PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

INDICATORS FOR AN INCLUSIVE GREEN ECONOMY

2020 MANUAL FOR INTRODUCTORY TRAINING

UN environment

ILO

UNDP

UNIDO

unitar
United Nations Institute for Training and Research

PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

INDICATORS FOR AN INCLUSIVE GREEN ECONOMY

2020 MANUAL FOR INTRODUCTORY TRAINING

UN environment · ILO · UNDP · UNIDO · unitar

The manual is published as part of the Partnership for Action on Green Economy (PAGE) – an initiative by the United Nations Environment Programme (UN Environment), the International Labour Organization (ILO), the United Nations Development Programme (UNDP), the United Nations Industrial Development Organization (UNIDO) and the United Nations Institute for Training and Research (UNITAR).

Citation

PAGE (2020), Indicators for an Inclusive Green Economy – Manual for Introductory Training. Geneva.

This publication has been produced with the support of PAGE funding partners.

Contents

Acknowledgements

The content for the manual presented here was developed by José Pineda of the Sauder School of Business, University of British Columbia, Canada and and Albert Merino-Saum of the Laboratory for Human Environment Relations in Urban Systems (HERUS) at the École Polytechnique Fédérale de Lausanne (EPFL), Switzerland, under the technical guidance of UN Environment's Resources and Markets Branch. The manual development was supported by the International Training Centre of the International Labour Organization (ITCILO). The project was coordinated by Jamal Srouji (UN Environment) and Najma Mohamed (ITCILO) under the guidance of Fulai Sheng and Joy Kim (UN Environment) and Linda Deelen and Ralf Krueger (ITCILO).

This manual also benefited greatly from a workshop held in September 2018. UN Environment and ITCILO appreciates the technical inputs from all participants at the workshop, these include: Ronal Gainza (UN Environment), Ralf Krueger (ITCILO), Albert Merino-Saum (EPFL), Najma Mohamed (ITCILO), José Pineda (UBC), Abu Saieed (UNIDO), Jamal Srouji (UN Environment), and Maya Valcheva (UNITAR). The team would also like to thank the following people who sent written comments on a previous version of the manual, which helped to improve the final version: Marek Harsdorff (ILO) and Amrei Horstbrink (UNITAR).

The report was edited by Ward Rinehart and Sarah Johnson, Jura Editorial Services and designed by the Multimedia Design and Production team, ITCILO. Administrative support was provided by Yuliya Dzulyk and Grace Restelli, ITCILO. This training manual was produced with the financial contribution of the European Union, Finland, Germany, Norway, Republic of Korea, Sweden, Switzerland and the United Arab Emirates through the Partnership for Action on Green Economy (PAGE). PAGE gratefully acknowledges the support of all its funding partners: European Union, Finland, Germany, Norway, Republic of Korea, Sweden, Switzerland and the United Arab Emirates.

Introductory Training on Indicators for an Inclusive Green Economy

This course is intended to introduce the concept of indicators to support policymaking for an Inclusive Green Economy (IGE) and to illustrate the use of methodologies for selecting and applying indicators. It seeks to contribute to the capacity of countries to choose indicators for IGE relevant to their country contexts, particularly in light of the pursuit of the Sustainable Development Goals. Potential participants in this training include policymakers in governments and international and regional organizations; policy analysts and statisticians in these organizations; and academics from a range of disciplines concerned with the economy, environment and society.

This course explains how indicators can support policymaking in measuring progress toward an IGE and presents examples from three countries. It reviews conceptual frameworks to guide countries in the selection of indicators, with particular focus on the Green Economy Progress Measurement Framework developed by UN Environment under the Partnership for Action on Green Economy (PAGE). It describes various approaches to indicator measurement. Finally, the course addresses the process of indicator selection and reviews the indicator frameworks used by some international organizations.

The introductory course consists of four sessions and a group exercise and usually takes approximately five hours.

Session 1. Introduction to concepts

- Why is an Inclusive Green Economy important?
- What will it take to achieve an Inclusive Green Economy?
- How do indicators support policymaking for an Inclusive Green Economy?

Session 2. Choosing appropriate frameworks for green economy (GE) indicators

- What is a conceptual framework?
- Why do we need conceptual frameworks?
- What kind of frameworks might GE indicators rely on?
- Why are hybrid frameworks particularly suitable?

Session 3. Approaches to measurement

- Dashboards – Why present some crucial metrics separately?
- Composite indices – How to create a summary metric?
- Footprints – How to reflect environmental sustainability?
- Adjusted or extended economic measures – Can we improve on GDP and other conventional measures?

Session 4. Selecting green economy indicators

- What criteria can be used to select GE indicators?
- What can we learn from exploring selection criteria?
- Which selection criteria do GE measurement frameworks take into account?
- Which indicators should GE measurement frameworks adopt?
- In practice how can we deal with competing selection criteria?

Group exercise and review. We will end with a hands-on group exercise, going through the process to select green indicators for an imaginary country, followed by a wrap-up review.

Slides highlighting the main points covered in this manual are available for review and presentation at (https://www.un-page.org/resources/green-economy-learning/training-manuals-indicators-green-economy-policymaking).

A second, advanced course explores a framework for measuring a country's **progress** toward a green economy – the Green Economy Progress Measurement Framework. Policymakers, technical analysts and academics interested in quantifying progress on key aspects of an economy, particularly those related to an Inclusive Green Economy, will want to take this course after taking the introductory course.

Intended learning outcomes of the introductory course

1. Participants understand the role and value of Green Economy indicator frameworks and their relation to improved green economy policymaking.
2. Participants have a general understanding and overview of Green Economy indicator frameworks, and their linkages with the Sustainable Development Goals (SDGs).
3. Participants understand the process of establishing a Green Economy indicator framework.
4. Participants understand the process of prioritizing and selecting indicators and how this can be incorporated into a national monitoring framework.

Session 1: Introduction to Concepts[1]

Key points

- An Inclusive Green Economy addresses, at the same time, (1) persistent poverty, (2) overstepped planetary boundaries and (3) inequity in the sharing of prosperity.
- An Inclusive Green Economy decouples economic growth from resource use and environmental impacts. Thus, it can be environmentally sustainable.
- Green economy indicators support each stage of the policymaking cycle.

I. Why is an Inclusive Green Economy Important?

An Inclusive Green Economy (IGE) is a pathway for delivering sustainable development and a response to three sets of global challenges: (1) persistent poverty (2) overstepped planetary boundaries and (3) inequities in the sharing of growing prosperity.

How could an IGE help to address these challenges and ensure a sustainable future for all? It contributes to the overarching goals of poverty eradication and shared prosperity in an intergenerational context by safeguarding planetary boundaries,[2] some of which – for example, climate, freshwater, oceans and land – are mirrored in the Sustainable Development Goals (SDGs). Planetary boundaries should induce innovative solutions that respect these ecological thresholds while improving the livelihoods of communities around the world. Figure 1 illustrates the interconnection of the three sets of challenges that an IGE seeks to address.

UN Environment definition of Inclusive Green Economy

"an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities"

An IGE also emphasizes the accumulation of a new generation of capital assets (Rockström et al. 2009) that **produce goods and services in an environmentally friendly manner**. However, research on a case-by-case basis is required to identify the complementarities and trade-offs that exist between these assets for producing such goods and services. Moreover, such goods and services should be produced through **decent work** and should contribute to **social inclusion**. At the same time, to induce the transformation of production, an IGE also promotes the shift of consumption, investments, public spending and trade towards goods and services produced with this new generation of assets (Figure 1).

Inclusive Green Growth (IGG) is a closely related concept. "IGG aims to foster economic growth and development while ensuring that natural assets are used sustainably and continue to provide the resources and environmental services on which the growth and well-being rely" (GGKP 2013).

Resource: Partnership for Action on Green Economy (PAGE) (2017). Green Economy Progress Measurement Framework – Methodology. Geneva

1 José Pineda prepared this session.

2 The concept of planetary boundaries (Rockström et al. 2009; Steffen et al. 2015) defines global environmental limits and postulates that crossing these boundaries could destabilize the earth system that supports contemporary human societies.

II. What will it take to Achieve an Inclusive Green Economy?

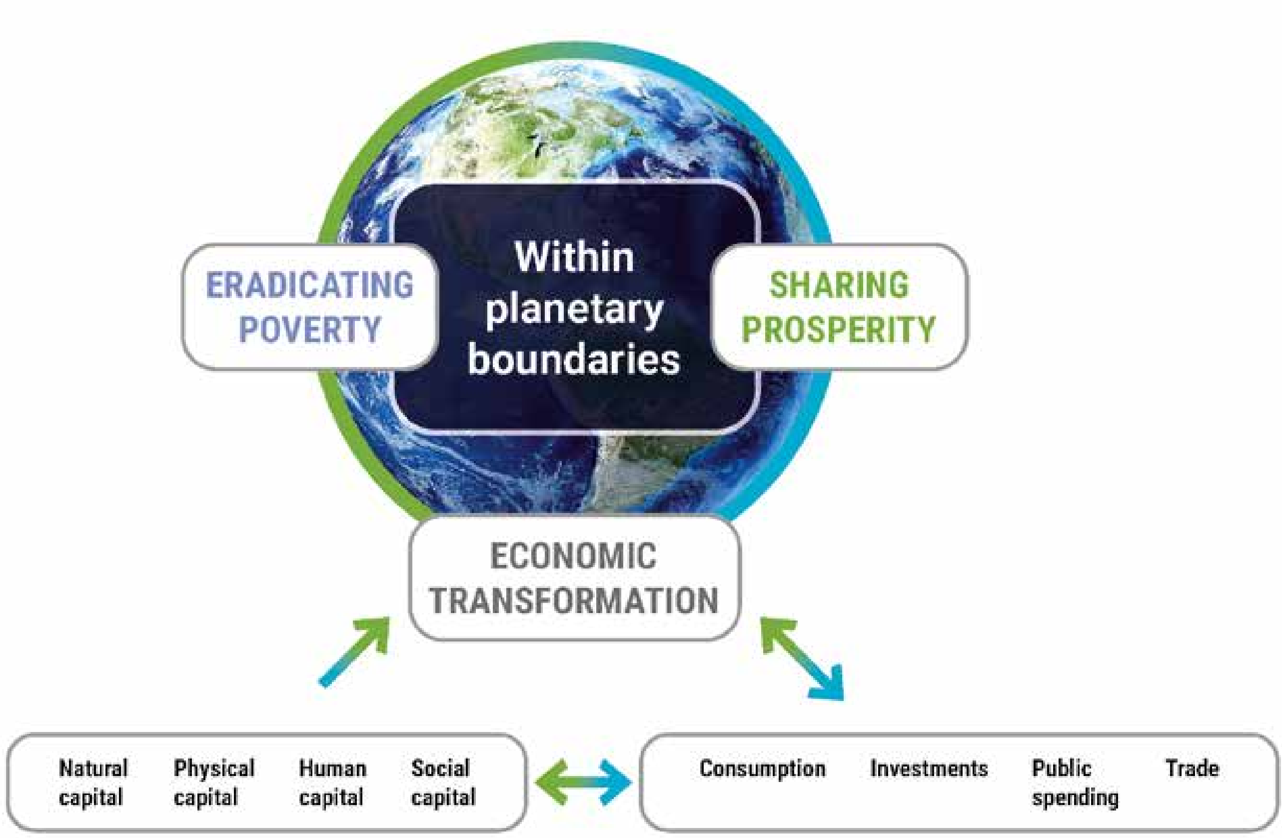
> Progress will have been achieved only if improvements in human well-being are sustainable.

An IGE could be interpreted as, among other things, a means of **decoupling economic growth from resource use and environmental impacts** (e.g., reducing the material and environmental footprint of economic activity). To achieve this decoupling, key factors and policies must be established, including:

- private and public investment aimed at greening the economy
- fiscal policies (e.g., ecological tax reform and phasing out harmful subsidies)
- enhanced market access for low carbon technologies and sustainable technologies in general
- development of green industrial policies
- generation of green jobs
    - promotion of social inclusion and use of trade opportunities from new markets and technological innovation.

Progress will have been achieved only if these improvements in human well-being are **sustainable** – meaning that the path of future development stays within planetary boundaries.

Figure 1 Sets of challenges that an Inclusive Green Economy aims to answer



Source: UNEP 2017b

The concept of Inclusive Green Economy both parallels and complements the notion of sustainability and sustainable development. Most obviously, both are ultimately concerned with sustaining the quality of life and making progress forward more equitable sharing of that quality of life. Thus, both concepts involve multidimensionality, require intergenerational considerations and link development goals with distributional issues. This conceptual closeness has been numerically demonstrated by Loiseau et al. (2016) and Merino-Saum et al. (2019, forthcoming).

The particular emphasis of the IGE, in contrast to the sustainable development context, is that it pays special attention to the interface between the economic and the environmental dimensions (but without ignoring the social dimension). Given its narrower scope, the IGE also tends to address more specific stakes than sustainable development does (Bowen and Hepburn 2014; Ferguson 2015). More practical and operational than the traditional concept of sustainable development (Choi 2015; GGKP 2016), the Green Economy is often presented as one of the key enablers of sustainable development (for example, UNCTAD 2010; ten Brink et al. 2012; UNDESA 2012).

The SDG framework highlights the strong connections between sustainable development and the IGE concept. When Merino-Saum et al. (2019) analysed the content of 140 green economy/green growth definitions in the literature, they found that 42% of them explicitly referred to economic growth (SDG 8), 24% to resource efficiency (SDG 12), 23% to well-being (SDG 3) and 18% to equity (SDG 10), to cite the most frequent references to SDG concepts. Earlier, Merino-Saum et al. (2018) analyzed 494 green economy indicators and numerically showed the importance that GE measurement initiatives attribute to SDGs, in particular to "responsible consumption and production" (SDG 12) and "affordable and clean energy" (SDG 7) (see Figure 2 and Session 4, section IV of the introductory course).

Figure 2 Relative importance of SDGs in 12 international green economy measurement frameworks

Source: adapted from Merino-Saum et al. (2018).

III. Why are Indicators Important?

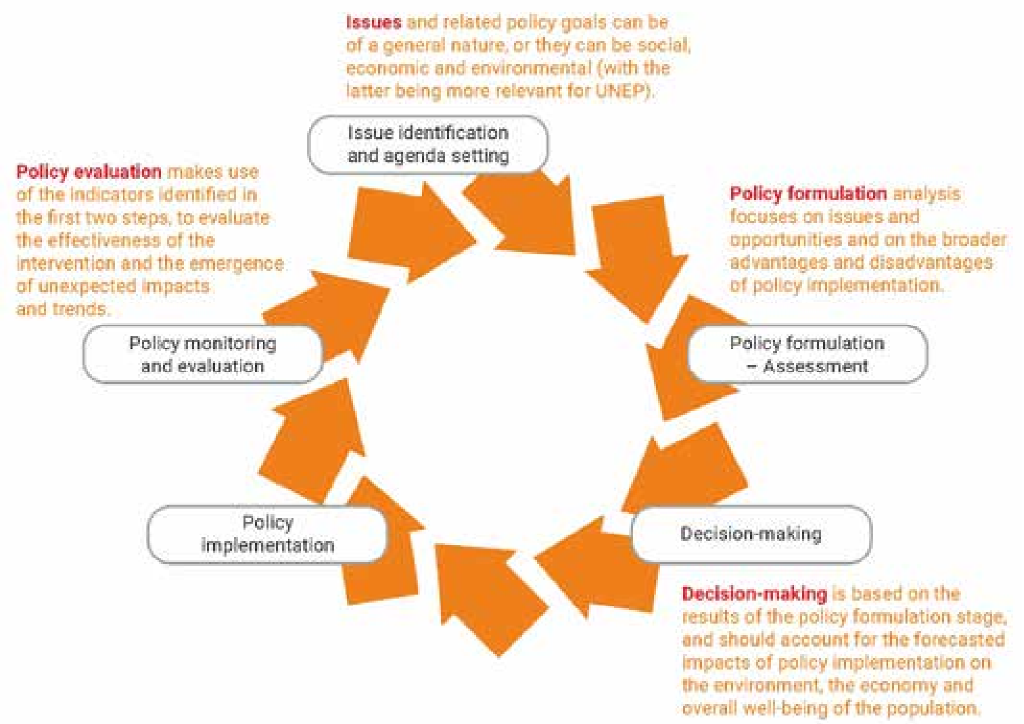
> Green economy indicators capture the nexus of economic performance, environmental status and social dynamics.

Effective policymaking for a green economy requires a robust set of indicators to identify major issues, to formulate appropriate policy responses and assess potential impacts of policy and then to monitor actual impacts. Indicators used in each of these major policymaking stages capture the nexus of economic performance, environmental status and social dynamics.

In addition to informing various steps in the policymaking process (as described below), indicators are a powerful tool for developing consensus among stakeholders on national priorities. Indeed, statistics derived from indicators sometimes can be so illuminating—or so shocking—as to propel public and political support for concerted action. Reaching consensus on priorities can be time-consuming, but the process of reaching agreement focuses action and helps to ensure that all stakeholders contribute to achieving the agreed goals. At a technical level, such agreement also promotes cooperation on data development and sharing.

To facilitate the transition to a green economy, UN Environment, under PAGE, has developed the Green Economy Progress (GEP) Measurement Framework, which provides a structure for comparing GE indicators between time periods, thus furnishing evidence-based information for effective green economy policymaking at the country level as well as for international comparison. Session 2 of this course reviews this and other frameworks that can guide the selection of green economy indicators. The PAGE

Figure 3 Overview of the integrated policymaking process



Source: UNEP 2009

Advanced Course on Green Economy Indicators, which is the follow-on to this course, explains in detail how to apply the GEP Measurement Framework.

Resource: Evidence-based green economy policymaking (UNEP 2014b)

IV. How do indicators support Policymaking for an Inclusive Green Economy?

A useful way to categorize indicators is by their function in the policymaking cycle.

Measurements of IGE can serve a range of purposes along the main stages of the policymaking process: (i) issue identification, (ii) policy formulation, (iii) policy assessment and (iv) monitoring and evaluation (Figure 3). Thus, a useful way to categorize indicators is by their function in the policymaking cycle.

A. THE POLICYMAKING PROCESS

The GEP Measurement Framework proposed by UN Environment aligns with the Integrated Policymaking approach developed in 2009 by UN Environment in collaboration with the Lee Kuan Yew School of Public Policy (UNEP 2009). The Integrated Policymaking approach suggests a normative template for considering critical environment, social and economic implications and their interactions in the policymaking process. The approach can apply both to economic, environmental and social concerns – for example, access to and quality of drinking water – and to issues that focus on processes and institutions – for example, local planning and analytical capacity.

As Figure 3 illustrates, the stylized integrated policy cycle has five stages. The robustness of a policy is critically determined in the first two stages – first, issue identification and agenda setting and, second, policy formulation. Thus, the indicators that inform these two stages are crucial. The third stage, decision-making – a point in time – is informed by the policy formulation stage and, therefore, does not require separate indicators. Indicators for implementation (the fourth stage) and for monitoring and evaluation (the fifth stage) act as a report card. They reflect the performance and impacts of a policy and serve to analyze trends, pointing to any adjustments that may be needed in the next policy cycle.

As noted above, a major difference between IGE indicators and other sustainable development indicators is that IGE indicators emphasize the interface between the economic and the environmental. Also, IGE indicators are issue-specific and so may vary from country to country, whereas most sustainable development indicators – reflecting the global agenda on sustainable development – tend to be more general and similar across countries. Another difference is that different groups of GE indicators usually share close connections to each other through the policy cycle: Indicators used for issue identification may also be monitored over time to measure policy impact, and indicators that inform policy formulation and decision-making may also be used to assess implementation. At the same time, policies are likely to have broader, society-wide effects that must be assessed ex-ante and evaluated ex-post, thus linking to indicators of these effects.

Green economy indicators differ from other sustainable development indicators by:

- emphasizing the interaction of the economic and the environmental
- being more issue- and country-specific
- being applicable throughout the policymaking cycle.

B. INDICATORS FOR ISSUE IDENTIFICATION

These indicators address the question: "What is the problem?" Thus, they help to identify and prioritize green economy challenges and opportunities and to set a prioritized agenda for policymaking and goal-setting (UNEP 2009). This goal-setting can include establishing a long-term vision for an IGE, establishing baselines against which to compare developments over time and setting long-term targets aligned with national priorities (Mediavilla-Sahagun and Segafredo 2014).

Indicators for issue identification measure the current state and past trends, and they project future trends. These indicators focus on outcomes, such as expected climate change or health consequences of air pollution, and their drivers, such as emissions.

> Examples of indicators for issue identification rate of deforestation
> - environmentally related disease incidence
> - per capita fresh water withdrawal
> - percentage of workforce in green jobs

Key steps for issue identification are as follows:

- Analyse a broad range of data to detect troublesome conditions or trends. In practice, scanning routinely collected data is often how potential problems and adverse trends are detected.
- Assess the ramifications of the identified issue. What environmental, social and economic impacts could it have (remembering that social and economic issues will often have environmental repercussions and vice versa, and these may be hidden or unexpected)? How great will these impacts be, and how broadly will they be felt? This step helps gauge the potential seriousness of the problem and, thus, helps to determine its policy priority.
- Analyze underlying causes broadly. What environmental, social and economic trends are driving this issue? Which current policies are contributing to the problem?
- Analyze impacts on sustainable development in general.

C. INDICATORS FOR POLICY FORMULATION

> What makes the green economy approach different is its emphasis on investment.

While indicators for issue identification help frame the issue, indicators for policy formulation support in the design of potential solutions by defining the direction and extent of the potential investments needed to change any undesirable trend previously detected. These indicators address the question, "What should we do?" Based on the identified priorities, possible solutions are formulated. For example, if reduction of CO_2 emissions is a goal, policies could focus on decarbonizing the energy system (e.g., inducing low-carbon energy supply or increasing energy efficiency), and carbon emissions by the energy industry could be the indicator.

At the policy formulation stage, what makes the green economy approach different from other approaches is its emphasis on investment – enabled by policy – to address environmental/social/economic issues in an integrated manner. This is the natural result of the focus of an IGE on the accumulation of a new generation of capital, as shown in Figure 1. Indicators help to define the direction and extent of the potential investment and policy support for it.

> Examples of indicators for policy formulation
> - Share of energy from renewable sources
> - Share of population with safe drinking water
> - Per cent of agriculture mechanized
> - Number of hotels with waste water treatment

Policy goals and targets are more likely to be achieved when they are measurable. This is why, as much as possible, policymakers pursuing green economy policies should try to set quantifiable targets, reflected in measurable indicators.

The key steps for policy formulation are as follows:

- Focusing on the issues identified in the previous stage, determine desired outcomes and define policy objectives. Set measurable targets for their achievement.
- Identify intervention options and their intended outputs. Make an initial list of potential investment and policy instruments. Analyze current and past policies and interventions that address the same or similar issues and assess their outcomes (see box below).

> ▶ Identifying relevant existing policies is a major part of the analytical basis for a Green Economy Policy Assessment. Consider first those policies that are explicitly designed to achieve existing priority targets. Relevant policies typically include national development plans and poverty reduction strategies as well as strategies or plans specific to a green economy transition.
>
> ▶ In fact, many countries already have policies aimed at achieving their various sustainable development targets. These policies can indicate the country's current priorities, which in turn can inform the (re) prioritization process. Existing policies should form the foundation for building green economy interventions, including both investments and enabling policies. Green economy interventions often represent adjustments to, or enhancements of, existing policies.

D. INDICATORS FOR POLICY ASSESSMENT

Policy assessment is closely related to policy formulation. Indicators for policy assessment address the question, "What will be the impacts?" Once policy objectives and targets are defined and the options for interventions are identified, it is necessary to assess the broad, cross-sectoral impacts of potential investment and policy options. A Green Economy Policy Assessment involves evaluating the effectiveness and effects of each option (UNEP 2014a). The assessment should cover broad social, economic and environmental consequences and, thus, requires a multi-stakeholder approach.

> Examples of indicators for policy assessment
>
> ▶ Economic gain from more reliable supply of electricity
>
> ▶ Number of new green agricultural jobs
>
> ▶ Improvement in coastal water quality
>
> ▶ Revenue from waste taxes

The key steps for policy impact evaluation are as follows:

- Estimate policy impacts across sectors. Evaluate the direct economic, environmental and social benefits (and potential unintended consequences) of the interventions under consideration.
- Analyze impacts on the overall well-being of the population. Identify the potential impacts of the policy on poverty alleviation, equity, social inclusiveness, inclusive wealth, economic growth and employment, among other relevant key areas.
- Analyze the short-, medium- and long-term advantages and disadvantages of the various policy options.
- Compare options, based on the analysis of advantages and disadvantages.

