Chapter 2.
Assessments for sustainable development

"An expert is a person who has made all the mistakes that can be made in a very narrow field." (Niels Bohr)

"Pollution is not a technical problem. The fault lies... in the sense of values of the contemporary world which ignores the rights of others and is oblivious of the longer perspective." (Indira Gandhi, 1972)

This chapter maps the *landscape of assessments* rather than their findings. It might help as an entry point for decision-makers who are interested in the scientific basis of their decisions.[39]

2.1. Introduction

What is an assessment?

Assessments differ from academic reviews. Assessments are typically prepared for decision-makers and address broad and complex topics, by drawing on large and representative groups of experts. Assessments are problem-driven and usually synthesize scientific findings on complex issues, reducing complexities. They inevitably make judgements, but generally aim to separate descriptive and normative elements of the assessment. In order to support decision-making, uncertainty statements are essential and often controversial (Table 4).[40] Participating experts in this report expressed preferences for different variations of assessment models and emphasized the practical difficulties in clearly separating political and scientific considerations in these assessments.

Table 4. Comparing reviews with assessments.

	Review	Assessment
Audience	Scientists	Decision-makers
Carried out by	One or a few	Large and varied group based on relevant geographic and disciplinary representation
Topic	Simple, narrow	Broad and complex
Identifies gaps in	Research: curiosity-driven	Knowledge for implementation of outcomes: problems-driven
Uncertainty statements	Not required	Essential
Judgement	Hidden; a more objective analysis	Required and clearly flagged
Synthesis	Not required, but sometimes important	Essential to reduced complexity
Coverage	Exhaustive, historical	Sufficient to deal with main range of uncertainty associated with the identified issues

Source: Watson and Gitay (2004), cited in IAASTD (2009), Global Report[41], p.5.

It should also be noted that choosing sustainable development goals necessarily involves a normative judgement as to the relative importance of issues. Therefore, broad sustainable development assessments can never live up to the scientific standards of the natural sciences.

In fact, it has been suggested that no assessment can live up to the scientific standards of the natural sciences. Efforts to mobilize science and technology for sustainable development are more likely to be effective if they manage boundaries and enhance salience, credibility and legitimacy. However, there are trade-offs between these three characteristics - one cannot optimize credibility, e.g. through scientific standards, without compromising relevance and legitimacy.[42]

Scientific assessments have also been characterized as contributions of science to the overall process of social learning, by which science informs multiple stakeholders with the aim of responding to their needs and aspirations. In turn, multi-stakeholder dialogues can guide the way science is designed and help target its efforts towards societal outcomes. *"[I]f assessments were perceived as continuous learning processes, they could be organized as processes of perpetual improvement and reflective change of the assessment as an institution itself and, consequently, they might become more powerful institutions in the process of solving environmental problems"*.[43]

Which assessments are assessed?

For the purpose of this report, assessments qualify as *sustainable development assessments*, if their underlying sustainable development definition captures at least one item to be sustained, one item to be developed, and at least two of the economic, social and environmental dimensions (Table 2). Most of the identified assessments are broader and include all three dimensions, yet fully comprehensive assessments are exceedingly rare.

There are thousands of sustainable development assessments. In view of the limited time and resources, the present report considered the following subset:

- 57 international assessments suggested through the crowd-sourcing website
- 125 flagship publications of the United Nations system
- 23 outlook reports prepared by intergovernmental organizations
- 69 national sustainable development reports submitted to Rio+20.

2.2. International assessments

2.2.1. International scientific assessments

The United Nations crowdsourcing platform registered 319 contributions from scientists around the world, who voted on each

other's ideas and contributed a total of 57 assessments that they would like to bring to the attention of decision-makers. On top of the list came prominent intergovernmental assessments and United Nations publications (Table 5). A number of high-profile assessments such as the Intergovernmental Panel on Climate Change (IPCC) were suggested but did not make it to the top of the list, possibly because scientists felt that decision-makers were already sufficiently familiar with them.

