact assessments tend to focus on land-use planning processes and infrastructural projects, such as highways, power plants and industrial facilities. The United Nations Environment Programme (UNEP) identifies 10 key steps for conducting environmental impact assessments in the context of sustainable development planning, including (UNEP, 2008): (1) project screening, (2) scoping of the project, (3) policy/administrative aspects, (4) project description, (5) baseline data, (6) evaluation of impacts, (7) impact mitigation, (8) summary/conclusions, (9) management/monitoring plan, and (10) review and decision-making including review and approval of the environmental impact assessment process and document, and imposition of impact mitigation measures and monitoring activities.

Support to the policymaking cycle

Environmental impact assessments are useful to support the policy formulation and decision-making steps of the policymaking cycle. Correct estimation of the expected environmental impacts of planned projects is a necessary element to assess interventions and make evidence-based decisions on alternative investment options.

Practical application to inclusive green economy planning in Africa

[8] This includes natural resource data management, assessment of demand and supply for natural resources, valuation of natural resources, ecosystem services, geography and spatial models.

[9] Environmental impact assessments are also being used to assess social impacts, and in this case are called "environmental and social impact assessments".

In Africa, infrastructure projects and international aid programmes are increasingly assessed by means of environmental impact assessments. Indeed, several African countries have either enabling legislation or specific regulations, or both, that cover environmental impact assessments. However, while the assessment process has influenced decisions in some countries, most environmental impact assessments have been disregarded. A review of environmental impact assessments conducted in African countries has shown that impact assessments are most influential when results are quantified and expressed in economic terms (ECA, 2005).

Contribution to inclusive green economy assessments

Strengths: A central objective of inclusive green economy assessments is to evaluate the impact of external interventions on natural capital and ecosystems. Therefore, the use of environmental impact assessments is key to facilitate the analysis of the environmental soundness of specific investment projects. When combined with the definition of thresholds and targets, environmental impact assessments are an effective instrument to direct public and private investments in a way that minimizes environmental impacts while ensuring sustained and inclusive economic growth.

Weaknesses: Since environmental impact assessment is a data-intensive methodology, it might not be suitable to support inclusive green economy assessments in countries with limited statistical capacity. Furthermore, the analysis focuses on a snapshot of the state of the system, with little consideration of the future interplay between economic, social and environmental variables.

Environmental audits

Description

Environmental audits comprise several types of evaluations aimed at assessing the environmental compliance of a project or site, and any implementation gap in the management system. In both cases, the emphasis is put on the operational context, for the confirmation of the legal compliance status of a company or a project.

Sectoral or integrated	*Sectoral*
Data needs	*High (energy, emissions, pollution)*
Capacity-building	*Environmental science*[10]
Step of the policy cycle	*1, 5*
Time horizon	*Snapshot*

An example of environmental protocol is ISO 14001, a voluntary international standard for environmental management systems. An environmental management system that meets the requirements of ISO 14001 is a management tool enabling an organization of any size or type to: identify and control the environmental impact of its activities, products or services; improve its environmental performance continually; and implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

[10] This includes natural resource data management, assessment of demand and supply for natural resources, valuation of natural resources, ecosystem services, geography and spatial models.

Support to the policymaking cycle

Environmental audits are very useful to identify issues and policy gaps. Therefore they primarily support issue identification and policy monitoring and evaluation. In this respect, policy formulation can originate from the identification of gaps highlighted by audits and the results of policy implementation can be measured on the ground through environmental audits.

Practical application to inclusive green economy planning in Africa

Environmental audits are particularly useful in Africa to identify options for intervention (for example for improvements in energy efficiency). These audits prevent the deterioration of natural capital, ensuring compliance with the agreed-upon project design and implementation process. In 2004, the Government of South Africa published guidelines for the implementation of environmental audits across sectors including safety, health, environment and quality auditing (Department of Environmental Affairs and Tourism, 2004).

Contribution to inclusive green economy assessments

Strengths: Environmental audits reach the private sector, including small entrepreneurs. An increase in audits would highlight the existence of policy gaps, identify roles and responsibilities, and create new jobs.

Weaknesses: Environmental audits are sectoral. Although they account for several project dimensions (such as energy, emissions and water pollution), they can hardly be integrated in a coherent macro assessment. In other words, environmental audits are almost exclusively project-based, and carried out after the project. Finally, the skill gap is large, and new capabilities need to be created for proper implementation of programmes, including large-scale use of environmental audits.

2.1.4 Governance assessment

Governance assessments by the United Nations Development Programme

Description

The United Nations Development Programme provides support to governments for the realization of country-led multi-stakeholder governance assessments. In particular, assistance is provided for the identification of key indicators needed to evaluate good and efficient governance in a variety of sectors, including those related to the environment (such as forest management). Key principles on which the assessments are based include accountability, participation, transparency and legitimacy.

Sectoral or integrated	*Integrated*
Data needs	*Medium (accountability, law enforcement)*
Capacity-building	*Political science, sociology, qualitative research methods.*
Step of the policy cycle	*2, 4*
Time horizon	*Snapshot*

Support to the policymaking cycle

Governance assessments represent a valuable tool for analysing strengths and weaknesses of the national institutional and policy frameworks prior to the implementation of green economy policies and strategies. In particular, governance assessments can help decision makers in the assignment of roles and responsibilities for the implementation of sustainable development plan. Also, the analysis can be used to identify potential institutional and policy gaps that should be filled in order to create the enabling conditions for a green economy transition, and to monitor the transparency, accountability and effectiveness of the actors who are implementing the transition.

Practical application to inclusive green economy planning in Africa

Governance assessments have been extensively used in African countries as a means to assess the performance of governments in reaching stated policy goals, and the effectiveness of civil society organizations and non-governmental organizations [11]. In particular, forest governance assessments are being conducted for evaluating the viability of the reducing emissions from deforestation and forest degradation (REDD+) process in African countries (Samuel, 2010).

Contribution to inclusive green economy assessments

Strengths: An adequate institutional framework should be set up to guide the green economy transition. This involves strengthening good governance and establishing horizontal and vertical coordination mechanisms to encourage the elaboration of cross-sectoral inclusive green economy strategies. Governance assessments provide an effective method for the selection of customized indicators that support the identification of governance strengths and weaknesses in relation to inclusive green economy goals and, consequently, the prioritization of capacity-building activities.

Weaknesses: Given the high degree of political sensitiveness, governance assessments might be strongly influenced by the political context. Furthermore, these assessments provide a snapshot of the institutional setup, without fully considering potential future political and institutional developments that might have a strong influence on the success of green economy strategies.

[11] Available at http://www.undp.org/content/dam/undp/documents/partners/civil_society/additional_documents/Africa%20Forum%20on%20Civil%20Society%20and%20Governance%20Assessments/Africa%20Regional%20Civil%20Society%20and%20Governance%20Workshop%20-%2028%20September.pdf

2.1.5 Integrated assessment

Decision support systems

Description

Sectoral or integrated	*Integrated*
Data needs	*High (economic, social, environmental)*
Capacity-building	*Computer science, decision analysis*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Continuous (short, medium, long)*

A decision-support system is an interactive platform that helps decision makers elaborate and analyse different types of information in order to make best-informed, evidence-based choices. A precise definition is provided by Turban (1995), who defines a decision-support system as "an interactive, flexible, and adaptable computer-based information system, especially developed for supporting the solution of a non-structured management problem for improved decision making" (Turban, 1995). Typically, a system comprises: a database (or knowledge base), a model to process the data, and a user interface to facilitate the interaction of decision makers with complex back-end structures.

Support to the policymaking cycle

Since these systems are able to gather and categorize large amounts of data over time, and to create projections, they can potentially help decision makers in all key stages of the inclusive green economy policymaking process, from identifying problems to monitoring policy and evaluation. In particular, the level of support provided depends on the type of decision-support system. Hättenschwiler (1999) distinguishes between three types of system, namely:

(1) **Active decision-support systems:** generate specific suggestions or solutions in support of decision-making

(2) **Passive decision-support systems:** provide only relevant information to guide decision makers in their final choice

(3) **Cooperative decision-support systems:** provide a solution, but also allow decision makers to refine and customize the outcome to their specific context and questions (Haettenschwiler, 1999).

Practical application to inclusive green economy planning in Africa

An example of a decision-support system applied to green economy policymaking in Africa is the Green Economy Tourism System, a tool that allows decision makers in the sustainable tourism sector to access relevant data and knowledge and to project potential policy outcomes with a simulation interface based on system dynamics. The Green Economy Tourism System has been already tested in Sharm el-Sheikh, Egypt, to support hotel owners in assessing the economic impacts (for example on their energy bill), social impact (in the form of goodwill from visitors), and environmental impact of deploying renewable energy technologies in hotel facilities (Law and others, 2012).

Contribution to inclusive green economy assessments

Strengths: Green economy policies should be designed to address economic, social and environmental aspects of development in a balanced manner. The assessment of such integrated policies implies that decision makers have access to multiple data sources and frameworks, which should be analysed in a comprehensive way to understand policy impacts across sectors and actors. Given the complexity of this task, computer-based systems are essential to support the decision-making process. As a result, a variety of decision-support systems are being adopted in the context of inclusive green economy assessments.

Weaknesses: The development of decision-support systems requires a high level of technical expertise (in computer science and modelling), which may not be readily available in all country contexts. Furthermore, the databases for decision-support systems should be constantly updated in order to support inclusive green economy assessments effectively.

2.2 Description of tools available for inclusive green economy analysis

The methodological frameworks analysed in the previous section require the use of one or more tools for their implementation. In this section, a selection of these tools is described and analysed with respect to their potential application in inclusive green economy assessments, including their potential application in African countries. The tools are categorized as follows:

- **Indicators and measurement frameworks**, which are essential tools for the analysis of the current state, trends, impacts and outcomes along the entire policy cycle. A variety of indicators are proposed by international organizations and research institutes for the assessment of green economy and sustainable development policies and strategies. For the purpose of this study, a few measurement frameworks have been selected and analysed, including:

  (1) UNEP green economy indicators

  (2) Indicators proposed by the Green Growth Knowledge Platform for the assessment of green growth/green economy policies

  (3) Global Green Economy Index for benchmarking country performance making use of perception indicators and data on actual performance

  (4) Sustainable development indicator framework for Africa of the Economic Commission for Africa (ECA)

  (5) System of National Accounts (SNA) and the Social Accounting Matrix (SAM) for economic assessments

  (6) System of Environmental-Economic Accounting (SEEA) to add the environmental dimensions to the System of National Accounts

  (7) Economic and environmental vulnerability indicators

  (8) Ecological footprint estimations[12].

[12] The indicators and measurement frameworks selected for analysis are intended to serve as examples of the most recent frameworks proposed by leading international organizations working in the field of inclusive green economy assessments. While many other examples exist, the proposed ones are considered to be best aligned with the purpose and scope of this study. In particular: (1) the green economy indicators of the United Nations

- **Policy and project assessment tools**, which relate to the assessment of green economy policies, investments or products. These include:

  (1) Ecosystem service valuation tools, which add the economic dimension to the estimation of the services provided by nature (including stocks and flows)

  (2) Cost-benefit analysis techniques, which add an assessment of the broader economic advantages and disadvantages (or required investment, avoided costs and added benefits) resulting from project/policy implementation

  (3) Life-cycle assessment, a tool used for evaluating the environmental impact of products along their entire lifetime.

- **Scenario-creation tools (qualitative)**, which are used to identify possible futures and agree on the most desirable ones. These include, among others, visioning exercises for national development planning, such as *Kenya Vision 2030*, and conflict-resolution undertakings (e.g. for cross-border environmental issues). Tools include Delphi analysis, causal loop diagrams, and decision trees. These tools and methodologies are generally used to support policymakers in the initial phase of the integrated policymaking cycle, namely the identification of worrying trends, and the prioritization of problems in the public agenda.

- **Scenario forecasting tools (quantitative)**, which are used to quantify scenario and policy outcomes, through the creation of projections (e.g. until 2050). These projections can then be used to identify the most desirable scenario and the most effective policy interventions. The tools reviewed under this category include spatial-planning tools (for example for land use), computable general equilibrium (for economic analysis), energy-optimization models (for sectoral assessments), nested models, and integrated models for cross-sectoral assessments.

2.2.1 Indicators and measurement frameworks

The United Nations Conference for Sustainable Development advocated the establishment of innovative measurement frameworks for sustainable development, stating that "progress towards the achievement of the goals needs to be assessed and accompanied by targets and indicators while taking into account different national circumstances, capacities and levels of development" (United Nations, 2012). In this sense, an inclusive green economy policy is expected to be guided by indicators capable of showing the linkages between the economy, society and environment, and guiding implementation. Five types of indicators and measurement frameworks related to inclusive green economy have been reviewed for the purpose of this study, including the UNEP green economy indicators; input-production-output indicators; the ECA Sustainable Development Indicator Framework for Africa; the System of National Accounts and the Social Accounting Matrix; and the System of Environmental-

Environment Programme are designed to assist decision makers in each stage of the integrated policymaking cycle, (2) indicators of the Green Growth Knowledge Platform represent a widely-shared measurement framework for conducting inclusive green economy assessments, (3) the sustainable development indicators of the Economic Commission for Africa have been proposed to measure progress towards sustainable development in African countries, (4) the System of National Accounts (SNA) and the Social Accounting Matrix (SAM) are statistical frameworks widely used across Africa to formulate and evaluate national policies, and (5) the System of Economic and Environmental Accounts (SEEA) is the internationally agreed standard for integrating environmental data into the SNA. Guidelines for the selection of indicators and examples of several applications can be found in UNEP (2014a) and Bassi and others (2015a, 2015b).

Economic Accounting, which adds environmental dimensions to the System of National Accounts.

Green economy indicators of the United Nations Environment Programme

Description

Sectoral or integrated	*Integrated*
Data needs	*High (economic, social, environmental, governance)*
Capacity-building	*Statistics [13], policy analysis, natural resource valuation*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Continuous (short, medium, long)*

The United Nations Environment Programme (UNEP) proposes green economy indicators to support governments in the elaboration of sound and inclusive green economy policies. They aim to "provide guidance to policy analysts and advisers, and other stakeholders, who are involved in developing green economy policies by using indicators as a tool for identifying priority issues, formulating and assessing green economy policy options, and evaluating the performance of policy implementation" (UNEP, 2014a).

Support to the policymaking cycle

UNEP green economy indicators are designed to support the problem identification, policy formulation, and monitoring and evaluation phases of the policy cycle. At the problem identification phase, baseline indicators allow the evaluation of relevant thresholds or targets, at the policy formulation phase, green economy indicators are useful to assess the direction and extent of potential policy responses. Finally, indicators of policy targets and goals can be constantly assessed to evaluate the actual impact of policies in the monitoring and evaluation stage.

Practical application to inclusive green economy planning in Africa

UNEP provides technical and substantive support to African governments for the assessment of green economy strategies and policies with the help of relevant indicators. For example, the green economy indicators framework was used for the elaboration of a green economy assessment study of South Africa. In this case, indicators were used to identify the drivers and consequences of unsustainable production and consumption on natural resources, agriculture, energy and transport, and to guide the analysis of potential green economy policy interventions (UNEP, 2013).

Contribution to inclusive green economy assessments
Strengths: Green economy indicators are extensively used, in combination with other tools (such as integrated or nested models), to conduct inclusive green economy assessments in different countries. The main strength of this measurement framework is the focus on cross-sectoral and distributional impacts of green policies, considering that a green economy approach should be integrated and inclusive (UNEP, 2012).

[13] Indicators' construction and interpretation, data collection, consistency check, analysis, etc.

Weaknesses: The national level of statistical capacity heavily influences the selection and use of green economy indicators, as a comprehensive set of economic, social and economic historical data is required to conduct inclusive green economy assessments.

Input, production and output indicators of the Green Growth Knowledge Platform

Description

Sectoral or integrated	*Integrated*
Data needs	*High (economic, social, environmental, governance)*
Capacity-building	*Statistics*
Step of the policy cycle	*1,2, 5*
Time horizon	*Continuous (short, medium, long)*

Indicators provide clear information on the historical and current state of the system and highlight trends that can shed light on causality in order to detect better the key drivers of the problem. In an attempt to identify a commonly agreed measurement framework, the Green Growth Knowledge Platform classified green economy and green growth indicators, according to their three main characteristics, namely (Green Growth Knowledge Platform, 2013):

- **Input indicators**: this category collects indicators that measure both the services and resources provided by natural capital. By capturing the state of the natural asset base, input indicators facilitate the accounting of natural capital into decision-making processes, thereby highlighting the impact of environmental degradation on economic productivity and social well-being. When considering the integrated inclusive green economy policy cycle, input indicators can also be used to measure the interventions of the government (or other stakeholders) aimed at reaching inclusive green economy goals and objectives (a concept very similar to the UNEP policy formulation indicators. For example, investments in green sectors (e.g. renewable energy plants, sustainable transport infrastructure) can be measured as inputs for the realization of a green economy transition (Adam and others, 2003).

- **Production indicators**: these indicators measure either the intensity of the use of natural resources (i.e. the amount of resources needed to produce a unit of output) or the resource productivity (i.e. the amount of output produced with one unit of natural resource). As such, production indicators allow decision makers to identify the main drivers of environmental degradation and design suitable policy interventions to minimize the use of resources, while ensuring sustained and inclusive economic growth.

- **Output indicators**: indicators that measure the impact of production processes on material and non-material well-being. In particular, the environmental quality of life is assessed, namely the socioeconomic well-being deriving from a healthy environment (e.g. labour productivity and population health).

Support to the policymaking cycle

Within the integrated decision-making process, these indicators can be used to (1) identify issues and their primary causes, (2) carry out a cost-benefit analysis to evaluate the intervention options, and (3) support the integrated monitoring and evaluation of the strategy/policy impacts.

Practical application to inclusive green economy planning in Africa

Input, production, and output indicators are extensively used for the assessment of development-planning processes in African countries. In Kenya, for example, a number of key indicators related to natural capital and the environment were selected for conducting a green economy assessment study. These included, among others: wetland area (hectares), fresh water endowment (m^3 per capita), biodiversity (number of plants, birds and mammals species), forest cover (percentage of total land), electricity consumption (terawatt hours/TWh), carbon dioxide emissions (metric tonnes of CO_2), combustible renewables and waste (percentage of total energy), and energy production (kilotonnes of oil equivalent) (UNEP, 2014c).

Contribution to inclusive green economy assessments

Strengths: The subdivision of input, production and output indicators provides an invaluable methodological support to decision makers as they conduct comprehensive and systemic assessments of inclusive green economy policies. By highlighting the relationship between natural resource extraction, processing and final consumption, this measurement framework facilitates the identification of worrying trends that should be addressed in order to maximize resource efficiency. Further, the same indicators can be used to evaluate the success of inclusive green economy policies during and after implementation.

Weaknesses: Input, production and output indicators are derived from historical time series on the state of the environment and the impact of production processes. These data might not be readily available in national statistics offices. Furthermore, while these indicators are useful in the problem-identification and monitoring and evaluation phases, they are less adequate for policy formulation and assessment.

Global Green Economy Index

Description

Sectoral or integrated	*Integrated*
Data needs	*High (economic, social, environmental, governance)*
Capacity-building	*Statistics*
Step of the policy cycle	*1,2, 5*
Time horizon	*Short*

The Global Green Economy Index uses indicators to generate a benchmark of the green economic performance of 60 countries, of which 12 are in Africa (Dual Citizen, 2014). As has been discussed already, green economy indicators should reflect the unique economic, environmental and social characteristics of a country, region or city. However, global indices such as Global Green Economy Index can also be quite useful in providing an international benchmark defined by a consistent set of topics and themes that can be monitored over time. This offers national policymakers a standardized reference point to understand how their green economic performance compares to others, and insight into reasons for superior or inferior results.

The Index is published every two years and the fourth edition, published in October 2014, measured national green economic performance in four dimensions: leadership and climate change, efficiency sectors, markets and investment, and environment and natural capital. Given the diversity of countries covered and resulting lack of uniform data coverage, a variety

of indicators defined these main dimensions, referenced from global databases, international organizations and in some cases qualitative assessments calculated by its publisher.

Support to the policymaking cycle

The Global Green Economy Index is structured primarily to support the problem identification, policy formulation and monitoring and evaluation phases of the policy cycle. By covering perceptions, it also supports assessing the intangible dimensions of the inclusive green economy, including governance.

Practical application to inclusive green economy planning in Africa

The 2014 edition of the Global Green Economy Index covers 12 African countries (Burkina Faso, Ethiopia, Ghana, Kenya, Mauritius, Morocco, Mozambique, Rwanda, Senegal, South Africa, Tanzania and Zambia) and their cities. Thanks to this customization it can highlight the potential to improve performance at the country and city level, with targeted interventions.

Contribution to inclusive green economy assessments

Strengths: The index's coverage is cross-sectoral, and the latest edition offers a comparative global viewpoint of four sectors: buildings, transport, tourism and energy. By revealing performance between countries and across each sector for individual countries, the Global Green Economy Index can show policymakers how countries with similar profiles perform, often revealing useful indicators to incorporate or consider from their work. Importantly, the Global Green Economy Index also measures perceptions of the same topics and themes defining these four dimensions. These perceptions are gathered from a survey targeted to expert practitioners that have real knowledge and experience in the issues being explored. In many cases, these data reveal significant gaps in terms of performance, which indicates to policymakers that practitioner understanding does not correspond to reality.

Weaknesses: The compilation of the Global Green Economy Index relies on the availability of information published in international and national databases. As a result, the low statistical capacity in African countries and their low representation in several global indices might represent a challenge for the estimation of the Global Green Economy Index at the country and regional level.

The Sustainable Development Indicators Framework for Africa of the Economic Commission for Africa (ECA)

Description

Sectoral or integrated	*Integrated*
Data needs	*High (social, economic and environmental)*
Capacity-building	*Statistics*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Continuous (short, medium, long)*

Based on the work conducted in the context of the *Sustainable Development Report on Africa*, the Economic Commission for Africa led a regional process for the identification of sustainable development priorities, goals, targets and indicators for Africa. The process, which involved consultations at regional level, led to the creation of a sustainable development indicator framework and a compendium of indicators for the successive editions of the report. These indicators cover the economic, social and

environmental dimensions of sustainable development, and key elements of governance. The ECA sustainable development indicators facilitate the identification of pressing sustainable development concerns and priorities in the African region.

Support to the policymaking cycle

A measurement framework adapted to the African context provides invaluable support to the problem identification, policy formulation and monitoring and evaluation phases of the policy cycle in all sustainable development activities conducted in the region. In particular, this measurement framework supports the alignment of local and national policies with regional targets and goals.

Practical application to inclusive green economy planning in Africa

The ECA sustainable development indicators could undergo continuous refinement based on lessons and new developments for sustainable development and inclusive green economy assessment at regional level and adaptation for country-level assessment.

Contribution to inclusive green economy assessments
Strengths: There is no universal approach to a green economy, but rather different paths should be followed depending on local, national and regional contexts and priorities. In this sense, the ECA sustainable development indicator framework could be built upon to provide a customized framework for measuring progress towards regional inclusive green economy goals in Africa.
Weaknesses: Low statistical capacity in African countries might represent a challenge for the effective monitoring of indicators that enable effective integrated assessment.

Text Box 1
Sustainable development goals for a post-2015 development agenda

The outcome document of the United Nations Conference for Sustainable Development, *The Future we Want*, gave a mandate to establish an Open Working Group to develop a set of sustainable development goals that will guide the global development agenda beyond 2015, building on the progress achieved through the Millennium Development Goals (United Nations, 2012).

Sustainable development goals are accompanied by targets and indicators for measuring progress towards sustainable development. They take into account different national realities, existing national policies and development priorities. Indeed, while targets are defined as aspirational global objectives, each government and region is encouraged to establish its own targets under the guidance of global sustainable development goals. The goals and targets integrate economic, social and environmental aspects and recognize the importance of adopting a systemic and cross-sectoral approach for moving towards sustainable development in all its dimensions.

The Open Working Group has submitted 17 sustainable development goals and 169 targets to the United Nations General Assembly for consideration and action. In the African context, the monitoring and evaluation framework of post-2015 and Agenda 2063 could be useful for inclusive green economy assessment. The Africa sustainable development goals informed the Africa post-2015 consultations which culminated in the adoption of the Common African Position (CAP) on post-2015. The latter has now been subsumed within Agenda 2063 for which a monitoring and evaluation framework has been developed.

System of National Accounts (SNA) and Social Accounting Matrix (SAM)

Description

Sectoral or integrated	*Sectoral*
Data needs	*High (national accounts and input-output tables)*
Capacity-building	*Economics, Statistics*
Step of the policy cycle	*2, 5*
Time horizon	*Snapshot*

The System of National Accounts (SNA) is the "internationally agreed standard set of recommendations on how to compile economic activities" (European Commission and others, 2009). The System of National Accounts provides a statistics framework for the classification of national macroeconomic accounts in a way that facilitates policymaking, analysis, research and international comparisons. The System of National Accounts provides the basis for the construction of Social Accounting Matrix (SAM).