E. INDICATORS FOR IMPLEMENTATION

Monitoring **implementation** of the policy is a fundamental stage in the policymaking cycle. Indicators of implementation often measure outputs, responding to the question, "Are we doing what we planned to do?" These indicators enable decision-makers to verify whether the intervention is functioning as intended and whether it is generating expected results. Monitoring of implementation can lead to in-course corrections (UNDP 2009).

> Examples of indicators of implementation
> - Volume of waste water treated
> - Number of marine conservation areas created
> - Number of public–private partnerships for recycling

Implementation of a policy often requires simultaneous or sequential actions in different sectors or by different administrative divisions. Qualitative and quantitative indicators of implementation can measure the actual responsiveness of the different participants, the effectiveness of their actions and the suitability of implementation and enforcement procedures. In this context monitoring becomes a powerful process to strengthen stakeholder coordination, enhance accountability and reinforce understanding of the integrated nature of the intervention.

F. INDICATORS FOR POLICY MONITORING AND EVALUATION

Indicators for monitoring and evaluation (M&E) address the question, "How are we performing?" Once priority policies are identified and measurable actions are underway, indicators can track progress and assess the impacts of policy action. These indicators also help to assess whether further policy interventions or mitigating actions are required to achieve the policy objectives.

> M&E often uses indicators already applied in previous stages of the policymaking process.

M&E indicators also inform the ex-post assessment of the **effects** of the policy intervention that is being implemented. This approach focuses on the use of indicators already identified in previous stages. Comparing pre- and post-intervention measurements gauges the extent of progress, some of which may be attributable to implementation of the policy. Indicators of performance often measure outcomes – for example, the percentage of electricity coming from wind and solar power – and impacts – for example, CO_2 emissions or job creation.

Comprehensive M&E requires engaging a broad range of stakeholders to provide feedback on the policies' perceived performance. Research projects may also be needed to answer specific questions with precision.

The key steps for policy M&E are as follows:
- Measure policy impact in relation to the initially identified issue (with the indicators used for issue identification).
- Measure the investment leveraged and assess enabling policies implemented (with the indicators used for policy formulation).
- Measure impacts across sectors and on the overall well-being of the population (with the indicators used for policy assessment).

The integrated policymaking cycle is continuous. It requires constant monitoring and impact evaluation not only to support a new policymaking cycle, but also to undertake corrective actions in the meantime.

> Examples of indicators for M&E
> - CO_2 emissions
> - Incidence of water-borne diseases
> - Productivity of agricultural land

G. COUNTRY APPLICATIONS

Case studies for three countries – Ghana, Mauritius and Uruguay – show how countries can focus on the GE issues of most concern to them and identify relevant indicators that suit the stages of the policymaking cycle. Annex 1 details these studies.

In all three countries, a series of workshops with stakeholders, including representatives of key ministries, identified potential policies, decided on areas of action and considered potential indicators. Although reaching agreement was time-consuming and posed some challenges, the process was highly positive. Achieving consensus of national priorities ensured greater validity of the results and increases the potential for cooperation on data development.

Overall, two major lessons emerged from these studies:

1. **Finding useful indicators for issue identification was the most successful task.**

The most precise indicators analyzed and proposed were those for issue identification. This was mostly because of the relatively greater availability of data for these indicators and also because it is easier to reach consensus on the issues that need to be addressed than it is on the specific policies to address them. It was more challenging to define indicators for policy formulation and monitoring.

Close collaboration with modellers is important to help stakeholders define indicators for policy formulation and policy assessment. Modelling for policy assessment requires targets to be specified in terms of a concrete set of indicators. The choice of a set of policy indicators should be matched with the answers that modelling tools can provide. That is, if we want the model to provide sectoral information, we need to adapt the model and the type of indicators in order to do so. This adaptation will enhance the role of indicators in the integrated policymaking process.

> It is easier to reach consensus on the issues that need to be addressed than on the specific policies to address them.

2. **The country studies presented too many indicators, implying the need to improve the setting of priorities.**

Although the country studies highlighted the need to keep the number of indicators small, the desire to be more comprehensive and to cover a broad spectrum of issues and challenges often resulted in too many measures being identified. Annex 1 presents only a small set of indicators from the larger set to illustrate application of UN Environment's Green Economy Progress Measurement Framework at the country level. The idea is to highlight the importance of prioritizing a small set of indicators for which data are relatively easy to collect, analyze and update periodically. Session 4 of this course and Session 3 of the advanced course deal in depth with criteria and process for selecting a manageable number of indicators.

To reduce the number of indicators to a manageable set, further consultations on national priorities as well as pre-assessments of the availability of the relevant data are required. To ensure coherence, the chosen set of indicators will need to be linked to existing national indicator frameworks. Decision-makers may find it helpful to make a clear distinction between indicators that are crucial to informing policymaking and those that are useful mostly for background technical analysis.

Resource: Indicators for Green Economy Policymaking – A Synthesis Report of Studies in Ghana, Mauritius and Uruguay (UNEP, 2015)

Review and discussion questions for Session 1

- What three issues does an Inclusive Green Economy address?
- Why are indicators crucial to effective policymaking?
- What are the four stages of the policymaking cycle where indicators are most important?
- Why are indicators for issue identification often used as indicators of impact in M&E as well?

Sources

Bowen, A., and C. Hepburn (2014). Green growth: an assessment. *Oxford Review of Economic Policy*, vol. 30, No. 3, pp. 407–422.

Choi, Y. (2015). Intermediary propositions for green growth with sustainable governance. *Sustainability*, vol. 7, No. 11, pp. 14785–14801.

Ferguson, P. (2015), The green economy agenda: business as usual or transformational discourse? *Environmental Politics*, vol. 24, No. 1, pp. 17–37.

Green Growth Knowledge Platform (GGKP) (2016). *Measuring Inclusive Green Growth at the Country Level*.

Loiseau, E., and others (2016). Green economy and related concepts: an overview. *Journal of Cleaner Production*, vol.139, pp. 361–371.

Merino-Saum, A., and others (2018). Articulating natural resources and sustainable development goals through Green Economy Indicators: a systematic analysis. *Resources, Conservation and Recycling*, vol. 139, pp. 90–103.

Merino-Saum, A., and others (2019). Unpacking the green economy concept: a quantitative analysis of 140 definitions. *Journal of Cleaner Production* (in press).

Mediavilla-Sahagun, A., and L. Segafredo (2014). Establishing vision, baselines, and targets. In: *Green Growth in Practice: Lessons from Country Experiences*. Seoul: Global Green Growth Institute, pp. 59–78.

Programme for Action on Green Economy (PAGE) (2017). *The Green Economy Progress Measurement Framework – Application.*

Partnership for Action on Green Economy (PAGE) (2017). Green Economy Progress Measurement Framework – Methodology. Geneva.

ten Brink, T., L. Mazza, T. Badura, M. Kettunen, and S. Withana (2012). *Nature and Its Role in the Transition to a Green Economy*. London and Brussels: Institute of European Environment Policy.

United Nations Conference on Trade and Development (UNCTAD) (2010). *The Green Economy: Trade and Sustainable Development Implications*. Geneva.

United Nations Department of Economic and Social Affairs (UNDESA) (2012). *A Guidebook to the Green Economy Issue 3: Exploring Green Economy Policies and International Experience with National Strategies.*

United Nations Environmental Programme (UNEP) (2009). *Integrated Policymaking for Sustainable Development*. Geneva.

________ (UNEP) (2014a). *A Guidance Manual for Green Economy Policy Assessment.* Geneva.

________ (UNEP) (2014b). *Using Indicators for Green Economy Policymaking*. Geneva.

________ (UNEP) (2015). *Indicators for Green Economy Policymaking – A Synthesis Report of Studies in Ghana, Mauritius and Uruguay*. Geneva.

Session 2: Choosing Appropriate Frameworks for GE Indicators[3]

Key points

- Conceptual frameworks structure indicators and put them into context. However, they unavoidably introduce a certain degree of normativity into the assessment.
- Different kinds of conceptual frameworks exist, each with its particular strengths and weaknesses.
- Structuring indicators across several framing schemes at the same time seems a useful way to elucidate the varied information that indicators might convey.
- The framework of the Green Growth Knowledge Platform (GGKP), which structures indicators under five themes, can be particularly appropriate for policymaking.

I. What Is a Conceptual Framework?

Conceptual frameworks are logical structures through which indicators are developed, selected, grouped and/or communicated. Graphically or in narrative, they explain the key factors, concepts or variables shaping the system under study. In some cases (but not always), they also shed light on the interrelations among such key elements. Conceptual frameworks not only delimit the scope of an indicator system (i.e., by defining its boundaries); they also determine a particular understanding about what a GE is or should be. Unavoidably, they impose a certain degree of normativity, which needs to be clearly described in the assessment. In that sense it is important to note that developing frameworks is more a process of invention than of discovery; they are built rather than found (Turnhout 2009).

Numerous conceptual frameworks have been developed in the fields of sustainability and green economy (GE). Such frameworks differ in: (i) how they conceptualize the elements of the system (i.e., the reasoning behind the structure of indicator categories (variously called "dimensions", "issues", "goals", "themes" or the like)); (ii) the extent to which they integrate into the analysis the interrelations among such elements; and (iii) how indicators are grouped or aggregated.

Conceptual frameworks are built rather than found.

II. Why do we need Conceptual Frameworks?

Conceptual frameworks might play several key roles in measurement initiatives:

- They support and orient steps to **reduce complexity** in indicator development processes. Indeed, the informational bases of GE measurement systems involve uncertainties and are usually (if not always) complex and ambiguous. Hence, conceptual frameworks are needed to structure such multi-dimensional and sometimes contradictory information and to make it more accessible and intelligible to decision-makers and the public.
- They can ensure comprehensive coverage of themes and can reveal gaps in preliminary sets of indicators. Thus, they help to **guide the indicator selection process** (Niemeijer and De Groot 2008).

[3] Albert Merino-Saum prepared this session.

- When indicator selection involves multiple stakeholders, conceptual frameworks might also **provide a basis for discussion** – i.e., a common ground for their discussions. Frameworks clarify what is being measured, what to expect from measurement and which indicators might be used (Pinter et al. 2005).
- Conceptual frameworks also **put indicators into context**, providing to them a coherence without which they unavoidably lose their meaning and become mere ad hoc data (Pinter et al. 2012).

III. What kind of Conceptual Frameworks might structure GE indicators?

Different types of frameworks can be used for developing, selecting, grouping and/or communicating sustainability and/or GE indicators. Maclaren (1996) describes five basic types:

- domain-based frameworks
- goal-based frameworks
- sectoral frameworks
- issue-based frameworks
- causal frameworks.

Additionally, Maclaren considers a sixth framework category, whose main feature is to combine elements from more than one of the other types of schemes. Below, we explain in detail each of these types of frameworks and illustrate each with several examples from the fields of sustainability and GE.

A. DOMAIN-BASED FRAMEWORKS

Domain-based frameworks most often rely on a small number of categories that generally correspond to the three key dimensions (or pillars) of sustainability – environment, economy and society. In some cases domain-based frameworks include additional categories, such as "institutions", "technology" or "health", that complement the usual triptych associated with the concept of sustainable development.
Most frequently, these frameworks are applied in combination with other, more detailed frameworks (e.g., issue-based), either hierarchically or not.

> Domain-based frameworks often categorize indicators under three groups – environment, economy and society.

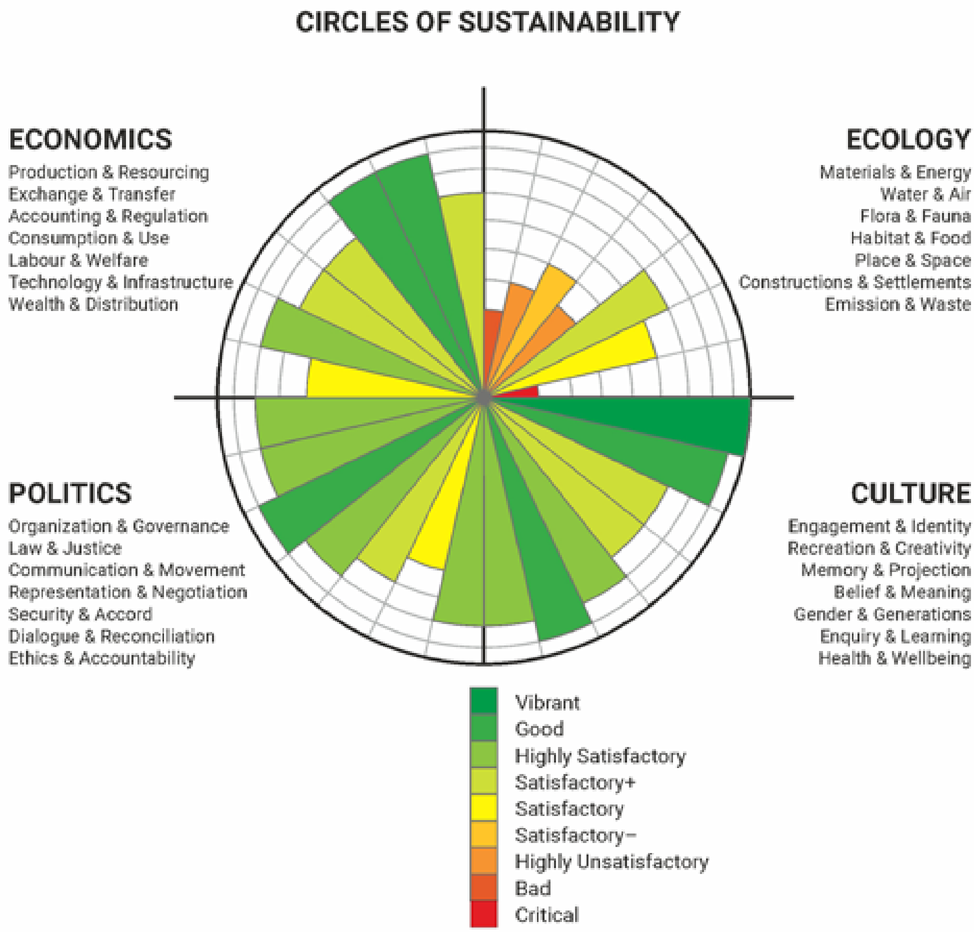
The main advantage of domain-based frameworks is that they use a universal language easily understandable among experts, practitioners and lay people alike. They are particularly helpful to check the extent to which a particular indicator system covers all dimensions of sustainability in a balanced manner. That said, they frequently involve classifications that simply split up indicators by pillar, without paying attention to the interfaces between these pillars.

Many examples of domain-based frameworks can be found in the literature on sustainability and GE. One good illustration is the Circles of Sustainability, used notably by the United Nations Global Compact Cities Programme and the World Association of the Major Metropolises. Such a framework, generally applied at the urban scale, relies on four key domains for mapping indicators: (i) ecology, (ii) economics, (iii) politics and (iv) culture (James 2015). Each of these basic domains is further divided into seven subdomains, creating a hierarchical structure with two basic levels.

As an illustration, the "ecology" domain covers the following sub-categories: (i) materials and energy, (ii) water and air, (iii) flora and fauna, (iv) habitat and settlements, (v) built-form and transports, (vi) embodiment and sustenance and, finally, (vii) emission and waste.

The approach is generally presented as a circular figure in which each quarter corresponds to one of the four domains. The quarters are then split into sub-categories populated with operational indicators. The overall assessment leads to a sort of radar profile in which shades of colours (green, yellow and red) are used to communicate about the performance of the system under consideration (Figure 1).

Figure 1 An illustration of the Circles of Sustainability

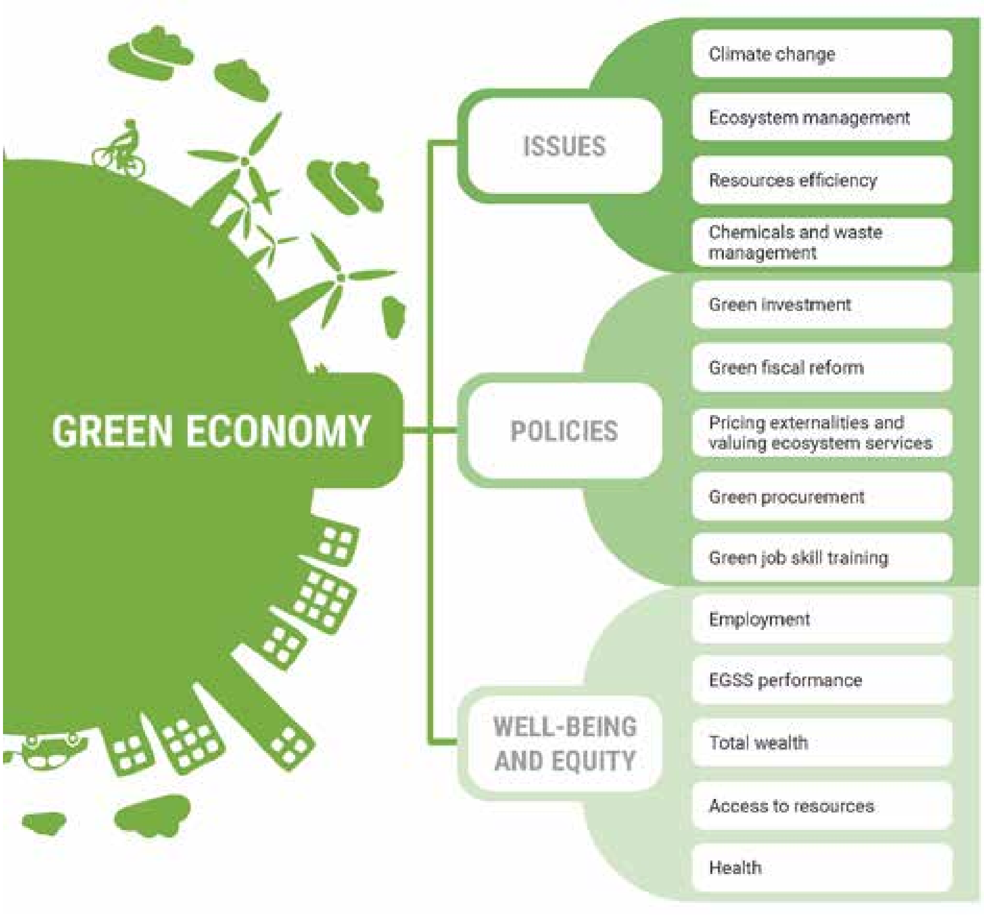


Source: James (2015: xii).

In the field of green economy specifically, the set of diagnostic indicators developed by the Global Green Growth Institute (GGGI 2013) was clearly derived through domain-based reasoning. GGGI considers five basic indicator categories, two of which – "human well-being" and "economy" – correspond to the social and economic pillars of sustainability and the remaining three – "resources", "climate & air", "ecosystem" – relate to the environment.

Similarly, UN Environment clustered its illustrative indicators for GE policymaking into three basic dimensions – "environmental issues", "policies" and "well-being and equity" (UNEP 2012) (Figure 2). In the same way, the World Bank proposed to measure potential benefits from green economy policies by considering three kinds of benefits: "environmental", "economic" and "social" (World Bank 2012). In both cases, such elementary dimensions were further split into several sub-categories.

Figure 2 Classification scheme developed by the United Nations Environmental Programme



EGSS = Environmental goods and services sector
Source: Adapted from UN Environment (2012).

In the scientific literature, an interesting domain-based framework is the Tetrahedral Model of Sustainability (O'Connor 2006). This scheme proposes to frame and assess sustainability problems by considering four basic "spheres": the three standard dimensions of sustainable development (i.e., economic, environmental, social) and an additional "sphere", the political dimension, referring to the conventions, rules and institutional settings through which economy, society and environment are regulated.

Such an approach seems particularly suitable to measure GE transitions, since it puts strong emphasis on the interfaces, interactions and interdependencies between the spheres (see, for example, EEA 2014; GGKP 2016). Indeed, instead of splitting the domains, as many other domain-based approaches do, the Tetrahedral Model of Sustainability encourages practitioners to cross the "spheres" and look for indicators operating at their intersections. In practice, the Tetrahedral Model of Sustainability is generally operationalized through a symmetrical 4x4 matrix in which the "spheres" constitute both the rows and the columns. The model serves as a supportive indicator map (Figure 3).

Figure 3 Symmetric matrix resulting from the Tetrahedral Model of Sustainability

	SOCIAL	ECONOMIC	ENVIRONMENTAL	POLITICAL
SOCIAL	Forms of Collective Identity and Community: THE SOCIAL SPHERE			
ECONOMIC	OPPORTUNITIES & IMPACTS: "The economy versus the community"	Performance, Products and Output: THE ECONOMIC SPHERE		
ENVIRONMENTAL	LIVING WITH (IN) NATURE Meanings, Values & Risks: Sustaining what & for whom?	ENVIRONMENTAL FUNCTIONS: Pressures on & services of the envi-ronment	Energy, Matter, Natural Cycles & Biodiversity: THE ENVIRONMENTAL SPHERE	
POLITICAL	SOCIAL POLICY: (Capacity of communities; citizen/ public participation)	ECONOMIC POLICY: (Shaping the rules and limits of markets)	ENVIRONMENTAL POLICY: (Regulation of what counts as environmental value)	Coordination, Power & Governance: THE POLITICAL SPHERE

Source: O'Connor (2006: 287).

B. GOAL-BASED FRAMEWORKS

As the name implies, goal-based frameworks require identifying beforehand a set of sustainability or GE goals for a country or group of countries. Most often, indicators are subsequently linked to a goal or to a combination of goals. Thus, goal-based frameworks rely on a clear normative basis (the structure involves concrete statements about what a society must address); they imply a teleological perspective, in which objectives play a key role.

This kind of framework has two main strengths (Maclaren 1996: 191): First, they help to reduce the number of candidate indicators to only those referring to specific sustainability goals. Second, they orient the assessment in a way that explicitly identifies whether the system under study is moving towards or away from sustainability. Their main weakness is that they quite often oversimplify the complex interlinkages among sustainability dimensions. Also, their normative nature can hide potential value conflicts.

Goal-based frameworks rely on concrete statements about what society must address.

A good illustration of goal-based frameworks is the Sustainable Development Goals (SDGs), devised by the international community as a fundamental part of the 2030 Agenda for Sustainable Development. SDGs unambiguously express the aspiration (and commitment) to build a more sustainable, safer, more prosperous planet for all humanity. Indeed, such a framework does not merely refer to "water" or "energy", as issue-based frameworks do. Rather, it considers categories such as "clean water & sanitation" and "affordable & clean energy", phrasing that clearly indicates a particular desired direction.

An additional example, taken from the literature on GE/green growth, is the framework suggested by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2013). This framework clusters its selected indicators into categories that imply goals, such as "equitable distribution and access", "eco-efficiency" and "investments in natural capital". Each of these categories is then split into two sub-categories according to a domain-based reasoning. One sub-category refers to the environmental dimension; the other relates to governance issues. Thus, it is an example of a hybrid framework.

C. SECTORAL FRAMEWORKS

In sectoral frameworks, indicators are clustered according to the sectors over which governments (i.e., decision-making agencies, offices or departments) typically have responsibility – for example, housing, transportation, waste management, land use, police services (Maclaren 1996: 191). Clearly, such a classification is more an administrative than a scientific one. In that sense, although it might resonate in policymaking arenas, it might be less accepted in academic circles.

Scholars and non-academic practitioners alike have seldom applied this kind of framework; it is difficult to find extensive examples in the literature. One illustration is that proposed by the ESPON-GREECO project (Territorial Potentials for a Greener Economy) (ESPON-TECNALIA 2014). This framework suggests two complementary indicator sets. One is based on a sectoral typology including, among other sectors, “agriculture”, “building & construction”, “energy production”, “manufacturing” and “tourism”. The other set of indicators is structured according to key topics, or “spheres”.

> Sectoral frameworks group indicators as government administration is structured.

D. ISSUE-BASED FRAMEWORKS

Issue-based frameworks are made up of a finite set of the key issues, concerns or criteria of interest for the system under study. As a general rule, these frameworks go to a deeper level of detail than domain-based classifications do. Actually, the two schemes are usually combined into hierarchical systems – a basic domain-based classification further broken down into several issue-based categories in each domain. In contrast to goal-based frameworks, issue-based schemes rely on purely descriptive labels, without any explicit normativity.