Table 5. Top 15 assessments scientists worldwide would like to bring to the attention of decision-makers

Assessment	Led by
Assessment of Assessments on Oceans	United Nations
Proceedings of the National Academy of Sciences Sustainability Science	United States Academy of Sciences
Scientific Synthesis of the Impacts of Ocean Acidification on Marine Biodiversity	CBD
Global Energy Assessment (GEA)	International Institute for Applied Systems Analysis (IIASA)
Census of Marine Life	Alfred P. Sloan Foundation
SD21 project for Rio+20	United Nations, European Union
TRENDS report	United Nations
Global Biodiversity Outlook (GBO)	CBD
Intergovernmental Platform on Biodiversity and Ecosystem Services	IPBES
Reports on the achievement of the MDGs	United Nations
Grand Challenges	ICSU
Global assessments listed on the website of IPBES	IPBES
Global Forest Resources Assessment	FAO
State of the World's Plant Genetic Resources for Food and Agriculture	FAO
World Water Futures until 2050	UNWWAP
Work of the International Programme on the State of the Ocean (IPSO)	IPSO

Source: United Nations crowdsourcing platform results as of 2 September 2013, http://www.allourideas.org/assessments
Note: The above list is user-generated and no judgement has been made as to what constitutes an assessment (see Table 4).

Widening scopes and multiple goals of international assessments since 2000

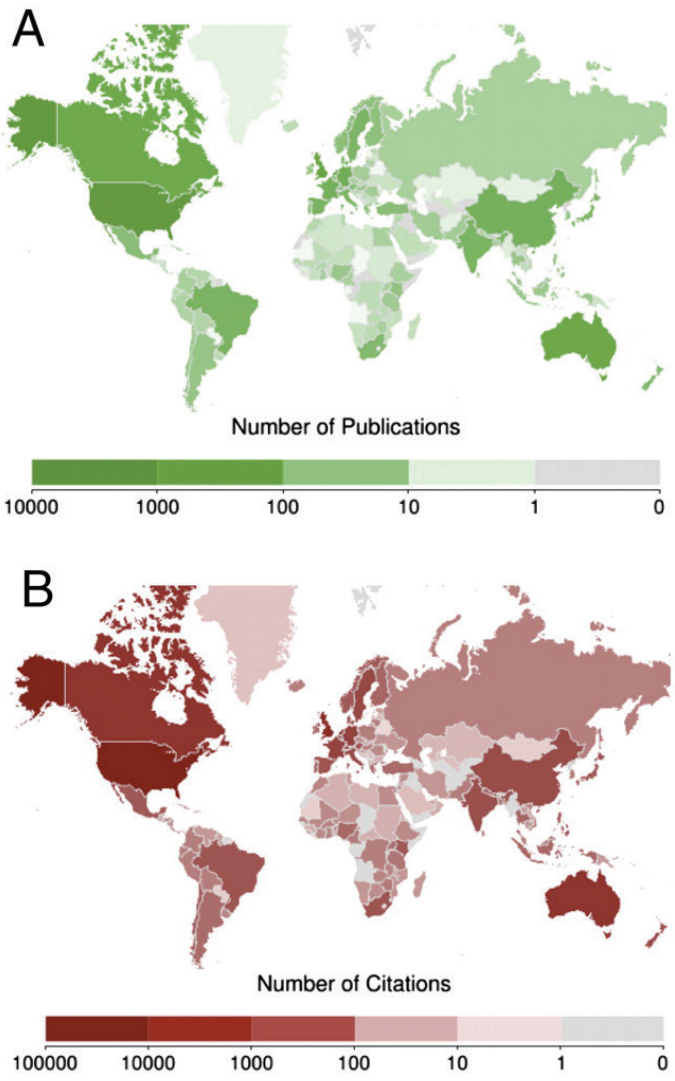
Sustainable development assessments conducted in the 1970s and 1980s considered a wide range of issues, even when the assessments had a sectoral focus to begin with.[44] Later sustainable development assessments typically followed increasingly narrow scopes and explored single objectives or goals, such as identifying optimal technology systems for reducing greenhouse gas (GHG) emissions. Examples include the periodic assessments by the IPCC, as well as the assessments on ozone depletion in support of the Montreal Protocol.

Since the 2000s, assessments have started to widen again their scopes and to consider co-benefits and multiple goals. Notable examples are the Millennium Ecosystem Assessment (MEA; 2005), the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD; 2008), and the Global Energy Assessment (GEA; 2012).