A Social Accounting Matrix (SAM) is a square matrix in which each economic account is represented by a row and a column. It provides a comprehensive picture of the economic transactions of an economy during a time period, almost invariably one year (Drud, Grais and Pyatt, 1986). Each cell shows the payment from the account of its column to the account of its row. Thus, the incomes of an account appear along its row and its expenditures along its column.

Support to the policymaking cycle

System of National Accounts and Social Accounting Matrix are statistics frameworks that organize and/or provide statistics information on the national economy. They allow data collection and organization and thus provide information on economic aggregates and interlinkages. They inform and facilitate the formulation and assessment of economic policy interventions at the national level, especially in the issue identification phase and for policy formulation when used in models, such as computable general equilibrium models. They help classifying and organizing national accounts in a consistent manner, thereby facilitating the analysis of policy impacts on the economy and society.

Practical application to inclusive green economy planning in Africa

Social Accounting Matrices have been used for assessing sectoral government policies in several African countries, such as Botswana, South Africa, Zambia and Zimbabwe. In Zambia, for example, a Social Accounting Matrix was developed to support the analysis of agricultural investments, including considerations on the environmental impacts of the policy decisions (Nokkala, 2000). African countries prioritize the implementation of the 2008 System of National Accounts as an effective tool for assessing national policies. To accelerate this process, the African Group on National Accounts has created a regional implementation strategy and a five-year regional project for the years 2012 to 2017 (African Development Bank and others, 2012).

Contribution to inclusive green economy assessments

Strengths: Social Accounting Matrix and System of National Accounts are used in a variety of country contexts to assess the impact of governmental policies across key economic indicators. As they provide a standardized framework for the classification of economic activities, they allow a comparison of green economy policy impacts across countries.

Weaknesses: In order to support integrated assessments, Social Accounting Matrix and System of National Accounts should be combined with other measurement frameworks that include environmental indicators (such as the System of Economic and Environmental Accounts). Also, these measurement frameworks provide a static snapshot of the state of the system, thereby missing the dynamic interplay between key indicators other than the economic ones.

System of Environmental-Economic Accounting (SEEA)

Description

Sectoral or integrated	*Integrated*
Data needs	*High (natural resources stocks and flows)*
Capacity-building	*Environment, economics, statistics*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Snapshot*

The System of Environmental-Economic Accounting (SEEA), adopted by the United Nations Statistics Division (UNSD) in 2012, is an international standard for the inclusion of environmental indicators into the System of National Accounts. The System of Environmental-Economic Accounting relies on environmental statistics on natural capital stocks and flows (e.g. water, forest and fish) and brings together individual components to inform integrated policies, highlighting trade-offs between policy options and facilitating the assessment of policy impacts on social, economic and environmental indicators. The framework of the System of Environmental-Economic Accounting follows a similar accounting structure as the System of National Accounts and uses concepts, definitions and classifications consistent with that system in order to facilitate the integration of environmental and economic statistics.

The System of Environmental-Economic Accounting Central Framework includes a chapter entirely dedicated to environmental goods and services sectors, which are defined as those sectors that produce goods and services for environmental protection and resource management. Statistics on these sectors describe output, value added, employment and exports for all types of producers and products that are included in the environmental goods and services sectors list, covered in Annex 1 of the System of Environmental-Economic Accounting Central Framework) (United Nations and others, 2014).

Support to the policymaking cycle

The purpose of the System of Environmental-Economic Accounting is to incorporate sustainability issues, such as the depletion of natural resources and ecosystems, into the assessment of national economic performance (UNSD, 2012). Therefore, the indicators of the System of Environmental-Economic Accounting are expected to become an integral part of each step of the inclusive green economy decision-making process, especially when coupled with simulation models. In the case of poor data availability, the System of Environmental-Economic Accounting can be used to identify gaps and prioritize data-gathering exercises.

Practical application to inclusive green economy planning in Africa

The practical implementation of the System of Environmental-Economic Accounting approach to the measurement of national economic performance requires the establishment of common criteria for the economic valuation of natural capital and ecosystem services. Several initiatives have been launched in this respect, including Wealth Accounting and Valuation of

Ecosystem Services (WAVES), led by the World Bank, and The Economics of Ecosystems and Biodiversity (TEEB) frameworks. African countries have taken steps towards the integration of natural wealth into national accounts. For example, a Wealth Accounting and Valuation of Ecosystem Services project was launched in Botswana in 2012, focusing in particular on (1) water accounts, (2) land and ecosystems accounts, (3) mineral and energy accounts, and (4) macroeconomic indicators of sustainable development (Botswana PEI-WAVES Steering Committee, 2012). In Mauritius, the Ecosystem and Natural Capital Accounts initiative aims to provide a coherent framework for the integration of natural wealth into the System of National Accounts (SNA) through using the System of Environmental-Economic Accounting (Weber, 2014).

Contribution to inclusive green economy assessments

Strengths: A green economy implies the recognition of natural capital and ecosystems goods and services as an integral part of the production function. The System of Environmental-Economic Accounting framework responds to this need by providing a standard to integrate the environment into national accounting systems. As such, it represents an effective tool to conduct integrated assessments of inclusive green economy policies and their impacts on national economies and sectors.

Weaknesses: The System of Environmental-Economic Accounting framework is a global standard for the integration of environmental indicators into national accounts. As a result, its major weakness is the low degree of adaptability to national specificities and the high data requirements.

Vulnerability indicators (economic and environmental)

Description

Sectoral or integrated	*Integrated*
Data needs	*High (economic flows and climate trends)*
Capacity-building	*Environment, economics, statistics*
Step of the policy cycle	*1, 2*
Time horizon	*Snapshot*

"Vulnerability[14] expresses the susceptibility that something or someone could be harmed by external forces as a result of exposure to them. Joined with vulnerability are the concepts of "resilience" and "sustainable development": the former describes the ability to cope with the exposure to vulnerabilities through a combination of withstanding damage and developing a propensity to recover from any damage (Briguglio and others, 2008), whereas the latter refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). Vulnerability is considered to be the result of inherent features, but resilience is considered to be the result of policy measures. The juxtaposition of vulnerability and resilience would indicate the risk of an economy being harmed by external shocks.

[14] With inclusive green economy, in addition to social vulnerability, the novelty is for more economic and environmental vulnerability indicators.

Economic and environmental vulnerability indexes were developed and piloted for Indian Ocean countries, in the context of the ISLANDS project (Deenapanray and Bassi, 2014, Deenapanray and others, 2014). The Economic Vulnerability Index for the Indian Ocean Developing Island States was created with three components: trade openness, dependence on a narrow range of exports, and dependence on strategic imports. The Environmental Vulnerability Index instead has four components: natural sea-borne hazards, natural land-based hazards, rainfall variations, and temperature variations.

Support to the policymaking cycle

The purpose of the vulnerability indicators is to support two main steps of the policy cycle: issue identification, and policy formulation and assessment. Specifically, these indicators can support the identification of existing and upcoming issues related to external factors, and evaluate the potential improvement in (reducing) vulnerability when new inclusive green economy interventions are implemented.

Practical application to inclusive green economy planning in Africa

Vulnerability indicators have been implemented in Mauritius, Comoros, Seychelles, Madagascar and Zanzibar of Tanzania, in the context of the ISLANDS project. Economic vulnerability is considered intrinsic to small island developing states, mostly due to the small domestic market, and this means that these states are heavily dependent on external economic conditions. The same applies to environmental vulnerability, due to the small size of these states and their extensive reliance on the environment and their need to adapt to climate conditions. Reducing vulnerability is a key goal of inclusive green economy interventions for these states and many other countries. Other goals include increasing inclusiveness and equity, for a more sustainable future.

Contribution to inclusive green economy assessments

Strengths: A green economy aims at increasing resilience, reducing vulnerability and increasing equity and inclusiveness. Vulnerability indicators specifically address the capacity of a country to face changes in external conditions, and extensively contribute to the assessment of inclusive green economy interventions.

Weaknesses: The vulnerability indicators provide considerable insights on past trends, but require a careful assessment of these trends in relation to possible (and unknown) future trajectories (e.g. relating to economic shocks and climate change trends).

Ecological footprint

Description

The ecological footprint is a metric that quantifies the relation between human activities and natural capital. It is calculated by comparing biocapacity, namely the planet's biologically productive land areas such as its forests and fisheries), with humanity's demand on natural

Sectoral or integrated	*Sectoral*
Data needs	*High (natural resources)*
Capacity-building	*Environment, statistics*
Step of the policy cycle	*1, 5*
Time horizon	*Snapshot*

resources. In other words, the ecological footprint corresponds to the amount of productive land necessary to provide sufficient renewable resources to sustain human activities, and to absorb the waste produced by such activities (Ewing and others, 2010). The Global Footprint Network, an international think-thank on sustainable development, developed the Footprint Calculator, a tool that elaborates user's responses to an online questionnaire in order to estimate the amount of land area needed to support a user's lifestyle[15].

Support to the policymaking cycle

The ecological footprint highlights the required use of resources to sustain our economic growth. As such, it is useful primarily in the stage of identifying issues. It is possibly useful for policy assessment if the outcomes of policy implementation can be measured through the main categories of the ecological footprint.

Practical application to inclusive green economy planning in Africa

The ecological footprint resource-accounting tool could be useful to several African countries, especially if it could be applied to value chains and the private sector. On the other hand, data are often not available or there is lack of interest. Certainly the ecological footprint could gain visibility with the implementation of inclusive green economy interventions that internalize externalities and put an economic value on natural resources. Examples of existing work include reports prepared by the Global Footprint Network, which in 2009 covered 24 African countries (Global Footprint Network, 2009).

Contribution to inclusive green economy assessments

Strengths: One of the pillars of an inclusive green economy is the preservation of natural resources and the increase of natural capital. The ecological footprint is a good indicator to assess how sustainable an economy is, and can therefore contribute to inclusive green economy issue identification and policy assessment.

Weaknesses: The footprint is expressed in hectares of land, and it is often not intuitive to understand and use (for example in relation to CO_2 emissions). Further, the calculator seems to be dominated by carbon footprint and, in order to effectively contribute to policy formulation, it should be coupled with policy-assessment tools, such as scenario-forecasting tools.

2.2.2 Policy and project assessment tools

Policy and project assessment tools are specific instruments that can be used to assess the compatibility of public policies, investments, or products with inclusive green economy principles and goals. These tools provide crucial support to decision makers in the policy formulation and monitoring and evaluation phases, as they generate quantitative outputs that can be readily used to prioritize interventions and discard potentially damaging actions. The tools reviewed in this study include: ecosystem service valuation tools, cost-benefit analysis techniques, and life-cycle assessment.

[15]Available from http://footprintnetwork.org/en/index.php/GFN/page/calculators/.

Ecosystem services assessment/valuation tools

Description

Sectoral or integrated	*Sectoral*
Data needs	*High (natural resources stocks and flows)*
Capacity-building	*Environment, economics*
Step of the policy cycle	*1, 2*
Time horizon	*Snapshot*

Ecosystem services valuation tools (such as integrated valuation of ecosystem services and trade-offs or InVEST) are used to value the external costs and benefits of losing or maintaining ecosystems and their services. Depending on the specific method applied, natural capital valuation illustrates a certain dimension of economic impacts from changes in natural capital. A framework called The Economics of Ecosystems and Biodiversity (TEEB) sets out the case for natural capital valuation and frames approaches to economic valuation (Kumar, 2010). It follows a three-tiered approach towards ecosystem valuation by recognizing, demonstrating, and capturing value.

Support to the policymaking cycle

These tools are increasingly used in the policy formulation phase of the policy cycle. The monetization of ecosystem goods and services provide key quantitative information to decision makers for the comparison of alternative policy options, thereby guiding their decisions as they choose the most effective options.

Practical application to inclusive green economy planning in Africa

The valuation of ecosystem services is increasingly considered a key tool for assessing the environmental impact of development plans and investment projects in African countries. For example the InVEST model was used for the mapping of key ecosystem services in the Eastern Arc Mountains of Tanzania, and facilitated the understanding of the relation between ecosystem health and social well-being. In particular, the tool allowed the creation of a series of maps using field-based or remotely sourced data. Further, socioeconomic scenarios were added as an additional layer on ecosystems maps in order to assess potential impacts of alternative inclusive green economy policy options (Fisher, Turner, Burgess, Swetnam, Green, and Green, 2011).

Contribution to inclusive green economy assessments

Strengths: The economic valuation of ecosystem services supports the process for the integration of environmental indicators in the system of national accounts, and the assessment of environmental externalities prior to the elaboration of pricing policies. Also, spatially disaggregated tools allow the monitoring of the state of natural capital in a given country/area, thereby providing insights on policy impacts during and after implementation.

Weaknesses: The economic valuation of nature should be always interpreted in relation to priorities for policymakers, so as to avoid a situation where valuation results remain on the fringe of economic decision-making. Furthermore, a correct estimation of the value of ecosystems implies the collection and analysis of a significant amount of environmental data, which are often unavailable or incomplete.

Cost benefit analysis

Description

A cost-benefit analysis is a systematic process for calculating and comparing the benefits and costs of a given decision, and it is based on assigning a monetary value to all the activities performed (either as input or output). The most common cost-benefit analysis techniques are: Payback period, net present value, and rate of return.

Sectoral or integrated	*Integrated or sectoral*
Data needs	*Medium (investments, avoided costs)*
Capacity-building	*Economics*
Step of the policy cycle	*2*
Time horizon	*Snapshot*

In the payback period, the total costs of a policy or project are divided by the expected financial returns deriving from its implementation, and the result indicates the time needed for the investment to pay for itself. The net present value of a policy or project is calculated as in the payback period technique, but it is found by comparing the present value and the estimated future value of the financial costs and benefits, including an estimation of future trends in inflation. The rate of return technique consists of subtracting the total costs of the policy or project from the expected added benefits it will bring, and then dividing the value obtained by the costs of the investment, thus obtaining the percentage return on investment. Companies and policymakers may also use alternative techniques to assess the viability of investments, including, for example, cost-effectiveness analysis and multi-criteria analysis. The former is a form of economic analysis that compares relative costs and outcomes (effects) of two or more courses of action. It is broader than a cost-benefit analysis and includes the analysis of non-monetary impacts, evaluated qualitatively, or ranked, for instance, on a scale from 1 to 5. A multi-criteria analysis is a decision-making process that allows the assessment of different options against a variety of criteria, including quantitative and qualitative indicators. In contrast to a cost-benefit analysis and a cost-effectiveness analysis, a multi-criteria analysis can be conducted in a case where multiple objectives and criteria exist.

Support to the policymaking cycle

These methodologies are extensively used in the policy formulation and assessment phase of the policy cycle, in particular for the choice of the most cost-effective policy or project among the options available. In order to assess green economy interventions effectively, investments should be compared by assessing their economic, social and environmental added benefits and the avoided costs, i.e. the costs that would arise or result from inaction. In this sense, a cost-benefit analysis of inclusive green economy policies might use data obtained through ecosystem services valuation techniques, among others

Practical application to inclusive green economy planning in Africa

Cost-benefit analysis methodologies are widely used in African countries for the assessment of policy options. An example of cost-benefit analysis applied to the analysis of green economy investments is the study conducted by AfariSefa and Gokowski on cocoa in Ghana certified by the Rainforest Alliance. The study considered key indicators such as (1) labour quantity and costs, (2) physical input costs, (3) net annual return, and (4) expenditures during production and harvest seasons. The results of the study showed that a shift to certified cocoa in Ghana would lead to 30 per cent lower yields in the short term. However, benefits of

a 25 per cent yield increase following certification training exceeded the costs of certification (Afari-Sefa and Gockowski, 2010).

Contribution to inclusive green economy assessments

Strengths: cost-benefit analysis techniques can be used to assess the economic feasibility of investments against a range of indicators related to the inclusive green economy. In order to appreciate the benefits of green economy interventions fully, the assessment should focus on the comparison between investments and economic, social and environmental benefits and avoided costs. In this sense, integrated cost-benefit analysis is an essential tool to make the business case for investments in green sectors and innovative technologies, thereby reducing the skepticism of investors and opening the way for broad changes in consumption and production patterns.

Weaknesses: cost-benefit analysis provides an assessment of the expected outcomes of green economy policies and investments based on a snapshot of the system and without considering complex feedback relations between economic, social and environmental variables. Also, the outcomes of cost-benefit analysis can be only used in the policy formulation phase.

Life-cycle assessment

Description

Life-cycle assessment is defined as "a systematic set of procedures for compiling and examining the inputs and outputs of materials and energy and the associated environmental impacts directly attributable to the functioning of a product or service system throughout its life cycle" (ISO, 2006). These assessments are subdivided into four main stages:

Sectoral or integrated	*Sectoral*
Data needs	*Medium (production and consumption emissions, energy and water requirements)*
Capacity-building	*Environment, technology, environmental process technology*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Snapshot*

(1) Goal and scope: the objectives and scope of the assessment are outlined at the beginning of the study

(2) Life-cycle inventory: in this phase, the natural inflows (for example water and energy) and outflows (for example emissions) related to the specific product are assessed over the product's entire life cycle

(3) Life-cycle impact assessment: based on the outcome of the life-cycle inventory, the potential environmental impacts of the product are evaluated using a life-cycle impact assessment methodology

(4) Interpretation: as a last step, the results of the life-cycle inventory and impact-assessment phases are summarized and interpreted.

Based on the analysis, a set of recommendations is provided[16].

[16] Available from http://eplca.jrc.ec.europa.eu/.

Support to the policymaking cycle

Life-cycle assessment can be used in the problem identification and policy monitoring phases of policymaking for the inclusive green economy. It is particularly useful for identifying worrying production and consumption trends and prioritizing actions for the greening of key sectors and products.

Practical application to inclusive green economy planning in Africa

Life-cycle assessment methods are increasingly adopted in Africa to analyse the impacts of production and consumption, and raise awareness on the need for maximizing resource efficiency while improving the competitiveness of African products on regional and global markets. Furthermore, some sustainability certification programmes (e.g., "Eco Standard Eco Product South Africa") adopt life-cycle assessment methods for the evaluation of African products such as building products[17].

Contribution to inclusive green economy assessments

Strengths: A green economy assessment requires the measurement of the social, economic and environmental impacts of alternative production and consumption modes, so as to prioritize interventions that minimize environmental externalities while boosting economic growth and improving well-being. Life-cycle assessment is a tool to assess the material and environmental inputs and outputs of production and consumption and can be used effectively to inform inclusive green economy assessments.

Weaknesses: Life-cycle assessment generally focuses on a specific product or service. Consequently, it should be combined with other tools in order to support inclusive green economy assessments effectively.

2.2.3 Scenario-creation tools

Scenario-creation tools are qualitative tools and approaches that are used to identify possible futures and agree on the most desirable. These tools are mainly used in the initial stages of inclusive green economy assessments in order to engage multiple actors, encourage an integrated and cross-sectoral approach to inclusive green economy assessments and gain insights on the challenges, needs and sustainable development perspectives of different social groups. The combination of qualitative approaches with quantitative tools is a common practice for integrating multiple perspectives in a coherent assessment framework. Furthermore, qualitative tools are often used to make up for data gaps and limited background information on certain key topics. The tools reviewed include Delphi analysis, causal loop diagrams, and decision trees.

[17]Available from http://www.ecolabelindex.com/ecolabel/ecoproduct-south-africa.

Causal loop diagrams

Description

Sectoral or integrated	*Integrated*
Data needs	*Low (cause-effect relations)*
Capacity-building	*System analysis*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Continuous (short, medium, long)*

A causal loop diagram is a map of the system analysed. It can better be described as a way to explore and represent the interconnections between the key indicators in the analysed sector or system. A more accurate definition is that a causal loop diagram is an integrated map (because it represents different system dimensions) of the dynamic interplay (because it explores the circular relations or feedbacks) between the key elements – the main indicators – that constitute a given system.

Support to the policymaking cycle

Causal loop diagrams are particularly useful in the initial stages of inclusive green economy assessment for engaging multiple stakeholders in the analysis of key issues to be addressed, and the identification of potential entry points for action.

Practical application to inclusive green economy planning in Africa

The diagrams have been used in several African countries to support multi-stakeholder policymaking processes in the context of inclusive green economy planning. For example, causal loop diagrams were used to identify key indicators and causal relations to be included in the Mauritius Green Economy Model, a dynamic simulation model that projected policy outcomes in the agriculture, energy, waste and water-management sectors.

Contribution to inclusive green economy assessments

Strengths: In order to be successful in the short, medium and longer term, inclusive green economy policies should be based on the understanding of system's structure and behaviour. By highlighting the drivers and impacts of the issue to be addressed and by mapping the causal relationships between key indicators, causal loop diagrams support a systemic inclusive green economy assessment that considers the dynamic interplay between economic, social and environmental variables. The ease of customization and use makes this tool particularly effective for engaging multiple actors in inclusive green economy assessment exercises.

Weaknesses: The creation of a causal loop diagram represents only an initial step in an inclusive green economy assessment. Analysis through a causal loop diagram should be combined with other tools that allow the assessor to estimate the impacts of green economy policies quantitatively.

Delphi analysis and story and simulation (SaS)

Description

Sectoral or integrated	*Integrated*
Data needs	*Low (questionnaires)*
Capacity-building	*Facilitation, policy dialogue, focus group discussion, participatory appraisal*
Step of the policy cycle	*1*
Time horizon	*Continuous (short)*

Scenario storylines are built through multi-stakeholder processes. The Delphi analysis method entails a group of experts who anonymously reply to questionnaires and subsequently receive feedback in the form of a statistics representation of the "group response," after which the process repeats itself. The goal is to reduce the range of responses and arrive at something closer to expert consensus.[18] Story and simulation (SaS) is a scenario-development method that combines qualitative and quantitative approaches. In the initial phase, scenario storylines are developed through multi-stakeholder discussions. Subsequently, quantitative modelling tools are used to assess the impacts of the scenarios.

Support to the policymaking cycle

Scenario storylines can be used in the initial phases of green economy policy assessment as an effective approach to engage multiple stakeholders in the exercises of identifying problems and setting agendas. Finding a common agreement on possible alternative futures is likely to set the stage for the development of widely shared green economy policies and sustainable development plans.

Practical application to inclusive green economy planning in Africa

The Delphi technique was used in a study conducted in South Africa to prioritize the key factors that must be taken into account when selecting the most sustainable and inclusive energy technologies. A number of energy experts responded to anonymous questionnaires, providing relevant insights to decision makers in the problem-identification phase of the policy cycle. Key factors identified included: the ease of maintenance and support over the life cycle of the technology, the identification of suitable sites that would be readily available for pilot studies, and the need to secure access to suitable sites (Barry, Steyn, and Brent, 2009).

Contribution to inclusive green economy assessments

Strengths: Delphi analysis and story and simulation are effective tools for assessing expectations about possible future events, and analysing potential responses to these new and upcoming developments. Consequently, they can be used to conduct qualitative, participatory and inclusive green-economy assessments in which several future development alternatives are designed, agreed upon, explained, and analysed for discussion about their causes and consequences. Further, scenario storylines include the exploration of the system responses to external interventions, such as inclusive green economy policies, thereby contributing to identification of the most effective (and widely shared) intervention options.

[18]For more information see the following link: http://www.rand.org/topics/delphi-method.html

Weaknesses: While both methods are suitable for the problem-identification phase of green economy policymaking, they cannot support decision-making throughout the entire inclusive green economy policy cycle.

Decision tree

Description

Sectoral or integrated	*Sectoral*
Data needs	*Low (key questions and alternative solutions)*
Capacity-building	*Decision analysis, focus group discussion, participatory appraisal*
Step of the policy cycle	*2, 4*
Time horizon	*Snapshot*

A decision tree is the graphical representation of a decision in the form of a graph in the visual form of a tree. It is widely used as a tool that supports the logical steps of the decision-making process in view of the attainment of stated goals. In particular, decision trees help policymakers to identify competing alternative options, thereby stimulating an in-depth analysis of the advantages and disadvantages of their choices. A typical decision tree is composed of three main elements:

(1) Decision nodes, which are commonly represented by squares, indicate the question that needs to be answered

(2) Chance nodes, which are represented by circles, provide the list of options available

(3) End nodes, which are represented by triangles, indicate the final outcome of following a path from the root node of the tree to that endpoint.

Support to the policymaking cycle

Decision trees can be particularly effective decision-support tools in the decision-making phase of green economy policymaking. An example of their application is NETGREEN, a project that aims to create an online interactive inventory to guide policymakers in different countries in their selection and use of green-economy indicators and assessment tools[19]. The online platform enables the user to follow a qualitative decision tree that leads to the selection of the most suitable indicators and tools for policy assessment in each specific context and sector.

Practical application to inclusive green economy planning in Africa

Decision trees can be used to facilitate multi-stakeholder discussions during green-economy planning processes in Africa. They are particularly effective at supporting the preliminary assessment of alternative policy options, without relying on more complex assessment tools, which would require higher levels of technical expertise.

Contribution to inclusive green economy assessments

Strengths: Inclusive green economy assessments require policymakers to undertake a rigorous logical process in order to make informed decisions on a variety of subjects, such as: What are the best assessment indicators? What should the targets of inclusive green economy policies

[19] http://netgreen-project.eu/start.

be? What are the policy instruments available to reach the stated targets? Decision trees facilitate the identification of the options available for assessing inclusive green economy policies and strategies, and provide a logical framework to guide decision makers in the assessment process.