Issue-based frameworks often have popular appeal because they are easy to construct and readily understandable. As Maclaren (1996) notes, however, in some cases the issues might be “identified in a “shotgun” manner, with no attempt to match indicators with sustainability goals or ensure coverage” of all sustainability dimensions.

> Issue-based frameworks reflect a set of key issues, stakes or criteria.

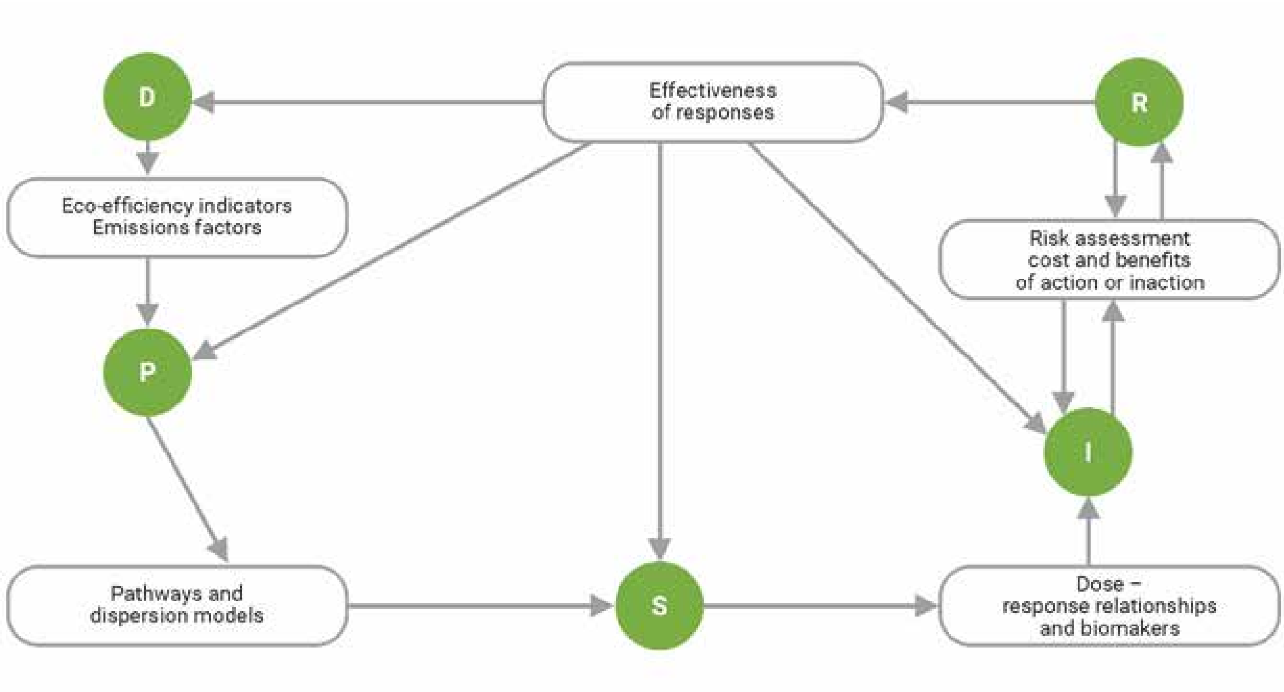
A frequently cited issue-based framework specifically dealing with GE is the one developed by the Green Growth Knowledge Platform (GGKP) for measuring IGE at the country level (GGKP 2013; 2016). This framework, largely inspired by UN Environment (2012) and OECD (2011) frameworks, proposes five “themes” – natural assets, resource efficiency and decoupling, risks and resilience, economic opportunities and efforts, and inclusiveness. These five basic themes derive from both previous conceptualizations developed by international organizations (notably OECD) and the discussions held at GGKP. The five themes are then subdivided into 20 “measurement categories”. We will explore the GGKP framework in more detail later in this session.

E. CAUSAL FRAMEWORKS

Causal frameworks go beyond the taxonomic approaches of the preceding frameworks by introducing the notion of cause-and-effect relationships (Maclaren 1996). Indeed, what distinguishes these frameworks from the others is that they explicitly link internal categories or indicators with each other, thus elucidating the sequential narrative on which the system under study relies. This strength is also the main weakness: cause-and-effect systems often oversimplify the real world and may convey the (false) idea that we know all about social–ecological systems and can fully and accurately predict their evolution.

> Causal frameworks explicitly link internal categories or indicators with each other.

Figure 4 A graphic representation of the DPSIR model



D = drivers; P = pressure on the environment; S = state of the environment; I = impacts; R = responses
Source: EEA (2014: 19).

One of the most widely used causal frameworks in the fields of sustainability and green economy is the DPSIR Model (Drivers–Pressures–State–Impact–Responses) (Stanners et al. 2007; EEA 2014) (Figure 4). According to this model, social and economic development drives (D) changes that exert pressure (P) on the environment. As a consequence, changes occur in the state (S) of the environment, which lead to impacts (I) on, for example, human health, ecosystem functioning and the economy. Finally, societal and political responses (R) affect earlier parts of the system directly or indirectly.

Two features of the DPSIR framework have contributed to its wide application around the world. First, for a given problem, the framework structures potential management measures that are linked to particular political objectives. Second, it presents causal relationships, which are easily understood, if at the cost of neglecting non-causal relationships.

The European Environment Agency (EEA) used the DPSIR framework in its Environmental Indicator Report 2012, which focused on ecosystem resilience and resource efficiency in a green economy in Europe (EEA 2012). Actually, in this report EEA combined the DPSIR model with an issue-based scheme made of 12 "themes" – for example, "air pollution", "biodiversity", "waste" and "tourism". Hence, each indicator was clustered and mapped according to the two complementary schemes.

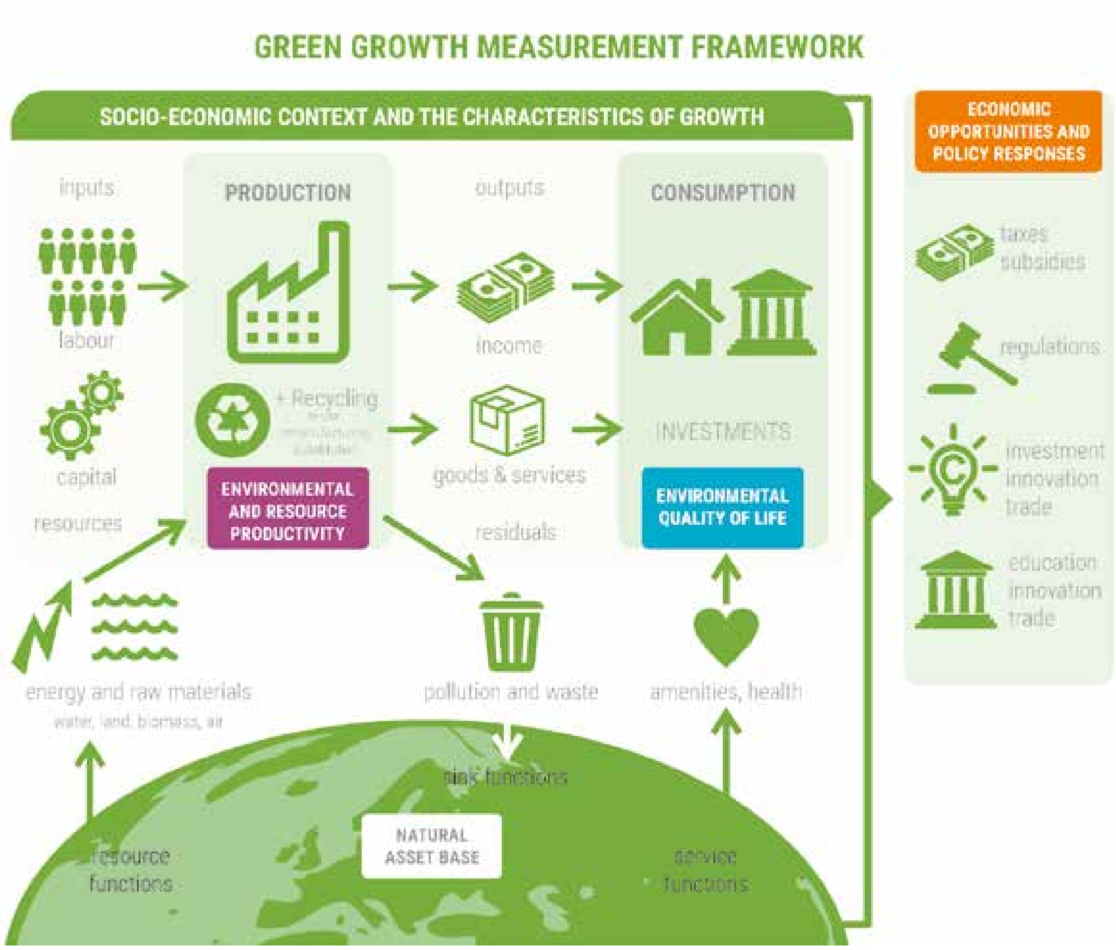
Another good illustration of a causal scheme applied in the GE field is the Green Growth Measurement Framework developed by the Organisation for Economic Cooperation and Development (OECD) (2011; 2014; 2017) (Figure 5). The OECD framework contains 26 indicators grouped into four main areas:

- natural asset base (reflecting whether natural resources are being kept intact and within sustainable thresholds in terms of quantity, quality or value);

- environmental and resource productivity (which captures the need for efficient use of natural capital and other aspects of production that are rarely quantified in economic models and accounting frameworks);
- environmental quality of life (capturing the direct impacts of the environment on people's lives);
- economic opportunities and policy responses (capturing the opportunities associated with the green economy as well as institutional measures promoting green transitions).

The framework starts with the sphere of production, where inputs are transformed into valuable outputs. Such a transformation relies at least partly on natural assets – either resources that are subsequently transformed into inputs or are a sink for pollutants and residuals emitted during production. Both (i) the natural asset base and (ii) the sphere of production influence (iii) people's quality of life, in the first case through goods and income and in the second case through amenities and health. Finally, all these interrelations might be influenced in turn by (iv) institutional rules and incentives, technological development and/or education.

Figure 5 OECD's **Green Growth Measurement Framework**



Source: OECD (2017: 14).

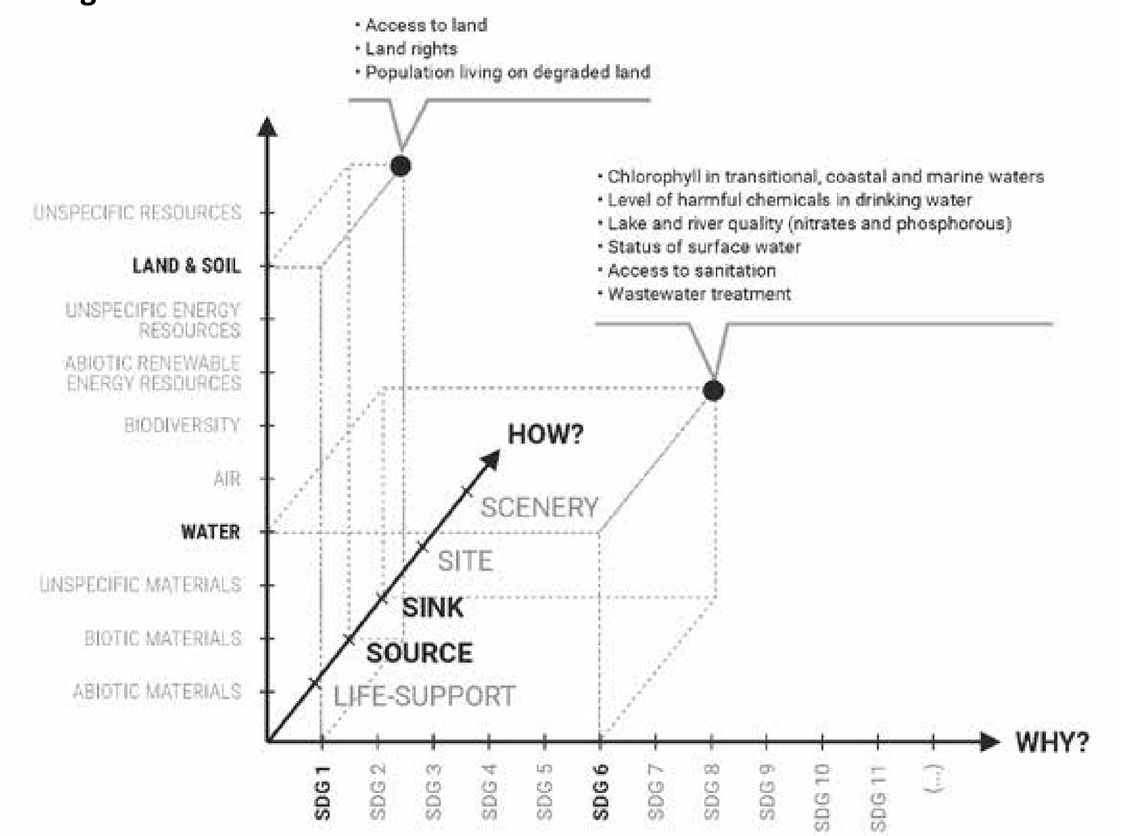
F. HYBRID CONCEPTUAL FRAMEWORKS

The idea of framing indicator systems through several conceptual models simultaneously is not a new one. Several international organizations working on GE have already done so (see EEA 2012, for instance). At the national level also, several offices or agencies employ plural reasoning in their sustainability indicator frameworks; see, for instance, the MONET indicator system developed in Switzerland, which combines causal-based and goal-based frameworks (SFSO 2004).

> Hybrid frameworks can look at indicators through a multi-dimensional prism.

The GEP Measurement Framework is one example of a hybrid conceptual framework (PAGE 2017). It combines an issue-based approach (by including indicators that measure several key issues on which an IGE relies) with a goal-based approach (by incorporating targets and critical thresholds into its weighting system). This hybrid approach sends the policy message that a country making substantive

Figure 6 "Green Cube" framework based on three dimensions: substantive, instrumental and teleological



Source: Merino-Saum et al. (2018: 99).

achievements on a few IGE issues (or indicators) at the cost of others will not necessarily be doing better than a country that is making small advances in all areas. In addition, the GEP Measurement Framework emphasizes this combination of issues-based and goals-based approaches by its focus on not overstepping planetary boundaries and not allowing potential substitutability for such transgressions. This is the main justification for a separate dashboard of environmental sustainability as an autonomous set of indicators.

Combining conceptual frameworks provides the opportunity to look at indicators through a multi-dimensional prism. This is appropriate to the plural information that most GE indicators convey. The "Green Cube" framework developed by Merino-Saum et al. (2018) illustrates the added value of a hybrid conceptual framework. This framework might be used either to compare several existing measurement initiatives (ex-post usage) or to develop a new indicator system (ex-ante application).

The "Green Cube" framework provides a tri-dimensional space in which indicators can be characterized and mapped according to: (i) most related natural resources – NRs; (ii); most related environmental functions – EFs; and (iii) most related SDGs (Figure 6). Hence, for each indicator the framework specifies:

- **what** human society is using from natural systems (e.g., water, air, materials, biodiversity); i.e., which NRs are being used (the substantive dimension);
- **how** such resources are being used (e.g., recreation, extraction, waste disposal); i.e., how NRs are used (instrumental dimension);
- **why** such resources are used (e.g., to reduce poverty, to increase economic growth); i.e., which particular goals does human society target when using the resources (teleological dimension).

A key reason for using a multi-dimensional framework such as the "Green Cube" is that it overcomes the limitations of one-dimensional frameworks. One-dimensional frameworks might lead to both measurement gaps and conceptual ambiguities.

Let us imagine, for illustrative purposes, a framework based exclusively on natural resources and focused on a particular category, such as "air" or "water" (the same reasoning works if we select any specific value from any other dimension). In this NRs-oriented framework, many candidate water-related indicators exist, such as "Access to drinking water", "Nutrients in freshwater" and "Bathing water quality". Although all these indicators deal with water issues, the information that they convey is clearly heterogeneous and should not be clustered. Thus, for instance, "Access to drinking water" involves a particular conception of water systems as provisioning entities (i.e., performing a source function). Water is implicitly seen as a tangible product that humans can extract, use, trade and consume. In terms of the SDGs, the indicator clearly refers to SDG 6 [Clean water & sanitation] but also to SDG 1 [No poverty] and to some extent also to SDG 10 [Reduced inequalities]. In contrast, "Nutrients in freshwater" relates to water systems as natural regulators that might neutralize wastes disposed by human societies (i.e., performing a sink function). This concept is not about providing; rather, it is about assimilating. With regards to the SDGs, this indicator is linked to SDG 2 [Zero hunger], which includes potential sustainability issues related to agricultural activities (which is the origin of most of the nutrients found in drainage basins). Finally, "Bathing water quality" refers to the recreational function of water systems (also known as the scenery function) and relates to SDG 12 [Sustainable consumption & production], which incorporates sustainability targets concerning tourism activities.

This simple example demonstrates, in brief, that several indicators referring to the same NR might inform us about very different environmental functions and SDGs. Symmetrically, several indicators linked to a common SDG (or to an environmental function) might convey dissimilar information about NRs and EFs (or SDGs).

Table 1 presents the main strengths and weaknesses of each indicator framework type.

Table 1. Main types of indicator frameworks

Framework	Advantages	Disadvantages
Domain-based	• They are easily understood. • They are helpful to check the relative importance of each sustainability dimension.	• They often ignore what is happening (or might happen) at the interfaces between sustainability dimensions (e.g., trade-offs, values conflicts, potential synergies). • In some cases they might oversimplify reality and stay at an excessively broad level of description.
Goal-based	• They relate indicators to specific sustainability/ GE goals. • They are particularly supportive when the assessment's goal is to evaluate whether a country is evolving (or not) towards a GE.	• They involve high doses of normativity. • They might hide values conflicts.
Sectoral	• They are easily understood. • They resonate particularly well in policy-making arenas.	• The resulting structure is biased by an administrative way of thinking, which does not necessarily fit the reality of social–ecological systems; • Administrative classifications differ across countries; therefore, sectoral frameworks might be difficult to apply at the international scale.
Issue-based	• They are readily understandable and used worldwide. (Many comparable applications might be used as reference points or sources of inspiration.)	• In some cases coverage of sustainability dimensions might be unbalanced. • Indicators might lack a clear link with GE goals.
Causal	• They pay particular attention to the way that GE indicators are linked to each other. (The indicators are no longer seen as unrelated pieces of information.) • They force practitioners and potential participants in the evaluation process to adopt a systemic perspective.	• In some cases asserted causal relationships between indicators are not based on empirical evidence. • Indicator interactions often involve uncertainties, complexity and ambiguities, which might be difficult to operationalize.
Hybrid	• They make it possible to exploit existing synergies between different kinds of frameworks. • They invite practitioners to work at a meta-level instead of directly selecting the indicators. (This previous step might enlarge and/ or pertinently adapt the initial scope of the assessment.) • They can express the multidimensional information that GE indicators usually convey.	• They are time-consuming to construct. (Indicators must be conceived from multiple angles.) • They involve a high degree of complexity (which might reduce their attractiveness for policy-makers).

Source: Adapted from Maclaren (1996).

IV. The GGKP Framework: Five Themes for Measuring IGE

The Green Growth Knowledge Platform (GGKP) framework is an issue-based indicator framework developed through the joint effort of the partners in the GGKP: OECD, UN Environment, the World Bank and the Global Green Growth Institute (GGKP 2013; GGKP 2016). As a consensus product of some of the major international institutions active in the field of green economy, the GGKP framework has particular appeal in policymaking settings.

The GGKP framework classifies indicators into five main themes relevant to measuring IGE:

Natural assets: natural resources used to generate economic growth and ecosystem services that support economic activities;

Resource efficiency and decoupling: how efficiently (or wastefully) economic outputs are produced and consumed;

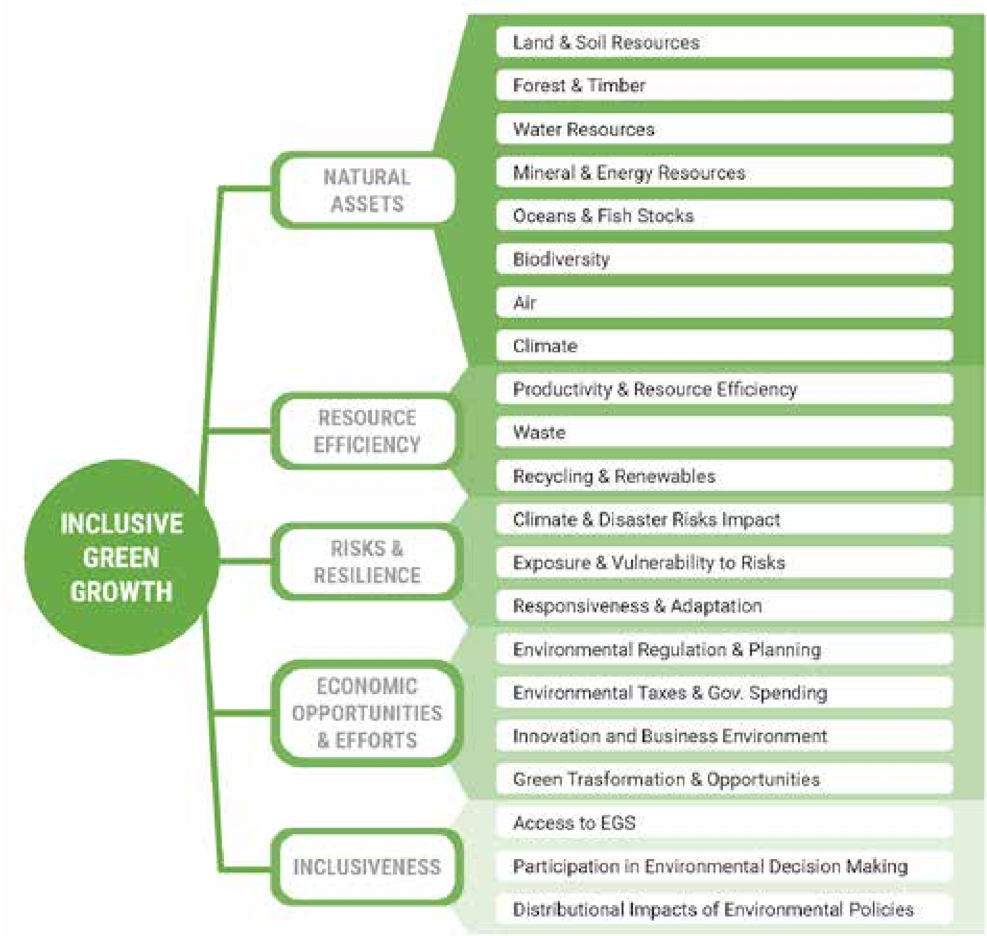
Risks and resilience: how resilient the economic growth process is to ecological shocks and risks, especially those related to pollution, degradation, natural disasters and climate change;

Economic opportunities and efforts: adoption and implementation of policies enabling transformation towards IGE as well as tracking the transformation itself;

Inclusiveness: social aspects of the green economy, measuring how the costs and benefits of environmental policies are distributed among different groups.

The themes are, in part, meant to parallel the conventional elements of the production sphere in a macroeconomic model. The distinctions among these themes are not strict, however. Measurement concepts may fall within more than one category. Moreover, there is no hierarchy among themes, and their importance may depend on country-specific circumstances. The five themes are further divided into 20 measurement categories (Figure 7).

Figure 7 **Measurement themes and categories suggested by the Green Growth Knowledge Platform for measuring Inclusive Green Growth at the country level**



Source: adapted from GGKP (2016: 3–8).

The tables that follow present illustrative examples of aspects of each theme; they are not prescriptive sets of indicators applicable in all countries. Indeed, the examples suggest the different sorts of indicators that countries might choose, depending on the policy issue at hand. For example, some indicators measure monetary value, others are stated in physical terms; some measure current stocks of resources, while others reflect change from a previous state (e.g., percentage of forest cover lost).

The GGKP suggests that countries use the criteria proposed by OECD (2011) to select specific indicators (GGKP 2013). These criteria include:

- **"Policy relevance:** The indicator needs to address issues that are of (actual or potential) public concern relevant to policy-making. In fact, the ultimate test of any single indicator's relevance is whether it contributes to the policy process.
- **"Analytical soundness:** Ensuring that the indicator is based on the best available science is a key feature to assure that the indicator can be trusted.