Emergence of sustainability science by 2000

Sustainability science emerged as a new interdisciplinary, unified scientific endeavour around the year 2000. It is a field defined by the problems it addresses rather than by the disciplines it employs, similar to health science.[45] The number of authors who published articles with "sustainable development" or "sustainability" in the title doubled about every eight years since the early 1970s. In 2010, about 37,000 scientists authored such articles in biology, engineering and social science journals. They worked in universities or were practitioners in government, non-governmental organizations (NGOs) or the private sector in 174 countries.[46] Google scholar registered 150,000 academic articles published in 2012 alone that indicate sustainable development as their ultimate objective - six times more than 10 years ago (Figure 4). The geographic distribution of sustainability science is unusually wide, when compared to typical specialized fields of the natural sciences, which indicates the quality and quantity of sustainability science contributions from developing countries (Figure 3).[46]

Figure 3. Geographic distribution of sustainability science publications



Notes: (A) National counts of number of publications. (B) National counts for number of citations received. Source: Bettencourt and Kaur (2011)[46]
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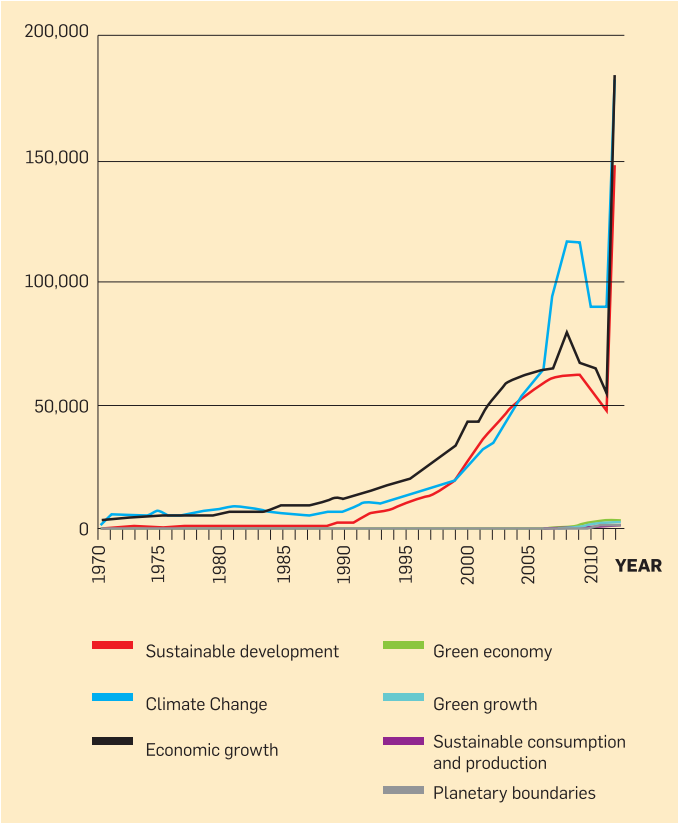
Thousands of sustainable development assessments

Thousands of scientific assessments have been performed - some of them on a regular basis - on various temporal and geographic scales. Most of them focused on specific systems and sectors that are of special importance for sustainable development. For example, there are 1,023 assessments in the database for the *Assessment of Assessments on Oceans*[47] and 215 assessments at multiple scales in the database for the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).[48] These lists are growing and have to be updated on a regular basis. Comprehensive databases could not be identified that capture sustainable development assessments in other relevant areas.[49] There is evidence for a large number of climate change-related assessments.

Figure 4. Number of articles (contained in Google Scholar) indicating selected ultimate objectives



Source: Authors' calculations based on Google Scholar data.

Assessments differ greatly in terms of scope, scale, organization, process, participation, resources and perceived policy relevance

A total of 57 international assessments were suggested through the crowdsourcing website and are considered here. While the full list of assessments is available on the United Nations website,[50] here we present selected international assessments, especially those that have served as models for new initiatives. They illustrate very different approaches in terms of scope (one or multiple goals), scale (from local to global, present to centuries), organization (by universities, NGOs, Governments or the United Nations), process, participation (from a few to 3,000 scientists), resources (from a US$0.05 million ad hoc project to a US$650 million ten-year programme), and policy relevance (linked to a political process or not). It should be noted that all of these assessments have been perceived by some to be to a varying extent political, even when conducted by scientists.