Weaknesses: A decision-making process that is conducted with the help of decision trees is generally based on a static analysis of present conditions. As a result, decision makers are likely to underestimate the analysis of complex dynamics and alternative future scenarios, which might be relevant for the success of green-economy policies.

2.2.4 Scenario forecasting tools

Quantitative scenario-forecasting tools are used to quantify outcomes of scenarios and policies, through the creation of projections. These projections can then be used to identify the most desirable scenario and the most effective inclusive green economy policy intervention that would allow decision makers to reach the stated goals. Linear tools provide a static assessment of policies or projects, without accounting for feedback loops within and across sectors. On the other hand, dynamic simulation tools project how a scenario would unfold over time, accounting for feedback loops (both positive and negative) that may constrain or support the realization of the scenario. The tools reviewed hereafter include: spatial-planning tools, computable general equilibrium, energy-optimization models, nested models and integrated models.

Spatial-planning tools

Description

Spatial-planning tools, such as Marxan software and IDRISI Land Change Modeler,[20] are tools that combine geographic information system applications with simulation models in order to assess the expected impacts of policies, investments and projects on land use.

Sectoral or integrated	*Sectoral*
Data needs	*High (land use, socioeconomic trends)*
Capacity-building	*Geographic information system*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Snapshot (medium, long)*

Support to the policymaking cycle

Spatial-planning tools are used especially in the problem identification and monitoring and evaluation stages of the policy cycle. In the problem identification phase, spatially disaggregated tools allow decision makers to analyse the environmental impacts of land-use changes over the previous years and to identify potential causes and effects of such changes.

Practical application to inclusive green economy planning in Africa

The IDRISI Land Change Modeler is used in the framework of the United Nations reducing emissions from deforestation and forest degradation (REDD) programme to model baseline land cover changes and to predict future scenarios, including the impact of forest management projects on natural habitat, biodiversity and CO_2 emissions. This tool has been

[20] IDRISI is an integrated geographic information system and remote sensing software developed by Clark Labs in Worcester, MA, USA, and now known as TerrSet (see https://clarklabs.org/terrset/).

used in several African countries that are eligible for projects under the programme, such as Madagascar[21].

Contribution to inclusive green economy assessments

Strengths: Spatial-planning tools are used to plot out optimal physical placement of economic activities, human settlements and other initiatives. Consequently, these tools are used to support land-use planners in environmental-conservation efforts.

Weaknesses: Since the assessment is often conducted without reference to socioeconomic effects or monetary valuation of loss or gain in natural capital assets, the combination of spatial-planning tools with other integrated modelling tools is recommended to ensure the inclusive green economy assessment is comprehensive.

Computable general equilibrium

Description

Computable general equilibrium models are tools for economic analysis. The World Bank defines them as "completely-specified models of an economy or a region, including all production activities, factors and institutions, including the modelling of all markets and macroeconomic components, such as investment and savings, balance of payments, and government budget"[22].

Sectoral or integrated	*Sectoral*
Data needs	*High (SAM and SNA)*
Capacity-building	*Economics, General equilibrium modelling*
Step of the policy cycle	*2*
Time horizon	*Snapshot*

Support to the policymaking cycle

Policymakers use the models for policy formulation and assessment, identifying those policies that are likely to maximize economic performance across sectors and actors.

Practical application to inclusive green economy planning in Africa

Computable general equilibrium models are used to assess potential implications of green-economy policies in African countries. For example, the effects of the introduction of a carbon tax in South Africa have been analysed with the help of a dynamic computable general equilibrium model. The study revealed that a phased-in carbon tax that reaches US$30 per ton of CO_2 by 2022 would achieve the emission reduction targets, but it would negatively impact on welfare and employment (Alton and others, 2012). A key limitation of the model used in this study is that the socioeconomic benefits of reducing CO_2 emissions are not taken into account.

[21] Available from http://www.redd-gis.org/2012/03/redd-deforestation-modeling-video.html.
[22] Available from http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPSIA/0,,contentMDK:20481443~menuPK:1108016~pagePK:148956~piPK:216618~theSitePK:490130~isCURL:Y,00.html.

Contribution to inclusive green economy assessments

Strengths: Computable general equilibrium models allow decision makers to project the impact of economic green economy policy interventions, such as fiscal interventions, on the national or regional economy. They provide snapshots of the optimum state of the economy and so they are an effective tool for understanding the economic implications of alternative paths towards an inclusive green economy. In addition, recent computable general equilibrium models include some social and environmental indicators, which facilitate integrated policy assessments.

Weaknesses: As the models rely heavily on historical data (generally derived from the Social Accounting Matrix and the System of National Accounts), the level of statistics capacity might strongly influence the effectiveness of inclusive green economy assessments conducted with these models. The models are used exclusively in economic policies and mainly to support policy formulation, while they are less effective in the problem identification and policy monitoring phases.

Energy-optimization models

Description

Sectoral or integrated	*Sectoral*
Data needs	*High (energy demand and supply, technology)*
Capacity-building	*Engineering*
Step of the policy cycle	*2*
Time horizon	*Continuous (medium, long)*

Energy-optimization models use linear optimization techniques to identify the least-cost policy options to satisfy energy demand. The main exogenous assumptions used include:

- Economic growth (for example based on the work of the Organization for Economic Cooperation and Development, the International Monetary Fund and World Bank)
- Demographics (linked to the work of the United Nations Population Division),
- International fossil-fuel prices and
- Technological developments

(UNEP, 2014d).

Support to the policymaking cycle

Modelling tools such as MARKAL are commonly used in the policy-formulation phase to assess impacts of alternative policy interventions on the energy system. In particular, energy-optimization models allow decision makers to identify and prioritize the interventions that are likely to optimize the performance of the energy system.

Practical application to inclusive green economy planning in Africa

Energy-optimization models are used at the regional, national and local levels to support energy-supply planning processes in Africa. In South Africa, for example, the optimal configuration of the energy system has been investigated with the help of MARKAL. The study provided specific recommendations on the development of South African renewable energy potential to achieve national emissions targets while ensuring sustainable energy supply (Hughes and others, 2007).

Contribution to inclusive green economy assessments

Strengths: Energy-optimization models are used for the assessment of sustainable energy policies. Software modelling platforms such as MARKAL allow national decision makers to identify the optimal energy mix after imposing specific constraints such as emissions limits (Loulou and others, 2004).

Weaknesses: Since energy demand and prices are in most cases exogenously represented in energy optimization models, the scenarios simulated lack the dynamic analysis of the market, and for this reason the models must be coupled with other models to conduct comprehensive assessments.

Nested (or coupled) models

Description

Nested models integrate several other models and methodologies in a unified framework of analysis. An example is the Integrated Model for Sustainable Land and Economic Planning (IM-SLEP), which integrates a variety of participatory spatial planning tools, including Marxan, InVEST and system dynamics modelling.

Sectoral or integrated	*Integrated*
Data needs	*Medium (economic, social, environmental)*
Capacity-building	*Multi-disciplinary*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Continuous (short, medium, long)*

Support to the policymaking cycle

The combination of modelling tools and methodologies allows for holistic assessment of green-economy policy outcomes in the policy-formulation and monitoring phases, including spatial representations and projections of socioeconomic implications of land use changes. Also, trend analysis conducted with dynamic and spatially disaggregated tools results particularly effective in the problem-identification phase.

Practical application to inclusive green economy planning in Africa

Coupled models have the potential to address the specific planning needs of African countries in their path towards a green economy. In particular, the combination of spatially disaggregated tools and integrated dynamic simulation models may support planning efforts in countries that have both national development visions and local goals and targets. In these cases, nested models could be used to identify synergies and complementarities between policy interventions at different levels, and to identify potential unintended consequences such as duplication or unintended local impacts of national policies. Examples of a nested model used for inclusive green economy assessments are IM-SLEP and Integrated Model for Climate Mitigation and Adaptation (IM-CLIMA), which are customized simulation models aiming for the explicit representation of causal relations, feedback, non-linearity and delays between changing quantity and quality of ecosystem services and socioeconomic indicators, including jobs, revenues and multiplier effects, and allowing macroeconomic analysis to be connected to the spatial planning context[23].

[23] Available from http://www.ke-srl.com/KnowlEdge_Srl/Models.html.

Contribution to inclusive green economy assessments

Strengths: The flexibility and ease of customization of nested models make them particularly effective for conducting inclusive green economy assessments in a variety of sectoral contexts. These models allow the evaluation of cross-sectoral impacts of inclusive green economy policies in the short, medium and long-term. Furthermore, the combined use of spatial-planning tools makes it easier to assess and monitor environmental issues at the local level.

Weaknesses: Nested models are data-intensive, as they rely on time series of statistics derived from several economic, social and environmental indicators. Further, they require significant maintenance efforts in order to ensure that inclusive green economy assessments are based on updated data and reliable projections.

Integrated models

Description

These models are built by design as integrated assessment tools and are built using several methodologies, including econometrics, optimization and system dynamics. Although they are less flexible and adaptable to multiple planning processes than nested models, integrated models are particularly effective in assessing cross-sectoral feedback loops (horizontal integration).

Sectoral or integrated	*Integrated*
Data needs	*Medium (economic, social, environmental)*
Capacity-building	*Multi-disciplinary*
Step of the policy cycle	*1, 2, 5*
Time horizon	*Continuous (long)*

Support to the policymaking cycle

Integrated models are designed to support decision makers in the problem-identification, policy-formulation and monitoring and evaluation phases of the policy cycle. Worrying trends can be identified by analysing the current and future impacts of so-called business-as-usual policies on economic, social and environmental indicators. After key issues have been identified, policymakers can test alternative policy options and monitor the impacts of selected policies during and after implementation.

Practical application to inclusive green economy planning in Africa

Integrated models have been extensively used in African countries to support the policy formulation and assessment phases. The Threshold 21 model[24] (Millennium Institute, 2005) customized to Kenya (UNEP, 2014c) and the South African Green Economy Model are examples of integrated models used for the assessment of inclusive green economy policies. For example, the South African Green Economy Model is based on a system-dynamics modelling approach and traces the effects of a proportion of GDP on four of the nine core sectors prioritized to support a green economy (UNEP, 2013). Another example is the

[24] The Threshold 21 model was also used by UNEP for the assessment of the outcomes of green-economy investment in its flagship report titled "*Towards a Green Economy. Pathways to Sustainable Development and Poverty Eradication*" (2011). On the other hand, the model created for this study is global (i.e. it is not disaggregated by country). See also Bassi (2010) and Bassi and others (2010) for more details on the Threshold 21 World model.

application of the green economy model[25] in Africa, for the assessment of green-economy policies in Mauritius (Bassi and others, 2014) and Mozambique, focusing on agriculture, forests, energy, water and waste sectors.

Contribution to inclusive green economy assessments

Strengths: Integrated models are increasingly used to conduct inclusive green economy assessments to support the simultaneous analysis of the social, economic and environmental performance of a country. In this respect integrated models provide insights into the potential impact of development policies across a wide range of sectors, and revealing how different strategies interact to achieve several desired development goals and objectives.

Weaknesses: Unlike nested models, integrated models are not suitable for combination with other tools, and require highly specialized skills to be customized. Further, they are heavily reliant on a variety of economic, social and environmental data, and these can only be properly used through a multi-stakeholder approach, although this can be seen both as a strength and a weakness).

Text Box 2

Integrated assessment models for climate-change projections

An integrated assessment model can be defined as "any model which combines scientific and socioeconomic aspects of climate change primarily for the purpose of assessing policy options for climate change control" (Kelly and Kolstad, 1998). They are often nested models, based on partial equilibrium modules primarily driven by land use.

The models are primarily focused on forecasting climatic changes (by addressing its primary stressor).They account for feedbacks in the environmental sectors, but often lack detail and dynamics in their social and economic modules. The projections can be used in the problem-identification and policy-formulation phases to identify worrying climatic trends and design mitigation and adaptation strategies. Ideally, the models should be combined with other modelling tools in order to integrate social and economic considerations in the policymaking cycle.

They have been used in African countries to project climate-change impacts and support mitigation and adaptation planning efforts at different levels. For example, analyses conducted with the Regional Integrated model of Climate and the Economy (RICE model) highlighted that Africa is the region most vulnerable to climate change and that the vulnerability gap with other regions is higher in case of higher temperature increases. Projections made with the Climate Framework for Uncertainty, Negotiation and Distribution (FUND) model showed that climate-driven mortality is likely to be higher in sub-Saharan Africa than in any other region of the world by 2100, and that most damages from water resource scarcity will happen in North Africa (AfDB, 2011).

[25] Available from http://www.ke-srl.com/KnowlEdge_Srl/Models.html.

2.3 Assessment criteria to determine suitability to Africa

2.3.1 Relevance and support to the integrated policymaking process

The use of tools and methodologies and their support to the policymaking process is to be evaluated in the context of an inclusive green economy. In particular, the relevance of a tool or methodology should be assessed along the policy cycle, from identifying issues to policy monitoring and evaluation. While acknowledging that tools and methodologies play only a limited to marginal role in determining the successful implementation of policies, certain criteria can be identified that would align policymakers' expectations on their potential medium- to long-term contributions.

More specifically, the following key items are assessed:

- Support to the different stages of the policymaking process
- Target audience (multi-stakeholder involvement)
- Time horizon of the analysis
- Complementarity with other methodologies and tools.

2.3.1.1 Support to the policymaking process

The methodologies and tools described in the previous sections are designed to support one or more steps of the policymaking cycle. In some cases, multiple tools and methods can be combined to gain additional insights and explore different perspectives in each step of the process. Overall, it can be said that each approach, methodology and tool has the potential to support decision-making (i.e. their results are taken into account when decisions are made), but the specific approach, methodology and tool is not explicitly used in the decision-making phase of the policy cycle.

The above assessment indicates that no single tool exists that can support decision makers throughout the entire policy cycle. On the other hand, some tools can support two or more steps of the cycle due to their flexibility and features. For example, certain types of decision-support systems are designed to integrate multiple data-management and modelling tools, thereby providing support such as trend analysis from the problem-identification to the monitoring and evaluation phases, with the exclusion of the implementation phase.

Further, we find that all the tools that are used to support the initial stages of problem identification and policy formulation can normally be used in the final step of monitoring and evaluation. This is the case with indicators, and nested and integrated models, which aim to reproduce the system's behaviour in order to understand its functioning and problems, select intervention options and monitor the system's reaction over time, including before and after the implementation of policy interventions.

Finally, some tools are dedicated primarily to one step of the policy cycle. For example, qualitative scenario storylines techniques, such as Story and Simulation (SaS), are specifically designed for the initial stage of the policy process, when multiple perspectives need to be gathered from a variety of actors on key issues that should be prioritized in the government agenda. On the other hand, governance assessments are conceived to support the evaluation of institutional strengths and weaknesses in view of assigning roles and responsibilities in the policy implementation phase (but can also support the policy formulation stage). Further,

optimization models, such as computable general equilibrium and other models with a sectoral focus, for instance on energy, are exclusively intended to facilitate the selection of optimal sectoral interventions in the policy formulation phase.

Table 1 summarizes the results of the assessment of tools and methodologies with respect to the support provided to policymakers in each step of the policymaking cycle.

Table 1
Classification of methodologies by which step of the policymaking cycle they support

	Agenda setting	***Policy formulation***	***Decision-making***	***Policy implementation***	***Monitoring and evaluation***
Methodological frameworks					
Economic assessment					
Feasibility studies		*x*			
Impact analysis		*x*			*x*
Social assessment					
Poverty and social-impact analysis		*x*			*x*
Environmental assessment					
Strategic environmental assessment	x	*x*			*x*
Environmental impact assessment	x	*x*			*x*
Environmental audits	x				*x*
Governance assessment					
UNDP's governance assessments		*x*		*x*	
Integrated assessment					
Decision-support systems	x	*x*			*x*
Green economy tools					
Indicators and measurement frameworks					
Green economy indicators	x	*x*			*x*
Input production and output indicators	x				*x*
Global Green Economy Index	x	*x*			*x*
ECA sustainable development indicators	x	*x*			*x*
System of National Accounts and Social Accounting Matrix		*x*			*x*
System of Environmental-Economic Accounting	x				*x*
Vulnerability indicators	x	*X*			
Ecological footprint	x				*x*
Policy/project assessment tools					
Ecosystem services valuation	x				
Cost-benefit analysis		*x*			
Life-cycle assessment	x				*x*
Scenario creation tools and methodologies (qualitative)					
Causal loop diagram	x	*x*			*x*
Delphi analysis; Story and Simulation	x				
Decision tree		*x*		*x*	

Scenario forecasting tools and methodologies (quantitative)					
Spatial-planning tools	x				*x*
Computable general equilibrium		*x*			
Energy optimization models		*x*			
Nested models	x	*x*			*x*
Integrated models	x	*x*			*x*

2.3.1.2 Target audience (multi-stakeholder involvement)

A key criterion for the assessment of tools and methodologies is the type of audience that should or could be engaged in their development and use. The results of the assessment show that some specific technical skills are required for developing and using almost all the tools reviewed in this study. Furthermore, all the tools are more effective when multiple stakeholders from different disciplines and sectors are involved in using them and cross-sectoral tools support communication across several stakeholder groups.

More precisely, most tools require collaboration between technical experts and decision makers. For example, computer and data-management experts are needed to build the back-end structure and user interface of any decision-support systems. At the same time, decision makers should provide their inputs in the development phase in order to customize the features of decision-support systems to their policy priorities.

On the other hand, we find that at times there is a lack of connection between science and policy. Scenario-forecasting tools are often developed by expert modelers in collaboration with sectoral experts and they feed results to policymakers without involving them directly in the modelling process. However, integrated models for national development planning would require the input of multiple stakeholders, such as sectoral experts, local communities, vulnerable groups and private actors, in the conceptualization phase to ensure they are effective. The outcome of multi-stakeholder discussions should be reflected in the structure of the model, which is then developed by expert modellers. After that, sectoral experts and national decision makers are among the stakeholders who should be engaged in the model-validation phase. Finally, either policymakers could be directly involved in analysing the results or they could be simply informed by technical experts, for instance through periodic assessment reports). The roles would depend on how easy each specific model is to use.

Close collaboration is needed between economists, environmental experts, statisticians, political scientists, sociologists and decision makers in order to establish indicators and frameworks for measurement. Economists and environmental experts should collaborate with statisticians to collect and categorize data in compliance with the requirements of each measurement framework. On the other hand, decision makers have to make effective use of indicators (economic, social and environmental) for conducting integrated policy assessments and reporting on national development progress. In this respect, decision makers are expected to use the outputs of these analyses but not be the end-users of inclusive green economy tools and methodologies.

The policy and project assessment tools reviewed above require the collaboration of technical experts, such as environmentalists and economists for ecosystem services valuation, integrated cost-benefit analysis or other tools, or environmentalists and product engineers for

example in the case of life-cycle assessment. Once the assessment is completed, policymakers are provided with concrete results that can be used immediately to support decision-making.

Finally, qualitative scenario-creation tools may have different audiences. Both causal loop diagrams and scenario storylines (such as Story and Simulation) should be developed through multi-stakeholder discussions. However, the diagrams also require specific expertise in systemic analysis and systems thinking while scenario-storylines methodologies and decision-tree tools require expertise in facilitation and qualitative research methods, as indicated in table 2, which shows a possible repartition of methodologies and tools by target audience.

Table 2
Classification of methodologies and tools by target audience

	Policy makers	***Private sector***	***Economists and statisticians***	***Environment specialists***	***Political scientists and sociologists***
Methodological frameworks					
Economic assessment					
Feasibility studies	x	*x*	*x*	*X*	
Impact analysis	x		*x*	*X*	*x*
Social assessment					
Poverty and social-impact analysis	x				*x*
Environmental assessment					
Strategic environmental assessment	x	*x*		*X*	
Environmental impact assessment		*x*		*X*	
Environmental audits		*x*		*X*	
Governance assessment					
UNDP's governance assessments					*x*
Integrated assessment					
Decision-support systems	x	*x*		*x*	
Green economy tools					
Indicators and measurement frameworks					
Green economy indicators	x		*x*		
Input production and output indicators	x			*x*	
Global Green Economy Index	x	*x*			*x*
ECA sustainable development indicators	x			*x*	*x*
System of National Accounts and Social Accounting Matrix			*x*		
System of Environmental-Economic Accounting				*x*	
Vulnerability indicators			*x*	*x*	
Ecological Footprint	x	*x*			
Policy and project Assessment tools					
Ecosystem services valuation	x		*x*	*x*	
Cost-benefit analysis	x	*x*	*x*		
Life-cycle assessment		*x*	*x*	*x*	

Scenario creation tools and methodologies (qualitative)					
Causal loop diagram	x		*x*	*x*	*x*
Delphi analysis & Story and Simulation					*x*
Decision tree					*x*
Scenario forecasting tools and methodologies (quantitative)					
Spatia- planning tools				*x*	
Computable general equilibrium			*x*		
Energ- optimization models		*x*			
Nested models			*x*	*x*	
Integrated models			*x*	*x*	

2.3.1.3 Time horizon of the analysis

The time-horizon of the analysis provided by each of the tools and methodologies reviewed above varies. This depends largely on whether the tool focuses on short-term assessments (less than three years), medium-term (between three and ten years) or long-term (beyond ten years), and on the type of output produced, such as snapshots or dynamic projections). Some methodological frameworks, such as decision-support systems and strategic environmental assessment, are designed to support policymakers in the dynamic assessment of short-, medium- and long-term impacts of policies and investments. Other frameworks, such as poverty and social impact analysis, governance assessments and feasibility studies, provide a snapshot of policy impacts.

All policy and project assessment tools provide a static analysis. While these may include future developments, their results consist in a single value indicating the performance of a project.

All qualitative scenario-creation tools are suitable for analysing potential policy impacts over different time horizons. However, while causal loop diagram and scenario storylines allow the analysis of the dynamic interplay between a system's variables over time, especially over the long term, decision trees can only provide a static representation of the decision-making process, exclusively focusing on a specific set of questions to be addressed.

Finally, there are big differences in treatment of time between different scenario-forecasting tools. Most target long-term trends, apart from computable general equilibrium models, which provide a snapshot and are most often used to assess short- to medium-term impacts of policy implementation, as indicated by table 3.

Table 3
Classification of methodologies and tools by time-horizon

	Snapshot	***Short term (up to 3 years)***	***Medium term (up to 10 years)***	***Long term (beyond 10 years)***
Methodological frameworks				
Economic assessment				
Feasibility studies	x			
Impact analysis	x	*x*	*x*	*x*
Social assessment				
Poverty and social impact analysis	x			
Environmental assessment				
Strategic environmental assessment		*x*	*x*	*x*
Environmental impact assessment	x	*x*	*x*	*x*
Environmental audits	x			
Governance assessment				
UNDP's governance assessments	x			
Integrated assessment				
Decision-support systems		*x*	*x*	*x*
Green economy tools				
Indicators and measurement frameworks				
Green economy indicators		*x*	*x*	*x*
Input Production and Output indicators		*x*	*x*	*x*
Global Green Economy Index		*x*		
ECA sustainable development indicators		*x*	*x*	*x*
System of National Accounts and Social Accounting Matrix	X			
System of Environmental-Economic Accounting	X			
Vulnerability indicators	X			
Ecological Footprint	X			
Policy and project Assessment tools				
Ecosystem services valuation	X			
Cost-benefit analysis	X			
Life-cycle assessment	X			
Scenario creation tools and methodologies (qualitative)				
Causal loop diagram		*x*	*x*	*x*
Delphi analysis & Story and Simulation		*x*		
Decision tree	X			
Scenario forecasting tools and methodologies (quantitative)				
Spatial planning tools			*x*	*x*
Computable general equilibrium	X			
Energy-optimization models			*x*	*x*
Nested models		*x*	*x*	*x*
Integrated models			*x*	*x*

2.3.1.4 Complementarity with other methodologies and tools

The majority of the methodologies and tools reviewed can be used in combination with other assessment frameworks and tools. Indeed, depending on the focus of the assessment and the stage of the policymaking cycle, decision makers can use different tools in combination to gain multiple insights and address the problem under different perspectives. This is very important, as decision makers often need a toolbox from which specific tools can be employed to support their policymaking, for example combining sectoral and integrated tools or for investigating the short-term compared to the long-term outcomes of implementation the policies.

The entire set of methodological frameworks reviewed makes use of a variety of tools to perform policy assessments. Indicators are the basic element of each assessment framework. For example, environmental indicators are used for strategic environmental assessment, transparency and accountability indicators for governance assessments, and poverty and social-impact indicators to analyse poverty and social impact. Further, some frameworks make use of policy and project assessment tools to evaluate specific policy interventions. For example, feasibility studies often use cost-benefit analysis techniques while environmental impact assessments can be conducted with the help of life-cycle assessment.

Indicators and measurement frameworks are commonly used in combination with other assessment frameworks and tools. For example, the green economy indicators used by the United Nations Environment Programme are the building blocks of integrated assessment models for the green economy. National accounting frameworks, such as the System of National Accounts, Social Accounting Matrix and System of Environmental-Economic Accounting, are either used in isolation for computable general equilibrium models and other uses, or integrated into a single framework for capturing economic, social and environmental aspects of production and consumption at the national level.