- **“Measurability:** the need to reflect reality on a timely and accurate basis and be measurable at a reasonable cost, balancing the long-term nature of some environmental, economic and social effects and the cyclicality of others. Definitions and data need to allow meaningful comparison … across [both] time and countries or regions.
- **“Usefulness in communication:** the ability to provide understandable, easily interpretable signals for the intended audience” (GGKP 2013).

Resource: Moving towards a common approach on green growth indicators. A Green Growth Knowledge Platform scoping paper. (GGKP, 2013)

A. NATURAL ASSETS

Natural asset indicators reflect the natural resources that generate economic growth and the ecosystem services that support economic activities. These indicators can monitor, for example, issues related to land and soil, forests and timber, water, minerals and energy resources, fish stocks, air and climate. Table 2 presents examples of aspects of natural assets that might be measured. In theory, they can cover the total available biophysical stock of natural assets and their change over time, their quality and respective economic values and risks related to depletion, scarcity or threshold limits such as planetary boundaries.

Table 2. Examples of measurement categories and aspect within natural asset theme

Measurement Categories	Aspects Measured
Land And Soil Resources	Agricultural land area and value
	Land degradation (e.g. topsoil loss or change in net primary productivity)
Forest And Timber	Forest area and forest cover change
	Value of timber stocks
	Value of forest resource depletion
Water Resources	Available renewable freshwater resources
	Areas/population exposed to water scarcity
	Water resources exposed to harmful pollution levels
Minerals and Energy Re-sources	Available stocks and reserves (e.g. minerals, crude oil, gas)
	Value of remaining stocks and reserves
	Value of energy extraction and depletion
Oceans And Fish Stocks	Sustainable Seafood production
	Proportion of fish stocks overexploited or collapsed
	Value of fish stock depletion
Biodiversity	Species abundances
	Number of threatened species
Air	Air pollution
	Cost of air pollution
Climate	CO2 and other GHG emissions
	Remaining CO2 or GHG emissions budget to stay within certain climate goals

Source: GGKP (2016).

B. RESOURCE EFFICIENCY

Indicators of resource efficiency and decoupling suggest how efficiently (or wastefully) economic outputs are produced and consumed (Table 3). Efficiency indicators focus on comparisons of economic outcomes with the environmental inputs or pollution associated with their production or embedded in their consumption. Production-based indicators of environmental and resource productivity account for environmental inputs or pollution directly linked to domestic production. Examples of production-based indicators are greenhouse gas emissions and productivity of land.

Demand-based indicators paint a fuller picture, accounting for the environmental effects related to the full production chain for domestically consumed goods. Examples of demand-based indicators are atmospheric CO_2 concentration and area of forested land as a percentage of original forest cover. These indicators can track the development – or relief – of environmental pressures in absolute or per capita terms. Indicators of decoupling, whether production- or demand-based, can show, over time, whether environmental degradation per unit of output can be reduced – or, indeed, whether the two rates can be entirely dissociated.

Table 3. Examples of IGG categories and aspects within resource efficiency theme

Measurement Categories	Aspects Measured
Productivity/Efficiency and Resource Preservation	Natural resource productivity
	Environmentally adjusted multifactor productivity
	GHG intensity and GHG footprint
	Energy efficiency and energy footprint
	Land productivity and biodiversity damage potential caused by direct and indirect land use ("biodiversity footprint")
	Water intensity; nitrogen balances ad water footprint
	Material productivity and material footprint
Waste	Waste generation
	Waste collection
	Waste treatment
Recycling And Renewables	Reuse and recycling rates (households, construction sector and phosphorus, among others)
	Use of renewables

GHG = greenhouse gasses
Source: GGKP (2016).

C. RISKS AND RESILIENCE

Indicators of risks and resilience measure how easily and quickly the economic growth process recovers from ecological shocks and risks – especially those coming from pollution, degradation, natural disasters and climate change (Table 4). The Intergovernmental Panel on Climate Change (IPCC) defines resilience as "[t]he capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning and transformation" (IPCC 2014). The latest Sendai Framework for Disaster Risk Reduction defines resilience as the "ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner" (WCDRR 2015).

Resilient systems are better able to respond and adapt to impacts and recover from them. If, however, resilience is low, countries are likely to experience more negative impacts (e.g., fatalities and economic damage). These impacts depend on (1) exposure (i.e., presence of people, livelihoods and assets that could be adversely affected and the characteristics of those adversely affected) and (2) the vulnerability of people and economic systems to the climate change or disaster hazard (i.e., the degree to which a system is susceptible to, or unable to cope with, the adverse effects) (IPCC 2014).

Table 4. Examples of IGG categories and aspects within resilience and risks theme

Measurement Categories	Aspects Measured
Climate and Disaster Risks Impacts	Fatalities (loss of life, injured, homeless)
	Economic damages
	Propensity to experience climate and disaster impacts
Exposure And Vulnerability To Risks	People/assets in high-risk areas (e.g. low-elevation coastal zones)
	Economic production sensitive to environmental impacts (e.g. agricultural production in water-scarce areas)
	Assets vulnerable to environmental and climate risks
	Adoption of climate resilient building standards
	People with access to early warning systems
	People with climate-risk insurance
Responsiveness/Adaptation	Government action for disaster risk prevention
	Government capacity to manage disaster risks
	Time to rebuild/reconstruct physical capital

Source: GGKP (2016).

D. ECONOMIC OPPORTUNITIES AND EFFORTS

Indicators of economic opportunities and efforts reflect the adoption and implementation of policies enabling transformation towards IGE as well as tracking the transformation itself. Many green policies aim for such structural transformations (Table 5). Hence, their outcomes are often difficult to measure in the short run. Instead, a notion of the opportunities created and the efforts made to facilitate such transformations can and should be accounted for. Thus, most of the indicators in this theme measure the intended scope of a policy rather than its actual outcomes or impacts.

Table 5. Examples of IGG categories and aspects within economic opportunities and efforts theme

Measurement Categories	Aspects Measured
Environmental Regulation and Planning	Environmental action plan or strategy in place
	Measures of environmental policy stringency
	Extent of protected areas
	Environmental standards
	Renewable energy feed-in tariffs
	Adoption of environmental accounts
	Number of international environmental treaties signed
Environmental Taxes and Government Spending	Environmentally related taxes
	Fossil fuel subsidies
	Public environmental expenditure
Innovation And Business Environment	R&D expenditure (green, total, public and private)
	Green patent counts
Green Transformation/Opportunities	Green investments (e.g. renewables, public and private)
	Green Jobs
	Value added of environmental goods and services sectors
	Adoption o certified products from sustainable value chains (e.g. as market share or number of companies)
	Exports of environmental goods and services sector

Source: GGKP (2016).

E. INCLUSIVENESS

Measurements of inclusiveness relate to the social aspects of greening economies, measuring how the costs and benefits of environmental policies are distributed among different groups. This theme can include some of the measurement aspects of other themes, but it explicitly covers distributional aspects by measuring which households, groups or communities have access to environmental amenities, who is exposed to environmental risks, who incurs the benefits or costs of green policies and who can participate in environmental decision-making (Table 6).

Table 6. Examples of IGG categories and aspects within inclusiveness theme

Measurement Categories	Aspects Measured
Access to Environmental Goods and Services	Air pollution (exposure by socioeconomic group)
	Water services (access by socioeconomic group)
	Sanitation services (access by socioeconomic group)
	Sewage treatment (access by socioeconomic group)
	Modern energy (access by socioeconomic group)
Participation in Environmen-tal Decision-Making	Representation in environmental agencies and bodies (e.g. by mi-nority, location, gender)
	Control over environmental resource (e.g. land) by social groups (e.g. minorities, indigenous people, gender)
	Value of forest resource depletion
Distributional Impacts of En-vironmental Policies	Distribution of costs and benefits of energy subsidies or envi-ronmental taxes, e.g. focusing on low-income groups
	Types of jobs created and destroyed, skill requirements
	People benefiting from payments for ecosystem services

Source: GGKP (2016).

Review and discussion questions for Session 2

- What is a conceptual framework, and how is it useful in an indicator development processes?
- What are the main types of conceptual frameworks used in the sustainability and GE fields? What are their respective strengths and weaknesses?
- Why might combining several types of conceptual frameworks be a good idea? Can you illustrate your reasoning with a real example?
- Among the five themes in the GGKP framework, which are mostly like to reflect the effects of change on people and communities?
- Can measurement concepts framework fall within more than one category among the five themes in the GGKP?

Sources

European Environment Agency (EEA) (2012). *Environmental Indicator Report 2012: Ecosystem Resilience and Resource Efficiency in a Green Economy in Europe*. Copenhagen, Denmark.

_________ (2014). *Resource-efficient Green Economy and EU Policies*. EEA Report n° 2/2014. Copenhagen, Denmark.

ESPON–TECNALIA (2014). *Territorial Potentials for a Greener Economy, Final Report*.

ESPON Programme – Global Green Growth Institute (GGGI) (2013). *Diagnostic Indicators; GGGI set of indicators for assessing country sustainability*. International Workshop on Green Economic Transformation and Environmental Competitiveness Indicators, Fujian Normal University, March 26–27, 2013.

Green Growth Knowledge Platform (GGKP) (2013), Moving Towards a Common Approach on Green Growth Indicators. *Green Growth Knowledge Platform Scoping Paper*.

_________ (2016). *Measuring inclusive Green Growth at the Country Level. Taking Stocks of Measurement Approaches and Indicators*. GGKP Research Committee on Measurement & Indicators. Working Paper 02-2016.

James, P., and others (2015), *Urban Sustainability in Theory and Practice: Circles of Sustainability*. London: Routledge.

Maclaren, V.W. (1996). Urban sustainability reporting. *Journal of the American Planning Association*, vol. 62, No. 2, pp. 184–202.

Niemeijer, D., and R. de Groot (2008). A conceptual framework for selecting environmental indicator sets. *Ecological Indicators*, vol. 8, pp. 14–25.

Organisation for Economic Co-operation and Development (OECD) (2011). *Towards Green Growth: Monitoring Progress: OECD Indicators*. Paris.

_________ (2014). Green Growth Indicators 2014. *OECD Green Growth Studies*. Paris.

_________ (2017). Green Growth Indicators 2017. *OECD Green Growth Studies*. Paris.

O'Connor, M. (2006). Building knowledge partnerships with ICT? Social and technological conditions of conviviality. In: Guimarães Pereira, A., S. Guedes Vaz and S. Tognetti (Eds.). *Interfaces between Science and Society*. Sheffield, UK: Greenleaf Publishing, pp. 298–325.

Pintér, L., P. Hardi and P. Bartelmus (2005). Indicators of sustainable development: proposals for a way forward. In: *Expert Group Meeting on Indicators of Sustainable Development*. New York, pp. 13–15.

Pintér, L., and others (2012). Bellagio STAMP: Principles for sustainability assessment and measurement. *Ecological Indicators*, vol. 17, pp. 2–28.

Swiss Federal Statistical Office (SFSO) (2004). *Monitoring Sustainable Development – MONET: Final Report, Methods and Results*. Neuchatel, Switzerland.

Stanners, D., and others (2007). Frameworks for environmental assessment and indicators at the EEA. in: Hák, T., B. Moldan and A.L. Dahl. (Eds.). *Sustainability Indicators: A Scientific Assessment*. Scope Series. Washington, DC: Island Press. pp. 145–162.

Turnhout, E. (2009). The effectiveness of boundary objects: the case of ecological indicators. *Science and Public Policy*, vol. 36, No. 5, pp. 403–412.

United Nations Environment Programme (UNEP) (2012). *Measuring Progress towards an Inclusive Green Economy*.

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2013). *Green Growth Indicators: A Practical Approach for Asia and the Pacific*. Greening of Economic Growth Series.

World Bank (2012). *Inclusive Green Growth: The Pathway to Sustainable Development*. Washington, D.C.

Session 3: Approaches to Measurement[4]

Key points

- Indicators of an Inclusive Green Economy can be categorized in four different ways: (1) dashboards, (2) composite indicators, (3) footprints and (4) adjusted economic indicators.
- These approaches vary as to how granular or summary a picture they paint, the assumptions and value judgements involved and how easily they are communicated.

Tracking progress towards an Inclusive Green Economy (IGE) requires measurement across different themes and sectors. There is a wealth of environmental, economic and social indicators that are relevant for measuring IGE. In practice, to inform policymaking, decisions need to be made among indicators and the approach to measurement, particularly since measuring, processing, interpreting and communicating information all come at a cost. In general, there are four different approaches to measurement of sustainability and IGE indicators.

I. What are the Approaches to Measurement?

Measurement of granular environmental, economic and social indicators has been approached in four ways:

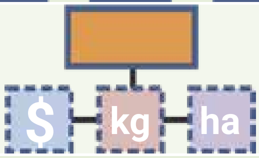
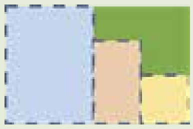
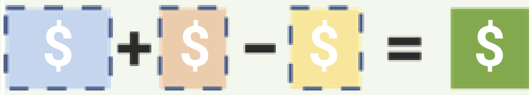
- **dashboard** sets of indicators
- **composite** indicators
- **footprints**
- **“adjusted”** economic measures.

These classifications are directly adopted from the seminal work of Stiglitz, Sen and Fitoussi (2010) on the measurement of sustainability, where these classifications and their strengths and weaknesses are outlined.

These four approaches combine information on the interactions among the economy, environment and society in different ways (Figure 1). They reflect different answers to the question of how to measure and present this information both accurately and usefully. Each approach has its strengths and weaknesses, and one approach or another may be the most appropriate for a specific statistic, issue or use.

[4] José Pineda prepared this session.

Figure 1 Typology of measurement approaches

Measurement Approach	Final Metric(s)	Combination of Components
Dashboards	A set of indicators – often measured in different units – without hierarchy	
Composite indices	Aggregated measure that combines a set of indicators – often measured in different units – through rescaling the individual components and applying weights	
Footprints	A metric that indicates how much of the existing biological capacity (e.g. land) is used to support economic activities and human needs	
Adjusted economic measures	A single monetary metric derived through an adjustment of a selected economic variable (GDP, wealth and savings, among others) with monetary valuations of developments related to broader environmental and social sustainability	

Source: GGKP (2016).

A. DASHBOARDS – WHY PRESENT SOME CRUCIAL METRICS SEPARATELY?

Dashboards are sets of metrics presenting information on various environmental, economic and social indicators as well as combinations of these indicators (see box for examples). Dashboards simply present multiple indicators. They can contain different types of indicators. They may be expressed in different units (e.g., some monetary, some physical) and with various relationships to IGE. In fact, they often include indicators from the other classifications, such as composite indices.

Dashboards allow for a broad assessment, in keeping with the multidimensional nature of IGE. Dashboards do not usually impose on their user decisions about the importance of individual indicators or the relationships among them (e.g., trade-offs). In principle, it is up to the user to select and emphasize the most relevant indicators from a dashboard.

This approach implies that the indicators on a dashboard are more in line with the idea of "strong sustainability", where each of the important dimensions of IGE needs to be monitored, and one is not assumed to be substitutable for another (Neumayer 2003) (see box, Strong versus weak sustainability).

The use of different units of measurement also means that dashboards can do without the rigid and difficult assumptions necessary to convert units into a common single metric, as a composite index must. Similarly, it allows explicit differences among indicators in measurement horizons or areas (e.g., regions). For example, dashboards can easily report both national data and data on subnational regions under stress.

The breadth and flexibility of dashboards also has disadvantages, primarily related to communication. The large number of different indicators may require

Strong versus weak sustainability

- Assumptions of strong or weak sustainability reflect quite differing views of natural resource assets (Deitz and Neumayer 2004). The main difference between these concepts of sustainability is that "weak" allows for substitutability across all forms of capital, while "strong" recognizes that sustainability requires preserving certain critical forms of natural capital. As examples show, each assumption may be valid for particular resources.
- **"Strong sustainability"** assumes that one resource cannot be easily substituted for another. Resources necessary to sustain life are good examples. Both clean air and water are necessary to sustain life. If a country runs short of clean water, it cannot make up for this shortage by using more air (or any other resource). An important implication is that there are limits specific to each of these resources. If the limits are exceeded, the environmental system would not have the resilience to recover. The concept of planetary boundaries, discussed in Session 1, focuses on such resources and their limits.
- **"Weak sustainability"**, in contrast, assumes that, as one resource is increasingly depleted, market forces will compensate by driving technological improvements in efficiency and substituting another, more plentiful (or cheaper) resource that can perform the same function in production. For example, as oil resources have declined or become more expensive to extract, petrol and diesel engines have been made more efficient, and hybrid and electric vehicles have become more available and more popular.
- **Dashboards** and **footprints** are approaches particularly suited to strong sustainability assumptions. **Composite indices** and **adjusted economic indicators** reflect weak sustainability assumptions.

the user to make an explicit interpretation to draw out an overall trend. General international comparisons are difficult, even if comparisons on each single indicator can be quite meaningful. An attempt to limit these problems is to flag a limited number of indicators as "headline" indicators that merit special attention (OECD 2011, 2014). This can entail difficult choices, however, and, ultimately, omission of dimensions that may be important for specific countries.

Examples of dashboards

- OECD Green Growth Indicators. For 48 countries, more than 50 indicators on environmental and resource productivity, natural asset base, environmental quality of life, economic opportunities and policy responses, plus socio-economic context and characteristics of growth.
- European Union (EU) Sustainable Development Indicators. More than 100 indicators for the EU countries, linked to the 17 Sustainable Development Goals.

B. COMPOSITE INDICES – HOW TO CREATE A SUMMARY METRIC?

In contrast to dashboards, composite indices aggregate different metrics into one by scoring and weighting the underlying indicators. Through weighting and aggregation, composite indices assume that there is a certain relationship among the underlying components (Nardo et al. 2008). This is in line with the "weak sustainability" concept – that is, assuming de facto that improvements in one dimension of IGE can substitute for deterioration in another.

A composite index is easy to communicate and allows comparisons across countries and time. However, in such indices the weighting and aggregation is often rather arbitrary, as there exists no agreed way of valuation of the phenomena captured by the different components. Moreover, to achieve comparability, such aggregation methods are usually fixed – across countries and over time – implying little room for priorities to differ or shift. As a result, the meaning, interpretation and robustness of these

Examples of composite indices

Yale Environmental Performance Index ranks 180 countries on 24 performance indicators across 10 issue categories covering environmental health and ecosystem vitality. It was last published in 2018.

Global Green Economy Index measures both the green economic performance of 80 countries and how experts assess that performance. The index aggregates 32 indicators for 60 countries and their largest metropolitan areas. Its latest report appeared in 2018.

indices is often unclear (Ravallion 2012), making them more suitable as flags to draw attention to the components that make them up rather than as direct guides to policymaking (Stiglitz et al. 2010). However, PAGE (2017) through the GEP Measurement Framework, presents a weighting system that is guided by theory and overcomes many of the limitations of ad hoc weighting. The advanced course on indicators for measuring IGE progress explores this system in detail.

C. FOOTPRINTS – HOW TO REFLECT ENVIRONMENTAL SUSTAINABILITY?

Footprints aim to indicate whether current production/consumption patterns are sustainable, whether locally or within planetary boundaries (Dao et al. 2015). Generally, these indicators relate to some kind of environmental threshold or limit that, if passed, is deemed unsustainable. Such indicators can measure selected single phenomena relevant for different sectors or environmental domains, such as greenhouse gas emissions or overconsumption of land or water (see Frischknecht et al. 2013). They also can aggregate a multitude of economic and environmental issues into a single indicator – for example, human demand for various ecological resources expressed in land area.

Footprints provide an easy-to-communicate and appealing metric. However, they may fail to account for future technological progress that could shift

Examples of footprints indicators

- atmospheric concentrations of greenhouse gases
- area of forested land as % of original forest cover
- consumptive blue water use

a threshold or limit (Stiglitz et al. 2010). Where thresholds and limits are unknown or uncertain, some minimum standards could be established following a precautionary principle.

D. ADJUSTED OR EXTENDED ECONOMIC MEASURES – CAN WE IMPROVE ON GDP AND OTHER CONVENTIONAL MEASURES?

Adjusted or extended economic measures of GDP, savings and wealth attempt to correct these conventional economic variables to account for environmental or, less frequently, both environmental and social dimensions. For example, **adjusted GDP** measurements aim to correct GDP by the value of welfare-increasing or reducing activities, such as natural resource degradation, to arrive at an improved, "green" GDP metric. **Environmentally adjusted multifactor-productivity growth** seeks to adjust conventional productivity measures for the use of natural resources and emission of pollutants (OECD 2016). Similarly, **extended wealth measures** combine various subcomponents of a country's wealth, including stocks of capital that will sustain production in the future, such as natural capital, along with financial, physical and human assets. Extended wealth builds on the concept of green natural accounts. It augments standard national accounts measures (World Bank 2006, 2011) by adjusting **gross domestic savings** to reflect changes in environmental and human capital, valued in monetary terms. The net change is labelled adjusted net savings (Hamilton & Clemens 1999) or genuine investments (Arrow et al. 2004).

The relative strengths and weaknesses of these aggregated measures are similar across adjusted GDP, extended wealth and adjusted savings measures. On the plus side, a single measure can be easily communicated and compared across countries and over time. This approach can provide a comprehensive metric if all changes in natural and other capital forms can be valued accurately. However, the valuation of non-marketed goods and services (e.g., amenities, scenic landscapes, carbon sinks or ecosystem regulatory functions) is tricky, especially in the presence of non-linearities and threshold effects (see, for example, Farley 2012). In addition, there are often philosophical and political objections to assigning monetary values to natural and human capital; some believe that these things cannot or should not be monetized. Moreover, most adjusted measures assume weak sustainability. Thus, for purposes of comparison the values of environmental inputs and outputs – and, hence, the implicit trade-offs among them – are usually assumed constant across countries and time, which may be a questionable assumption.

II. How do these Approaches Differ?

The primary difference among these approaches to IGE indicators lies in how they treat the multidimensional character of IGE (Table 1). **Dashboards** generally make explicit the selection of different environmental, social and economic indicators, often by presenting these components without aggregation. This allows users more freedom to tailor the choice of IGE indicators to the specific needs of a particular country. The disadvantages of dashboards are also linked to this freedom of choice. It can make comparability across countries difficult, if not impossible. Further, because of the multitude of indicators, it can frustrate efforts to communicate a general message.

In contrast, **composite indice**s, **footprints combining multiple dimensions**, and **adjusted economic measures** integrate a number of different components into a single metric by using pre-defined weighting and aggregation methods. **Adjusted GDP metrics** and the **extended wealth approach** combine some of the benefits of ease of communication and providing information about the state of natural, physical and human capital. Both adjusted GDP measurements and extended wealth metrics rely on the principle of weak sustainability, assuming that different environmental, social and economic dimensions can be substituted for one another. Also, both are aggregate measures, which usually fail to provide information on the distribution of effects among social, demographic and geographical groups. Moreover, while communication is easier with aggregated measures, this does not necessarily imply that interpretation of these measures is straightforward.

The Green Economy Progress (GEP) Measurement Framework (PAGE 2017) is composed of a GEP index, a companion dashboard of sustainability indicators and, in its global application, a country ranking that is based on the index and the dashboard. In this sense, the GEP Measurement Framework is a hybrid approach (as noted in Session 2). Ranking countries based on the issues in which they have made least progress gives them the incentive not to ignore or neglect any specific issue and to develop a balanced and integrated policy approach aimed at making progress in a large number of the dimensions that characterize an IGE.

Resource: Measuring Inclusive Green Growth at the Country Level Taking Stock of Measurement Approaches and Indicators (Green Growth Knowledge Platform 2016)

Dashboards present multiple indicators, while composite indices and footprints combine multiple dimensions. Adjusted economic measures integrate multiple components into a single metric, usually presented in monetary terms.

Table 1. Comparison of approaches to measurement

Approach	Sustainability assumption	Can present distribution effects?	Strengths	Weaknesses
Dashboards	Strong	Yes	• Transparent. No formulae or weighting obscures underlying data. • Breadth and flexibility. • Countries can pick and choose among indicators.	• Difficult to communicate • General international comparisons are difficult
Composite indicators	Weak	Not usually	• Single measure can be easily communicated • Easy to make international comparisons and time trends	• Weighting and aggregation are arbitrary
Footprints	Strong	Yes	• Easy to communicate and to understand	• Difficult to account for technological change of a limit or threshold
Adjusted economic indicators	Weak	Not usually	• Single measure can be easily communicated • Easy to make international comparisons and time trends	• Difficult to value non-marketed goods and services • Assumes that values of environmental inputs and outputs are fixed across countries and time

Review and discussion questions for Session 3

- Among the four approaches to the presentation of IGE indicators, which can most easily communicate a general picture? Which provide a direct look at crucial metrics?
- How could footprint indicators take account of planetary boundaries?
- How do adjusted or extended economic indicators, such as adjusted GDP, try to improve on conventional indicators?