The Intergovernmental Panel on Climate Change (IPCC) - created in 1988 - has produced some of the most well-known assessments. The global assessments take a very long-term perspective and focus on a single objective - to prevent dangerous anthropogenic interference with the climate system. They are sponsored by the United Nations and engage more than 2,000 scientists from 154 countries who are collaboratively working on assessments for up to six years at a time. The assessments are comprehensive reviews of the academic literature and have become very detailed, exceeding 1,500 pages in each working group. The assessments directly support the United Nations Framework Convention on Climate Change (UNFCCC) process. Most importantly, the *Summary for Policymakers* is adopted/negotiated by Governments in the IPCC plenary. Governments are also nominating participating scientists. The operational budget is about US$8 million per year and in-kind contributions are estimated at several times that amount. The total cost of the current six-year assessment cycle was probably around US$168 million.[51]

The *International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)* is another example of an intergovernmental scientific assessment. In contrast to the IPCC, the IAASTD was a one-time assessment and included local and traditional knowledge in the assessment alongside peer-reviewed academic material. It had a multistakeholder bureau and put emphasis on a consultative process involving 900 participants in 110 countries. IAASTD looked at the period of 1940-2050 and explored three overarching goals: (a) reducing hunger and poverty; (b) improving nutrition, health and rural livelihoods; and (c) facilitating social and environmental sustainability. It was a three-year initiative, co-sponsored by six United Nations system entities and had an operational baseline budget of US$10.7 million.

The *Millennium Ecosystem Assessment (MEA)* was a scientific appraisal - at multiple scales - of the condition and trends in the world's ecosystems and the services they provide, as well as the scientific basis for action. It was governed by a board comprising United Nations entities, civil society and the private sector. The assessment was drafted by a team of 1,360 experts from 95 countries, and it was reviewed by 44 Governments, 9 scientific organizations, and 600 individuals. The budget of the five-year assessment amounted to US$24 million plus in-kind contributions. There was no formal link of MEA to a political process, but the impact of its capacity-building activities is often noted.

The *Assessment of Assessments on Oceans* is an ongoing eight-year initiative with an operational budget of about US$5 million per year. In contrast to many of the other assessments that aim to assess existing academic literature and/or other knowledge, the initiative carries out a "critical analysis of the assessments in order to evaluate their scientific credibility, policy relevance, legitimacy and usefulness". It aims to assess more than 1,000 relevant marine and coastal environmental assessments at global, regional and national levels. Ecological, social and economic aspects are considered. The *Assessment of Assessments on Oceans* is tasked to support a working group of the United Nations General Assembly.

The planned assessments of the *Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES)* are expected to focus on an assessment of hundreds of existing assessments.

The *Global Energy Assessment (GEA)* has followed an approach

similar to the IPCC's for collaborative drafting of the extensive report.[52] It explores four goals: (a) stabilizing global mean temperature rise to 2°C above pre-industrial levels by 2050; (b) energy security by diversification and resilience of energy supply (e.g. dependence on oil imports); (c) eliminating household and ambient air pollution; and (d) universal access to modern energy services by 2030. It also focuses on the global and regional levels and takes a long-term perspective (1850-2050). The assessment was initiated by the International Institute for Applied Systems Analysis (IIASA), an international research and policy think tank of academies of science (and similar entities) of 20 countries. In contrast to the IPCC, the more than 300 authors and 200 academic reviewers were selected exclusively by their peers. The GEA informally and de facto supports the United Nations Secretary-General's ad hoc initiative "Sustainable energy for all".

The United Nations reports on the achievement of the *Millennium Development Goals (MDGs)* have regularly monitored progress towards the achievement of the 8 MDGs, in order to directly support the MDG process. They are United Nations publications that are prepared by United Nations staff with inputs from the entire United Nations system, together with other experts and scientists. They assess progress using official data at the national, regional, and global levels for the period 1990-2015.