Policy and project assessment tools are often combined to conduct integrated assessments of green economy policies and investments. For example, the results of ecosystem services valuation could be used to assign a monetary value to environmental indicators when performing integrated cost-benefit analyses.

Finally, some quantitative scenario-forecasting tools can be combined to create more comprehensive assessment toolkits, such as for nested models. On the other hand, some other models are designed to provide specific sectoral analysis and it is hard to combine that with any other tool or methodology. This is the case of computable general equilibrium models, although these can sometimes be combined with energy-optimization models, and integrated models, which are already very comprehensive and are not easily coupled with other models.

2.3.2 Suitability to the African context

2.3.2.1 Thematic focus

The sectoral or thematic focus of each tool and methodology is assessed against the local definition of the inclusive green economy, which would vary depending on the national context. In particular, tools and methodologies are assessed against their capacity to support the elaboration of policies that consider economic, social and environmental aspects of development, and build on synergies and complementarities across sectors. Importantly, the

evaluation is also done against their capacity to assess the inclusiveness and pro-poor nature of different policy options for the inclusive green economy.

The assessment reveals that tools and methodologies can be either integrated or sectoral, depending on their purpose and scope. Some methodological frameworks may support African decision makers to assess one pillar of the inclusive green economy thoroughly. For example, strategic environmental assessments and environmental impact assessments are designed to assess only the environmental component of policies and investments. On the other hand, integrated methodological frameworks provide guidance for a comprehensive assessment of economic, social and environmental issues, as illustrated by poverty and social impact analyses, which are focused on the socioeconomic impacts of environmental policies.

Most of the indicators and measurement frameworks reviewed support an integrated, cross-sectoral analysis of inclusive green economy policies and plans. This is consistent with the needs of policymakers in Africa, where social development, economic growth and environmental quality are strongly interconnected, due to a different structure to the economies relative to more advanced economies. Production in Africa generally relies more heavily on the availability and quality of natural resources as the primary sector is more prominent in Africa compared with in more industrialized countries. At the same time, several African countries have vibrant tertiary sectors, where energy efficiency and social capital are key determinants of competitiveness. Further, most African countries are currently undergoing economic transitions such as moving from focus on primary to secondary sectors, and are expanding infrastructure, including for transport and sanitation. This means that opportunities to change development patterns are more immediate, including because some African countries have smaller current stock of capital compared to other countries, which have a lot of infrastructure, but instead struggle because it is old.

Green economy indicators, input-production-output indicators, the Global Green Economy Index and the ECA sustainable development indicators allow the simultaneous assessment of environmental, economic and social issues and measure progress towards the achievement of inclusive green economy policy targets both within and across sectors. On the other hand, the System of National Accounts and the Social Accounting Matrix have a sectoral focus, as they provide a detailed picture of the economic transactions at the national level, but they neglect the analysis of the cause-effect relations that link economic performance with environmental preservation and social well-being.

The policy- and project-assessment tools reviewed are focused either on the environment (for example ecosystems services valuation and life-cycle assessment) or the economy (e.g. cost-benefit analysis), and seek to generate specific information that could be used in the assessment process for the inclusive green economy. However, an integrated approach could be used when implementing cost-benefit analysis techniques. In particular, an extended cost-benefit analysis involves comparing upfront investments and policy-implementation costs with economic, social and environmental added benefits and avoided costs deriving from policy implementation. These tools are certainly valid in supporting project assessment in Africa, where the scope of the investment is not necessarily related to reaching the national vision, but instead an investment focuses on generating value in the form of a sustainable and resilient stream of profits for stakeholders.

Among the qualitative tools reviewed, causal loop diagrams, Delphi analysis and Story and Simulation are aimed to facilitate dialogue among key stakeholders from various fields, in

order to explore potential alternative futures using an integrated perspective. The Global Green Economy Index supports the assessment of perceptions and governance. These tools are able to support the qualitative assessment of inclusive green economy policy impacts across different sectors, themes and actors. On the other hand, decision-trees are suitable for responding to a specific assessment question across several domains but they are not very useful for cross-sectoral analysis.

Finally, quantitative scenario-forecasting tools are either sector-specific or cross-sectoral. In particular, some tools are designed to support the assessment of one sector (e.g. energy-optimization models, computable general equilibrium) or the expected environmental impacts of external interventions (e.g. spatial-planning tools). Other tools, such as nested and integrated models, are explicitly created for simulating policy impacts across economic, social and environmental indicators over time. In the case of nested models, the combination of different sectoral simulation tools broadens the scope of the analysis to ensure a comprehensive assessment of multiple topics at different levels, for example local, national and regional projections for an in-depth analysis of poverty eradication impacts. How tools are applied to sectors and themes is summarized in table 4.

Table 4
Assessment of methodologies and tools by sectoral and thematic focus

	Integrated	***Economic***	***Social***	***Environmental***
Methodological frameworks				
Economic assessment				
Feasibility studies		*x*		
Impact analysis		*X*	*x*	
Social assessment				
Poverty and social impact analysis	*x*			
Environmental assessment				
Strategic environmental assessment				*x*
Environmental impact assessment				*x*
Environmental audits				*x*
Governance assessment				
UNDP's governance assessments	*x*			
Integrated assessment				
Decision-support systems	*x*			
Green economy tools				
Indicators and measurement frameworks				
Green economy indicators	*X*			
Input production and output indicators	*X*			
Global Green Economy Index	*X*			
ECA sustainable development indicators	*X*			
System of National Accounts and Social Accounting Matrix		*x*		
System of Environmental-Economic Accounting	*X*			
Vulnerability indicators	*X*			
Ecological footprint				*x*

Policy/project assessment tools				
Ecosystem services valuation				*x*
Cost-benefit analysis	*X*	*X*		
Life-cycle assessment				*X*
Scenario creation tools and methodologies (qualitative)				
Causal loop diagram		*X*	*x*	*X*
Delphi analysis and Story and Simulation		*X*		
Decision tree	x			
Scenario forecasting tools and methodologies (quantitative)				
Spatial planning tools			*x*	*X*
Computable general equilibrium	x			
Energy-optimization models			*x*	*X*
Nested models	x			
Integrated models	x			

2.3.2.2 Ease of customization and use

African countries are confronted with different problems related to environmental conservation, such as land degradation and loss of biodiversity; inclusive growth, such as structural transformation; and social well-being, for example poverty. National development priorities largely depend on the political vision of governments, and are strongly influenced by cultural, economic, social and environmental differences across countries. Consequently, tools and methodologies should be easily adaptable to different country contexts in order they should fully support decision makers in their efforts towards an inclusive green economy.

The tools and methodologies reviewed have different flexibility and usability features. Some methodologies are extremely easy to modify and adapt to a variety of contexts and inclusive green economy assessment topics, while others require the user to replicate a rigid structure or process. For example, poverty and social impact analysis and governance assessments only provide general guidance to decision makers on the analytical approach and the process for the selection of key assessment indicators. On the other hand, strategic environmental assessment, environmental impact assessment, decision-support systems and feasibility studies have some features and processes that users should comply with and some other components that can be modified to fit the specific assessment needs.

Similarly, some tools are extremely flexible in order to support the assessment of an inclusive green economy transition in accordance with national priorities and needs. This is the case, for example, of green economy indicators, which are selected on a case-by-case basis through broad multi-stakeholder discussions. Other tools, such as computable general equilibrium and energy-optimization models, are characterized by a standardized structure that should be strictly followed in order to obtain the desired outcomes.

Importantly, while the ease of customization might be an essential feature in some cases, in other situations decision makers might be more interested in using a standardized methodology. In the African context, this choice might depend on a number of possible reasons, such as:

(1) Greater possibility to compare results, for example with other African countries or with developed countries

(2) Little time needed to customize the tool, especially when decisions have to be made on tight deadlines,

(3) Required capacity-building and financial efforts for the development and use of a customized tool.

2.3.2.3 Data requirements and data availability

Data-collection efforts have been intensified over the last years, especially due to the increasing importance given to trend and scenario analysis for sustainable development policymaking. However, the availability of reliable data on economic, social and especially on environmental indicators is often a concern for African countries. The same can be said for the assessment of governance, which is crucial for the design and assessment of policies as much as for evaluating the quality and coherence of the data used in these assessments. For this reason, tools and methodologies that require extensive data-collection efforts might turn out to be difficult to use in certain contexts.

The assessment conducted indicates that most tools and methodologies are characterized by intensive data requirements. This is especially true for integrated assessment tools, which need to be fed with economic, social and environmental data in order to perform a comprehensive evaluation of inclusive green economy policies and investments. In particular, quantitative scenario forecasting tools are heavily reliant on historical data, which are needed to replicate the structure of the system analysed and validate the projections against the historical behavior of key indicators.

All indicators and measurement frameworks rely heavily on data quantity and quality for their development and use. On the other hand, some of these data may be already available in national statistics. For example, an extensive database containing historical economic, social and environmental data should be developed in each African country in order to monitor progress towards the achievement of the sustainable development goals. Similarly, the adoption of the System of Environmental-Economic Accounting framework at national level implies the systematic collection and categorization of environmental data and the identification of linkages between economic and environmental trends.

Among other policy and project assessment tools, cost-benefit analysis and life-cycle assessment require a significant amount of data on economic transactions and on input and output of production, but this information is generally available in national statistics offices. On the contrary, ecosystem service valuation requires a type of data - such as ecosystem health, natural capital stocks and flows – that is often hard to find in the national databases of African countries, except from some basic indicators such as on deforestation and water resources.

Among the tools reviewed, qualitative scenario-creation tools are the only ones that do not require much data. As qualitative methods rely mainly on stakeholders' perspectives and descriptive information, they can be easily used in contexts where quantitative data are missing or insufficient. Furthermore, qualitative tools such as causal loop diagram, Delphi analysis and Story and Simulation can be used in the preliminary stages of the inclusive green economy assessment process in order to gather key information that cannot be retrieved from existing

databases. Subsequently, the information collected by means of qualitative methods can be used to support quantitative inclusive green economy assessments.

The assessment focused both on the amount of data and on the type of data needed for developing and using each tool and methodology. It also considered the ease of access to information in Africa. Results show that data-collection efforts in African countries might be particularly challenging when seeking to gather quantitative information on the environment. Indeed, while relevant progress has been made with the periodic updating of macroeconomic and social databases (e.g for the System of National Accounts and the Millennium Development Goals), the quality of historical information on the state of natural capital and ecosystems is still lagging behind in Africa, when compared to other regions. In this sense, highly customizable tools and methodologies enjoy an important advantage, as they can be easily adapted to make up for data limitations. Table 5 indicates the kind of data that needs to be collected in order to use each tool.

Table 5
Repartition of methodologies and tools by data requirements

	Data intensity	***Type of data (economic, social, environmental)***	***Examples of indicators/approaches***
Methodological frameworks			
Economic assessment			
Feasibility studies	Medium	*Ec*	*Investments, costs, revenues, technology*
Impact analysis	*Medium*	*Ec, S*	*Investment, GDP, revenues, profits, employment.*
Social assessment			
Poverty and social impact analysis	*High*	*Ec, S*	*Income, poverty, equity, access*
Environmental assessment			
Strategic environmental assessment	*High*	*En*	*Land use, emissions, natural capital*
Environmental impact assessment	*High*	*En*	*Land use, emissions, natural capital*
Environmental audits	*High*	*En*	*Energy consumption, emissions, water pollution and waste*
Governance assessment			
Governance assessment	Medium	*Ec, S*	*Accountability, transparency, law enforcement*
Integrated assessment			
Decision-support systems	*High*	*Ec, S, En*	*Economic growth, social well-being, state of natural capital*
Green economy tools			
Indicators and measurement frameworks			
Green economy indicators	*High*	*Ec, S, En*	*Environmental trends, policy costs, policy impact on well-being and social inclusion*
Input production and output indicators	*High*	*Ec, S, En*	*Natural resource extraction and use, production inputs, production outputs, environmental externalities*
Global Green Economy Index	*High*	*Ec, S, En*	*Leadership, investments, technology, natural resource flows, policy effectiveness*
ECA sustainable development indicators	*High*	*Ec, S, En*	*Social, economic and environmental trends*
System of National Accounts and Social Accounting Matrix	*High*	*Ec*	*National accounts and input-output tables*

System of Environmental-Economic Accounting	*High*	*Ec, En*	*Natural resources stocks and flows*
Vulnerability indicators	*High*	*Ec, En*	*Economic flows and climate trends*
Ecological footprint	*High*	*En*	*Natural resource stocks and flows*
Policy/project assessment tools			
Ecosystem services valuation	Medium	*Ec, En*	*Natural resources stocks and flows*
Cost-benefit analysis	*High*	*Ec*	*Costs, investments, economic returns, avoided costs*
Life-cycle assessment	*High*	*Ec, En*	*Inputs and outputs of production*
Scenario creation tools and methodologies (qualitative)			
Causal loop diagram	*Low*	*Ec, S, En*	*Cause-effect relations*
Delphi analysis &Story and Simulation	*Low*	*Ec, S, En*	*Questionnaires, focus groups*
Decision tree	*Low*	*Ec, S, En*	*Key issues, policy options*
Scenario forecasting tools and methodologies (quantitative)			
Spatial-planning tools	*High*	*En*	*Land use and land cover change, socioeconomic trends*
Computable general equilibrium	*High*	*Ec*	*Social Accounting Matrix and System of National Accounts*
Energy-optimization models	*High*	*Ec, En*	*Energy demand and supply, technologies*
Nested models	*High*	*Ec, S, En*	*Economic, social and environmental time series, land use trends*
Integrated models	*High*	*Ec, S, En*	*Economic, social and environmental time series*

2.3.2.4 Capacity development requirements

African countries are striving to create domestic capacity for conducting integrated assessments of inclusive green economy policies and plans. This is clear from the growing number of capacity-building exercises being conducted on the inclusive green economy. Given that technical experts play an essential role in the inclusive green economy assessment process, the level of knowledge and expertise required for the development, use and customization of assessment tools and methodologies is analysed in this section. In particular, the technical and conceptual gaps identified in the previous sections are considered in terms of the training efforts required to close those gaps.

All the tools and methodologies reviewed in this study have been used in one or more African countries as part of policy-assessment exercises. This means that capacity-building programmes have already been set up in several countries to improve technical skills for the evaluation of inclusive green economy interventions, or for evaluating elements, for example through sectoral and thematic analysis rather than integrated assessments. Overall, the tools and methodologies analysed require specific expertise in one or more fields. The degree of technical complexity requires varies, mostly according to the type of tool and the depth of the inclusive green economy assessment. In some cases, new expertise should be created to allow the development and use of innovative tools and methods, such as integrated and nested inclusive green economy models. In other cases, however, it would be enough to adapt existing knowledge and skills to the specific methodological steps required, for example political scientists could also conduct governance assessments. In general, it can be said that, in accordance with the inclusive green economy concept, the use of all these tools would be boosted by capacity-building on system analysis.

The methodological frameworks have been categorized into five main categories, which also coincide with the expertise required for their implementation:

(1) Economic, e.g. feasibility study and impact analysis
(2) Social, e.g. poverty and social impact analysis

(3) Environmental, e.g. strategic environmental assessment and environmental impact assessment

(4) Governance, e.g. governance assessments

(5) Integrated assessment, e.g. decision-support systems.

Poverty and social impact analysis, governance assessments and feasibility studies are based on conventional social, political and economic analyses and so capacity-building requirements are limited and would focus on the specific methodological steps to be followed by the users. On the other hand, impact analysis, decision-support systems, environmental impact assessment and strategic environmental assessment require technical skills - such as modelling skills, advanced computer and interface development skills and environmental assessment skills - that may not be adequately developed in some African countries.

Regarding indicators and measurement frameworks, specific skills are required for the integration of environmental statistics into national databases and accounting systems (for example using the System of Environmental-Economic Accounting) and for the selection and use of inclusive green economy indicators, especially for the analysis of complex relations between economic, social and environmental drivers and impacts.

Technical capacity is also required when using policy- and project-assessment tools, including in running multi-stakeholder exercises. In the case of life-cycle assessment, for example, technical experts across disciplines including engineers, product development specialists and environmentalists should be involved simultaneously in the assessment. Each of these should be adequately trained in order to apply his or her existing knowledge to the life-cycle assessment. Similarly, while economists in African countries are used to conduct cost-benefit analyses for assessing the suitability of investment options, additional training should be conducted on how to integrate environmental and social indicators into the cost-benefit analysis process. Finally, ecosystem service valuation is a relatively new field, which requires the establishment of dedicated capacity-building programmes in African countries, for example on geographic information systems and on valuation.

Some qualitative scenario-creation approaches and tools - such as Delphi analysis, Story and Simulation and decision trees - are commonly adopted and implemented in African countries with the support of experts in facilitation, stakeholder engagement and decision analysis. On the other hand, a gap was identified with respect to system-analysis skills, which are needed to facilitate the identification of cross-sectoral cause-effect relations in the process of creating causal loop diagrams, among others.

Finally, specific technical skills are required for the elaboration of sectoral quantitative scenario-forecasting models, such as geographic information systems for spatial planning tools, or engineering skills for energy optimization models. On the other hand, integrated and nested models require the collaboration of experts from a wide variety of fields, as they attempt to integrate sectoral knowledge into a coherent assessment framework. Importantly, while sectoral capacity is already developed in most African countries, additional efforts should be created for

developing integrated models, analysing simulation results and informing the inclusive green economy decision-making process.

3 Chapter 3: Review of inclusive green economy methodological frameworks and tools: a comparative assessment

3.1 General appraisal of methodological frameworks

Methodological frameworks aim to guide decision makers in the selection of the most adequate tools and the implementation of a step-by-step assessment process. The assessment of methodological frameworks against a specific set of criteria has been presented in detail in the previous sections. An overview of the outcome of the assessment and a more detailed discussion on their suitability for an inclusive green economy assessment in Africa is presented in section 3.3.

The assessment in this report suggests that no single methodological framework is explicitly designed to assist decision makers along the entire policy cycle. On the other hand, three methodologies (decision-support systems, strategic environmental assessment and environmental impact assessment) can support the initial and final stages of the cycle, namely problem identification (agenda-setting), policy formulation, and policy monitoring and evaluation. Poverty and social impact analyses are generally used in the policy formulation and monitoring phases for assessing potential policy impacts on the poor and for monitoring progress towards poverty eradication after policies have been implemented. Impact analysis studies are similar to poverty and social impact analyses, but they are mostly focused on the economic impacts of policies and technologies, such as effects on GDP growth, revenues or employment creation.

Most methodologies require technical expertise when they are implemented, which means that statistical analysis and data management entail needs for cross-cutting capacity-building. For example, computer and data-management experts are required to build the back-end structure and user interface of decision-support systems. Technical capacity in environmental impact assessment is required for strategic environmental assessment and environmental impact assessment. Importantly, for all the methodologies reviewed, communication and collaboration between technical and sectoral experts on one hand and national decision makers on the other is crucial to ensure the uptake of any inclusive green economy assessment outcome.

Of relevance, some methodological frameworks, such as decision-support systems and strategic environmental assessment, are designed to support policymakers in assessing short, medium and long-term impacts of policies and investments. Other frameworks, such as poverty and social impact analysis, governance assessments and feasibility studies, provide a snapshot of policy impacts at a given point in time. Finally, impact-analysis methodologies can provide either a static or dynamic assessment of policy interventions, depending on the type of tools adopted.

Depending on the specific goals of the assessment, decision makers can either choose methodologies that address one specific sector in detail or employ those that allow for a more comprehensive assessment, as is often required in the case of an inclusive green economy study. For example, strategic environmental assessment and environmental impact assessment are

exclusively focused on the environment, while impact analyses assess economic effects and poverty and social impact analyses focus on the socioeconomic impacts of policies. Feasibility studies and governance assessments are focused on specific issues, such as the profitability of a given investment or policy and the degree of institutional transparency and accountability. Combining them offers the best of all the methodologies, ensuring that social, economic and environmental dimensions are addressed simultaneously.

Some methodologies can be easily customized to national priorities and specific assessment needs. For example, poverty and social-impact analysis and governance assessments allow decision makers to adapt social-impact and governance indicators depending on the context under analysis. On the other hand, strategic environmental assessment, environmental impact assessment, decision-support systems, impact analysis and feasibility studies tend to be more rigidly structured.

Finally, African countries need to develop capacity for applying methodological frameworks to inclusive green economy assessments, outlined in table 6. Some frameworks would require relatively low training efforts, as they involve the adaptation of existing knowledge to specific assessment procedures – examples are poverty and social-impact analysis, impact analysis, governance assessments and feasibility studies. On the other hand, more intensive capacity-building activities would be needed for the development and use of decision-support systems, environmental impact assessment and strategic environmental assessment. New skills could be created through direct cooperation at the national level, as well with the support of regional development partners.

Table 6:
Overview of the assessment of inclusive green economy methodological frameworks

Name	*Tool Characteristics*			*Tool development and use*			*Possible impact*		
	Sectoral or integrated	***Data needs***	***Time horizon***	***Ease of customization and use***	***Effort for maintenance***	***Capacity-building needs***	***Policy cycle step***	***Compl. with other tools***	***Target audience***
Methodological frameworks									
Economic assessment									
Feasibility studies	Sectoral	Medium (investments, costs, revenues, technology)	Snapshot	Medium	n.a.	Economics	2	Yes	Policymakers, private sector, economists, statisticians, environmental specialists
Impact analysis	Sectoral	Medium (investments, GDP, revenues, profits, employment)	Snapshot or integrated	Medium	n.a.	Economics	2, 5		Policymakers, economists, statisticians, sociologists
Social assessment									
Poverty and social-impact analysis	Integrated	High (income, poverty, equity, access)	Snapshot	High	n.a.	Social science, economics	2, 5	Yes	Policymakers, political scientists, sociologists
Environmental assessment									
Strategic environmental assessment	Sectoral	High (land use, emissions, natural capital)	Continuous (short, medium, long)	Medium	n.a.	Environmental science	1, 2, 5	Yes	Policymakers, private sector, environmental specialists
Environmental impact assessment	Sectoral	High (land use, emissions, natural capital)	Snapshot (short, medium, long)	Medium	n.a.	Environmental science	1, 2, 5	Yes	Private sector, environmental specialists
Environmental audits	Sectoral	High (energy, emissions, pollution)	Snapshot	Medium	n.a.	Environmental science	1, 5	Yes	Private sector, environmental specialists
Governance Assessment									
Governance assessment	Integrated	Medium (accountability, transparency, law enforcement)	Snapshot	High	n.a.	Political and social sciences	2, 4	Yes	Political scientists, sociologists
Integrated Assessment									
Decision-support systems	Integrated	High (economic, social, environmental data)	Continuous (short, medium, long)	Medium	High	Computer science, decision analysis	1, 2, 5	Yes	Policymakers, private sector, environmental specialists

3.2 General appraisal of tools

The tools reviewed are designed to support decision makers in the assessment of policies, projects and investments against stated objectives and goals. They have been already used in African countries for policy formulation and assessment activities, and they could provide invaluable support along Africa's path towards integrated planning for sustainable development. The following section presents a more detailed discussion of their suitability for inclusive green economy assessment in Africa.

Close collaboration is required between experts across domains for the development and use of some tools, especially the integrated ones. In general, since the target audience for the use of inclusive green economy tools is national decision makers (who will assess results in terms of their ability to reach effective policy decisions), the communication between scientists and policymakers is crucial for effective use of each tool.

Some of the tools reviewed allow projecting the impacts of policies and investments over the short, medium and long terms. Examples are quantitative integrated and nested models for sustainable development planning. Other tools, such as policy and project assessment tools, provide a static representation of the system, indicating the impact of the external intervention on a set of indicators. In the context of an inclusive green economy assessment, a balance should be found between these two approaches, ensuring that both immediate and longer-term outcomes of policy implementation are taken into account and assessed.

Interestingly, most tools can be used in combination with each other to carry out an inclusive green economy assessment. Indicators and measurement frameworks, for example, are used in almost all the assessment tools analysed. The underlying equations of policy and project assessment tools are often incorporated in scenario-forecasting tools to conduct integrated assessments of green economy policies and investments (e.g. ecosystem services valuation coupled with extended cost-benefit analysis or spatial-planning tools combined with system dynamics models). A few tools, such as computable general equilibrium and integrated models, are generally used in isolation, but examples can be found where they are coupled together, such as the MARKAL/TIMES[26] model.

Sectoral or integrated tools can be chosen depending on the nature of the assessment to be conducted. Most of the indicators and measurement frameworks reviewed support an integrated, cross-sectoral analysis of inclusive green economy policies and plans, while policy and project assessment tools are focused either on the environment (ecosystem services valuation and life-cycle assessment) or the economy (cost-benefit analysis). Finally, quantitative scenario-forecasting tools are either sector-specific, for example specific to energy sector, or cross-sectoral such as integrated models.

The ease of customization and use largely vary depending on the specific tool analysed and the policy environment in which it has to be used. Some tools, such as green-economy indicators, are designed to be easily adaptable to any country context. Other tools, such as computable general equilibrium and, energy-optimization models, are characterized by a rather standardized structure.