Sources

Arrow, K.J., and others. (2004). Are we consuming too much? *The Journal of Economic Perspectives*, vol. 18, No. 3, pp. 147–172.

Dietz, Simon and Eric Neumayer (2006). Weak and strong sustainability in the SEEA: Concepts and measurement. *Ecological Economics*, vol. 61, No. 4 (March).

Green Growth Knowledge Platform (GGKP) (2016). *Measuring Inclusive Green Growth at the Country Level. Taking Stock of Measurement Approaches and Indicators*. GGKP Research Committee on Measurement & Indicators. Working Paper 02|2016.

Hamilton, K., and M. Clemens. (1999). Genuine savings rates in developing countries. *World Bank Economic Review*, vol. 13, No. 2, pp. 333–356.

Nardo, M., and others (2008). *Handbook on Constructing Composite Indicators.* Paris: OECD Publishing.

Neumayer, E. (2003). Weak versus strong sustainability: exploring the limits of two opposing paradigms. Northampton, Massachusetts, USA: Edward Elgar.

Organisation for Economic Co-operation and Development (OECD) (2011). *Towards Green Growth: Monitoring Progress – OECD Indicators*. Paris.

__________ (OECD) (2014). Green Growth Indicators 2014. *OECD Green Growth Studies.* Paris.

__________ (2016). Environmentally adjusted multi-factor productivity: methodology and empirical results for OECD and G20 countries. *OECD Environment Directorate Working Paper*. Paris.

Partnership for Action on Green Economy (PAGE) (2017). *The Green Economy Progress Measurement Framework – Methodology.*

Ravallion, M. (2012) Troubling tradeoffs in the Human Development Index. *Journal of Development Economics*, vol. 99, No. 2.

Stiglitz, J.E., A. Sen, and J.P. Fitoussi (2010). *Report by the Commission on the Measurement of Economic Performance and Social Progress*. Paris: Commission on the Measurement of Economic Performance and Social Progress.

Swiss Federal Office for the Environment (FOEN) (2014). *Development of Switzerland's Worldwide Environmental Impact: Environmental Impact of Consumption and Production from 1996 to 2011* (summary in English, full report in German). Bern, Switzerland: Treeze and FOEN. Retrieved from www.bafu.admin.ch/uw-1413-e.

World Bank. (2006). *Where Is the Wealth of Nations? Measuring Capital for the 21st Century.* Washington, DC.

World Bank. (2011). *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*. Washington, DC.

Session 4: Selecting GE Indicators[5]

Key points

- A universally agreed and directly applicable menu of criteria for selecting GE indicators neither exists nor is it desirable.
- There is no such thing as the ideal indicator. Indicators cannot meet all potential selection criteria. Indeed, in some cases selection criteria may be mutually exclusive.
- Indicator selection should reflect what makes each country distinct politically, socially, economically and environmentally.GE indicator sets often emphasize (i) decoupling measures, (ii) sustainable production systems and consumption activities, and (iii) use of natural resources.

I. Exploring Selection Criteria for GE Indicators

There are hundreds of indicators that might be used for measuring GE. For illustration, in their literature review on GE indicators, Merino-Saum et al. (2018) collected 296 indicators used by international organizations (after several rounds of checking for and eliminating both explicit and implicit duplicates). Further, some indicators partially overlap with each other, while others are distinct in terms of their units of measurement, their thematic focus or their data source. Therefore, criteria can help practitioners make their own selection of indicators in keeping with the assessment context, its goals and the available time and budget.

Just as there are hundreds of potential indicators, a plethora of criteria for indicator selection can be found in both scientific and grey literature on sustainability and GE. Such criteria are labelled differently from one case to another. In some cases, although two or more measurement frameworks refer to the same selection criteria (as it is termed in such frameworks), they conceptualize these criteria differently and render them operational in very different ways. For instance, "measurability" might refer to either "data availability" or "statistical accuracy" or even "indicator specificity",

Defined criteria can help practitioners make their own selection of indicators to suit context, goals, time and budget.

depending on which source we consult. Actually, most selection criteria are vague concepts that need to be clearly defined on a case-by-case basis. Given such a fuzzy context, it is crucial that new measurement initiatives systematically specify which criteria they apply, how they conceive such criteria and how they are concretely implemented.

As general principles, the well-known Bellagio Principles (Hardi and Zdan 1997) have oriented many sustainability assessments in the policy arena over the last 20 years and are still frequently applied around the world. Indeed, although these principles were originally conceived as guidelines for the whole assessment process (not only the indicator selection stage), most of them have been (and might be) used as a source of inspiration when choosing the most suitable metrics in GE measurement initiatives. The guidelines were developed under the auspices of the International Institute for Sustainable Development (IISD). They were partially revised in 2009, leading to the so-called Bellagio STAMP principles (IISD 2009; Pintér et al. 2012) (see box).

[5] Albert Merino-Saum prepared this session.

Guidelines for indicator-based assessments (Bellagio STAMP principles)

1. Guiding vision

- Assessment of progress towards sustainable development will be guided by the goal to deliver well-being within the capacity of the biosphere to sustain it for future generations.

2. Essential considerations

- Sustainability assessments should consider:
  - (i) the underlying social, economic and environmental system as a whole and the interactions among its components
  - (ii) the adequacy of governance mechanisms
  - (iii) dynamics of current trends and drivers of change and their interaction
  - (iv) risks, uncertainties and activities that can have an impact across boundaries
  - (v) implications for decision-making, including trade-offs and synergies.

3. Appropriate scope

- Sustainability assessments should consider:
  - (i) an appropriate time horizon to capture both short- and long-term effects of current policy decisions and human activities
  - (ii) an appropriate geographical scope ranging from local to global.

4. Framework and Indicators

- Sustainability assessments are based on:
  - (i) a conceptual framework that identifies the domains that core indicators have to cover
  - (ii) the most recent and reliable data, projections and models to infer trends and scenarios
  - (iii) standardized measurement methods wherever possible, in the interest of comparability
  - (iv) comparison of indicator values with targets and benchmarks, where possible.

5. Transparency

- Assessment of progress toward sustainable development:
  - (i) ensures that the data, indicators and results of the assessment are accessible to the public
  - (ii) explains the choices, assumptions and uncertainties determining the results of the assessment
  - (iii) discloses data sources and methods
  - (iv) discloses all sources of funding and potential conflicts of interest.

6. Effective communication

- In the interest of effective communication, to attract the broadest possible audience and to minimize the risks of misuse, sustainability assessments:
  - (i) use clear and plain language
  - (ii) present information in a fair and objective way that helps to build trust
  - (iii) use innovative visual tools and graphics to aid interpretation and tell a story
  - (iv) make data available in as much detail as is reliable and practicable.

7. Broad participation

- To strengthen their legitimacy and relevance, sustainability assessments should:
  - (i) find appropriate ways to reflect the views of the public, while providing active leadership
  - (ii) engage early on with users of the assessment so that it best fits their needs.

8. Continuity and capacity

- Assessment of progress towards sustainable development require:
  - (i) repeated measurement
  - (ii) responsiveness to change
  - (iii) investment to develop and maintain adequate capacity
  - (iv) continuous learning and improvement.

Source: Pintér et al. (2012).

One of the most widely cited sets of criteria used for indicator selection in institutional reports and policy briefs all over the world is the so-called SMART typology, originally suggested by Doran (1981). According to the SMART typology, good indicators should be:[6]

Specific. Are indicators telling us something about the issue they relate to? Is it clear exactly what is being measured? Are indicators diagnostically unambiguous?

Measurable. Are changes objectively verifiable? Do indicators provide a reliable and clear measure of results? Are indicators supported by consistent data? Are they quantified using standard methodology? How much and what kinds of information is necessary to calculate reliable estimates of the indicator?

Achievable. Can the required data be measured and collected? Are the agencies, organizations and specific staff to be involved in data collection able and willing to do so?

Relevant. Do indicators reflect the most important and emerging issues? Do indicators capture the essence of the desired result?

Time-bound Are the indicators able to show trends over time? Do indicators adopt a long enough time horizon to capture both human and ecosystem time scales? Do indicators build on historic and current conditions to anticipate future conditions – where we want to go, where we could go?

Another list of selection criteria that is also frequently used outside the academic arena is the one suggested by the Organisation for Economic Cooperation and Development (OECD) (2001) (Table 1). This list is organized into three main categories, or "meta-criteria":
(i) policy relevance
(ii) analytical soundness
(iii) measurability.

Table 1. Indicator selection criteria as defined by OECD (2001)

	An indicator should…
Policy relevance	• provide a representative picture of environmental conditions, pressures on the environment or society's responses • be simple, easy to interpret and able to show trends over time • be responsive to changes in the environment and related human activities • provide a basis for international comparisons • be either national in scope or applicable to regional environmental issues of national significance • have a threshold or reference value against which to compare it, so that users can assess the significance of the values associated with it
Analytical soundness	• be theoretically well founded in technical and scientific terms • be based on international standards and international consensus about its validity • lend itself to being linked to economic models, forecasting and information systems
Measurability	• be readily available or made available at a reasonable cost/benefit ratio • be adequately documented and of known quality • be updated at regular intervals in accordance with reliable procedures

Source: adapted from OECD (2001: 133).

[6] The meaning that SMART criteria are given varies from one case to another. We present here (in brackets) some recurrent questions that are posed in the literature for each selection criterion.

The academic literature also offers dozens of selection criteria sets. The list suggested by Hezri (2004) is one of the most frequently cited (Table 2). According to Hezri, indicator selection criteria can be grouped into four major themes: (i) robustness, (ii) democratic inclusion, (iii) longevity and (iv) relevance.

Table 2. Indicator selection criteria suggested by Hezri (2004)

	An indicator should…
Robustness	• be scientifically credible • be measurable • be sensitive to changes • have a practical focus (i.e., limited number of key issues; comparing values with targets) • be based on models with holistic perspectives • have appropriate scale
Democratic inclusion	• be developed with the participation of community interests, experts and policymakers • rely on accessible methods and explicit judgements
Longevity	• emonstrate capacity for repeated measurement • be iterative and adaptive to change • be cost-effective
Relevance	• consider institutional capacity for data collection, maintenance and documentation • meet the needs of audience and users • be simple in presentation structure • be guided by a clear vision of sustainability (or GE)

Source: adapted from Hezri (2004: 365).

Also coming from academia, Cloquell-Ballester et al. (2006) suggest yet another classification, slightly different from Hezri's. This classification distinguishes three basic meta-criteria in indicator selection processes: (i) conceptual coherence, (ii) operational coherence and (iii) utility (Table 3). Such a framing could be particularly useful since it explicitly distinguishes conceptual and operational issues. It also introduces a chronological distinction between criteria referring to the indicator development stage and those relating to indicator use. Further lists of selection criteria that may be helpful are suggested by Dale and Beyeler (2001), Parris and Kates (2003) and Niemeijer and de Groot (2008), to cite just a few. Regrettably, a comprehensive typology based on an extensive literature review is lacking for the moment.

Table 3. Indicator selection criteria suggested by Cloquell-Ballester et al. (2006)

	Selection criteria to be considered
Conceptual coherence	• The definition of the indicator and the concepts that comprise it are suitable. • There is a correspondence between the indicator and the factor to be quantified. • The interpretation and meaning of the indicator are suitable.
Operational coherence	• The mathematical formulation suitably quantifies the intended concept of the indicator. • The data used to establish the indicator and its units are suitable. • The proposed measurement procedures to obtain the indicator are suitable, allowing for its reproduction and comparison. • The indicator's accuracy is suitable and is sensitive to changes in the factor.
Utility	• The indicator is suitably reliable. • The source of data for the indicator is reliable. • The data are accessible. • The indicator is applicable. • The information provided by the indicator is reliable. • The information for the indicator can be obtained at an acceptable cost.

Source: Cloquell-Ballester et al. (2006: 87).

As comparison of these various sets of criteria illustrates, selection criteria sets do not match perfectly with each other, and some criteria – for instance, "relevance" – clearly are understood in divergent ways. As noted, such a cacophonic literature requires practitioners to identify **ex ante** (i.e., at early assessment stages) which criteria they deem most pertinent for their own measurement framework. Such a preliminary determination is particularly important in inclusive selection processes. Indeed, when the rules for selection are not clear and understandable from the beginning, participants might distrust the process and quit prematurely.

II. Lessons from Exploring Selection Criteria

What lessons can we draw from this brief overview of typologies and conceptualizations?

First, **an unequivocal and universally accepted menu of selection criteria does not exist**. There are almost as many sets of selection criteria as sustainability/GE measurement frameworks. This is not necessarily a problem. Indeed, the creation of a single consensually agreed and perfectly replicable set of selection criteria is neither feasible nor desirable. What makes a good indicator actually depends on the context in which the assessment takes place and its specific goals. Just as we cannot evaluate the quality of a pair of shoes without considering why we want them (for hiking? dancing? attending a job interview?), neither can we judge the suitability of an indicator without taking into account how we want to apply its information. Indicators do not exist in isolation from their specific function and their institutional context (Cartwright 2000; Briassoulis 2001).

What makes a good indicator depends on the context of the assessment and its goals.

Hence, **before starting the selection process, practitioners should think carefully about the actual roles that indicators might play in their assessment** (Sebastien et al. 2014; Lethonen et al.

2016). Will indicators be used as direct inputs to specific decisions (instrumental role)? Or, rather, will they convey particular perspectives to the policy arena (conceptual role)? Or, instead, will they be used as influential language(s) within the policy agenda, for instance, by highlighting particular neglected issues (political role)?

Also, **practitioners should carefully reflect on the purposes of their assessment.** Indeed, a good indicator for tracking performance (results-based evaluations) might not be suitable for discriminating among competing hypotheses (scientific exploration) or for comparing alternative policies (decision analysis) (see Failing and Gregory 2003).

Additionally, it is important that practitioners consider both their **temporal and budgetary constraints** before designing the selection process and deciding which criteria to apply when selecting indicators. When selection processes focus on reducing large lists of candidate indicators, the systematic application of certain criteria might be time-consuming and expensive.

Second, all the sets of selection criteria presented earlier must be understood as theoretical typologies, describing how "ideal" indicators should look. In actual practice **very few indicators (and perhaps none) meet all suggested selection criteria**. This is due in part to the fact that some of these criteria are mutually exclusive. A good illustration is the challenging balance that practitioners often need to find between "technical accuracy" and "social resonance". Indicators that are scientifically sound, robust and credible are quite often difficult for laypersons to interpret. (Some authors call them 'cold' indicators.) As a result they fail to reach wider audiences. By contrast, technicians often reject indicators that other people can most readily grasp (i.e., "hot" indicators), generally because they lack scientific rigor and/or statistical precision (Abbot and Guijt 1998; Cartwright 2000). Taking biodiversity as an example, typical "hot" indicators would be "Number of endangered species" or "Protected area coverage", which are easily understandable and may resonate for non-experts. Potential "cold" indicators for the same issue are: "Human appropriation of net primary production", "Trends in nitrogen deposition" or "Marine trophic index".

Another example that illustrates the **trade-offs and sacrifices** that are made when considering several selection criteria at the same time is the inherent incompatibility between "parsimony" (i.e., measurement frameworks should be presented with as much simplicity as possible) and "comprehensiveness" (the full suite of indicators should cover all pertinent issues). A way to reconcile these two competing goals in a consistent manner is presented at the end of this session.

There also exist **synergies** between selection criteria. For instance, if an indicator relies on openly accessible data and is developed inclusively (i.e., involving key stakeholders) and transparently (i.e., the assumptions relied on are made explicit, uncertainties are clearly outlined, calculations are explained in depth), potential users are more likely to see it as legitimate.

Third, given the large number of potential selection criteria and the diversity of competing classifications, practitioners may feel overwhelmed by such complexity and cacophony. One way to overcome this feeling and to be able to deal with the fuzziness that characterize the so-called indicators "industry" is by considering very basic dichotomies. For instance, **we strongly encourage practitioners to distinguish selection criteria that refer to indicators individually** (e.g., data availability, conceptual soundness, international comparability) **from those relating to a set of indicators** (e.g., diversity, holistic perspective, parsimony, comprehensiveness) (see, for instance, Swart et al. 1995; Niemeijer and de Groot 2008; de Olde et al. 2017). Such differentiation will increase the clarity of the selection process.

In the same sense, it might be particularly helpful to **differentiate selection criteria according to whether they refer to data collection** (e.g., data affordability, timeliness, reliability), **indicator development** (e.g., specificity, sensitivity) **or indicator use** (e.g., resonance, legitimacy). As many authors have emphasized, indicators are much more than mere statistics or simple data. Therefore, selection criteria should be grouped, and subsequently applied, considering such distinctions.

Fourth, as stated by some sets of criteria presented here, **any new GE measurement framework must rely on a clear vision or definition of the GE concept**. Such a requirement might seem a mere formality. It is not. Concepts and indicators are two sides of the same coin, and the GE is a particularly ambiguous notion. Merino-Saum et al. (2019, forthcoming) identified no fewer than 95 different GE definitions. These definitions focus on such varied issues as economic growth, well-being, equity and the supply-side forces driving development. Given this backdrop, and as a way to prevent misunderstandings, practitioners considering any particular measurement framework should not take for granted how that framework conceptualizes a GE or what achieving it might involve.

Fifth, both the appropriate number and the pertinence of selection criteria will also depend on the starting point of the selection process – i.e., the initial number of potential indicators – and the targeted number of indicators to be included in the final set. Obviously, it is not the same to screen and rank 40 indicators or almost 300 indicators, as Merino-Saum et al. (2018) did. Clearly, the selection process must be different.

III. Which Selection Criteria do GE Measurement Frameworks Take into Account?

We propose now to look more closely at some specific GE measurement frameworks and explore how they selected the indicators they propose. The goal in this manual is not an exhaustive comparative analysis of all GE indicator-based approaches. Rather, we present some illustrative examples and point out the most important lessons.

The case of the Organisation for Economic Cooperation and Development (OECD) and its Green Growth Indicators (OECD 2014; 2017) is particularly illustrative – in part because the same institution suggests three different sets of selection criteria to be used depending on the particular context at hand. First, OECD (2014: 18) notes that indicators need to be: (i) embedded in a conceptual framework, (ii) based on internationally comparable data, and (iii) selected according to well-specified criteria (without providing any further detail). In its 2017 report the organization suggests slightly different criteria for selecting its headline indicators (a subset of key metrics chosen for particular attention from the entire indicator set): OECD headline indicators must: (i) capture the interface between the environment and the economy, (ii) be easy to communicate for multiple users and audiences, (iii) be aligned with the OECD measurement framework for green growth, and (iv) be measurable and comparable across countries (OECD 2017: 17). Finally, OECD suggests a third set of selection criteria when it comes to downscale the measurement framework to the national level. In such a context OECD (2014: 30) prioritizes indicators that: (i) adequately reflect national circumstances and policy issues, (ii) adequately reflect the linkages between economic growth and environmental issues, (iii) are relevant, sound and measurable and (iv) fit the national context by referring to aspects of particular importance to the country. Additionally, all indicators considered together must (v) include both internationally comparable measures and country-specific metrics.

In its well-known working paper on green economy indicators, the Green Growth Knowledge Platform (GGKP) (2016) suggests selecting indicators on the basis of (i) data quality and availability, (ii) analytical soundness, (iii) methodological transparency, (iv) policy relevance and (v) ease of communication and interpretation. Additionally, (vi) the underlying data should allow analysis at different levels of detail or aggregation (GGKP 2016: 31).

Finally, according to the Partnership for Action on Green Economy (PAGE 2017a), indicators included in the global application of the GEP Measurement Framework are supposed to: (i) be related to the challenges that an Inclusive Green Economy seeks to address, (ii) rely on high quality data with adequate coverage over time, (iii) be based on data publically available through international organizations and (iv) be widely recognized as addressing a planetary boundary (only for those indicators included in the Dashboard of Sustainability) (PAGE 2017a: 13-14).

PAGE insists also that indicators must be explicitly linked to the vision, paradigm or challenge that the framework addresses. In other words, **indicators must be expressly related to each other and collectively through a consolidating overall narrative.** Otherwise, they might easily be out of scope and potentially lack pertinence.

IV. Which Indicators should GE Measurement Frameworks Adopt?

This is a tricky question. As frequently stated in the reports published by most international organizations active in the GE field, international measurement frameworks should not be applied automatically at the national scale. Instead, indicator selection should reflect what makes each country distinct from others from political, social, economic and environmental points of view. In that sense, although international indicator sets might shape what we call the GE global narrative, and although they might establish the conceptual and methodological context in which national initiatives will be deployed, they are not suitable to cover local idiosyncrasies and/or to address case-specific interests. Application at the national level necessarily calls for flexibility and adaptability.

That said, a global GE narrative can still be a source of inspiration for national authorities seeking to develop their own measurement framework. Indicator sets developed by UN Environment, European Union, OECD, the Global Green Growth Institute (GGGI), GGKP (and others) can serve as a reference, either a starting point from which national authorities further develop their own set of indicators or a comparative grid used **ex post** to check how close their own national selection comes to the global GE narrative.

Table 4 lists the 14 most frequently used indicators in the sample of 14 indicator sets considered by Merino-Saum et al. (2018). It is important to note that an indicator can be understood in different ways across measurement frameworks and organizations involving, further, more varied levels of granularity. Therefore, to build an overall global "catalogue" of candidate indicators, the authors consolidated the collected indicators into common umbrella concepts. For that reason Table 4 shows that some frameworks use the same indicator more than once. The table shows that global organizations give some issues particular attention: **waste** (e.g., "waste generation", "waste recycling"); **energy** ("energy intensity", "renewable energy share") and **climate change** ("CO_2 emissions", "GHG emissions").

It is also worth noting the particular emphasis that international GE measurement frameworks place on measures of **decoupling** (i.e., indicators focusing on productivity/intensity ratios) such as "carbon intensity", "material productivity" or "water intensity". This emphasis fits with the conceptual foundations of the GE, as defined in most international reports. As several authors have noted, the GE concept pays particular attention to the ways and extent to which economic development and environmental protection can be made compatible.

Indicator selection should reflect what makes each country distinct politically, socially, economically and environmentally.

Table 4. Most frequently used indicators in GE international measurement frameworks

	OECD (2017)	UNESCAP (2013)	NETGREEN (2015)	ESPON (2014)	UNEP (2012)	PAGE (2017)	GGKP (2016)	EC (2011)	EEA (2012)	EEA (2016)	GGGI (2013)	Dual Citizen LLC (2016)	Tot. Gross Ind.	Tot. Framework
Energy intensity	2	1		1	1	1	2	2	1		1		12	9
Waste generation		1			1		2	1	1	1	1		8	7
Waste recycling		1		1	1		1.5	1		1		1	7.5	7
Carbon intensity/productivity	2			1	2		2				1	1	9	6
Co2 emissions				1	1		2.5	1			2	1	8.5	6
Forest area	0.5	1			1		2				3	1	8.5	6
Material intensity/productivity	2	1.5			2		0.5	1		1			8	6
Renewable energy share	1	0.5			1	0.5		0.5		0.5			4	6
GHG emissions (by gas and by sector)		1				1	1.5		2	2			7.5	5
Energy consumption (+/- disaggregated)				1	1				2	1	2		7	5
Land and marine conservation areas					1	1	1		1		2		6	5
Employment in EGS sector		1			1		1	1		0.5			4.5	5
Water intensity	1	0.5			1		1				1		4.5	5
Level of environmentally-related tax revenues	0.5	1					1	0.5		0.5			3.5	5

GHG = greenhouse gasses; **EGS** = environmental goods and services
Note: Numbers in cells indicate the number of times the indicator appears. If the indicator was a component in an aggregated indicator, it was counted as 0.5.
Source: Merino-Saum et al. (2018).