The Committee for Development Policy (CDP) is a group of 24 development economists appointed for a period of three years by the United Nations Secretary-General. It provides advice on emerging cross-sectoral development issues and on international cooperation for development. In particular, the Committee members meet once or twice a year to assess potential graduation from or inclusion in the list of least developed countries (LDCs). Reports are typically drafted by United Nations staff upon instruction by the committee members. The Committee has recently also been requested to produce assessments on climate change, as well as on small island developing states (SIDS). The Committee is subsidiary to the United Nations Economic and Social Council to which it makes its recommendations.

Sustainable Development in the 21st Century ***(SD21)*** was a two-year global assessment project carried out by UN DESA and co-financed by the European Union in preparation for Rio+20.[22] The project was the only assessment contribution that formed part of the official budget for Rio+20. It assessed progress since 1950 and explored a global sustainability transition to 2050. It also included a review of implementation of *Agenda 21* and the *Rio Principles*. The project studies were drafted by lead authors under the supervision of United Nations staff, in collaboration with 178 academics, practitioners, scientists, policy analysts and economists. The project studies were technical in nature, but linked to diverse political messages. Differences and commonalities in the views of scientists were identified and clearly described in the reports, with a view to finding common ground in support of intergovernmental negotiations under United Nations auspices.

The *Census of Marine Life* was an international scientific assessment at multiple scales. It was carried out as a 10-year research programme and engaged 2,700 scientists - even more than the IPCC. It was organized as a purely scientific process with no formal link to a political or governmental process. The assessment was initiated by the Alfred P. Sloan Foundation and had a total price tag of US$650 million.

The number of assessments and the resources devoted seem proportional to the associated economic stakes

The number of assessments and the resources devoted to different sectors and themes seems to be proportional to the associated economic stakes. This has made climate change assessments the most prolific area over the past 20 years.[53] In contrast, there is no standard international assessment on sustainable agriculture, food security and nutrition. The example of the IPCC highlights that even within one assessment there can be significant differences between chapters devoted to different sectors.

What typologies of assessments make most sense?

Three broad groups of assessments can be distinguished: intergovernmental scientific assessments (IGSAs); scientific-technocratic assessments; and scientific research collaborations. They can be further categorized along the following elements (Table 6):

- What is the scope? Broad sustainability or thematic/sectoral?
- What is the overall approach? Top-down like the IPCC or bottom-up like the Stanford Energy Modelling Forum?
- Who nominates/selects participants? For example, is it pro bono participation based on nomination, or consultants hired by an organization? Is participation representative?
- Who finances the assessment and its participants?
- Is there a formal or informal link to a political process?
- Is it a primarily descriptive assessment? Is it policy-relevant? Is it policy-prescriptive?
- Who drafts the text and who approves it?
- Is it a regular or an ad hoc assessment?
- What kind of knowledge is assessed?
- What is the content focus of the assessment? Does it focus on the diagnosis of problems or identification of solutions? Does it look at the past or the future?[54]

Strengths and weaknesses of various assessment models depend on the objective and particular context

The IPCC model of IGSAs has been very influential in shaping more recent assessments that aimed to strengthen the science–policy interface. In fact, IPCC-style assessments have been instituted also at the national level, for example, in Austria (the Austrian Panel on Climate Change) and Hungary. The IPCC model has been the most successful institutional model of formalizing the science–policy interface. It has put key problems identified by science high on policymakers' agendas and has also enabled science to inform solutions. It is not clear if any other model has the potential to mobilize the scientific community to the same extent. At the same time, the IPCC model of assessment has received a large amount of criticism, including from scientists - some of whom were long-time leading authors of the IPCC. Some contributors to the present prototype report noted deficits of the IPCC model in terms of comprehensiveness, objectivity and transparency. For example, it was suggested that the line-by-line government approval requirement of the *Summary for Policymakers* had politicized and constrained the work of scientists on the main report. Changes in the summary that had to be carried over into the main report had watered down the latter. On the other hand,