[26] "TIMES" stands for "The Integrated MARKAL-EFOM System" and was developed by the International Energy Agency's Energy Technology Systems Analysis Programme.

Most tools rely heavily on data quantity and quality for their development and use. Qualitative scenario-creation tools are the only ones that have low data requirements, as they rely on stakeholder consultations and interviews.

African decision makers are rapidly improving their integrated assessment skills. However, capacity-building is needed for new skills, such as system analysis and policy design, which are required for inclusive green economy assessments. In particular, technical skills are needed for the integration of additional economic, social, and environmental statistics into national databases and their use along the policy process. Nevertheless, in the short term more focus should be put on environmental statistics and communication and outreach activities to share these data.

Once this has been accomplished, capacity-building can concentrate on modelling and scenario-analysis skills, which are required for the creation of quantitative scenario-forecasting models that include cross-sectoral elements and that are then used to inform the decision-making process.

Table 7
Overview of the assessment of inclusive green economy tools

Name	*Tool characteristics*			*Tool development and use*			*Possible impact*		
	Sectoral or integrated	***Data needs***	***Time horizon***	***Ease of customization and use***	***Effort for maintenance***	***Capacity-building needs***	***Policy cycle step***	***Compl. with other tools***	***Target audience***
Tools									
Indicators and measurement frameworks									
Green economy indicators	Integrated	High (economic, social, environmental)	Continuous (short, medium, long)	High	Medium	Statistics	1, 2, 5	Yes	Policymakers, economists and statisticians
Input production and output indicators	Integrated	High (historical time series for state of the environment and impacts)	Continuous (short, medium, long)	High	Medium	Statistics	1, 5	Yes	Policymakers, environmental specialists
Global Green Economy Index	Integrated	High (economic, social, environmental)	Continuous (short)	Medium	Low	Statistics	1, 2, 5	Yes	Policymakers, private sector, political scientists, sociologists
ECA sustainable development indicators	Integrated	High (historical time series, social, economic and environmental)	Continuous (short, medium, long)	Low	Medium	Statistics	2, 5	Yes	Policymakers, environmental specialists, political scientists, sociologists
System of National Accounts and Social Accounting Matrix	Sectoral	High (national accounts and input-output tables)	Snapshot	Low	Medium	Economics, statistics	2, 5	Yes	Economists and statisticians
System of Environmental-Economic Accounting	Integrated	High (natural resources stocks and flows)	Snapshot	Low	High	Environment, economics, statistics	1, 2, 5	Yes	Environmental specialists
Vulnerability indicators	Integrated	High (economic flows and climate trends)	Snapshot	High	Low	Environment, economics, statistics	1, 2	Yes	Economists and environmental specialists
Ecological footprint	Sectoral	High (natural resources stocks and flows)	Snapshot	Medium	Low	Environment	1,5	Yes	Policymakers, private sector
Policy and project assessment tools									
Ecosystem services valuation	Sectoral	High (natural resources stocks and flows)	Snapshot	Medium	High	Environment, economics	1, 2	Yes	Policymakers, economists and statisticians, environmental specialists

Name	*Tool characteristics*			*Tool development and use*			*Possible impact*		
	Sectoral or integrated	***Data needs***	***Time horizon***	***Ease of customization and use***	***Effort for maintenance***	***Capacity-building needs***	***Policy cycle step***	***Compl. with other tools***	***Target audience***
Cost-benefit analysis	Integrated or sectoral	Medium (costs, investments, economic returns, avoided costs)	Snapshot	High	n.a.	Economics	2	No	Policymakers, private sector, economists and statisticians
Life-cycle assessment	Sectoral	Medium (inputs and outputs of production)	Snapshot	High	Medium	Environment, technology	1, 2, 5	Yes	Private sector, economists and statisticians, environmental specialists
Scenario-creation tools and methodologies (qualitative)									
Causal loop diagram	Integrated	Low (cause-effect relations)	Continuous (short, medium, long)	High	n.a.	System analysis	1, 2, 5	Yes	Policymakers, economists, statisticians, environmental specialists, and political and social scientists
Delphi analysis and Story and Simulation	Integrated	Low (questionnaires)	Continuous (short)	Medium	n.a.	Facilitation	1	No	Political scientists and sociologists
Decision-tree	Sectoral	Low (key questions and alternative solutions)	Snapshot	High	n.a.	Decision analysis	2, 4	No	Political scientists and sociologists
Scenario forecasting tools and methodologies (quantitative)									
Spatial-planning tools	Sectoral	High (land-use, socioeconomic trends)	Snapshot (medium, long)	Medium	High	Geographic information systems	1, 2, 5	Yes	Environmental specialists
Computable general equilibrium	Sectoral	High (SAM and SNA)	Snapshot	Low	High	Economics	2	No	Economists and statisticians
Energy-optimization models	Sectoral	High (energy demand and supply, technologies)	Continuous (medium, long)	Low	Medium	Engineering	2	Yes	Private sector
Nested models	Integrated	High (economic, social, environmental time series)	Continuous (short, medium, long)	Medium	High	Multi-disciplinary	1, 2, 5	Yes	Economists and statisticians, environmental specialists
Integrated models	Integrated	High (economic, social, environmental time series)	Continuous (medium, long)	Medium	Medium	Multi-disciplinary	1, 2, 5	No	Economists and statisticians, environmental specialists

3.3 Identification of suitable tools for the African context

Inclusive green economy assessments require the simultaneous analysis of the social, economic and environmental outcomes of policy implementation. In addition, impacts should be assessed across actors, for example whether they are in the public or the private sector, and over time periods ranging from short- to long-term.

The selection of tools for inclusive green economy assessments depends on which step of the policy cycle needs to be informed and on the type of policies to be assessed. Ideally, methodologies and tools should be combined to carry out an integrated assessment by making use of their respective strengths. As a result, relevant indicators should be integrated in decision-support systems that combine scenario capabilities (creation and forecasting) with policy and project assessment features.

In light of the above, it is difficult to identify the most suitable tools for inclusive green economy assessments in Africa. This is because the choice has to be based on the problem to be analysed, the context to be assessed and the preparedness of the team carrying out the study. Nevertheless, when considering the inclusive green economy definition and its characteristics, integrated models would seem to be the most adequate tools for inclusive green economy assessments in Africa. In addition they match the cross-sectoral scope of national vision and development plans. On the other hand, some of these integrated models are data-intensive and require cross-sectoral stakeholder involvement and interdisciplinary skills, which is both a strength and weaknesses of these models, depending on the local context. A similar approach could be used by combining several tools, through the use of nested models, but these are even more data-intensive and careful attention should be put into ensuring the coherence of the methodologies and assumptions used, and the complementarity of the models used. Common elements of the analysis include the need for a multi-stakeholder approach, and multidisciplinary knowledge.

Despite the challenges in the creation and use of integrated models, there are considerable advantages in using them to carry out an inclusive green economy assessment. First and foremost, they ensure that an appraisal of the sustainability of the policy interventions can be carried out to assess whether long-term goals can be reached. Specifically, the simultaneous assessment of social, economic and environmental indicators allows to compare the investment required with its resulting job creation and its potential emission reductions – an example would be to compare investment in renewable energy capacity with the jobs created in manufacturing operating and managing the capacity and the emissions reduced. Further, the increase in energy access can be related to income-generation and indirect employment creation in non-energy sectors. This simple assessment of the direct and indirect outcomes of investments in renewable energy supports the evaluation of policy outcomes on several development goals at the country and regional levels. In other words, the use of integrated approaches improves the monitoring and evaluation of inclusive green economy interventions and contributes to reducing the likelihood that side effects will emerge. This is particularly relevant for Africa, where several development goals are considered simultaneously (see for instance the Millennium Development Goals and the sustainable development goals, where indicators for social, economic development and environmental preservation are coupled in a unified set of targets and goals), and where short-term planning such as budgetary planning needs to be aligned with long-term development goals. As a result, in the context of Africa, the use of integrated models helps translate a conceptual vision into actionable interventions, to inform short and medium-term development planning.

Sectoral models can also contribute to inclusive green economy assessments, provided that their results are analysed in the context of cross-sectoral outcomes. For instance, economic models (such as computable general equilibrium models) and energy-optimization models can be used to assess the outcomes of removing fossil-fuel subsidies, either in isolation or in conjunction. The economic impacts of removing these subsidies will affect energy prices and energy consumption. Price impacts may trigger investments in energy efficiency and on the diversification of the energy mix and these investments will impact greenhouse-gas emissions. Sectoral models are also needed, especially in Africa, because they provide vertical details, compared with integrated models, which provide horizontal integration. In fact, once the strategic priorities are identified, taking into account cross-sectoral outcomes, detailed policy documents can be developed with the support of sectoral models. This pertains, for instance, the choice of technologies, for example for energy, or the identification of targeted interventions across household groups, such as for removing fossil-fuel subsidies.

The above focuses on policy assessments leading to an inclusive green economy action-oriented approach to reach sustainable development. The same can be said of project-related analysis, in which case it important to consider both short- and long-term impacts projected at least as far ahead as the lifetime of the project being assessed, and to analyse both the impact of the project, for example using an environmental impact assessment, and the behavioural responses resulting from the completion of the project, for example using social assessments. In this respect, spatial impacts at the landscape level are of particular relevance for capital investments, such as infrastructure. The analysis of maps in fact allows an expert to integrate socioeconomic and environmental assessments effectively, which is a crucial issue for the effective coordination of policy processes in Africa and in all areas where governance is weak.

Concluding, a hierarchical approach can be employed for selecting and adopting tools and methodologies for inclusive green economy planning, as follows:

- Policy planning for sustainable development and inclusive green economy requires capturing the interlinkages that exist between economy, society and environment and which are dynamic within a governance framework over the medium-to-long term. This requires the adoption of integrated, cross-sectoral tools that can capture the dynamics of systems and are not excessively data-intensive.

- The design and assessment of specific provisions within larger policy packages require instead a higher level of detail than what is offered by integrated tools. For this reason sectoral tools should be employed to provide more targeted inputs for decision makers.

As a result, the following tools are suggested for relevant policy processes:

- *(1) All policy processes* – indicators adopted by the United Nations Environment Programme, the Economic Commission for Africa (ECA) and the System of Environmental-Economic Accounting; vulnerability indicators; and monitoring progress on the sustainable development goals, which are essential to provide the basis for analysing the social and environmental dimensions of sustainable development; and other tools for project and policy assessment.

- (2) *All policy processes* – Causal-loop diagrams to understand better the connections between several sectors and the indicators within each. Developing causal-loop diagrams is essential as it is a first step to better understanding the

systemic nature of our society, economy and environment, which is a key peculiarity of the African continent. Further, causal loop diagrams inform the development and use of quantitative models.

- (3) *Medium- to long-term development plans* - Integrated models, such as the Green Economy Model and Threshold 21, should be further developed, customized and used to ensure that sectoral analysis is coherent and to obtain results simultaneously across social, economic and environmental indicators. Integrated models are the only quantitative tools that allow experts and policymakers to represent the national inclusive green economy definition coherently across sectors, actors and over time.

- (4) *Land use planning and spatial assessments* – Modelling tools linked to geographic information systems, such as MARXAN and InVEST, should be developed and employed to evaluate policy impacts on land-use and on natural capital, for instance how policy impacts the provision of ecosystem goods and services. This is crucial, given that African countries rely extensively on natural resources and the quality of their environment for social and economic development. Spatial tools can also support the economic valuation of natural capital, allowing it to be incorporated better into decision-making processes.

- (5) *Energy policy (demand and supply)* - Sectoral optimization models such as MARKAL and LEAP are commonly used to determine the best energy-supply mix required to reach stated goals. Sectoral optimization models can provide a high level of detail on the energy sector and inform the preparation of targeted policy and investment packages.

- (6) *Fiscal-policy analysis* - Computable general equilibrium and sectoral optimization models (e.g. GSI-IF and MARKAL) should be used, especially in conjunction with each other, to provide specific inputs on the distributional effects of reforms on fiscal policy, for example removing subsidies from fossil fuels. This would allow experts to link economic analysis with assessments of physical flows, such as of energy and water, and to avoid the use of inconsistent assumptions so they can generate projections that are more informative for policymakers.

4 Chapter 4: Assessment of statistical capacity in African countries

4.1 National statistical capacity

Quality statistical information and data are needed for better understanding and handling of much of the economic and structural problems that Africa faces, but there is a lack of comparable quality statistics reflecting African realities. Although some countries in Africa have improved their statistical capacity, many face a number of problems in providing reliable and relevant statistics that are compiled correctly, following standard practices and methodology. For Sub-Saharan Africa, the Statistical Capacity Indicator (SCI) increased from 55 in 2004 to 59 in 2011[27], as compared with an increase globally from 64 in 2004 to 68 in 2011 (Round, 2012).

[27] Excluding South Sudan, the overall statistical capacity indicator score in Africa increased from 56 in 2004 to 60 in 2013.

As an example of the challenges faced in Africa, in the 2013 edition of the *African Statistical Yearbook*, only 12 countries in Africa had data on manufacturing production, while only 8 countries had data on mining production, and the data series stops in 2011 or before. The agricultural and food-production indices series also cease in 2011 while electricity production ends in 2009-10. In several African countries, in addition to the weakness in data production, the dissemination of statistics is limited.

Between 2005 and 2013, the overall statistical capacity indicator has increased in 31 African countries, implying that these countries made progress in one or more dimensions of statistics methodology, data sources, and periodicity and timeliness of data publication. On the other hand, the Statistical Capacity Indicator declined for 20 countries. While Egypt had the highest overall statistical capacity indicator score, Somalia had the lowest score both in 2005 and 2013 (World Bank, 2013).

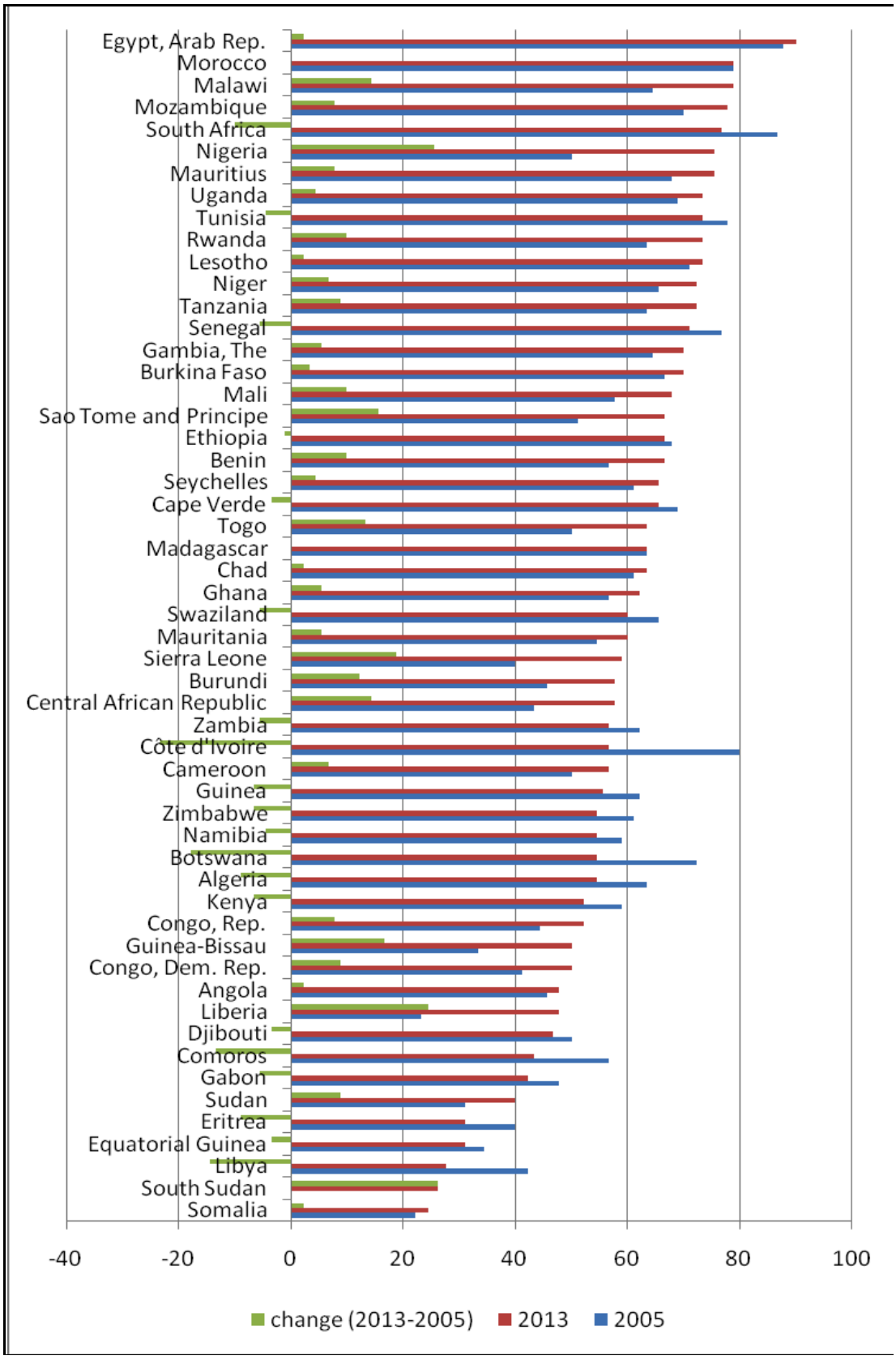
Text Box 3
"Statistical capacity", a definition

Statistical capacity is the ability of countries to meet users' needs for quality statistics. This usually focuses on those statistics that are considered to be "official" and which are produced by governments as a public good[28]. A country's statistical capacity is in fact the ability of the statisticians to produce reliable and up-to-date statistics that meet users' needs.

The Statistical Capacity Indicator (SCI) was developed by the World Bank in order to assess national statistical capacity across the world. The indicator provides an overview of the national statistical capacities of 145 countries. According to the World Bank, the diagnostic framework of the indicator makes it possible to review the capacity of national statistics systems using metadata information which is generally available for most countries, and to monitor progress in building statistical capacity over time. The framework comprises three dimensions: statistics methodology, source data, and periodicity and timeliness. The reason for having more than one dimension is that production and dissemination of reliable, relevant and timely statistics necessitate a certain degree of capacity in several different dimensions. Specific criteria for each dimension are used to score countries, using official inputs or publicly available information. A composite score for each dimension is obtained for each country on a scale ranging from 0 to 100 (OIC, 2012).

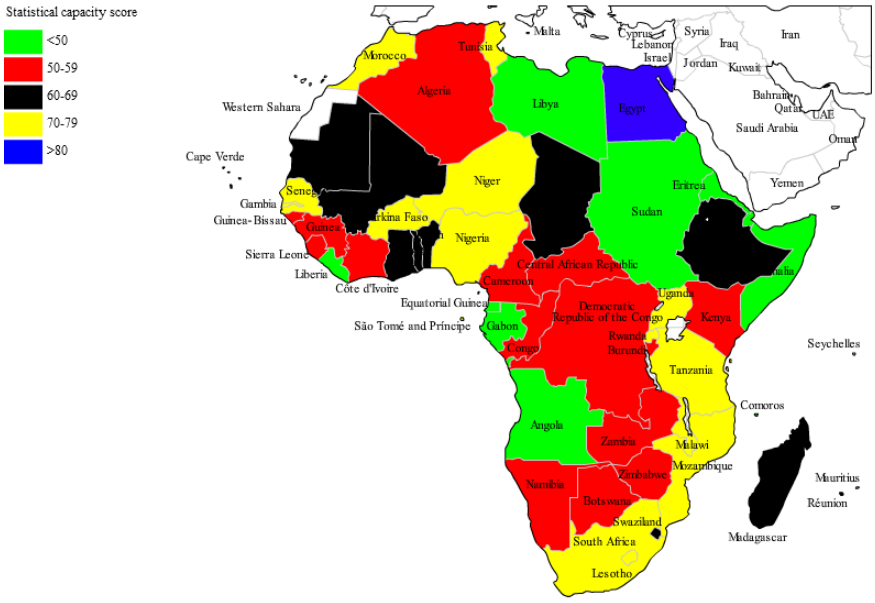
[28] http://www.worldbank.org/en/data/statistical-capacity-building/overview

Figure 2
Overall Statistical Capacity Indicator scores.



Data Source: World Bank Bulletin Board on Statistical Capacity, 2013.

Figure 3
Overall Statistical Capacity Indicator Score in Africa (excluding South Sudan).



Source: ECA (2014), based on World Bank Bulletin Board on Statistical Capacity 2013. Data source: World Bank Bulletin Board on Statistical Capacity, 2013.

Another composite index that assesses statistical capacity in African countries is the African Statistical Development Index[29]. This assesses statistical capacity by assigning a score comprised between 0 (lowest) and 1 (highest) to the performance of a country in each of the five fundamental areas of statistics development, as defined by the Reference Regional Strategic Framework for Statistical Capacity Building in Africa. These are: organization and coordination of the national statistics systems (C1), statistics infrastructure (C2), data-dissemination (C3), human-capital development (C4) and funding (C5). The average scores of the five different components provide an aggregated index of statistics development. For analysis purposes, African countries are grouped into quintiles (Sanga, Dosso and Gui-Diby, 2011).

In Class 5 countries, the national statistics system is well organized and coordinated and there is good statistics infrastructure for assessing users' needs and for collection, archiving, analysis and dissemination of data. Data are produced according to international standards and released to users according to an established calendar. These countries' national statistics offices are generally well staffed and have plans to develop their human capital. They are relatively well funded through public budgets in recognition that statistics are a public good.

The lowest quintile (Class 1) is made of countries whose index score in all five components is below the average of all countries that took part in the exercise. This class is made up of many post-conflict countries characterized by low government commitment to

[29] In order to develop the African Statistical Development Index, questionnaires were sent to 53 African countries in 2009 and 2010. Responses were obtained from 37 countries in 2010 and 28 countries in 2009, which is 70 per cent and 53 per cent response rates respectively. Assuming that there might be only minor changes between the two years covered by the survey, the two datasets were merged by using the most recent information for each country. This resulted in an operational dataset of 43 countries, constituting 81 per cent coverage.

producing and using statistics. This results in limited contribution to statistics activities, plans and infrastructure. There is limited investment in human capital resulting in the reduction of the capacity of the country to meet users' needs. Efforts are required in all areas of statistics development, as described earlier, to bring these countries to a level of statistics development that will help them efficiently to meet users' needs.

Table 8 shows that eight countries are in the highest quintile class and another eight countries are in the lowest quintile class. South Africa scores the highest African Statistical Development Index value and Swaziland the lowest (Sanga, Dosso and Gui-Diby, 2011).[30]

Table 8
Ranking and scores of African countries according to their African Statistical Development Index score

Countries	**SC1**	**SC2**	**SC3**	**SC4**	**SC5**	**ASDIU-A**	**Class-**
South Africa	0.567	0.891	0.688	0.733	0.639	0.703	5
Mozambique	0.740	0.603	0.653	0.714	0.750	0.692	5
Nigeria	0.665	0.661	0.688	0.562	0.650	0.645	5
Burkina Faso	0.587	0.691	0.583	0.407	0.867	0.627	5
Niger	0.636	0.535	0.465	0.484	0.833	0.591	5
Uganda	0.648	0.540	0.590	0.322	0.833	0.587	5
Malawi	0.541	0.675	0.563	0.428	0.722	0.586	5
Algeria	0.460	0.538	0.493	0.336	1.000	0.565	5
Botswana	0.505	0.601	0.389	0.291	1.000	0.557	4
Mauritius	0.592	0.549	0.590	0.370	0.639	0.548	4
Zimbabwe	0.674	0.521	0.500	0.294	0.700	0.538	4
Cameroon	0.662	0.526	0.389	0.361	0.750	0.538	4
Ethiopia	0.445	0.512	0.472	0.322	0.917	0.534	4
Cote d'Ivoire	0.545	0.494	0.528	0.298	0.783	0.529	4
Kenya	0.611	0.449	0.465	0.400	0.717	0.528	4
Tunisia	0.475	0.556	0.639	0.250	0.722	0.528	4
Ghana	0.650	0.472	0.590	0.225	0.700	0.528	4
Mali	0.577	0.551	0.521	0.268	0.550	0.493	3
Rwanda	0.537	0.640	0.354	0.360	0.572	0.493	3
Gambia	0.504	0.464	0.583	0.325	0.572	0.490	3
United Republic of Tanzania	0.512	0.494	0.389	0.341	0.700	0.487	3
Chad	0.534	0.462	0.354	0.303	0.750	0.481	3
Congo	0.611	0.344	0.306	0.368	0.767	0.479	3
Liberia	0.599	0.505	0.361	0.334	0.550	0.470	3
Democratic Republic of Congo	0.429	0.349	0.743	0.147	0.650	0.464	3
Namibia	0.416	0.363	0.389	0.228	0.833	0.446	3
Mauritania	0.609	0.383	0.458	0.273	0.439	0.432	2
Guinea-Bissau	0.376	0.360	0.361	0.339	0.689	0.425	2
Benin	0.585	0.418	0.431	0.419	0.244	0.419	2
Lesotho	0.424	0.564	0.389	0.278	0.439	0.419	2
Equatorial Guinea	0.528	0.388	0.431	0.389	0.356	0.418	2
Central African Republic	0.477	0.369	0.424	0.313	0.489	0.414	2
Sudan	0.442	0.470	0.271	0.504	0.356	0.408	2
Madagascar	0.335	0.290	0.403	0.437	0.522	0.397	2
Burundi	0.561	0.335	0.236	0.226	0.600	0.392	2
Seychelles	0.326	0.447	0.389	0.113	0.639	0.383	1

[30]Sanga, Dosso and Gui-Diby (2011).