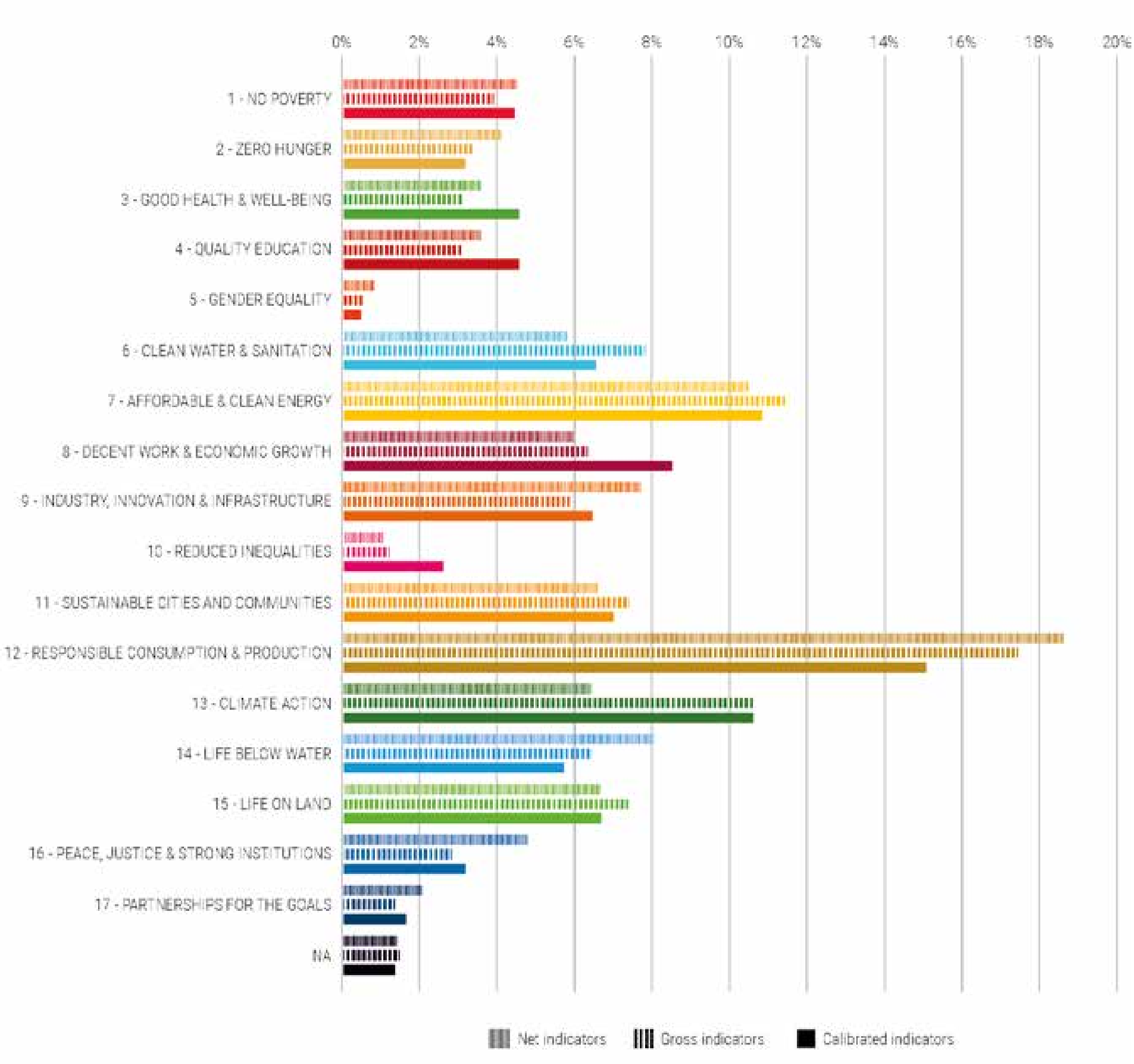
Another interesting observation from Table 4 is that traditional economic indicators such as GDP growth are not that frequently used in GE measurement frameworks (no purely economic indicator appears among those most frequently identified). That does not mean that these measures are not considered in GE frameworks. Actually, pure economic measures are implicitly embedded in resource intensity/ productivity ratios.

International frameworks often emphasize decoupling, which reflect ratios of natural resource use or degradation to economic output.

At the aggregate level, the frequency of indicators in GE measurement frameworks can be related to complementary typologies – for example, the Sustainable Development Goals (SDGs), SDG 12 [Responsible Consumption and Production] is the most frequent related SDG, linked to 15% per cent of the sample of indicators (Figure 1). This SDG appears approximately 1.5 times more often than the second and third most frequent SDGs, SDG 7 [Affordable and Clean Energy]) and SDG 13 [Climate Action].

SDG 12 [Responsible Consumption and Production] is the SDG most frequently related to GE measurement frameworks.

Figure 1 Coverage of Sustainable Development Goals by GE/GG indicators suggested in international frameworks



Note: "Gross indicators" include all the indicators exactly as they appear in the initiatives included in the sample (i.e., without homogenizing descriptive levels). "Net indicators" rely on a transformation stage in which the research team re-shaped the original indicators and express them at a common descriptive level (for instance, some indices were disaggregated into several simple indicators). Finally, "calibrated indicators" are based on a weighting system through which each initiative received exactly the same importance in the statistical analysis independent of the number of original indicators it includes.

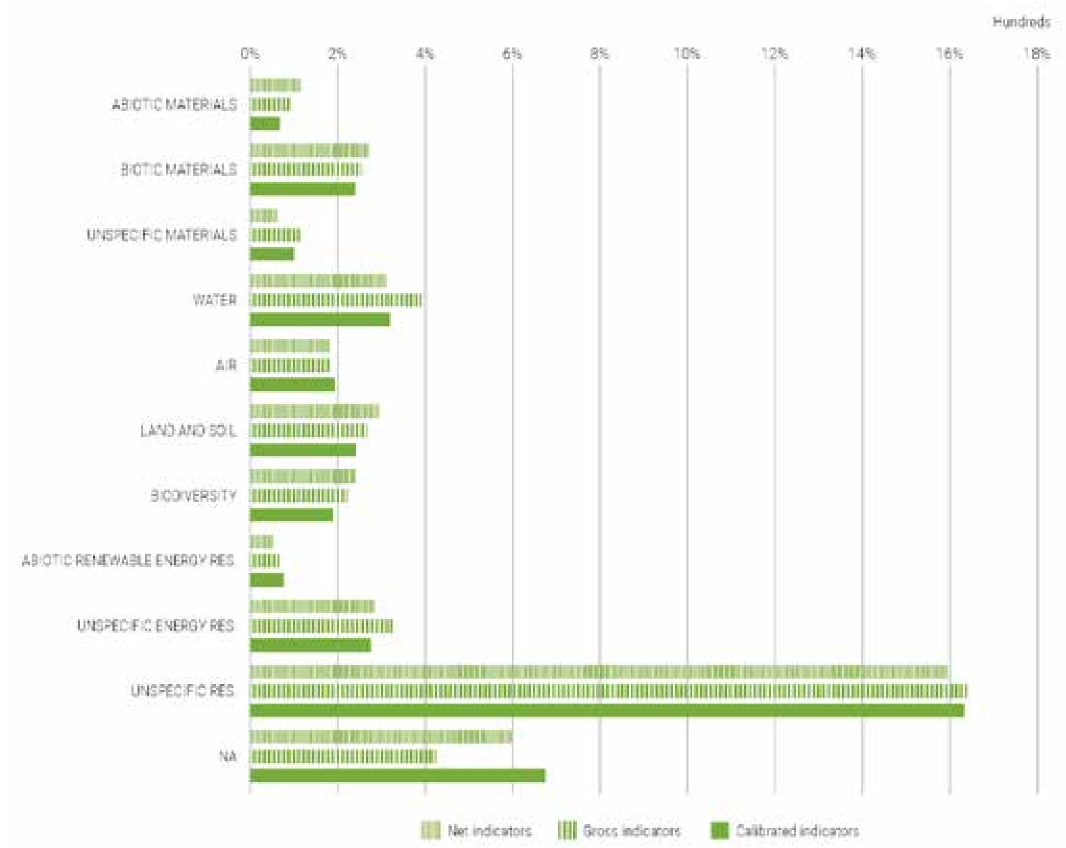
Source: Merino-Saum et al. (2018: 94).

Among the remaining SDGs, eight are particularly weakly represented (SDGs 1, 2, 3, 4, 5, 10, 16 and 17). SDGs 4 [Quality Education], 5 [Gender Equality] and 17 [Partnerships for the Goals] have been largely ignored so far by GE/GG frameworks. None of these three SDGs exceeded representation above 5 per cent in any framework. These weakly represented SDGs focus primarily on the social dimension of sustainability (Barbier and Burgess 2017). This suggests that, despite its stated objectives of social inclusion, the global GE narrative does not put strong emphasis on measurement of these issues. Of course, significant differences exist across frameworks, which, furthermore, can be upgraded in future.

The vast majority of GE indicators (85 per cent) are linked either explicitly or implicitly to natural resources (Figure 2). Most often, GE indicators relate indistinctly to several categories of natural resources. Although they have a link with natural resources or with some aspects of them (e.g., availability, affordability, quality, related impacts), they do not explicitly refer to any specific resource. Some examples are "environmental protection expenditure", "ecological footprint" and "green trade".

The vast majority of GE indicators (85 per cent) are linked either explicitly or implicitly to natural resources.

Figure 2 Coverage of natural resources by indicators suggested in international Green Economy/Green Growth frameworks



Source: Merino-Saum et al. (2018: 95).

Figure 2 also shows that GE/GG measurement frameworks pay special attention to material resources (which represent altogether around 10 per cent of indicators), and more particularly to biotic materials. Energy resources are also frequently mentioned: Unspecific energy resources and abiotic renewable energy resources account for almost 9 per cent of indicators. Finally, a significant number of indicators refer to water (8 per cent), which draws more attention than other resources such as land and soil (6 per cent), air (5 per cent) and biodiversity (5 per cent).

Finally, let us note that most of the remaining indicators (i.e., those not linked to natural resources) relate to social–institutional dimensions (e.g., "literacy rate", "road traffic fatalities", "European quality of government index", "official development assistance"). A few unrelated indicators also refer to economic issues (e.g., "foreign direct investment", "labour productivity"). Regarding SDG 8 [Decent Work and Economic Growth], one of the most important challenges is the measurement of its green aspects. The application of the Green Jobs Assessment Model, or GJAM, by ILO has contribute to the measurement of important social indicators (e.g., jobs, skills, gender, growth, income distribution) by the construction of policy scenarios in a macro-economic modelling framework based on input–output tables (IOT) or the Social Accounting Matrix (SAM).[7]

V. How to Deal in Practice with Competing Selection Criteria

There are various ways to meaningfully apply multiple (and potentially mutually exclusive) selection criteria. For instance, practitioners might apply statistical tools, such as Principal Component Analysis (PCA), which involves the use of more or less sophisticated algorithms to reduce the underlying complexity and arrive at a final set of indicators. An alternative is to approach the problem through multi-criteria reasoning and apply specific decision-aid methods (e.g., outranking approaches, analytical hierarchy process). The risk with these methods is creating "black boxes" that participants and potential users do not understand.

In this manual we present a simple approach based largely on the Green Cube introduced in Session 2. An actual indicator selection process in South Africa used this approach successfully. In South Africa the goal of the process was to reduce an initial set of 270 candidate indicators to a final list of approximately 20. This smaller set of indicators was subsequently implemented through the GEP Measurement Framework. It involved representatives of five national departments. We present this experience here to illustrate how "comprehensiveness" and "parsimony" – ostensibly conflicting selection criteria – might be applied in the same selection process. At a first stage, participants were given a catalogue of candidate indicators taken from existing South African indicator sets from initiatives dealing with sustainability and GE issues. These initiatives had been either suggested by the participants themselves or found by the research team through literature review. All of them were collectively considered to be legitimate sources of information. Participants received this catalogue of indicators as a basic EXCEL file in which all identified candidate indicators were classified by related SDGs. As a result, participants were able to try various filters and so explore available metrics for each SDG. (The indicator screening had been done beforehand by the research team, based on Merino-Saum et al. (2018).

During the consultation, each participant was invited to select up to 20 indicators from the EXCEL file. Participants were also given the opportunity to choose from among their own selection up to five key indicators (i.e., those they deemed particularly relevant for GE in South Africa). The research team collected the indicator sets suggested by the participants and added them into a new catalogue, which finally consisted of 65 unique indicators.

7 For a description of the GJAM methodology, see ILO (2017).

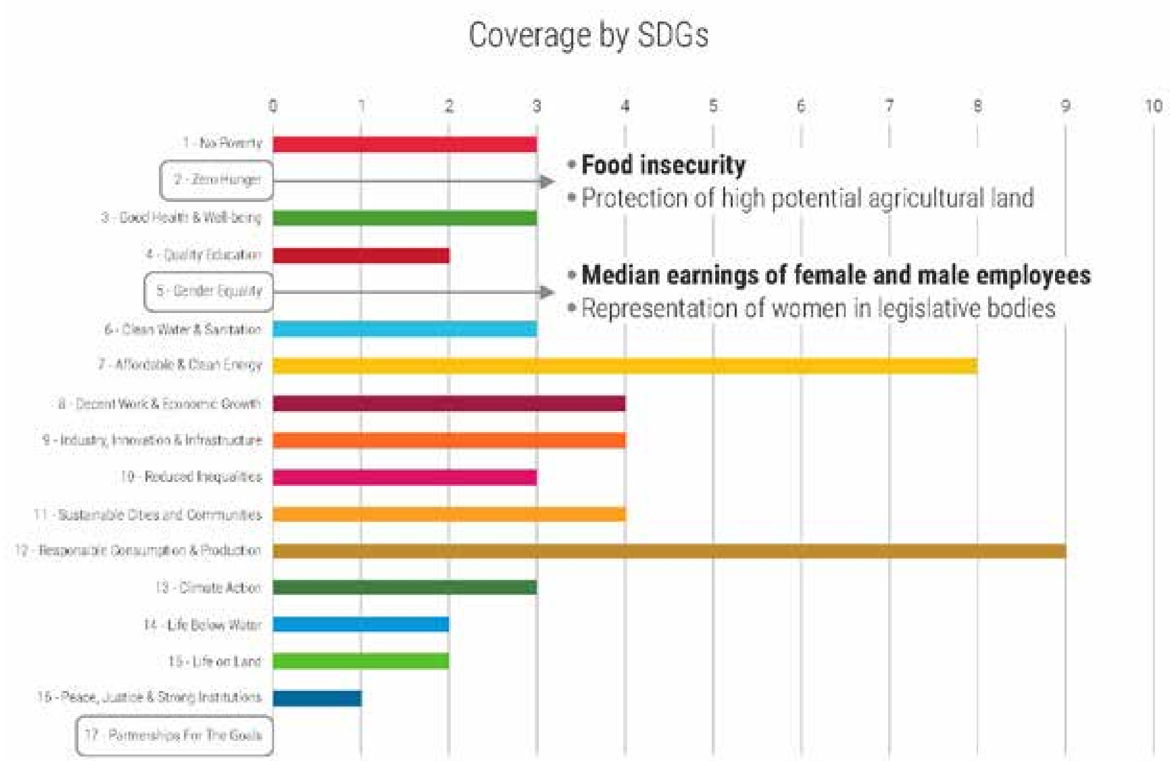
As a way to reduce the complexity inherent in the 65 suggested indicators, the research team decided to consider only those that were particularly salient. Saliency was measured as follows: Each suggested indicator was attributed 1 point (one for each participant's survey in which it had been included) and 3 points when a participant had selected it as a key metric. Then, the points from all the surveys were added to arrive at an overall score for saliency.

The rule applied to filter the indicators was to retain only those with a saliency score of at least 3 points. In other words, indicators were kept only if they fulfilled at least one the two following principles: (i) at least one participant had identified the indicator as key; (ii) at least three participants had selected the indicator. This filtering led to a final set of 33 indicators.

This set of 33 indicators was methodically screened across natural resources and environmental functions (in addition to the previous screening in terms of SDGs) – i.e., along the three dimensions of the Green Cube (described in Session 2). The results of this screening served as a radar signalling potential gaps in the preliminary selection.

Figure 3 shows the results of the consultation process in terms of SDGs coverage. Gaps (SDGs 2, 5 and 17) are in boxes. Indicators suggested by participants (but not included in the set of 33) to fill the gaps are noted with bullets; those in dark type were identified by the facilitators as most easily measured. SDG 17, Partnerships for the goals, was not considered crucial to South Africa. The objective of such a screening was not necessarily to assure that the selected indicators refer to all SDGs (or natural resources or environmental functions, for that matter). Rather, the

Figure 3 Results from the consultation process in terms of SDGs in South Africa – gaps and suggested indicators (the coverage is expressed as the number or related indicators)



Note: "Coverage by SDGs" indicates the number of indicators related to each SDG.
Source: authors' elaboration

goal was to alert participants in case particular issues were missed in the preliminary selection and so to foster deliberate consideration of their pertinence.

Once gaps were identified, the analysis focused on elucidating implicit overlaps among the selected indicators. To do that, the three dimensions of the Green Cube were used to build a similarity matrix. A similarity matrix is a symmetrical table crossing indicators with each other. It is conceived as a heat map, expressing the level of similarity between each pair of indicators in terms of shared SDGs, natural resources (NRs) and environmental functions (EFs). Each shared SDG, NR or EF scores one point on a similarity scale. Pairs of indicators with a level of similarity of 3 or more (as the number of dimensions considered in the analysis) were considered potentially redundant.

Based on these results, the research team suggested several clusters (Table 5), which led to the removal of 12 indicators whose information was considered already conveyed by other indicators.

Table 5. Clusters suggested by the research team (parsimony filter)

Indicators	Condensation process suggested by the research team	Indicators suggested by the research team*
• GHG emissions	Select one	GHG emissions
• CO2 emissions		
• Total employment	Select one	Unemployment rate (by sex, age and persons with disabilities)
• Unemployment rate (by sex, age and persons with disabilities)		
• Climate change adaptation frameworks	Select one	Climate change adaptation frameworks
• Implementation of National Strategy for Sustainable Development and Action Plan		
• Expansion and implementation of environmental sectors	Select one	Expansion and implementation of environmental sectors
• Green growth contribution to economic growth		
• Green investment (finance/capital/incentives/subsidies)		
• Priority area air quality indices (PAAQIs) (PM10 and SO2)	Select one	Priority area air quality indices (PAAQIs) (PM10 and SO2)
• Annual mean levels of fine particulate matter (PM2.5 and PM10) in cities		
• Electricity produced from renewable sources	Select just 3 indicators to deal with: (i) renewables, (ii) energy efficiency (iii) energy accessibility	(i) Renewable power generation
• Renewable power generation		
• Amount of renewable energy at annual operating capacity (by type of technology)		
• Population relying primarily on clean fuels and technology		(ii) Energy efficiency improvements
• Renewable energy share in total final energy consumption		
• Energy efficiency improvements		(iii) Population with access to electricity
• Population that uses solar energy as their main source of energy		
• Population with access to electricity		

GHG = greenhouse gasses; PM = particulate matter

*The research team based its suggestions on technical criteria such as measurability, international comparability and suitability for the GEP measurement framework.

Source: authors' elaboration.

Table 6 presents the set of indicators derived from both consultation and the consideration of four key selection criteria: salience, parsimony, comprehensiveness, and measurability. At the time of writing this manual, local actors were continuing to discussing this set before its final validation.

Table 6. Suggested set of GE indicators for South Africa based on salience, comprehensiveness, parsimony and measurability

	Indicators	Units	SDGs																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Climate change adaptation framework (i) for major biomes & aquatic ecosystems (ii) integrated into national sectoral plans	# biomes # sectors													13	14	15		
2	GHG Emissions	Mt CO2 eq									9				13				
3	Water use efficiency	Water use/actual water withdrawal						6											
4	Life Expectancy	years			3														
5	Renewable power generation	GW/hour							7										
6	Terrestrial Biodiversity Protection Index	index															15		
7	Municipal Waste diverted from landfills for recycling	% municipal waste											11	12					
8	Unemployment rate (by sex,age and persons with disabilities)	percentage								8									
9	Green Patents	# Patents in Green Techonologies									9			12					
10	Expansion and implementation of Environmental sectors	# Job Opportunities								8				12					
11	Energy Efficiency Improvements	% improvements							7										
12	Priority Area Air Quality Indices	Index			3								11						
13	Gini Coefficient	index										10							
14	Population in a given age group achieving at least a fixed level of proficiency in functional literacy and numeracy skills (by sex)	% population; rate of improvement				4													
15	Population using safety managed drinking water services	% population						6				10							
16	Population with access to electricity	% population	1						7			10							
17	Poverty Gap Index	index	1																
18	R&D expenditure (from public and private sources)	% GDP									9								
19	Protection of high potential agricultural land	% land considered high potential		2															
20	Food insecurity in population (based on the Community Childood Hunger Identification Project -CCHP-index)	% - index		2															
21	Representation of women in legislative bodies	# women %					5											16	

Source: authors' elaboration.

VI. Next steps

Once participants in the selection process have validated a reduced set of indicators, it is time to make the set operational by populating the measurement framework with the required data and then perhaps calculating an aggregate index, assessing progress (or regression) by comparing time periods and generating a narrative analysis for policymakers and the public.

At the stage of populating the measurement framework, practitioners may find that data for some of the selected indicators are not available for the desired time period or that their format does not suit the methodology. This can happen even when preliminary checking was done at initial stages of the selection process. If it does happen, the process presented in the preceding pages (e.g., indicator screening, similarity matrix) might be applied iteratively and, thus, serve as a basis for identifying the most suitable proxies for indicators that prove unavailable.

If, for operational reasons, previously validated indicators are replaced by other indicators that had not been selected, all actors involved must be informed about the replacement. Otherwise, the resulting set might be contested in the future, and the acceptability of the entire process could be questioned.

We strongly suggest that, before moving to further analysis of data, practitioners (i) qualitatively define each validated indicator (when such a definition is not available or is controversial) and (ii) specify the units of measurement that will be used. Indeed, the concept of "indicator" is quite ambiguous and might involve very different descriptive levels from one person or context to another.

Review and discussion questions for Session 4

- Which selection criteria are commonly applied in sustainability and/or GE measurement initiatives?
- How might potential selection criteria be organized into a limited number of meaningful categories?
- What factors must be considered before deciding which selection criteria will be applied?
- What are the most frequently used indicators in international GE measurement frameworks? What issues do these frameworks usually give the most attention?

Sources

Abbot, J., and I. Guijt (1998). Changing views on change: participatory approaches to monitoring the environment. *Sustainable Agriculture and Rural Livelihoods Discussion Paper,* No. 2. London: International Institute for Environment and Development (IIED).

Barbier, E.B., and J.C. Burgess (2017). The Sustainable Development Goals and the systems approach to sustainability. *Economics: The Open-Access, Open-Assessment E-Journal*, vol. 11 (2017–28), pp. 1–22.

Briassoulis, H. (2001). Sustainable development and its indicators: through a (planner's) glass darkly. *Journal of Environmental Planning and Management*, vol. 44, No. 3, pp. 409–427.

Cartwright, L.E. (2000). Selecting local sustainable development indicators: Does consensus exist in their choice and purpose? *Planning Practice & Research*, vol. 15, No. 1–2, pp. 65–78.

Cloquell-Ballester, V.A., R. Monterde-Díaz and M.C. Santamarina-Siurana (2006). Indicators validation for the improvement of environmental and social impact quantitative assessment. *Environmental Impact Assessment Review*, vol. 26, No. 1 , pp. 79–105.

Dale, V.H., and S.C. Beyeler (2001). Challenges in the development and use of ecological indicators. *Ecological Indicators*, vol. 1, No. 1, pp. 3–10.

de Olde, E.M., and others (2017). When experts disagree: the need to rethink indicator selection for assessing sustainability of agriculture. *Environment, Development and Sustainability*, vol. 19, No. 4, pp. 1327–1342.

Doran, G. T. (1981). There's a S.M.A.R.T. way to write management's goals and objectives. *Management Review*, vol. 70, pp. 35–36.

Failing, L., and R. Gregory (2003). "Ten common mistakes in designing biodiversity indicators for forest policy. *Journal of Environmental Management*, vol. 68, pp. 121–132.

Green Growth Knowledge Platform (GGKP) (2016). *Measuring Inclusive Green Growth at the Country level. Taking Stocks of Measurement Approaches and Indicators*. Working Paper 02–2016. GGKP Research Committee on Measurement & Indicators.

Hardi, P. and T. Zdan (1997). *Assessing Sustainable Development*. International Institute for Sustainable Development. Winnipeg, Canada.

Hezri, A.A. (2004). Sustainability indicator system and policy processes in Malaysia: a framework for utilisation and learning. *Journal of Environmental Management*, vol. 73, pp. 357–371.

Instituite for Sustainable Development (IISD) (2009). *Bellagio STAMP: Sustainability Assessment and Measurement Principles*. Winnipeg, Canada.