Countries	SC1	SC2	SC3	SC4	SC5	ASDIU-A	Class-
Djibouti	0.486	0.291	0.319	0.205	0.572	0.375	1
Guinea	0.466	0.370	0.326	0.239	0.422	0.365	1
Togo	0.445	0.429	0.410	0.240	0.244	0.354	1
Comoros	0.281	0.215	0.160	0.259	0.767	0.336	1
Cape Verde	0.406	0.376	0.347	0.304	0.244	0.336	1
Eritrea	0.253	0.286	0.194	0.234	0.639	0.321	1
Swaziland	0.365	0.239	0.326	0.304	0.356	0.318	1

Source: Sanga, Dosso and Gui-Diby (2011).

4.2 Sectoral statistics capacity

In recent years, a number of statistics development initiatives have been put in place and implemented in Africa. However sectoral statistics and data are not in a good state in many African countries. The systems are weak, uncoordinated, insufficiently resourced and essentially unsustainable. Further, their outputs are substandard in terms of quantity, quality and dissemination. The following sections provide an overview of sectoral statistical capacity in Africa.

4.2.1 Economic statistics

4.2.1.1 Macroeconomic statistics

The *2014 African Statistical Yearbook* published by the Economic Commission for Africa indicates that most African countries have smooth time series data for GDP growth for the last nine years (2005-2013). There are few gaps, owing to the importance of this data. However, the quality of the data made available to users is doubtful in many instances. Out of the 54 countries in Africa, 5 countries (Eritrea, Malawi, Morocco, Somalia and South Sudan) did not have data for the year 2013 on GDP growth in the *2014 African Statistical Yearbook*. Of the remaining 49 countries, 28.6 per cent have a perfect match between national sources, represented by the 2014 yearbook, and international sources, represented by the World Bank. For 34.7 per cent of the countries, the values given in the World Bank database are higher than the reported values in the yearbook. In 36.7 per cent of the countries, national sources reported a higher value than the World Bank.

The results of a survey conducted by the Economic Commission for Africa (ECA) in 2011 show that, in general, the continent is still in the early stages of developing viable harmonious national accounts systems. Different versions of the System of National Accounts are used in different countries. While most of the countries (88 per cent) are using the 1993 System of National Accounts, some countries (12 per cent) are still using the 1968 system. This is also confirmed by the fact that, according to the 2014 yearbook, all countries in Africa (except South Sudan and Sudan) had complete data for agricultural and food production for the four years (2009-2012) but data on other production indices was much weaker. Only seven countries had data on manufacturing production while only four countries had data on mining production for 2012. The latest data available for electricity and mining production were for 2010 and 2011 respectively.

4.2.1.2 Household surveys

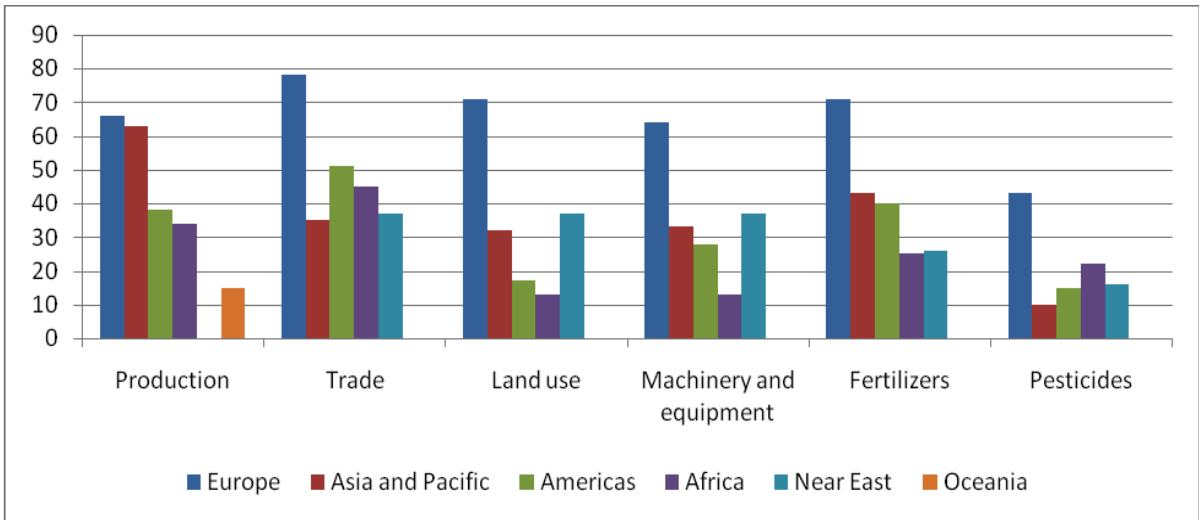
A review of the household surveys conducted in Africa during the last two decades shows significant disparities. Out of 53 African Member States, 30.2 per cent of them had conducted at most 5 household surveys, 45.4 per cent between 6 and 10 surveys, 22.6 per cent between 11 and 16 surveys and 1.9 per cent between 17 and 20 surveys, while none of the 53 countries had conducted more than 20 surveys during the last two decades. The disparities were such that Libya had conducted no household survey while Tanzania led the pack by conducting as many as 20 surveys. As many as 17 countries had not undertaken a single household income survey during the past two decades. It is worth noting that Mauritius, Seychelles, and Tunisia had not conducted demographic and health surveys during the period. This might be due to the fact that their administrative systems may have been generating the needed statistics on a regular basis. In fact, Mauritius and Seychelles had also not undertaken any Multi-Indicator Cluster survey or Core Welfare Indicators Questionnaire survey.

4.2.1.3 Agricultural statistics

Although African countries have a tradition of collecting agricultural statistics spanning a period of at least 40 years, most of them have not developed structured national agricultural statistics systems with well-defined objectives and clear strategic directions. Agricultural statistics systems have not been integrated into national statistics systems and national agricultural statistics systems are generally fragile, uncoordinated, insufficiently resourced and essentially unsustainable in several African countries. Many of them have been donor-driven rather than country-driven. These systems are an epitome of the "vicious cycle" of statistics under-development and under-performance in which low demand for data has led to fewer resources in terms of budgets, skilled and motivated staff, and financial and technical assistance for statistics production and development. This in turn has led to poor output in terms of data quantity, quality and dissemination (World Bank, 2010)**.**

There is a widening gap between data requirements and data availability and quality in many developing countries. Figure 4 below presents the response rates to the questionnaires sent by the United Nations Food and Agriculture Organization to countries classified by data domain (production, land-use, agricultural machinery, trade, fertilizer and pesticides) and by region. Response rates from the Pacific, Africa (except for trade and pesticides data) and the Near East are the lowest, while Europe has the highest rates. Response rates from Latin America for basic data on production, land use, machinery, and pesticides are also very low.

Figure 4
Countries' response rate (%) to FAO questionnaires for 2007 data



Data Source: World Bank (2010).

4.2.2 Social statistics

4.2.2.1 Demographic statistics

In order to assess national institutional capacity to produce population estimates and projections, a survey was conducted by the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (UNDESA, 2010).

The questionnaire was sent to 48 countries in Africa but only 8 countries (Cameroon, Gambia, Kenya, Mozambique, Namibia, Sierra Leone, Uganda and Zimbabwe) responded. However, even these eight countries did not provide information on some key indicators. In fact, all either have not provided data on a recent estimate of key indicators (such as life expectancy at birth, infant mortality, births or crude birth rate and deaths or crude death rate) or have provided an estimate that is judged to be unreliable.

The analysis of the response revealed that not all national statistics offices in developing countries are able to produce reliable demographic indicators or detailed population projections, mainly because many lack professional staff with specialized training in demography (UNDESA, 2010). Specifically, two of the eight African national statistics offices that responded to the inquiry reported a low number of professionals (one or two) working on demographic analysis, while three countries (37.5 per cent) reported seven or more professionals working on demographic analysis.

4.2.2.2 Health statistics

Health statistics are not evenly collected, both across countries and indicators. As an example, in the *2014 African Statistical Yearbook* only 26 countries in Africa had data on births attended by skilled health staff for 2009-11. On the other hand, all the 54 countries had data on infant and under-five mortality for 2013. Finally, it is acknowledged that in many African countries, evidence about the prevalence of child and maternal mortality and the lack of access to health services is often anecdotal (Okonjo-Iweala and Osafo-Kwaako, 2007).

4.2.2.3 Education statistics

Diagnoses conducted according to the Education Data Quality Assessment Framework methodology can be used by countries as a benchmark in the process of monitoring and evaluating quality improvement and the implementation of action plans for strengthening statistics capacities (UNESCO, 2014).

From December 2008 to July 2011, 12 countries (Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe) of the Southern African Development Community (SADC) participated in a review of the quality of their education data using the framework. This review was conducted within the UNESCO Regional Bureau for Education in Africa in support of the African Union Second Decade of Education for Africa action plan and the Southern African Development Community education programme.

The evaluation framework that assesses the quality of data produced by different sectors consists of three major categories: Institutional environment, statistics procedures and statistics results. It examines these categories through six dimensions - prerequisites of quality, integrity, methodological soundness, accuracy and reliability, serviceability, accessibility - and 22 sub-dimensions.

Table 9 shows the country scores sorted by dimensions, while Table 11presents the same results but sorted by scores (from the highest to the lowest). In this way, it is possible to highlight best practices in countries and those areas that need to be strengthened.

Table 9
Country scores on Education Data Quality Assessment Framework (sorted by dimensions)

Dimension	Lesotho	Madagascar	Mozambique	South Africa	Swaziland	UR Tanzania	Zambia	Zimbabwe	Botswana			Mauritius			Malawi	Namibia
									General ed.	TVET	Higher ed.	General ed.	TVET	Higher ed.		
0. Pre-requisites of quality	2	1	2	4	1	1	3	2	2	3	3	2	2	2	2	2
1. Integrity	3	2	1	4	2	2	4	2	2	2	2	2	2	2	2	2
2. Methodological soundness	4	2	3	4	3	3	4	3	3	3	3	4	3	3	3	3
3. Accuracy and reliability	2	1	1	3	3	3	3	2	3	3	3	2	2	2	2	3
4. Serviceability	1	1	2	3	1	2	3	2	3	3	3	3	3	3	3	3
5. Accessibility	2	1	1	4	1	1	3	1	1	1	2	2	2	2	1	2

Source: UNESCO (2014).

Table 10
Country scores on Education Data Quality Assessment Framework (sorted by scores)

Dimension	Lesotho	Madagascar	Mozambique	South Africa	Swaziland	UR Tanzania	Zambia	Zimbabwe	Botswana			Mauritius			Malawi	Namibia
									General ed.	TVET	Higher ed.	General ed.	TVET	Higher ed.		
2. Methodological soundness	4	2	3	4	3	3	4	3	3	3	3	4	3	3	3	3
3. Accuracy and reliability	2	1	1	3	3	3	3	2	3	3	3	2	2	2	2	3
1. Integrity	3	2	1	4	2	2	4	2	2	2	2	2	2	2	2	2
4. Serviceability	1	1	2	3	1	2	3	2	3	3	3	3	3	3	3	3
0. Pre-requisites of quality	2	1	2	4	1	1	3	2	2	3	3	2	2	2	2	2
5. Accessibility	2	1	1	4	1	1	3	1	1	1	2	2	2	2	1	2

Source: UNESCO (2014).

UNESCO (2014) reported the need to strengthen regional capacities to collect and process data. School administrators are typically not involved in data-collection and reporting. There are varying degrees of compliance by regional education officers in fulfilling data-collection mandates.

Data-collection and processing issues are not always dealt with. Sometimes, no information is compiled on coverage or non-response. There are no sound methodologies to address missing data, nor are imputation methods systematically applied. No systematic processes are in place to monitor data errors and omissions, and to generally address data problems. Poor integration with central ministry of education databases results in limited collaboration with the national statistics office. For instance, databases are not linked, especially to the technical and vocational education and training (TVET) and tertiary sectors. As such, ministries of education do not often take advantage of expertise available at central statistics agencies. It would be useful to encourage comparison of multiple data sources, such as household surveys, in order to understand the impact of education performance better and with a view to improving data quality. Very often education statistics are not widely circulated, in particular those relating to the Education for All global movement and the Millennium Development Goals. Dissemination on the Internet is infrequent. Publications such as statistics yearbooks only present raw data and indicators. Very few incorporate data analysis. Lengthy delays to upload to the Internet, coupled with incomplete production and dissemination of education statistics, results in lags in international reporting. Survey metadata are incomplete or do not exist.

4.2.3 Environmental statistics

4.2.3.1 Natural resources, land use and pollutants

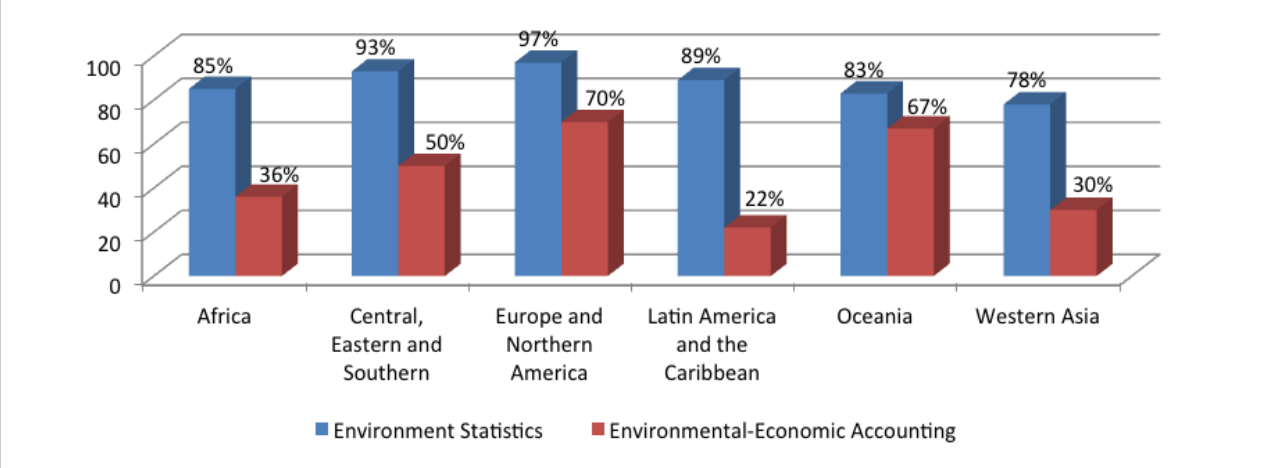
The United Nations Statistics Division undertook a global assessment of environment statistics and environmental-economic accounting under the auspices of the Committee of Experts on Environmental-Economic Accounting (UNCEEA), in collaboration with the Inter-Secretariat Working Group on Environment Statistics (UNSD, 2007). Countries identified that the lack of human and financial resources are the most common impeding factors for the

development of programmes for environment statistics and for environmental-economic accounting. However, in the compilation of these statistics, the availability and quality of data were considered key impeding factors. A number of questions in the assessment aimed at identifying the availability of environment statistics and environmental-economic accounting programmes in countries (whether in the responding institutions or in other institutions).

According to the 2007 report by the Statistics Division, an environment statistics programme was available in 91 per cent of the responding countries worldwide, including nearly all developed economies, all transition economies and a large majority of developing economies. The geographical distribution of the programmes ranged from a maximum of 97 per cent of countries in Europe and North America to a minimum of 78 per cent of countries in Western Asia (figure 5). The environment statistics programme was available in 85 per cent of the 13 countries in Africa that responded.

Conversely, about half of the countries that responded to the assessment had an environmental-economic accounting programme. The distribution of the programme among countries varied both by economic and geographical grouping. The geographical distribution ranged from a maximum of 70 per cent of countries in Europe and Northern America to a minimum of 22 per cent in Latin America and the Caribbean. The environmental-economic accounting programme was available in 36 per cent of the 14 responding counties in Africa.

Figure 5
Existence of environment statistics and environmental-economic accounting programmes in countries



Data Source: UNSD (2007).

An assessment of the situation of environment statistics in the member countries of the Economic Community of West African States (ECOWAS) shows that a number of countries (Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Niger and Nigeria) have a reasonable set of data on main environmental indicators covering several subfields such as greenhouse-gas emissions, emissions of pollutants, land-use, water resources and water supply, and waste collection. However, in none of the countries are specific statistics surveys on environmental aspects carried out by the National Statistics Institute. Data-collection is mainly carried out by various governmental bodies concerned with environment protection and environmental policy. Benin, Burkina Faso, Côte d'Ivoire, Senegal and Sierra Leone have a limited set of data on main environmental indicators, while Liberia has very little information. Cape Verde and Togo were

not able to provide any data. One of the main reasons of the low level of development of environment statistics in the ECOWAS countries could be that there was no cooperation or very little cooperation with the governmental bodies collecting the environmental data in the countries. The methodology used to collect and compile the data is often not well documented. It is expected that the methodology applied in those institutions is not in agreement with international methodologies on environment statistics. The amount of data disseminated through the Internet is limited and differs across countries in terms of the methods used for the design of the tables and their contents. This situation also reflects the varying priorities and areas of concern in the countries and that capacities in environmental statistics are still limited.

The assessment revealed substantial data gaps in all ECOWAS countries which concern all subfields of environment statistics. Some available data are of limited time and geographical coverage (UNSD, 2006).[31]

4.2.3.2 Climate observations

Despite covering a fifth of the world's total land area, Africa has the worst climate-observation network of all continents, and the network is deteriorating. This was pointed out during the United Nations Climate Change Conference that opened in Nairobi on 6 November 2006. Some of these aspects have also been expressed at other meetings where climate data related issues in Africa have been discussed, such as for example such as those of the Intergovernmental Panel on Climate Change, the United Nations Framework Convention on Climate Change and Global Climate Observing System

As stated in an earlier report (ECA, 2011) "There are 1,152 world weather watch (WWW) stations in Africa giving a station density of one per 26,000 km^2, eight times lower than the WMO minimum recommended level (Elasha et al., 2006). This shortage of data is exacerbated by an uneven distribution, leaving vast areas of central Africa unmonitored, and the lowest reporting rate of any region in the world… Moreover, it is indicated in the GCOS (Global Climate Observation Systems) Surface Network report covering the period of November 2010 – April 2011 that most of stations which are not recording or are recording less 50 per cent of the time are located in Africa.

"This is a clear signal that, in Africa, in addition to less number of stations which is usually inadequate network, the datarecording and transmission is another pressing challenge. Another challenge in Africa is the inaccessibleity of the data from the national networks. Washington et al. (2003) in their African Climate report described that many counties (sic) in Africa have useful networks of secondary stations which do not report internationally. The issue of data availability to the international community is a sensitive one and needs to be approached with the needs of the African climate community in mind" (ECA, 2011).

4.2.4 Governance and institutions statistics

The Economic Commission for Africa's *African Governance Report*, the most comprehensive report on governance in Africa, assesses and monitors the progress of African countries on governance, identifies capacity gaps in governance institutions and proposes policies and strategic interventions to improve governance on the continent. However, the report covered 27 African countries in its first report in 2005 and 35 in its second report,

[31] http://unstats.un.org/unsd/environment/envpdf/Assessment_report_ECOWAS_March2006.pdf).

published in 2009. The latest *African Governance Report* (AGR III, published in 2013) also did not cover all countries but was based on data from 40 countries.

In the 2013 report, it was stated that the consistency and reliability of the data were ensured. Data were collected using an expert opinion survey, focus-group discussions and desk-based research. However, the indices were calculated based on data from the expert panel study only. Moreover, the data were not collected in such a way that country comparisons are possible. Concepts which are somewhat invariant to time and place and are focused on citizens' evaluations rather than to interest groups' views are needed for meaningful governance comparisons across countries and over time (Iqbal and Shah, 2008).

Conversely, the Ibrahim Index of African Governance (IIAG) is the most comprehensive collection of data on African governance. However, paucity of data is a core concern for the Mo Ibrahim Foundation in the compilation of the index. Official data for many key indicators of governance, such as employment, poverty and inequality, are patchy or out-of-date and therefore do not meet the criteria for inclusion in the index[32].

The African Peer Review Mechanism (APRM) is a country-led - or arguably continent-led - process of assessing domestic governance and it differs from the other forms of assessment. However, like the other assessments, it encounters the poor capacity of African countries generally to gather relevant and reliable information, which is a major shortcoming for many African countries. The demands of peer review can be overwhelming in such circumstances (Rao, S., 2010).

Text box 4

Data-collection efforts for the *Sustainable Development Report on Africa*

The production of the first three issues of the *Sustainable Development Report on Africa* (SDRA) faced challenges related to availability and reliability of data and that prevented the report from objectively tracking progress over time, based on a set of quantifiable sustainable development indicators.

In 2012, an attempt was made to collect reliable standardized first-hand data from 15 selected African countries. In order to collect the desired data, a draft questionnaire was developed jointly by the former Food Security and Sustainable Development Division (FSSDD) and the African Centre for Statistics (ACS) of the Economic Commission for Africa (ECA). To pre-test the questionnaire, the proposed indicators were discussed with experts from Ethiopia's Central Statistical Agency and the Ministry of Finance and Economic Development, and the questionnaire was revised based on the comments received. The final questionnaire was prepared in two languages - French and English - and sent to 15 countries. The preparation of the questionnaire and the data collection was a joint activity of African Centre for Statistics and the Food Security and Sustainable Development Division, which has since been restructured. The aim was to contribute to the preparation of the fifth *Sustainable Development Report on Africa* (SDRA-V). There was also a plan to make the data from member States available to users on line at StatBase, the statistics database of the ACS.

[32] http://www.moibrahimfoundation.org/iiag-methodology/

The data requested in the questionnaire are available from different institutions within each country and the focal point officers at national statistics offices and ministries of environment were requested to collate the data from different sources in their country.

The data requested in the questionnaire were organized into sectors, including: demographic, social, national accounts, agricultural, energy, monetary and financial, foreign-trade and environment statistics. The sectors were further divided into variables that cover various subsectors. The data requests mainly covered the years 2002 to 2011. The questionnaire aimed to find key indicators data concerning sustainable development in each country.

The questionnaire and the glossary of indicators were sent to focal point persons in Botswana (Southern Africa), Burkina Faso (West Africa), Cameroon (Central Africa), Ethiopia (East Africa), Gabon (Central Africa), Ghana (West Africa), Kenya (East Africa), Morocco (North Africa), Namibia (Southern Africa), Nigeria (West Africa), Rwanda (East Africa), Senegal (West Africa), South Africa, Tunisia (North Africa) and Uganda (East Africa). The questionnaire and a set of indicators for the fifth report were discussed at a meeting on measuring sustainable development: sustainable development indicators held in December 2012 and were agreed by the partners involved in the report. Thirteen countries sent in questionnaires (Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Kenya, Mauritius, Morocco, Rwanda, Senegal, South Africa, Tunisia and Uganda) out of the 15 pilot countries, representing a completion rate of 86.7 per cent[33].

However, a significant amount of responses were incomplete and showed inconsistency with data available from international databases. As a result, despite efforts to make the questionnaire easy to complete as it required only primary indicators, the data supplied did not allow derived indicators to be calculated for benchmarking.

[33]Gabon and Namibia have not returned the questionnaire. "Completion rate" here refers to the percentage of countries that returned a questionnaire, not to the completeness of their responses.

Text box 5

Ongoing support from the Economic Commission for Africa to Member States in developing and strengthening economic and environment statistics relevant to assessing the green economy

The African Centre for Statistics of the Economic Commission for Africa (ECA) and its partners have been carrying out several activities to support Member States to develop and strengthen economic and environment statistics and accounting at country and regional levels.

At the regional level, the Centre has worked with United Nations Statistics Division and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. In October and December 2014 it organized an on-line training course on the System of Economic-Environmental Accounting (SEEA). More than 35 people registered for the training course and around 15 to 22 people have been actively participating in the course including online lectures, homework assignments, virtual meetings and discussions. A face-to-face meeting was planned for Addis Ababa early in February 2015 as a follow-up and the participants would be invited from among those that had already completed the on-line training course.

The United Nations Secretariat's Development Account has a three-year capacity-building project (2014 to 2017) on environment statistics and the System of Economic-Environmental Accounting. This aims to support countries in developing and strengthening environment statistics and integrated economic-environmental accounting for improved monitoring of progress on sustainable development. Pilot countries Burundi, Kenya, Rwanda, Tanzania, and Uganda were part of the project, which was scheduled to include a series of capacity-building activities including a workshop on environment statistics in late January 2015 in Mauritius.

The United Nations Development Account was also preparing another big project to support the post-2015 sustainable development agenda and to be carried out during the years 2016-18. This had the goal of strengthening the statistics capacity of Member States to measure, monitor and report on the post-2015 agenda. Two targets to be achieved by 2020 are:

- Enhance capacity-building support to developing countries to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts

Build on existing initiatives to develop measurements of progress on sustainable development that complement GDP and support building capacity in developing countries for statistics.

ECA is to develop a statistics knowledge network with the objective of strengthening the network of statisticians, increasing intraregional statistical cooperation and raising the regional profile of statistics to ensure the success of any future policies or initiatives in statistical development in Africa. The network will address issues relating to strengthening the capacity of Member States for producing, analysing and disseminating statistics required for national development planning, policy formulation and monitoring of development progress. It will increase communication and knowledge-sharing among statisticians, demographers and related professionals in national statistical offices, statistical training centres, universities, subregional organizations, regional and international organizations.

The System of National Accounts is the foundation and international standard not only for economic statistics but also for social and environmental statistics. It is also an integrated and harmonized information system for analysing, formulating and monitoring sustainable paths of development through a broad range of indicators. The African Project on the Implementation of the 2008 System of National Accounts is a common project and joint effort with the aim of enabling member States to produce timely and quality economic statistics in support of good economic governance, regional integration, and sustainable development.

5 Chapter 5: Case study - Ethiopia's climate-resilient green economy strategy

5.1 The climate-resilient green economy strategy

According to the vision document of Ethiopia's climate-resilient green economy strategy, the strategy "aims to provide Ethiopia with a common goal and roadmap for achieving a climate-resilient green economy" (EPA, 2014). The vision includes several streams of ongoing work, by incorporating climate resilience (or adaptation) through Ethiopia's Programme of Adaptation to Climate Change and climate mitigation through Ethiopia's Nationally Appropriate Mitigation Actions, among others. For this reason, the focus is on a climate-resilient green economy, despite the fact that a green economy should be climate-resilient by definition, as the green economy includes both climate adaptation and mitigation.

The vision is designed to be implemented through the creation of a strategy which identifies intervention options, a facility to channel finance, a unit to interact continuously with stakeholders and a plan to define an implementation plan.

The review in this chapter focuses on the strategy, which contains analytical and quantitative analysis for selecting policy interventions for reaching a climate-resilient green economy (Government of Ethiopia, 2011).

The highest levels of the federal government including the Prime Minister's Office, the Environmental Protection Authority and the Ethiopian Development Research Institute gave their support to the process for elaborating the strategy.

Its four pillars are:

1. Agriculture: Improving crop and livestock production practices for higher food security and farmer income, while reducing emissions

2. Forestry: Protecting and re-establishing forests for their economic and ecosystem services including as carbon stocks

3. Power: Expanding electricity generation form renewable energy for domestic and regional markets

4. Transport, industrial sectors and buildings: Leapfrogging to modern and energy-efficient technologies.

The strategy aims to boost income and improve sustainability in order to allow the country to reach middle-income status by 2025. In particular, it sets the target of cutting carbon emissions by about 64 per cent in 2030 compared with the business-as-usual development path. It is designed to be implemented through Ethiopia's five-year Growth and Transformation Plan to lift the economy into the path of becoming a climate-resilient green economy path. In the process of preparing the strategy, about 150 potential green-economy initiatives were identified and analysed, out of which 60 initiatives were selected to support the achievement of development goals and reduce greenhouse-gas emissions.

Despite the cross-sectoral nature of the vision and the broad scope of the four pillars of the strategy, the approach used to identify and select viable intervention options is primarily focused on climate mitigation and uses a conventional approach to planning that only partly addresses the full breadth of a green economy approach. This is consistent with the experience of several other countries, where it has proven difficult to translate inclusive green economy goals and targets into a coherent set of policies and analysis. It can be expected that first movers, including Ethiopia, will face a steep learning curve, paving the road for those that follow their example.

In fact, the first challenge highlighted[34] by the strategy is: "The development of a green economy strategy starts from an assessment of a country's economic and growth targets". This is an approach that aims at optimizing the policy process, while the inclusion of cross-sectoral feedbacks requires a "what if" approach (where the outcome of policies are forecasted rather than imposed). Along these lines, a guidance manual (UNEP, 2014b) from the United Nations Environment Programme states that a green-economy assessment should start from the identification of current and future challenges and related options, in order to turn them into opportunities. The implication is that the potential emergence of side effects and potential synergies, which are the backbone of the green economy approach, will not be considered as specific development goals are already assumed to be achieved.

A second challenge is related to monetization, as stated: "Because the immediate monetisation of building a green economy depends on verified emissions reductions, the Ministerial Steering Committee and the Technical Committee (described in the chapter 'Making it happen') have focused the analytic work of developing a green economy strategy on initiatives that contribute to reducing emissions. Other parts of the climate-resilient green economy strategy, specifically 'climate resilience' initiatives, will be incorporated subsequently". This approach does not consider the potential economic benefits of green economy interventions aside from the reduction of carbon dioxide (CO_2) emissions such as increased availability of natural resources, avoided costs for reduced consumption and for the replacement of otherwise lost ecosystem services. This introduces limitations because it only accounts for climate mitigation, which is an important part but only one dimension of the green economy and of the climate-resilient green economy vision.

Thirdly, while the green economy approach is innovative because it employs a system analysis, the strategy stresses the importance of sectoral interventions. It states: "The analytic backbone of the project was a sectoral analysis of greenhouse gas emissions, of initiatives (potential impact and cost), and implementation requirements, including financing".

The methodology adopted to generate projections of the performance of the sectors analysed is consistent with characterization of the assessment. The team used "[Growth and Transformation Plan] targets, past performance, and the ambition to reach middle- income status before 2025" as key drivers[35]. Details were not provided on the actual methodology used to develop "a realistic forecast for economic development over the next 20 years". However, the method for the selection and prioritization of activities in the Growth and Transformation Plan was more extensively explained. Specifically, extrapolation techniques were used (starting from plan targets) to project key drivers of emission generation and emission levels, and cost curves were developed to assess climate mitigation costs and effectiveness. A qualitative

[34] Quotations in this section are from Government of Ethiopia (2011).
[35] The Growth and Transformation Plan is the Federal Government's five-year development plan for 2010-2015. It is succeeded by the Growth and Transformation Plan 2 (2015-2020).

approach was used to assess the pertinence of the actions identified with the plan and with cross-sectoral development goals. More precisely, the following assumptions were used to guide the strategy-development process across sectors:

Agriculture sector:

- Crop-production projections were based on a report by Dorosh (2007). Total crop production was taken as a key driver of emissions.

- Targets for quantity of fertilizer per hectare of land were based on similar land in India (derived from World Bank data). Synthetic fertilizer use per hectare was selected as a key emission driver.

- The growth rate of the sector was calculated based on the plan and extrapolated to 2030, assuming no additional policies would be implemented to increase agricultural yield. Agriculture cultivated land was selected as a key emission driver.

- The growth rate of livestock population until 2030 was calculated based on 2008-2011 growth rates provided by Ethiopia's Central Statistical Agency. The increase in livestock population was selected as a key emission driver.

Industry sector:

- For the cement sector, projections were made based on the Growth and Transformation Plan up to 2015. An average level of cement consumption per capita in a middle-income country (0.5 ton) was assumed to project total cement production between 2015 and 2030. Cement production was selected as a key emission driver.

- For the textile sector, projections were based on data from the plan and fom plans by the Textile Institute. Textile production was selected as a key emission driver.

- For the steel and engineering sectors, projections were based on the plan up to 2015 and after that period, an annual growth of 11.2 per cent was assumed until 2030 (in line with assumed economic growth). Steel and engineering production (measured in billions of United States dollars - USD) was selected as a key emission driver.

- For the mining sector, projections were made based on the growth plan forecast until 2015. After 2015, a 1 per cent annual growth (naturally constrained growth) was assumed, taking gold mining and processing (measured in kilograms) as one of the key emission drivers.

- Using fertilizer production (million tons) as one of the key emission drivers, the baseline was estimated with data from the Metal and Engineering Corporation, assuming that actual production would start at two-thirds of production capacity. The forecast was made based on total domestic fertilizer demand.

Emissions:

- The emissions abatement costs were calculated in USD per metric ton of carbon dioxide equivalent (tCO2e) of reduced emissions in 2030. That is, the abatement

costs for a given year are divided by the abatement potential in that year to obtain the actual abatement cost. The abatement cost includes the incremental capital expenditure (investment) required for the implementation of the abatement initiatives compared with the business-as-usual scenario; the incremental operating cost required for the abatement level; and potential benefits, such as lower costs due to increased fuel efficiency or higher revenues, compared with the business-as-usual scenario.

Quantitative models were not used and the team developed a qualitative assessment, or a multi-criteria analysis, to determine the suitability of the interventions identified in the development plan. This is very pertinent to the assessment of methodologies and tools presented in this report. Specifically, the strategy document for the climate-resilient green economy states: "The assessment of the suitability of the initiatives to the Growth and Transformation Plan is a more delicate matter, as few models exist for macroeconomic impacts and some of the criteria are difficult to quantify analytically" (Government of Ethiopia, 2011). This qualitative assessment was aimed at identifying the likelihood that the intervention proposed was able to contribute to the plan's goals, including considerations on potential cross-benefits with other initiatives. This type of assessment is crucial for a green-economy approach and to identify the possible emergence of side effects and synergies, for example the implementation of a selected intervention could have very positive impacts on one sector, but several negative ones on other sectors. In this respect, most of the methodologies and tools reviewed in this report can provide a process like the one implemented in Ethiopia with a more targeted qualitative and quantitative estimation of the cross-sectoral outcomes of policy implementation, especially in the context of climate mitigation.

5.2 Climate-resilient green economy questionnaire

Given the cross-sectoral approach followed for the elaboration of the climate-resilient green economy vision and strategy, a questionnaire was developed which aimed to assess the types of integrated assessment tools and methodologies that are used in the elaboration and subsequent phases of the strategy, and the data used in applying these tools and methodologies. The questionnaire, whose full text is available in Annex I, was distributed to ministries and a research institute that were involved in the preparation of the climate-resilient green economy strategy. The questionnaire is divided into two main parts:

- **Part A: On integrated assessment tools and methodologies.** The questions were organized following the main steps of the integrated policymaking cycle, including agenda setting, policy formulation, policy assessment, decision-making, implementation, and policy evaluation. Furthermore, specific questions focused on the main capacity gaps that were encountered during the elaboration of the strategy.

- **Part B: On the nature of data and the indicators used.** The questions were aimed at assessing the type of data and information used in the policymaking process, and the barriers encountered in the data-collection and analysis processes.

The main outcomes of the survey are summarized hereafter.[36]

[36] In addition to the results of the questionnaire it is worth mentioning that one of the modelling tools analysed in this study (Threshold 21) is currently being customized to Ethiopia to further support the implementation of the climate-resilient green economy, specifically focusing on the agriculture sector. In fact, this model is being developed in the context of Millennium Institute's programme, Changing Course in Global Agriculture.

5.2.1 Questionnaire Part A

Agenda-setting

Integrated methodologies and tools should be used from the initial phases of the elaboration of a green economy strategy in order to identify key problems and prioritize interventions. In particular, the questionnaire aimed to evaluate the main reasons for elaborating a climate-resilient green economy and the extent to which multi-stakeholder approaches were adopted in the problem-identification and agenda-setting phase.

According to the respondents, the main reason for the elaboration of the climate-resilient green economy was the need to switch to a sustainable, low-emission development model, especially in the light of the country's objective to reach middle-income status by 2025. A green economy was seen as a means to harness sustainable development opportunities and guide the country from an economy based on agriculture to one based on industry.

All the respondents confirmed that a multi-stakeholder process was followed for the elaboration of the climate-resilient green economy. In particular, technical committees were comprised of high government officials and professionals from different fields. Also, international consultants (for example from McKinsey, a consultancy company) were hired to facilitate the adoption of guidelines issued by the Intergovernmental Panel on Climate Change (IPCC). In the industrial sector, consultations were held with representatives of selected industrial subsectors, including leather, textile, chemicals and metal. A stakeholder analysis was used to select the relevant stakeholders.

Policy formulation

In the policy-formulation phase, measurable and realistic targets should be identified, and policy options should be formulated with the aim to address the problems highlighted in the agenda-setting phase. The adoption of integrated assessment methods and tools is key to ensure that economic, social and environmental indicators are considered, and that policies are formulated based on the analysis of alternative future scenarios. The questionnaire aimed to evaluate the type of tools and processes followed for the elaboration of climate-resilient green economy policies across sectors.

Five out of six respondents stated that scenario creation tools were used to analyse potential future developments in different sectors. Economic, social and environmental trends were taken into consideration in the scenario-creation, target-setting and policy-formulation phase of climate-resilient green economy development. In particular, national development targets were drawn from the Growth and Transformation Plan and other plans at the sectoral level. The guidelines of the Intergovernmental Panel on Climate Change were followed to create "business as usual" and green-economy scenarios, using data and assumptions derived from literature review, and calculations were performed at the sectoral level. The scenario-creation tool was developed in Ethiopia, but it is not fully customized to local conditions. According to a respondent, the tool is currently being customized to the local context.

Policy assessment

In the policy-assessment phase, the expected impact of selected policies on the economy, society and environment should be assessed with the help of integrated tools and methods. The use of an adequate set of tools is essential in this phase, as it allows the ex-ante understanding

of system-wide responses to external interventions, thereby effectively guiding the process for selecting the most adequate sectoral policies. The questionnaire aimed to explore the type of tools and methodologies used in the climate-resilient green economy policy-assessment phase, and to highlight the main data constraints faced by Ethiopian decision makers.

Four out of six respondents affirmed that policy impacts were assessed using both quantitative and qualitative methods, and estimating the effect of interventions on key economic, social and environmental indicators. In particular, one respondent specified that multi-criteria analysis was used to prioritize intervention options based on their expected results. Out of 60 initiatives, 4 priority actions were selected for urgent implementation, including:

1) Improving crop- and livestock-production practices
2) Protecting and re-establishing forests for their economic and ecosystem service
3) Expanding electricity-generation from renewable sources
4) Leapfrogging to modern and energy-efficient technologies in the transport industries and building sectors.

The main data constraints faced during the utilization of assessment tools and methodologies regarded the access to baseline data (especially on greenhouse-gas emissions by sector). On the other hand, academic studies and expert opinions were used to fill the main data gaps, and all respondents affirmed that data-availability issues did not prevent the use of planning tools and methodologies. However, the need was acknowledged for a coherent data-collection and analysis framework, such as the Framework on the Development of Environment Statistics.

Decision making

In the decision-making phase, the most suitable policy options were selected based on the outcomes of the policy-assessment phase. This is an essential phase of the policy process, as it involves the elaboration of an action plan, including specific tasks organized in a coherent time frame. The use of integrated tools and the analysis of data derived from the previous phases heavily influence the success of the decision-making phase. Starting from this consideration, the questionnaire aimed to evaluate the use of data and tools for the selection of activities to be included in the climate-resilient green economy.

All respondents affirmed that specific data and quantitative assessments were taken into account for the prioritization of activities in the climate-resilient green economy. In particular, specific assessments were conducted by the Ethiopian Development Research Institute and the Ethiopian Institute of Agricultural Research one year before the establishment of the sectoral sub-technical committees. Key indicators analysed included, among others: livestock population, agricultural land demand, inorganic fertilizer demand, and fuel-wood consumption and demand.

The respondents observed that the scenario-forecasting tool was useful for the preparation of the climate-resilient green economy, as it brought new knowledge on climate, climate change, vulnerability assessments, greenhouse-gas emissions and their accounting, and the scope of green growth.

Implementation

The implementation phase can start after decisions have been made on priority activities. In this phase, roles and responsibilities should be assigned to key actors across sectors, and integrated tools and methods should be used to ensure that cross-sectoral synergies are exploited and that progress towards stated goals is carefully monitored. The questionnaire aimed to assess the use of data and tools in the implementation phase of the climate-resilient green economy, focusing on potential data and methodological barriers encountered.

Two-thirds of the respondents affirmed that policy-implementation steps were informed by the use of data and forecasting tools, while 75 per cent affirmed that a specific time schedule was decided for each activity. One of the respondents declared that most of the actors involved in the implementation phase of the climate-resilient green economy had not participated in the formulation and assessment phases, and that climate-resilient green economy units in the respective line ministries implemented the activities separately. Another respondent stressed that priority actions were clearly defined for the agriculture sector prior to implementation. More specifically, priority actions for the green-economy part of the strategy included: improving livestock production practices for higher food security and farmer income while reducing emissions; improving crop-production practices for higher food security and farmer income while reducing emissions; and sustainable land-management. Further, the climate-resilience part of the strategy in the agriculture sector highlighted themes based on the following priorities: macro-level responses, household-level responses and biodiversity responses.

Regarding the tools and methodologies used for implementing the activities, one respondent specified that Multi-Criteria Analysis was adopted in order to prioritize activities that had cumulative positive effects.

Policy evaluation

Once the activities are implemented, the reaction of the system to external interventions should be carefully monitored and evaluated in order to detect potential policy gaps promptly, and to adopt corrective or complementary measures. The use of integrated monitoring and evaluation tools and methodologies is crucial in order to effectively analyse the actual outcomes of implemented actions. The questionnaire aimed to evaluate the use of tools and methods for monitoring the impact of the strategy in achieving the targets of the climate-resilient green economy.

Three out of six respondents affirmed that no specific tools or methods were being used at that time to monitor the implementation of the climate-resilient green economy and that the action plan was not modified due to a change in the initial conditions. On the other hand, all the respondents affirmed that specific tools and methodologies were used for identifying gaps in the climate-resilient green economy and for designing alternative measures. Some of the tools included measurement, reporting and verification; vulnerability-accounting methods; and the climate-resilient green economy registry. According to one of the respondents, the main challenge for monitoring and evaluation was represented by shifting roles and responsibilities within the institutions and the lack of capacity of professionals at various levels.

Capacity

The development and use of integrated assessment tools and methodologies requires the creation of technical capacity in key institutions and across key sectors. Consequently, the questionnaire aimed to assess whether capacity-building activities on integrated policymaking were conducted prior to the elaboration of the climate-resilient green economy.

All the respondents stated that no capacity-building activities on integrated assessment tools and methodologies were conducted for decision makers before the development of the climate-resilient green economy. According to the respondents, the main capacity gaps faced during the elaboration of the strategy included lack of specialization in climate finance and economics, lack of statistics capacity and limited knowledge of innovative technologies and assessment methods.

The respondents stressed that capacity gaps were partially addressed through hiring international and local experts, and organizing workshops. However, there was a widely acknowledged need for providing continuous training to professionals involved in the implementation of the strategy.

5.2.2 Questionnaire Part B

Part B of the questionnaire focused on the type of data and indicators used for the elaboration of the climate-resilient green economy. The questions concerned the methods adopted for the collection, analysis and use of relevant data, and the data constraints faced throughout all the phases of climate-resilient green economy development.

All the respondents affirmed that indicators and data were needed during the policymaking process for the climate-resilient green economy and that data was mainly derived from available surveys and studies. The main data and indicators utilized included greenhouse-gas baseline data, vulnerability and exposure data, data from the Growth and Transformation Plan and the Driving Forces, Pressure, State, Impact and Response Framework. Data gaps were encountered in particular with respect to the industry sector's baseline potential for greenhouse-gas emissions and the greenhouse-gas emissions of livestock, crop and soils. The surveys and studies used for gathering data included: population projection data, crop production and livestock surveys, industry surveys, surveys for the Growth and Transformation Plan, biomass inventory, population census and agricultural statistics surveys.

According to one respondent, the indicators and data sources used at each key stage of the policy cycle included:

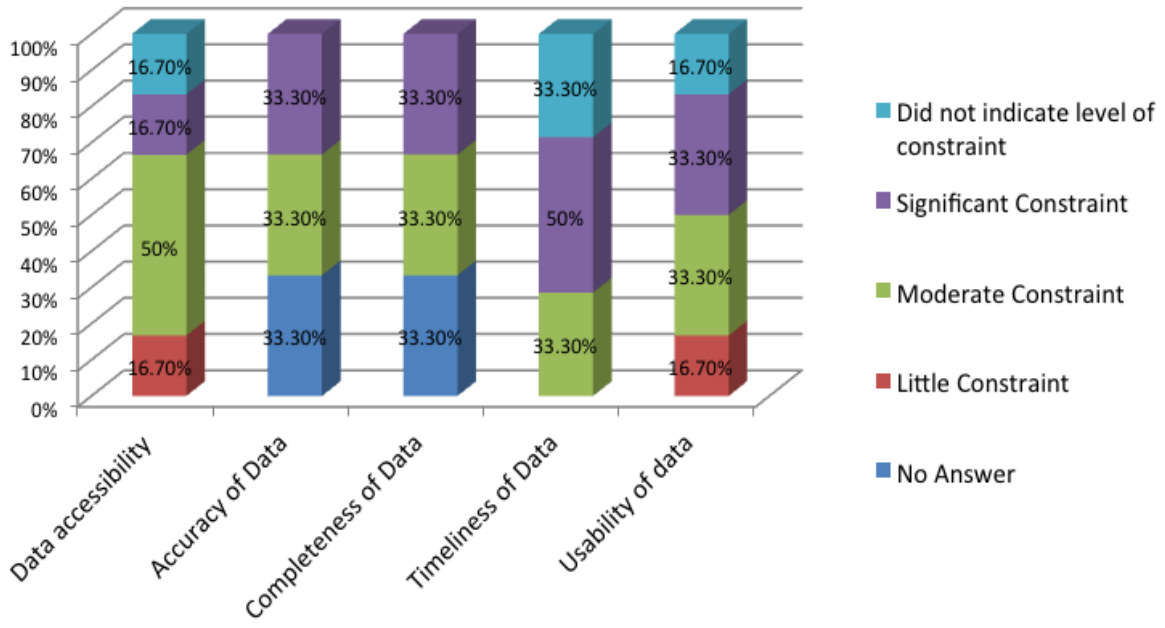
- Agenda-setting: Climate-change impacts such as droughts and floods, vulnerability, targets of the Growth and Transformation Plan, and sustainable development goals.
- Policy-formulation: Targets of the Growth and Transformation Plan, existing programmes and plans, greenhouse-gas emissions and vulnerability
- Decision making: Livestock population, agricultural-land demand, inorganic-fertilizer demand, and fuel-wood consumption and demand.

The criteria used for the selection of the indicators included: policy relevance to the Growth and Transformation Plan, consistency with sustainable development, cost-effectiveness and measurability.

Two-thirds of the respondents stated that no additional surveys were created specifically for the elaboration of the strategy. Half the respondents affirmed that there were significant deficiencies and gaps in the data, while the other half did not agree with this statement. All respondents affirmed that the data needed were not available on the Internet and that no specific indicators were used for the selection of specific tools and methodologies.

A qualitative assessment was made of the main gaps in the data and capacity-constraint indicators, which were evaluated on a scale from 1 ("no constraint") to 5 ("highly significant constraint"). The results of the assessment are summarized in the following table 11.

Table 11
Results of the climate-resilient green economy data questionnaire, constraints in data accessibility, accuracy, completeness, timeliness and usability



Source: Responses to questionnaire.

5.3 Statistics capacity questionnaire

5.3.1 Central Statistical Agency of Ethiopia

A questionnaire was used to gather data and information from the Central Statistical Agency of Ethiopia in order to assess the statistics capacity as it pertains to data availability, suitability and quality for the utilization of integrated assessment tools and methodologies.

The agency reported that it is the sole producer of data in the country. Moreover, it documented the methodologies and international methods used. While the agency uses a data-

quality assessment framework to assess the quality of data obtained from other sources, such as line ministries and organizations, it does not use this framework to assess the quality of data it collects. However the statistics products or releases meet the needs of users in terms of the concepts measured and the populations represented. Further, the agency said it had significant constraints, for example in the number of statisticians and in accessing data.

Currently the agency has a programme on environment statistics, covering land, biodiversity, forests and agriculture. The environment programme does not cover some other statistics, including water, energy, minerals and transport. The agency does not apply the System of Environmental-Economic Accounting. It does cooperate with other institutions and agencies in the construction of a social-accounting matrix, although it is not the leading agency.

5.3.2 Data availability

Economy

The requirement or demand is huge on various economic sectors for data for planning development, policymaking, national accounts, research and other purposes. In 2004, the Central Statistical Agency conducted a census of economic establishments. The census was carried out in urban parts of the country by face-to-face interview using a questionnaire. The qualities of the data collected on size indicators, which are very important for further economic-survey sampling, were not reliable. Moreover, there was lack of in-depth knowledge for establishing a database for the huge quantity of data required for sampling activities.

Industries

There is a problem that there is almost availability of a timely and updated business register, except for large and medium-scale manufacturing industries. Therefore the agency uses indirect methods such as area sampling, a mixed-households surveys approach and administrative data sources as a frame for conducting economic surveys on various sectors.

Agriculture

The agency has made several efforts to produce agricultural statistics through an "Integrated Household Survey Program" carried out on an annual basis since 1980. However, the reliability of the data in the survey result on large and medium-scale commercial farms and enterprises is unsatisfactory, for various reasons. Among others, this is due to the fact that the agency uses an unreliable frame and also because the enterprises purposefully report under-estimation of their income and related data.