International Labour Organization (ILO) (2017). *How to Measure and Model Social and Employment Outcomes of Climate and Sustainable Development Policies*. Green Jobs Assessment Institutions Network. Geneva.

Lehtonen, M., L. Sébastien and T. Bauler (2016). The multiple roles of sustainability indicators in informational governance: between intended use and unanticipated influence. *Current Opinion in Environmental Sustainability*, vol. 18, pp. 1–9.

Merino-Saum, A., and others (2018). Articulating natural resources and sustainable development goals through Green Economy Indicators: a systematic analysis. *Resources, Conservation and Recycling*, vol. 139, pp. 90–103.

Merino-Saum, A., and others (2019). Unpacking the green economy concept: a quantitative analysis of 140 definitions. *Journal of Cleaner Production* (in press).

Niemeijer, D., and R. de Groot (2008). A conceptual framework for selecting environmental indicator sets. *Ecological Indicators*, vol. 8, pp. 14–25.

Organisation for Economic Co-operation and Development (OECD) (2001). *OECD Environmental Indicators: Towards Sustainable Development*. Paris.

_________ (OECD) (2014). Green Growth Indicators 2014. *OECD Green Growth Studies*. Paris.

_________ (2017). Green Growth Indicators 2017. *OECD Green Growth Studies*. Paris.

Partnership for Action on Green Economy (PAGE) (2017a). *The Green Economy Progress Measurement Framework – Application*.

_________ (2017b). *The Green Economy Progress Measurement Framework – Methodology*.

Parris, T.M., and R.W. Kates (2003). Characterizing and measuring sustainable development. *Annual Review of Environment and Resources*, vol. 28, pp. 559–86.

Pintér, L., and others (2012). Bellagio STAMP: Principles for sustainability assessment and measurement. *Ecological Indicators*, vol. 17, pp. 20–28.

Sébastien, L., T. Bauler and M. Lehtonen (2014). Can indicators bridge the gap between science and policy? an exploration into the (non)use and (non)influence of indicators in UE and UK policy making. *Nature and Culture*, vol. 9, No. 3, pp. 316–343.

Swart, R.J., and others (1995). *Scanning the Global Environment: A Framework and Methodology for Integrated Environmental Reporting and Assessment*. Report No. 402001002. Bilthoven, Netherlands: National Institute for Public Health and the Environment (RIVM).

Conclusion

This introductory training on Indicators for Inclusive Green Economy (IGE) presents the concept of indicators to support policymaking for an IGE. It illustrates the use of a wide range of methodologies for selecting and applying indicators. It seeks to enable course participants to choose indicators for an IGE relevant to their country contexts and thereafter generate a narrative analysis on IGE.

PAGE has developed a methodology to support countries in tracking their progress toward an IGE, the Green Economy Progress (GEP) Measurement Framework (PAGE 2017a, 2017b). The advanced manual on IGE indicators, companion to this introductory training, describes this Framework and guides participants through its application to 19 indicators for 105 countries.

The GEP Measurement Framework builds both a composite of 13 indicators, the GEP Index, and a dashboard of six separate indicators crucial to gauging sustainability, the Dashboard of Sustainability. The methodology for building the GEP Index suggests a weighting system that gives greater importance to the indicators most in need of improvement. Also, it suggests a systematic method for setting goals for improvement and for setting thresholds not to be exceeded.

Countries may choose to adopt the GEP Measurement Framework or some parts of its methodology for their own IGE analysis. It may be worth keeping in mind, however, that the Framework was developed, at least in part, to make international comparisons. Therefore, it may not be perfectly suited for application as-is in every country. For example, for global application of the Framework, the number of indicators used had to be kept to 19 that were readily available for a large number of countries. These 19 might not cover all issues of concern to a country. Others among the 19 might be unavailable in a country, but negligible there. Countries considering use of the GEP Measurement Framework will want to review the choice of indicators. Also, the methods for setting goals and thresholds for the GEP Index indicators were devised so that they could apply to every country. As a result, they rely on a systematic mathematical approach. Countries may prefer to take a more policy-oriented approach that emphasizes political preferences and national capacity for change.

At the same time, an inability to populate all the indicators of the GEP Measurement Framework should not discourage a country from monitoring and analyzing those IGE indicators that it can collect. Likewise, lack of time series data should not discourage analysis. Most recent available data can provide a valuable snapshot of conditions and may flag crucial issues. They also can serve as the baseline for later assessment of progress.

Hands-on Exercise: Recreating an Indicator Selection Process[8]

Key points

- Participants are invited to list key priorities for an IGE in a given context (e.g., national scale).
- They are asked to think in a multidimensional way and collaborate with other participants, applying their own understanding and value systems.
- One key goal of the exercise is to understand how political priorities might be translated into a set of operational metrics and the challenges that such a process involves.

This exercise consists of two main phases. First, in an opening-up phase, participants explore and collect as many pertinent issues as possible. Second, in a closing-down phase the participants seek to limit implicit redundancies and to translate features into operational indicators. When too many indicators are on the table, further discussions on priorities may be needed.[8]

Materials and space: Each work group needs a big sheet of white paper (e.g., DIN A1), pens, pads of adhesive notes (e.g., "Post-it" notes) and adhesive ("scotch") tape or adhesive putty. Ideally, each group works in a different room, so that groups can have discussions without disturbing the others. Participants in each work group should be seated around a table, with the big paper placed in the middle of the table.

Estimated total time: 2 hours, 15 minutes

Opening-up phase

STEP 1. IDENTIFYING FOCAL ISSUES IN GROUPS

Trainers ask the participants to form groups of 3–5 persons each (depending on the size of the whole group and the available spaces). It is important that participants from the same organization work in different groups, so that they can interact with people from other organizations, who will have varying interests, different backgrounds and, potentially, diverse worldviews.

Brainstorming key features for an IGE. The first goal of the exercise is that each participant individually suggests the key features she/he considers crucial to an IGE. For this purpose, participants are given a pad of adhesive notes and a pen. They are invited to write down one key feature per note. They can suggest as many features or issues as they deem pertinent. (A potential maximum could be 10/15 per person, but such a limit is flexible).

[8] Albert Merino-Saum devised this exercise.

It is important that participants express their priorities even if the way they are written does not look like an indicator. At this stage, the exercise does not focus on operational measures but rather on arguments, ideas, expectations, etc. Hence, for instance, if a participant suggests "waste" as a key topic, trainers do not need for the moment to go further into details and ask her/him to specify if she/he is thinking about waste collection, treatment, management or recycling. Participants should not be intimidated by technicalities and/or scientific rigor. This first task might last at least 10 minutes.

Mapping features to dimensions. Once participants have completed their individual lists of features, they are asked to fill in the matrix shown below, also presented in Session 2 (Figure 3). The trainer must have drawn or printed such a matrix (an empty version) on each DIN A1 sheet before staring the exercise. The idea is that each participant maps her/his own adhesive notes according to the dimensions that the feature relates to most closely (e.g., social, economic, environmental and/or political). Ideally, participants do this task sequentially, one after the other, so that discussions can emerge from each particular list of features.

Symmetric matrix from the Tetrahedral Model of Sustainability

	SOCIAL	ECONOMIC	ENVIRONMENTAL	POLITICAL
SOCIAL				
ECONOMIC				
ENVIRONMENTAL				
POLITICAL				

Source: adapted from O'Connor (2006: 287).

Small group discussion of mapping results. Once all group members have placed their post-its on the large paper, they can be encouraged to start a discussion based on the resulting matrix. Discussions should focus on:
(i) the overall picture
(ii) explicit duplicates
(iii) gaps
(iv) dissimilar descriptive levels.

Participants should be given approximately 10–15 minutes for this discussion.

Plenary presentation and discussion of mapping results. Once all groups have discussed their matrices, they come back into plenary session for a general discussion. In turn, each group presents its matrices to the others. Ideally, each group is given at most 3–5 minutes, depending on the number of groups. One way to organize this task is to ask each group to designate one or two representatives to present for them. The presenters show the matrix that they have created. If clarifications are needed, questions are allowed after each presentation.

Break. After the last presentation, the trainers declare a break. During this break the trainers aggregate the inputs into a common matrix. We recommend that the trainers methodically transcribe the suggested issues into an MSWord file. Duplicates should be flagged by the number of occurrences in brackets – e.g., "water consumption (3)"; "employment (5)".

STEP 2. RE-CONSIDERING THE LIST OF KEY ISSUES IN A PLENARY WORK SESSION

Discussion of aggregated mapping result. After the break, the trainer shows the resulting aggregated matrix to the participants in plenary and opens a brief discussion, giving participants the opportunity to comment on the results.

Checking for missed issues. After this discussion, the trainer distributes the illustrative schemes provided in Appendix 1, which follows. These are the issues suggested by three international organizations – GGGI, GGKP and UN Environment – for monitoring the Green Economy or Green Growth. Participants are asked to:

(i) carefully consider the issues included in these schemes and then
(ii) suggest those issues that they see as important but were missed during previous steps of the exercise.

Closing-down phase

STEP 3. CLUSTERING ISSUES

Plenary work to reduce redundancy. Before translating issues into operational metrics, the trainer asks the participants to reduce the number of features included in the general matrix by considering potential overlaps and clusters. The idea here is to apply (in a non-systematic way) the notion of redundancy explained in Session 4. Trainers invite participants to reason in terms of SDGs, natural resources and environmental functions, as explained in the introductory course. This is also potentially the right moment to bring together similar issues expressed at different levels of description (e.g., "waste" and "recycled waste at the municipal level"). This discussion might last 15–20 minutes.

STEP 4. TRANSLATING ISSUES INTO METRICS

After at most 20 minutes, the trainer closes the discussion and distributes a new document, Appendix 2. This is a compilation of 112 indicators collected from GGKP, OECD and UN Environment indicator sets on green economy and green growth.

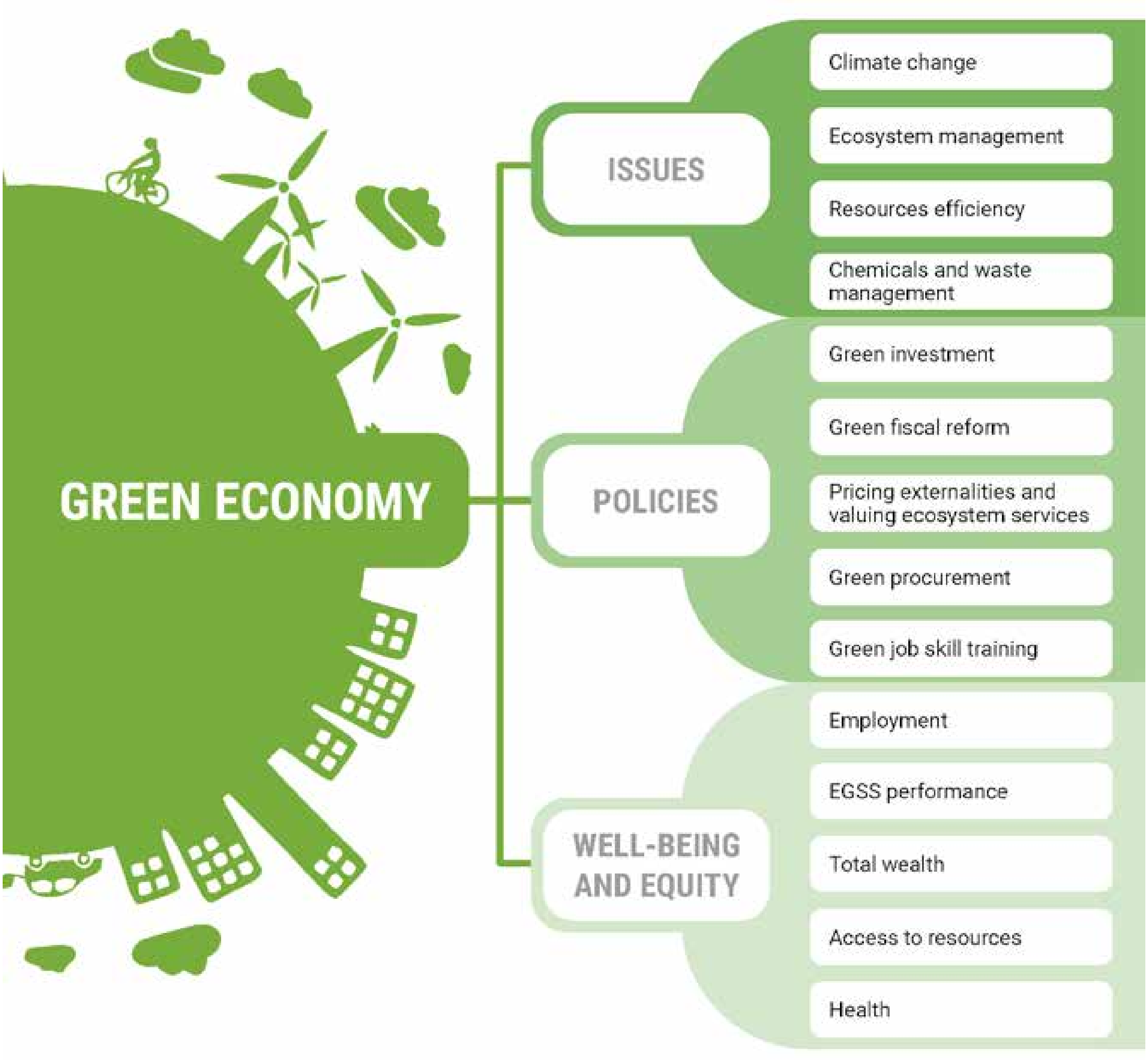
Small group work to identify indicators for issues. Participants are asked to work in small groups. (These groups might be different from those previously formed.) Their task is, working as groups, to relate each feature contained in the general matrix to one indicator from Appendix 2. In case of disagreements, they are invited to discuss and try to convince each other. If a feature is not covered by any of the indicators in Appendix 2, participants are asked to suggest an additional metric that could meaningfully address the issue at hand. The task might last 20–25 minutes.

Plenary work to agree on a concise set of indicators. All participants come back to the initial room for a final session. The goal of this work is to create a final consensus set of around 20 indicators. Again, trainers invite participants to check comprehensiveness and redundancy by looking at the set from the perspective of different typologies (such as SDGs, natural resources, environmental functions).

Feedback. In conclusion, the participants might be asked to give their feedback on the exercise as a way to improve it for further applications.

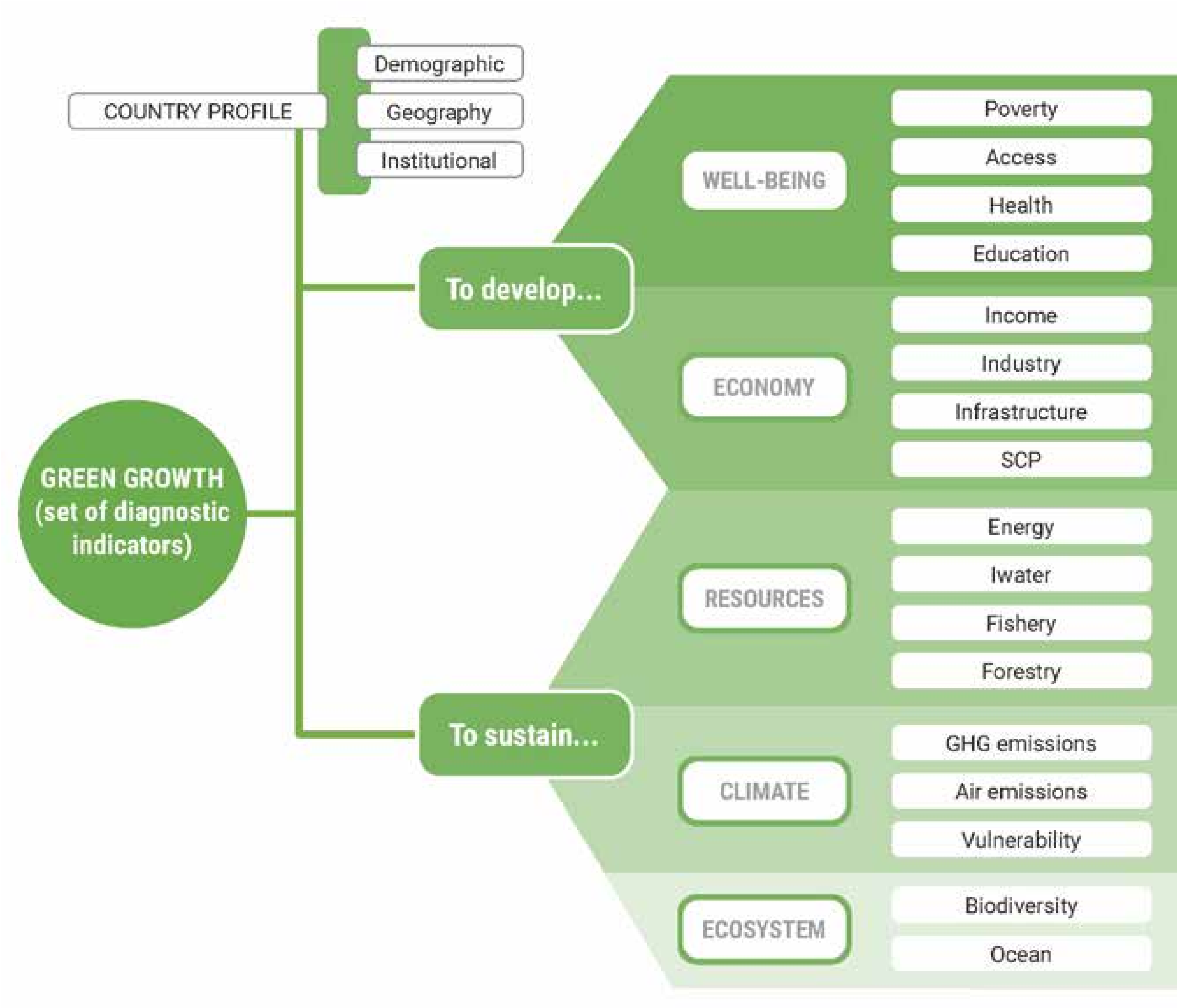
Appendix 1.
Issues considered by GGGI (2013), GGKP (2016) and UN Environment (2012)

Scheme n°1



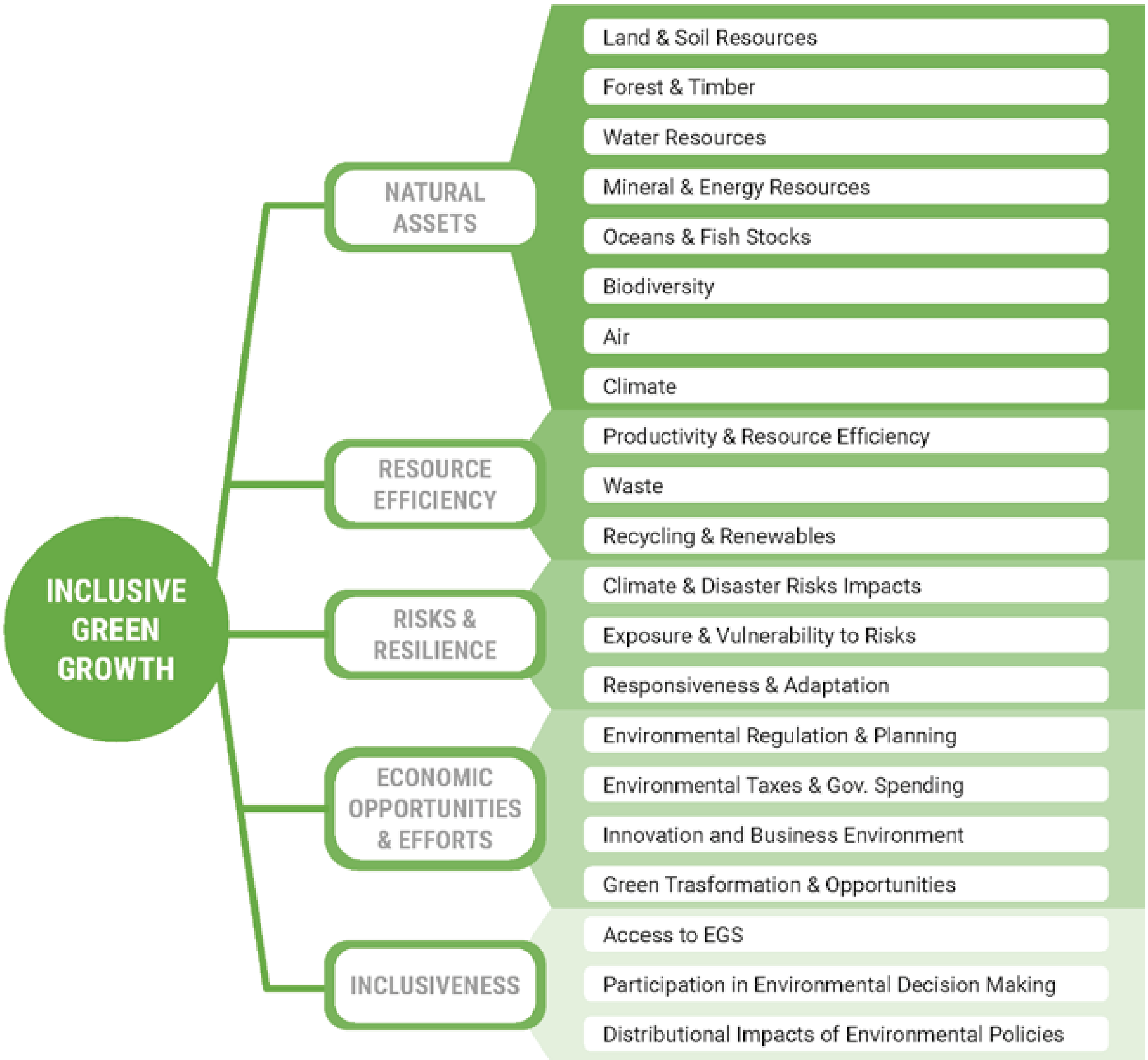
Source: adapted from UNEP (2012).

Scheme n°2



Source: adapted from GGGI (2016).

Scheme n°3



Source: adapted from GGKP (2016).

Appendix 2.
Indicators suggested by UN Environment (2012), GGKP (2016) and OECD (2017)

1	Access to drinking water
2	Access to electricity
3	Access to energy
4	Access to health care
5	Access to sanitation
6	Access to water source
7	Capacity to identify and reduce risks, respond and recover from catastrophes
8	Capacity to pay for disaster recovery
9	Carbon price
10	CO_2 emissions
11	CO_2 intensity/productivity
12	Consumer price index
13	Coverage of different types of social insurance and social transfers
14	Current agricultural area under different crops
15	Domestic material consumption (DMC)
16	Educational attainment: level of and access to education
17	Effects of natural disasters in the past
18	Environmental Goods and Services (EGS) sector investment
19	Electricity production from renewable sources
20	Emissions of air pollutants
21	Employment in construction
22	Employment in EGS sector
23	Energy consumption (+/- disaggregated)
24	Energy intensity
25	Energy pricing
26	Environmental patents
27	Environmental protection expenditure
28	Environmentally adjusted multi-factor productivity (EAMFP)
29	Environmentally induced health problems & related costs
30	Environmentally related subsidies

31	Environmentally related taxation
32	Environment-related innovation in all sectors
33	Expenditure in sustainable procurement
34	Exposure to natural or industrial risks and related economic losses
35	Fish resources
36	Forest area
37	Forest resources
38	Forest resources value
39	Fossil fuel subsidies
40	Fossil fuel taxation
41	Fragility and exposure of human and economic activity in disaster-prone areas
42	Freshwater abstractions (withdrawals)
43	Freshwater resources
44	Future flood risks (expected damages and population exposed)
45	GDP growth and structure
46	Greenhouse gas emissions
47	Gini coefficient
48	Global Aridity Index (rainfall deficit)
49	Green patents
50	Gross nutrient balances in agriculture (nitrates and phosphorus)
51	Gross value added (GVA) in EGS sector
52	Hazardous waste generation and municipal waste collection and treatment
53	Index of natural resources
54	Index of stringency of environmental policies
55	International financial flows of importance to green growth
56	Labour force participation rate
57	Labour productivity
58	Lake and river quality (nitrates and phosphorus)
59	Land and marine conservation areas
60	Land resources
61	Legal, institutional and financial conditions to implement disaster risks management policies
62	Level of harmful chemicals in drinking water
63	Life expectancy
64	Literacy rate
65	Material intensity-productivity (GDP/DMC)
66	Mineral and fossil resources

67	Multi-factor productivity
68	Net annual value addition
69	Net national income
70	Net present value (NPV) of production potential of agricultural land
71	Normalized Difference Vegetation Index
72	Number of dead or missing, injured and homeless caused by natural catastrophes in the past
73	Number of people hospitalized due to air pollution
74	Number of people trained (green job skill training)
75	Number of threatened species
76	Operation and management (employment)
77	Per cent of land under ratified agriculture
78	Per cent of population living less than 5 m above sea level
79	Population exposure to particulate matter
80	Population growth, structure and density
81	Prices of food, crude oil, minerals, ores and metals
82	Production of EGS sector
83	Progress towards disaster risk reduction goals
84	Proportion of fish stocks overexploited or collapsed
85	R&D expenditure for energy technology as per cent of GDP
86	R&D expenditure of importance to GG (+/- disaggregated)
87	R&D investment
88	Relative importance of trade: (exports + imports)/GDP
89	Renewable energy incentive
90	Renewable energy production
91	Road traffic fatalities
92	Species abundance and distribution
93	Standardized Precipitation and Evaporation Index (severity of drought conditions)
94	Topsoil loss of agricultural land
95	Trade weighted unit labour costs
96	Training expenditure (green job skills training)
97	Unemployment rate
98	Value of economic damages and losses due to natural disasters in the past
99	Value of ecosystem services
100	Value of natural resource stocks
101	Vulnerability Index
102	Waste collection

103	Waste generation
104	Waste recycling
105	Waste treatment (landfilled/incinerated/composted)
106	Wastewater treatment
107	Water consumption
108	Water pricing and cost recovery
109	Water productivity/intensity
110	Water stress
111	Wildlife resources
112	Women with secure land ownership

Source: UN Environment (2012); GGKP (2016); OECD (2017).

Sources

Green Growth Knowledge Platform (GGKP) (2016). *Measuring Inclusive Green Growth at the Country Level*.

Organisation for Economic Co-operation and Development (OECD) (2017). *Green Growth Indicators 2017*. Paris: OECD Publishing.

United Nations Environment Programme (UNEP) (2012). *Measuring Progress Towards an Inclusive Green Economy*. Geneva.

Annex: Identifying Indicators to Support the Policymaking Cycle for an Inclusive Green Economy: Country Examples[9]

Source: Adapted from United Nations Environmental Programme (2015). *Indicators for Green Economy Policymaking – A Synthesis Report of Studies in Ghana, Mauritius and Uruguay.* Geneva.

Ghana

Ghana has identified policy actions and strategies that are expected to catalyze positive developments in economic, environmental and social dimensions. In collaboration with UN Environment, the government has prepared a Green Economy Scoping Study, which identifies the priority areas for action. The Ghana Shared Growth and Development Agenda (GSGDA II) for 2014–2017 is the medium-term policy planning initiative. One of the strategies under GSGDA II is to promote adoption of the principles of green economy in national development planning. Agriculture, forestry, water, waste management and sanitation, energy and extractive industries have been identified as priority areas for Ghana's green economy transition. This selection was based on Ghana's economic, environmental and social profiles, the existing national initiatives and the input of stakeholders at workshops organized in Ghana with the support of UN Environment.

A. FORESTRY

Ghana has the highest deforestation rate in Africa. This presents a major threat to Ghana's environmental stability. Reducing the shrinking of the country's forest coverage has become a national priority. Since deforestation is partly due to a failure to properly value forests, the work on indicators considers the range and value of forest ecosystem services. Indicators also include the measurement of externalities generated by other sectors and activities (e.g., agriculture, land-clearing for human settlement) as well as policies to address these externalities. Table 1 summarizes Green Economy indicators for Ghana's forest sector.

[9] José Pineda prepared this annex.

Table 1: Proposed indicators for forestry in Ghana

ISSUE Highest deforestation rate in Africa, which presents a major threath to Ghana's environment stability	
Issue identification indicators	**Most recent value (year)**
Annual rate of deforestation	1.37% per annum (2011)
Share of wood fuels in total energy consumption (%)	Wood fuel and charcoal accounted for 55% of energy consumed (2012)
Expansion of land for agriculture (%)	Agricultural land form 55.4% 1990 to 69% of land area in 2012
Policy formulation indicator(s)	
Policy objectives	Intervention options
Forest cover (increased by X% in Y years)	Development of REDD+ proposal (number and amount of resources US$)
Share of protected areas (increased by X% in Y years)	Annual public expenditure to support reforestation activities (US$)
Share of wood fuels in total energy consumption (cut by X% in Y years)	Gazetting of land as protected areas
Policy assessment indicator(s)	
Change in forest cover area (%)	Change in share of protected areas (%)
Replacement of wood fuels by other clean energy in total consumption (%)	Green jobs created by additional investments
Change in indoor pollution (%)	

B. ENERGY

The nexus of energy, poverty reduction and the environment is critical to Ghana's transition to a green economy. Ghana's authorities report that wood fuel and charcoal account for 55 per cent of the country's consumption of energy. This is followed by petroleum (36 per cent) and electricity (9 per cent) (Republic of Ghana 2013). It seems likely that wood fuel and charcoal will continue to be the dominant sources of energy in the medium term.

In terms of reliability of electricity service, the authorities report that rural customers served by the Electricity Company of Ghana (ECG) experience on average 282 interruptions per year and urban customers, 266 interruptions. The authorities attribute these numbers to a failure to improve reliability as rural electrification has expanded, suggesting that generation capacity has not kept pace with increased load. Electricity tariffs reflected embedded subsidies, but these were phased out in 2014. The work on indicators in this area, therefore, focuses on the issues of reliability and affordability of access to electricity. Table 2 presents the proposed indicators in these areas.

Table 2: Proposed indicators for the energy sector in Ghana

ISSUE Limited role of generation capacity from renewable sources and problem of reliability and affordability of access to electricity	
Issue identification indicators	**Most recent value (year)**
Percentage of household with access to electricity, from the grid and through distributed sources (%)	72% of the population (2012)
Share of generation capacity accounted for by renewable sources (%)	Share of renewable (excluding large-scale hydro) is 0.01% of total capacity (2011)
Interruptions (number), distribution losses (%)	Rural customers served by the Electricity Company of Ghana (ECG) experienced 282 interruptions per year and urban customers 266 (2011); Distribution losses were 27% for ECG and 20.2% for NEDCO (Northern Electricity Distribution Company), which supplies northern regions (2011).
Policy formulation indicator(s)	
Policy objectives	Intervention options
Interruptions and distribution losses (cut by X% in Y years)	Amount invested in transmission and distribution networks (US$)
Fuel and electricity price subsidies (phasing out by Y years)	Government spending through feed-in tariffs (US$)
Share of total installed generation capacity for renewables (excluding hydro) (10% by 2020)	Investments in increasing generation capacity form renewable sources, including distributed and small-scale generation (US$)
Policy assessment indicator(s)	
Economic gains form improved reliability (US$)	Generation capacity from renewable sources

C. AGRICULTURE

Agriculture plays a vital role in Ghana's economy. The sector employs nearly 50 per cent of the labour force, and increasing income from agriculture is critical to alleviating rural poverty. Authorities are concerned that growth in the sector is too slow. The Government's Medium Term Agriculture Sector Investment Plan (METASIP) reported that productivity in major food crop sectors, as measured by yields per hectare, remained largely unchanged between 2002 and 2008 and that these yields fell well short of potential. According to authorities, the main constraints to productivity are poor soil conditions (further affected by land degradation), overreliance on rain-fed agriculture and unreliable rainfall patterns, the prevalence of pests and diseases, limited technical advancement and limited access to superior seed varieties and animal breeds. Inadequate storage and transport infrastructure result in significant postharvest losses. Reported figures are 35.1 per cent for maize, 34.6 per cent for cassava, 24.4 per cent for yam and 6.1 per cent for rice. Agriculture also suffers from a poor level of physical connectivity to markets and a lack of integration into value chains. Table 3 presents examples of indicators to address these areas.

Table 3. Proposed indicators for agricolture in Ghana

ISSUE Productivity in major food crop sectors has stagnated. this is associated with poor soil conditions, overreliance on rain-feed agriculture, limited technical advancement and high after-harvest losses	
Issue identification indicators	**Most recent value (year)**
Productivity (% of achievable yield)	45.3% cassava, 62.9% maize and 63.5 yam (2011)
Agricultural mechanisation	Tractator to farmer ratio (1:1 500 in 2011); Number of services established (89 in 2011)
Post-harvest losses (% of total harvest)	Reported figures are 35.1% for maize, 34.6% for cassava and 24.4% for yam (2013)
Policy formulation indicator(s)	
Policy objectives	Intervention options
Agriculture mechanisation (increased by X % in Y years)	Investments in mechanisation services (US$); Number of farmers trained per year in the proper use of mechanisation
Cultivated land under irrigation (increased by X% in Y years)	Government spending through feed-in tariffs (US$)
Food storage and transport infrastructure capacity (increased by X% in Y years)	Investments in food storage and distribution systems (US$)
Policy assessment indicator(s)	
Productivity (% of achievable yield)	Water consumption efficiency
Improvements to food security	Green jobs created by additional investments
Impact on poverty rates	

Mauritius

In Mauritius there is a strong political commitment at the national level to advance sustainable development through the adoption of the new long-term vision, “Maurice Île Durable” (MID). The main objective is to make Mauritius a model of sustainable development, particularly in the context of the Small Islands Developing States (SIDS). A National Sustainable Development Strategy in the form of the MID Policy, Strategy and Action Plan (MIDPSAP) has been elaborated, and the MID Commission in the Prime Minister’s Office harmonizes efforts, ensures timely implementation of relevant projects and looks into all aspects of sustainability. Green economy is one of the priority programmes in the MIDPSAP, and green economy principles are central to the MID strategy.

Stakeholder consultations identified agriculture, energy, transport, manufacturing, tourism, waste and water sectors as having significant potential for greening the economy because of their contribution to GDP, employment creation, global competitiveness and environmental impact. These sectors are not only interrelated but also reflect the country’s challenges related to food and water security, dependence on imported, high-cost energy, traffic congestion, impacts related to waste management and the vulnerability and fragility of the tourism sector.

A. TOURISM

The government projects a significant increase in the number of tourist arrivals in the foreseeable future. As a result, a number of issues need to be closely monitored in order to mitigate the potential negative impact, as indicated in Table 4.

B. WASTE MANAGEMENT

The waste management strategy in Mauritius still focuses largely on end-of-life sanitary land filling. This results in missed economic opportunities and is of concern because land is limited. Indicators for this sector focus on identifying trends related to unsustainable waste management (see Table 5).

Greening the waste sector is likely to have a positive impact across key sectors. For example, waste recycling increases resource availability. Reduced pollution and improved environmental quality from better waste management have increase attractiveness to tourists. The result would be increased revenues from tourism and, thus, contribution to GDP.

Table 4. Proposed indicators for tourism industries in Mauritius

ISSUE Mitigate potential negative impact of an increase in the number of tourists, given the relatively poor resource efficiency of the sector	
Issue identification indicators	**Most recent value (year)**
Coastal ecosystem degradation (coastal water quality (mg/1))	Nitrate, phosphate and silicate concentrations in underground freshwater seepage water were high, reaching 9 485, 105 and 24775 mg/l, respectively (2002).
Total waste disposal by hotels and restaurants (tonnes/ year)	Total waste in Mauritius amounts to 416000 tonnes of solid waste in 2009 (2011)
Energy and water consumption in hotels and restaurants (ktoe and m³/year)	Water consumption from domestic, industrial and tourism accounts for 205 m³/ year or 27% of total water used (2012)
Policy formulation indicator(s)	
Policy objectives	Intervention options
Number of marine conservations areas (increased by X% in Y years)	Marine protection fee per year by pleasure crafts (MUR/ year)
Number of hotels with waste water treatment facilities (increased by X% in Y years)	Investment in beach protection (MUR/year)
Energy and water consumption in tourism sector (cut by X% in Y years)	Hotels that have carried out energy audits (number of audits)
Policy assessment indicator(s)	
Health of coastal ecosystem	Intervention options
Resource efficiency	Green jobs created by additional investments
Production /sales of locally produced handicrafts in touristic areas (MUR/year)	

Table 5. Proposed indicators for waste management industries in Mauritius

ISSUE Largely an end-of-life activity with a focus on sanitary landfilling, which is of concern because of the limited availability of land	
Issue identification indicators	**Most recent value (year)**
Total MSW landfilled (tonnes/year)	The total amount of solid waste disposed at sanitary landfill went up to 41600 tonnes in 2009 (2011).
Total MSW recycled (tonnes/year)	130.9 tonnes of recycled waste materials as of 2006 (2011)
Hazardous waste generated, collected and treated (tonnes/year)	Total hazardous waste generated as of 2003 was 8500 tonnes/rears in average reaching a maximum value of 22 600 tonnes/year (2011)
Policy formulation indicator(s)	
Policy objectives	Intervention options
MSW landfilled (cut byX% in Y years)	Marine protection fee per year by pleasure crafts (MUR/ year)
Total MSW recycled (tonne/year) (increased by X% in Y years)	Fiscal incentives for waste reduction and recycling (MUR/year)
Hazardous waste collected and treated (increase by X% in Y years)	Disposal fees for hazardous wastes (MUR/ year)
Policy assessment indicator(s)	
Improvement on health due to better waste management	Economic value of wastes recycled (MUR/year)
Revenue from waste taxes/disposal fees (MUR/year)	Green jobs created by additional investments

C. WATER

The sustainable use of water resources is a priority for Mauritius. In particular, improvements in water efficiency are needed to accommodate water demand (see Table 6). The indicators analyzed focus on unsustainable water resources management practices. They include stock of water resources and pressure on water resources, water consumption, cost of water and water productivity and intensity of the economy.

Table 6. Proposed indicators for water in Mauritius

ISSUE Unsustainable use of water resources is a central concern. in particular, improvements in water efficiency are needed to curb water demand	
Issue identification indicators	**Most recent value (year)**
Water consumption, per type of user (m^3/year)	Domestic, industrial (used through Central Water Authority) and tourism sector accounts for 205 m^3/year (2012), agricultural sector accounts for 356 m^3/ year (2012), hydropower sector accounts for 181 m^3/year (2012)
Pressure on water resources (total freshwater withdrawal as % of actual renewable water resources)	26.35% (2003)
Volume of treated waste-water (m^3/ year)	Average monthly potable water production from treatment plants amount to 93.3 m^3/ year in the whole island (2012)
Policy formulation indicator(s)	
Policy objectives	Intervention options
Volume of treated waste and desalinated water (increased by X% in Y years)	Tax incentives/subsidies for use of treated waste desalinated water
% of meters checked for heavy users of water5 (increase by X in Y years)	Amount spent in meters replacement and in campaigns on water savings (MUR/year)
Share of population with access to safe drinking water and connected to sewage treatment (increase by X in Y years)	Amount invested on water and sewage treatment systems (US$)
Policy assessment indicator(s)	
Volume of water availability from sustainable sources	Water productivity (MUR/ m^3)
Incidence of water borne diseases	Green jobs created by additional investments

Uruguay

Since the Earth Summit in 1992, Uruguay has made important progress towards sustainable development. This has led the country to establish an extensive normative framework for sustainable development, particularly with respect to the environmental pillar (Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente [MVOTMA] 2012). Some relevant sectoral initiatives include, in the transport sector, the “urban mobility plan of the Municipality of Montevideo”, in the agriculture sector the “soil management plans (Law 18.564)” and in the tourism sector the “Land management plans (Law 13.308)”.

Uruguay has carried out studies to demonstrate the inter-linkages between poverty and environmental degradation in Montevideo (MVOTMA 2012). The studies were done in the context of the Poverty–Environment Initiative (PEI) supported by the United Nations Development Programme (UNDP) and UN Environment. The Packaging Law, which was introduced as a measure for greening the waste sector, demonstrated the links between improved environment, health and jobs and became a success story (UNEP 2013). As a result, the Ministry of Social Development supported the integration of these poverty–environment linkages into development policies for poverty, environment and waste management (UNEP 2013). Subsequently, the ministries of Environment and Social Development, the municipality of Montevideo and the private sector approved – with the support of PEI – the Montevideo Management Plan for the Recovery of Non-returnable Packaging Waste.

Table 7. Proposed indicators for agriculture in Uruguay

ISSUE High vulnerability of agricultural yelds due to a low water run-off and soil erosion and degradation	
Issue identification indicators	**Most recent value (year)**
Volume unused water run-off, (km³)	2.5-2.7 km³/ 92 km³ yearly (2013)
Non-irrigated crop area (1000 ha)	238 of 1760 1 000 ha (2013)
Soil losses in agriculture (tonne/ha/year)	Estimated to be between 13 and 17 tonnes/ha/year
Policy formulation indicator(s)	
Policy objectives	Intervention options
Irrigated crop area (increased by 50% in 10 years)	Amount of fiscal incentives for dam construction (US$)
Soil losses (cut by 53% in 20 years)	Number of soil management and use plans presented to MGAP
Volume of unused water run-off (cut by X% in Y years)	Volume of unused water run-off (cut by X% in Y years)
Policy assessment indicator(s)	
Share of irrigated crop areas	Soil losses caused by erosion (tonne/ha/year)
Productivity losses	Green jobs created by additional investments

A workshop was held in Montevideo in August 2013 for the selection of key sectors and the identification of potential policies and areas of action to create the conditions to enable a green economy transition. Five sectors were selected for inclusion in the Uruguay Green Economy Study: agriculture, livestock, tourism, transport and industry. For each sector, several barriers to a green economy transition were identified. This section presents indicators for agriculture, transport and tourism.

A. AGRICULTURE

Employment in the agriculture sector increased from 4.1 per cent of those employed in 2000 to 10.9 per cent in 2012 (UN 2012, 2014). It is estimated that every dollar of additional expenditure in the agriculture sector contributes US$6.22 to the economy as a whole. Two main environmental issues for the agriculture sector identified by national stakeholders are: (1) low use of water run-offs and high vulnerability of agricultural yields to climatic events; and (2) soil erosion and degradation. Table 7 presents indicators that address these concerns.

B. TRANSPORT

According to the latest available data, the Gross Value Added (GVA) of transport represents 4.9 per cent of Uruguay's GDP (Central Bank of Uruguay, 2012). During the period 2005–2012, transport GVA grew at an annual rate of 5.2 per cent, in line with national economic growth (5.6 per cent).

Increasing public transportation is one of the priority issues in Uruguay's transport sector. According to the results of the Household Survey on Mobility and Opinion of the System of Urban Public Transport 2009 (Municipality of Montevideo, 2010), a systematic decline in the modal share of public

Table 8. Proposed indicators for transport in Uruguay

ISSUE Low usage of public transportation, congestion problems at the city, higher fuel consumption and related CO^2 emissions	
Issue identification indicators	**Most recent value (year)**
Share of public transport in total average daily trips (%)	41% (2009)
Energy consumption (ktoe)	3 688.4 ktoe (2012)
CO2 emissions (tonne)	3 251.3 tonnes (2012)
Policy formulation indicator(s)	
Policy objectives	Intervention options
Share of public transport in total average daily trips (increased by 80% in 20 years)	Annual budget for improving efficiency and incentives to encourage the use of public transport (US$)
Energy efficiency of passenger transport (improve by 15% in 20 years)	Amount of investments for implementing a vehicle efficiency standard system (US$)
Emissions of transport cut by X% in Y years)	Number of implemented circulation regulations
Policy assessment indicator(s)	
Average travel time in the public transport system (in minutes)	Energy intensity of transport (toe/US$)
Emissions intensity in transport (tonne CO2/toe)	Green jobs created by additional investments

transport (buses) took place between 1996 (57 per cent) and 2009 (41 per cent). Another important aspect is the low use of railways in transporting cargo. Estimates are that rail transport moves only 5 per cent of the total volume of cargo transported annually. The high concentration of private cars is generating congestion in cities. The result is an increase in average travel times, higher fuel consumption and more CO_2 emissions. Table 8 presents a set of indicators that address some of the main issues identified in the transport sector.

C. TOURISM

Tourism in Uruguay is characterized by a concentration of hotels in the southeast and the prevalence of "sun and beach" activities. Concerns about sustainability relate to the degradation of the coast due to intensive exploitation and especially to real estate pressure (both hotels and second homes). According to the Ministry of Tourism and Sports (MINTUR), this problem mostly concerns the coastal areas of Colonia, Canelones, Maldonado and Rocha. In response to sustainability issues related to uncontrolled exploitation of the coasts, Law 18.308 of June 2008 introduced the Instruments of Spatial Planning and Sustainable Development (IOTDS), which provides a general regulatory framework. The law applies to areas of particular interest due to their heritage, cultural and environmental importance.

Another key sustainability issue is the inefficient consumption of electricity in tourism facilities. According to the results of the survey on energy use and consumption (DNE 2009), the hotel sector's total energy consumption was 14.1 ktoe (kilo tonnes of oil equivalent) in 2006. That represented 5.4 per cent of the total consumption in commercial and services sectors. In particular, electricity supplies 53 per cent of the total net energy consumption of the sector, with energy used by hotels mainly for cooling (24 per cent), lighting (23.2 per cent) and refrigeration (10.3 per cent).

Similar concerns relate to waste management in tourism facilities. To respond to these concerns, the Ministry of Tourism has relied since 2011 on the Manual on Environmental and Social Management (EGAS) as a guide for its investment projects. According to the manual, the share of costs dedicated to waste disposal must comprise between 10 per cent and 30 per cent of total project cost. Table 9 presents relevant indicators for these issues.

Table 9. Proposed indicators for tourism industries in Uruguay

ISSUE Sustainability concerns related to intensive exploitation of the coastal area especially due to real estate pressure, inefficient use of electricity and waste management	
Issue identification indicators	**Most recent value (year)**
Waste generation (% of total)	Coastal area represents 80% total. Expected rate of growth by 2030 for costal area (12.52%) vs total national (11.59%). (2011)
Electricity consumption in hotels and restaurants on the coast (kWh/hear)	100 898 505 kWh (2012)
Area impacted by regulatory instruments.	Currently 6 local plans within IOTDS, involving 2041.2 km²
Policy formulation indicator(s)	
Policy objectives	Intervention options
Electricity efficiency tourism (increased by 15% in 20 years)	Amount of investments in projects of energy efficiency in tourism (US$); Amount invested in energy consumption from renwable resources (US$)
Properly managed solid waste in coastal departments (tonne/year) (improve by 14% in 20 years)	Amount of resources allocated solid waste management
Areas that use local land plans in the coastal departments of Colonia, Canelones, Maldonado and Rocha (increased by 30% in 20 years)	Number of zoning rules; Total area impacted by new plans (km²); Number of municipalities involved
Policy assessment indicator(s)	
Tourism energy productivity (US£/ktoe)	Value of costal biodiversity
Emissions intensity in the tourism sector (tonne CO2/toe)	Green jobs created by additional investments

PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

The Partnership for Action on Green Economy brings together the expertise, convening power and networks of five UN agencies – UN Environment, the International Labour Organization, the UN Development Programme, the UN Industrial Development Organization and the UN Institute on Training and Research – to support countries and regions in addressing one of the most pressing challenges of the 21st century: transforming their economies and financial systems into drivers of sustainability and social equity. The Partnership supports countries in reframing economic policies and practices around sustainability to foster economic growth, create income and jobs, reduce poverty and inequality, and strengthen the ecological foundations of their economies.

PAGE works to build capacity within partner countries so that they are able to provide favourable conditions to meet their sustainability commitments, in particular the Sustainable Development Goals and the Paris Agreement, through inclusive green economy approaches.

PAGE is a direct response to the Rio+20 Declaration, The Future We Want, which called upon the United Nations system and the international community to provide assistance to interested countries in developing, adopting, and implementing green economy policies and strategies. Working closely with national governments, the private sector, and civil society, PAGE offers a comprehensive, coordinated, and cost-effective package of analytical support, technical assistance, and capacity building tools and services.

PAGE provides technical and financial assistance in 18 countries as of 2018.

www.un-page.org

European Commission

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

Ministry for Foreign Affairs of Finland

Norwegian Ministry of Climate and Environment

Ministry of Environment Republic of Korea

Sweden Sverige

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Economic Affairs SECO

For further information:

PAGE Secretariat
UN Environment
Resources & Markets Branch
11-13 Chemin des Anémones
CH-1219 Chatelaine-Geneva
Switzerland
page@un.org

www.un-page.org

@PAGExchange

@GreenEconomyUNEP

un-page.org/newsletter