Mining

The agency collects data on an annual basis on mineral exploration, investment, imports and exports. It has twice conducted comprehensive surveys on quarrying activities. However, the result of these surveys was not as good as it should have been. The list of establishments and enterprises (which forms the frame) obtained from administrative records is incomplete for taking a real sample. Furthermore, under-estimation of income and non-response rate are other major problems (Central Statistical Agency of Ethiopia, 2007).

Environment

Ethiopia was among the 15 countries in Africa selected by the Economic Commission for Africa (ECA) to collect reliable standardized first-hand data to be used in the production of the fifth *Sustainable Development Report on Africa* in 2012. Unfortunately data were not available under the categories of environment statistics (including greenhouse-gas emissions, ambient concentration of pollutants in the capital city, land area affected by desertification, people living on degraded land and wetland areas) and the Central Statistical Agency reported only about 30 per cent of the data requested under the categories of social, agriculture and energy statistics.

5.4 Lessons learned and conclusions

The experience of Ethiopia in developing the climate-resilient green economy vision and strategy is very useful to understand the main challenges that can be faced when adopting a green economy approach. The main lessons learned for this exercise can be summarized as follows:

- It is very important to define correctly what "the green economy" means at the country level. In other words, an inclusive green economy is an action-oriented approach to reach sustainable development. This means that the policy outcomes have to be evaluated across social, economic and environmental indicators; across actors such as the private and public sectors; and over time, for the short-, medium- and longer-terms. A low-carbon development pathway can contribute to building a green economy.
- Political commitment at the highest level is critical for the successful identification, formulation and implementation of inclusive green economy intervention options. In this regard, the use of a multi-stakeholder approach is critical to gather knowledge and opinions, and understand the ramifications of inclusive green economy outcomes across sectors.
- Methodologies and tools should be used that allow for a proper systemic analysis. These can be complemented with more detailed sectoral assessment. On the other hand, both should be developed and used taking into account the national definition of "inclusive green economy". In the case of the climate-resilient green economy strategy, only climate mitigation interventions are considered and this impacted the analysis, starting from the stated development goals and also for extrapolating trends using econometrics.
- Reliable and timely data are essential in the development and application of inclusive green economy methodologies and tools. Efforts should be planned early enough to support the process of identifying inclusive green economy indicators, analysing historical trends and selecting critical challenges and opportunities. With this information, tools can be developed and used to identify intervention options and assess their outcomes on several social, economic and environmental indicators.
- Capacity-building is essential to understand better, customize and use a coherent inclusive green economy approach. This is required for decision makers and technical staff at all levels of government, and for all the stakeholders involved in the development and implementation of inclusive green economy interventions.

6 Conclusions and recommendations

6.1 Conclusions

The inclusive green economy has gained considerable attention in the past years as an action-oriented approach to attain sustainable development. The main contribution of an inclusive green economy approach has been identified as the integration of economic, social and environmental dimensions of development policies in a coherent, cross-sectoral framework of analysis, among others, to support equity and social inclusion while avoiding excessive natural-resource depletion and environmental degradation.

During the preparations for the 2012 United Nations Conference on Sustainable Development, one area of research that received considerable attention in the context of an inclusive green economy was the development of methodologies and tools for the identification of worrying economic, social and environmental trends, and the evaluation of potential interventions through the analysis of alternative future scenarios. Specifically, the outcome document of the Africa Regional Implementation Meeting for the follow-up processes to the Conference calls on ECA and partners to adopt or enhance the use and application of approaches and tools, including integrated assessments, to promote the balanced integration of the three dimensions of sustainable development.

The present report has examined tools and methodologies deemed appropriate for analysing inclusive green economy policies (whether sectoral or integrated) in Africa and identified those (based on regional and country contexts) that could be used for capacity-building and advocacy activities for strategies to implement an inclusive green economy. Inclusive green economy assessments, or aspects of them, are already being conducted in African countries with the aim of maximizing the benefits of green-economy policies and strategies across economic, social and environmental sectors. However, additional capacity should be created on the cross-sectoral and systemic analysis of green-economy policy outcomes. In particular, while African decision makers are generally seen to acknowledge the importance of adopting a multi-stakeholder and inter-disciplinary approach, the actual formulation and implementation of government policies is still largely conducted following rigid sectoral frameworks and methodologies.

The analysis of statistical capacity, which is crucial for the use of quantitative methodologies and tools, indicates that despite the ongoing efforts to improve statistical capacity in Africa by the African statistics community and its partners over at least the past 45 years, the capacity of most countries in the region remains weak, and policymakers make little use of the data. Though some countries in Africa have improved their statistical capacity, many African countries face a number of problems in providing reliable and relevant statistics that are compiled correctly, following standard practices and methodology. Through the assessment of the interviews carried out and questionnaires collected to inform the current report, it can be concluded that enhancing human capacity in Africa would be an effective way to support countries in improving their statistics performance across the three dimensions of sustainable development.

The case study on the Ethiopia's climate resilient green economy strategy highlighted the main analysis and capacity-building gaps that were encountered at the national level at each stage of strategy development. According to the respondents, the main gaps encountered related to the availability of coherent and reliable data, and to the technical skills of the professional

staff. International consultants and national experts were hired for assessing the expected impacts of the climate-resilient green economy using scenario-forecasting tools. However, the lack of technical capacity on integrated assessment tools within the technical committees represented a barrier for the effective implementation, monitoring and evaluation of selected activities. The climate-resilient green economy example reinforces the conclusions mentioned above as regards the need for providing continuous training to key actors involved in the design and implementation of inclusive green economy strategies, especially with respect to the customization of innovative tools and assessment methods.

6.2 Recommendations

Knowledge should be created on systems analysis, to train professionals whose expertise cuts across several domains and sectors, as well as across different actors, for instance in the private and public sectors and in civil society). Further, the analytical capacity of policymakers should be strengthened in order to improve their understanding of both the short- and long-term impacts of inclusive green economy policies, and to favor the contextualization of analytical outcomes to the specific reality of each African country.

The improvement of the knowledge and skills of the decision makers has to go hand-in-hand with the development of technical skills. In fact, integrated analysis skills should be developed to ensure the effective selection and use of tools and methodologies at each stage of the policy cycle and the delivery of useful results to decision makers.

Capacity-building should focus on the creation of integrated tools, the combination of different tools and the simultaneous analysis of outcomes across social, economic and environmental dimensions. In particular, the combination of qualitative and quantitative methods is key to gain relevant insights on the actual context and the expected impacts of green-economy strategies.

Modelling and scenario-analysis skills are needed for simulating alternative future scenarios and for informing the decision-making process. As a result, it is suggested to improve capacity for the development and use of the following tools:

(1) System of Environmental-Economic Accounting and vulnerability indicators, which are essential to provide the basis for the analysis of the social and environmental dimensions of sustainable development, in combination with other tools for project and policy assessment.

(2) Causal loop diagrams to understand better how several sectors, and the indicators within them, are interconnected with each other. Developing causal loop diagrams is essential as it is a first step to better understanding the systemic nature of our society, economy and environment.

(3) Scenario-forecasting tools, to project and assess the cross-sectoral outcomes of desired interventions:

- *Spatial planning tools* (such as InVEST) should be developed and employed to evaluate policy impacts on land-use, and on natural capital such as on the provision of ecosystem goods and services. Spatial tools can also support the

valuation of natural capital, allowing for its improved incorporation into decision-making processes.

- *Sectoral models* (e.g. computable general equilibrium, GSI-IF, MARKAL, LEAP) should continue to be used and capacity should be built on their coupling. This would allow economic analysis to be linked with assessments of physical flows (for example for energy and water) and would avoid the use of inconsistent assumptions and would generate projections that are more informative for policymakers.

- *Integrated models* (such as green economy models and Threshold 21) should be further developed, customized and used to ensure coherence of sectoral analysis and obtain results simultaneously across social, economic and environmental indicators.

To effectively create multidimensional analysis, the collaboration among experts across domains should be enhanced by means of dedicated trainings on multi-stakeholder processes. In this context, the establishment of multi-actor institutional platforms and mechanisms should be set as a precondition for any integrated planning effort. Further, collaboration among multiple actors is specifically required for the combined use of integrated assessment methodologies and tools.

Concerning inclusive green economy methodologies and tools, the following priorities for further investigation and in depth capacity-building were identified:

- Support countries to identify adequate tools that will help their national-planning efforts. This can be done through workshops and technical and policy training sessions, and through the preparation of country reports in consultation and partnership with national stakeholders.

- Encourage data-collection and the use of inclusive green economy indicator frameworks, which are essential to provide the basis for the analysis of the social and environmental dimension of sustainable development with other tools for project and policy assessment.

- Promote and showcase the use of system analysis as a foundation to understand better how several sectors, and the indicators within them, are interconnected with each other and to support the effective implementation of inclusive green economy interventions.

- Support national stakeholders across sectors to reach out to the main actors shaping national and subnational development planning, effectively harmonizing planning across sectors.

- Support countries (possibly at the regional, national and subnational levels) to develop and adopt economic and environmental vulnerability and resilience indicators. This would highlight the potential contribution of the inclusive green economy approach at the agenda-setting level and would anticipate potential emerging issues.

- Support the development and customization of scenario-forecasting tools, to project and assess the cross-sectoral outcomes of desired interventions. Emphasis should be put on spatial planning tools, the integration of economic and sectoral tools (for instance linking energy and economy) and most importantly on integrated tools.

- Develop skills in carrying out integrated analysis using a multi-stakeholder approach to ensure the effective selection and use of tools and methodologies at each stage of the policy cycle and the delivery of useful results to decision makers. The assessment of inclusive green economy methodologies and tools was primarily focused on their contribution to the key steps of the policymaking cycle. In this respect, it is crucial to note that the development of technical skills has to go hand-in-hand with the improvement of the knowledge and skills of decision makers.

As outlined in the report, many African countries are still faced with constraints in their capacity to produce good statistics. The availability of, and access to, reliable data on economic, social and environmental indicators is crucial for inclusive green economy assessments. Indeed, most of the tools reviewed in this study rely heavily on statistical data across key sectors. Consequently, the development of statistical capacity should be prioritized in African countries, encouraging the establishment of comprehensive, cross-sectoral databases at the national and regional levels.

The main capacity needs associated with the use of indicators and measurement frameworks refers to the development of specific skills for the integration of environmental statistics into national databases and accounting systems (such as the System of Environmental-Economic Accounting).

African statisticians are improving their data-collection, categorization and analysis skills, but the integrated use of indicators across all stages of the policy cycle is still weak. Capacity-building programmes should focus on the establishment of clear procedural standards for ensuring continuous communication between data experts (such as statisticians) and policymakers at all stages of the inclusive green economy decision-making process.
Furthermore, capacity-building activities should be carried out on the monitoring of ECA Sustainable Development Indicators and the identification of key green-economy indicators that would support the elaboration and implementation of green-economy strategies and policies.

References

Adam and others (2003). *Performance-Based Conditionality: A European Perspective.* Clermont-Ferrand, France: Centre d'Études et de Recherches sur le Développement International (CERDI).

Afari-Sefa, V., and J. Gockowski (2010). *Economic Cost-Benefit Analysis of Rainforest Alliance Certified Cocoa in Ghana.* Accra: International Institute of Tropical Agriculture.

African Development Bank (2011). *The Cost of Adaptation to Climate Change in Africa.* Tunis.

_____ (2012). Briefing Notes for AfDB's Long-Term Strategy. Briefing Note 5: Income Inequality in Africa 1. Tunis.

African Development Bank and others (2012). *Regional Project for the Implementation of the 2008 SNA in Africa.* Available from http://unstats.un.org/unsd/nationalaccount/workshops/2011/addis/ECA-SD2-ENG.PDF .

Alton and others (2012). *The Economic Implications of Introducing Carbon Taxes in South Africa.* Helsinki: United Nations University World Institute for Development Economics Research (UNU-WIDER).

Barbier, E. (2010). *A Global Green New Deal.* Cambridge: Cambridge University Press.

Barry, M., H. Steyn and A. Brent (2009). Determining the most important factors for sustainable energy technology selection in Africa. *South African Journal of Industrial Engineering, 20* (2), 33-51.

Bassi, A.M. (2010). Greening the economy and national development: Six country case studies. Prepared for the United Nations Environment Programme's *Green Economy Report*. Arlington, USA: Millennium Institute.

Bassi, A.M., P. Deenapanray and P.I. Davidsen (2014). Energy policy planning for climate-resilient low-carbon development. Book chapter in *Energy Policy Modeling in the 21st Century*. H. Qudrat-Ullah, York University. Toronto, Canada: Springer.

Bassi, A.M., L. Gallagher and N. Lombardi (2015). Guidelines for the development of green economy indicators in developing countries. *Greenable*, a publication of the Korea Environment Institute. *Volume 1, 2015.* Seoul: Korea Environment Institute.

Bassi, A.M. and others (2010). T21- world model documentation, modeling the green economy. Arlington, VA, USA: Millennium Institute.

_____ (2015). Case studies for the development and use of green economy indicators in developing countries. *Greenable*, a publication of the Korea Environment Institute.*Volume 1, 2015.* Seoul: Korea Environment Institute.

Bernard, T. (2012). Impact analysis of rural electrification projects in sub-Saharan Africa. *World Bank Research Observer, 27* (1), 33-51. Washington, D.C.: World Bank.

Botswana PEI-WAVES Steering Committee (2012). Wealth accounting and valuation of ecosystem services (WAVES) in Botswana. Washington, D.C.: World Bank. Available from: http://siteresources.worldbank.org/ENVIRONMENT/Resources/Botswana_Policy_brief_w_work_plan_v3.pdf.

Briguglio and others (2008). Economic vulnerability and resilience: concepts and measurements. WIDER Research Paper No. 2008/55. Helsinki: United Nations University – World Institute for Development Economics Research (UNU-WIDER).

de Janvry, A., and E. Sadoulet (2010). Agriculture for development in sub-Saharan Africa: An update. *African Journal of Agricultural and Resource Economics, 5* (1).

de Janvry, A., A. Dustan, and E. Sadoulet (2011). *Recent Advances in Impact Analysis Methods for Ex-post Impact Assessments of Agricultural Technology: Options for the CGIAR.* CGIAR, formerly Consultative Group on International Agricultural Research, then Consortium of International Agricultural Research Centers. Berkeley, USA: University of California at Berkeley.

Department of Environmental Affairs and Tourism (2004). Environmental auditing, integrated environmental management. Information Series 14. Pretoria: Department of Environmental Affairs and Tourism (DEAT).

Deenapanray, Prakash B.K. and A.M. Bassi (2014). The experience of ISLANDS in deploying system dynamics modeling as an integrated policy tool. *Natural resources forum: a United Nations sustainable development journal,* Vol. 38, No 1 (2014), pp67-81. Oxford, UK: Blackwell.

Deenapanray, Prakash B.K. and others (2014). Integrating disaster risk reduction and climate change adaptation into national development planning. Submitted to the 32nd International Conference of the System Dynamics Society, ISDC 2014, July 20 – 24, 2014, Delft, Netherlands.

Dorosh (2007). *Agricultural Production* [not published].

Drud, A., W. Grais and G. Pyatt (1986). Macroeconomic modeling based on social accounting principles. *Journal of Policy Modeling, 8* (1).

Dual Citizen (2014). *The Global Green Economy Index, GGEI 2014. Measuring National Performance in the Green Economy 4th Edition – October 2014.* Washington, D.C.: Dual Citizen.

Economic Commission for Africa (2005). *Review of the Application of Environmental Impact Assessment in Selected African Countries.* Addis Ababa. Available from http://www.uncsd2012.org/content/documents/Review%20on%20the%20Application%20of%20Environmental%20Impact%20Assessment.pdf.

Economic Commission for Africa, African Union Commission and African Development Bank (2013). *Africa Regional Consultative Meeting on the Sustainable Development Goals. Outcome Document.* Addis Ababa: Economic Commission for Africa.

_____ (2015). *Africa Regional Report on the Sustainable Development Goals.* Addis Ababa: Economic Commission for Africa.

Economic Commission for Africa, Food and Agriculture Organization, United Nations Environment Programme, United Nations Industrial Development Organization and United Nations Development Programme (2015). *Fifth Issue of the Sustainable Development Report on Africa (SDRA V): Achieving Sustainable Development in Africa through Inclusive Green Growth. Agriculture, Ecosystems, Energy, Industry and Trade.* Addis Ababa: Economic Commission for Africa.

Elasha and others (2006). Background paper on impacts, vulnerability and adaptation to climate change in Africa, for the African Workshop on Adaptation Implementation of Decision 1/CP.10 of the UNFCCC Convention, Accra, Ghana 21-23 Sept 2006. pp.54. Available from https://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/application/pdf/200609_background_african_wkshp.pdf

Environmental Protection Authority (2014). Ethiopia's vision for a climate resilient green economy. Addis Ababa: the Federal Democratic Republic of Ethiopia.

European Commission and others (2009). *System of National Accounts 2008.* European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank. New York: United Nations. Available from *http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf.*

Ewing B. and others (2010). *Calculation Methodology for the National Footprint Accounts, 2010 Edition.* Oakland, CA, USA: Global Footprint Network.

Fisher R. and others (2011). Measuring, modeling and mapping of ecosystem services in the Eastern Arc mountains of Tanzania. *Physical Geography, 35* (5), 595-611.

Green Growth Knowledge Platform (2013). *Moving towards a Common Approach on Green Growth* Indicators. Conference edition published at 2nd Annual GGKP Conference, April 4-5, 2013 in Paris. Available from http://www.unep.org/greeneconomy/Portals/88/documents/partnerships/GGKP%20Moving%20towards%20a%20Common%20Approach%20on%20Green%20Growth%20Indicators.pdf

Global Footprint Network, (2009). *Footprint Factbook – Africa 009*., Oakland, CA, USA: Global Footprint Network.

Government of Ethiopia (2011). Ethiopia's Climate-Resilient Green Economy. Addis Ababa: Government of the Federal Democratic Republic of Ethiopia.

Haettenschwiler, P. (1999). *Neues anwenderfreundliches Konzept der Entscheidungsunterstüt zung*. Gutes Entscheiden in Wirtschaft, Politik und Gesellschaft. 189-208.Zurich, Switzerland: vdf Hochschulverlag AG.

Hughes, Alison M. and others (2007). *Energy Emissions. A modelling input into the Long Term Mitigation Scenarios process.* Cape Town, South Africa: University of Cape Town.

Iqbal, K. and A. Shah (2008). *A Critical Review Of Governance Indicators.* Washington, D.C.: World Bank Institute, unpublished paper, available at http://www.worldbank.org/wbi/publicfinance.

ISO (2006). *ISO 14040:2006.* Geneva: International Organization for Standardization. Available from http://www.iso.org/iso/catalogue_detail?csnumber=37456.

Kelly, D., and Kolstad, C. (1998). *Integrated Assessment Models for Climate Change Control.* Santa Barbara, CA, USA: University of California, Santa Barbara,. Available from http://www.econ.ucsb.edu/papers/wp31-98.pdf.

Kumar, Pushpam, editor. (2010). *The Economics of Ecosystems and Biodiversity (TEEB) Ecological and Economic Foundations.* London: Earthscan.

Law, A. and others (2012). Towards a green economy decision support system for tourism destinations. *Journal of Sustainable Tourism, 20* (6), 823-843.

Loulou, R., and others (2004). *Documentation for the MARKAL Family of Models.* IEA Energy Technology Systems Analysis Programme.

Millennium Institute (2005). *Threshold 21 (T21) Overview.* Arlington, VA, USA.

Nokkala, Marko (2000). *Social Accounting Matrices and Sectoral Analysis: The Case of Agricultural Sector Investments in Zambia.* Helsinki: University of Helsinki. Available from https://www.iioa.org/conferences/13th/files/Nokkala_ZambiaAgriculturalInvestments.pdf.

Organisation for Economic Cooperation and Development (2006). *Applying Strategic Environmental Assessments. Good Practice Guidance for Development Co-Operation.* Paris.

_____ (2011). *Towards Green Growth: Monitoring Progress.* Paris.

Okonjo-Iweala, N. and Philip Osafo-Kwaako P(2007). Improving health statistics in Africa. *The Lancet*, Volume 370, Issue 9598, pp 1527-1528, 3 November 2007.

Pearce, D., A. Markandya and E. Barbier (1989). *Blueprint for a Green Economy*. London: Earthscan.

Rao, S. (2010). Helpdesk Research Report: Critique of Governance Assessment Applications. Birmingham, UK: Governance and Social Development Resource Centre (GSDRC), University of Birmingham. Available from http://www.gsdrc.org/docs/open/HD699.pdf

Round, Jeffery (2012). Aid and Investment in Statistics for Africa. Working Paper No. 2012/93. Helsinki: United Nations University World Institute for Development Economics Research (UNU-WIDER).

Samans, Richard (2013). *Green growth and the post-2015 development agenda: an issue paper for the United Nations High-Level Panel of Eminent Persons.* Global Green Growth Institute. Available from http://gggi.org/green-growth-and-the-post-2015-development-agenda-by-richard-samans/

Samuel, J. (2010). *Democratic Governance Assessments for REDD+*. Oslo: United Nations Oslo Governance Centre.

Sanga, Dimitri, Bakary Dosso and Steve Gui-Diby (2011). Tracking progress towards statistical capacity building efforts: The African Statistical Development Index. *International Statistical Review*, Vol 79, Issue 3, pp 303-329, Dec 2011.

Stiglitz, Joseph (2013). Inequality is a choice. *The New York Times*, 13 October 2013. Available from http://opinionator.blogs.nytimes.com/2013/10/13/inequality-is-a-choice/.

Turban, E. (1995). *Decision support and expert systems : management support systems.* Englewood Cliffs, NJ, USA: Prentice Hall.

United Nations (2012). *The Future We Want. Outcome Document of the United Nations Conference on Sustainable Development.* New York.

United Nations and others (2014). *System of Environmental-Economic Accounting 2012 - Central Framework.* United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Cooperation and Development and The World Bank. New York: United Nations. Available from *http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf*

United Nations Conference on Environment and Development (1992). *Agenda 21*. Rio de Janeiro, Brazil. Available https://sustainabledevelopment.un.org/milestones/unced/agenda21.

United Nations Department of Economic and Social Affairs (2010). Report on the inquiry on national institutional capacity to produce population estimates and projections. Technical Paper No. 2010/1. New York.

United Nations Environment Programme (2008). *Desalination Resource and Guidance Manual for Environmental Impact Assessments.* Nairobi.

_____ (2009). *Integrated Policymaking for Sustainable Development. A Reference Manual.* Nairobi.

_____ (2011). *Towards a Green Economy. Pathways to Sustainable Development and Poverty Eradication.* Nairobi.

_____ (2012). *Measuring Progress Towards an Inclusive Green Economy.* Nairobi. Available from http://www.unep.org/greeneconomy/Portals/88/documents/research_products/Measuring%20Progress%20report.pdf.

_____ (2013). *Green Economy Scoping Study: South African Green Economy Modelling Report (SAGEM) – Focus on Natural Resource Management, Agriculture, Transport and Energy Sector.* Nairobi.

_____ (2014a). *Using Indicators for Green Economy Policymaking.* Nairobi.

_____ (2014b). *A Guidance Manual for Green Economy Policy Assessment.* Nairobi.

_____ (2014c). *Green Economy Assessment Report – Kenya.* Nairobi.

_____ (2014d). *Using Models for Green Economy Policymaking.* Nairobi.

United Nations Environmental Management Group (2011). *Working towards a Balanced and Inclusive Green Economy: A United Nations System-wide Perspective.* Geneva: United Nations. Available from http://www.fao.org/fileadmin/user_upload/suistainability/pdf/GreenEconomy-Full.pdf.

United Nations Statistics Division (2007). Global Assessment of Environment Statistics and Environmental-Economic Accounting. New York: Statistics Division of the United Nations Department of Economic and Social Affairs.

_____ (2012). *Revision of the System of Environmental-Economic Accounting (SEEA). SEEA Central Framework.* New York: Statistics Division of the United Nations Department of Economic and Social Affairs.

Washington, R., M. Harrison and D. Conway. (2003). *African Climate Report*, A report commissioned by the UK Government to review African climate science, policy and options for action. London: UK Department for Environment Food and Rural Affairs and Department for International Development.

Weber, Jean-Louis (2014). *Experimental Ecosystems, Natural Capital Accounts for Mauritius, 2000 – 2010.* Ebene, Mauritius: Indian Ocean Commission.

World Bank (2010). *Global Strategy for Improving Agricultural and Rural Statistics Implementation Plan for Africa.* Washington, D.C..

_____ (2011). *The Changing Wealth of Nations Measuring Sustainable Development in the New Millennium.* Washington, D.C.

_____ (2012). Inclusive Green Growth: The Pathway to Sustainable Development. Washington D.C.

_____ (2013) World Bank Bulletin Board on Statistical Capacity. Washington, D.C.

World Commission on Environment and Development (1987). *Our Common Future*. New York: United Nations. Available at http://www.un-documents.net/our-common-future.pdf.