Table 6. Simple typology of international sustainable development assessments

Type	Refer to as	Examples	Description	Link to political process	Participants nominated/ selected by	Drafted by	Text approved by	Frequency	Normative or descriptive	Type of knowledge assessed
Intergovernmental scientific assessments (IGSA)	IPCC model	Intergovernmental Panel on Climate Change (IPCC), Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)	Regular IGSA	Formal	Governments	Scientists	Governments, peers	Regular	Primarily descriptive	Academic, peer-reviewed
	IAASTD model	International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)	Ad hoc stakeholder IGSAs	Formal	Multi-stakeholder Bureau	Scientists	Governments	Ad hoc	Primarily descriptive	Academic and traditional/local knowledge of stakeholders
	GEO model	Global Environment Outlook (GEO)	Regular United Nations science publication with formal link	Formal	Governments, stakeholders	Scientists guided by United Nations	Peers	Regular	Descriptive and normative	Academic, peer-reviewed, United Nations
	Asian Highway model	Asian Highway expert group	Intergovernmental United Nations expert group	Formal	Governments	United Nations staff guided by experts	United Nations	Regular	Descriptive	Governments, United Nations, academic, private sector
Scientific, technocratic assessments	CDP model	United Nations Committee for Development Policy (CDP)	Standing United Nations expert groups with formal reporting to Governments	Formal	United Nations Secretary-General	United Nations staff guided by Committee members	Committee	Regular	Normative	Academic, peer-reviewed, United Nations
	GSP model	High-level Panel on Global Sustainability (GSP)	Ad hoc initiatives of the Secretary-General	Formal, weak	United Nations Secretary-General	United Nations staff guided by Panel	Panel	Ad hoc	Normative	United Nations, Governments, academic, NGOs, stakeholders
	United Nations flagship model	Global Biodiversity Outlook (GBO), World Economic and Social Survey (WESS)	United Nations flagship publications, drawing on United Nations expert groups, and linked to United Nations process	Formal, weak	United Nations	United Nations staff jointly with experts	United Nations	Ad hoc or regular	Descriptive and normative	Academic, NGOs, United Nations, Governments, stakeholders
	Pre-Summit stocktaking	United Nations SD21 study	Stocktaking made in preparation for high-level international conferences	Formal, weak	United Nations	Lead authors, sometimes with United Nations staff	United Nations	Ad hoc	Descriptive	Academic, practitioners' views
Scientific research collaborations	GEA model	Global Energy Assessment (GEA)	Collaborative scientific collation of scientific knowledge	Informal	Peers	Scientists	Authors, Peers	Ad hoc	Descriptive and normative	Academic, peer-reviewed
	MEA model	Millennium Ecosystem Assessment (MEA)	Identification of scientific basis and knowledge gaps for action.	Non-governmental	Selected by science panel, endorsed by board	Scientists	Peers	Ad hoc	Descriptive and normative	Academic, peer-reviewed, stakeholders
	Census of Marine Life model	Census of Marine Life; Future Earth	Collaborative scientific research programme	Non-governmental	Peers	Scientists	Authors, Peers	Ad hoc	Descriptive	Academic, own research

Note: Increasing role of Governments from top to bottom. Source: Authors' elaboration.

it was pointed out that the government approval would guarantee a functioning science–policy interface in the first place. Further, a fundamental inconsistency was noted between the need of decision-makers for certain and "unequivocal" statements on the one hand, and the need for continuous questioning as fundamental drivers of scientific progress on the other.[55] Most importantly, it was suggested that the IPCC model poses a number of constraints to the voice of developing countries. In particular, it was pointed out that developed country academics and analysts still make up to 80 per cent of the IPCC assessments teams and: "*97 per cent of the references in IPCC reports are from Western journals*". Academics from developing countries have fewer resources and are time-poor. They do not publish as regularly in international journals, but in local journals or books that are unknown internationally, because

of language barriers and also because of the way the academic peer review system functions. Yet most contributing scientists recommended the IPCC model as one of the most useful ways to improve the science–policy interface by, improving the dialogue among scientists, and between scientists and policymakers.

The United Nations flagship publication model has been praised for its relatively low cost and wider stakeholder participation, as well as the fact that a wider range of knowledge can be tapped, and that resultant publications are directly linked to a United Nations process which guarantees consideration by decision-makers. It was also pointed out that the flagship publications of some United Nations entities typically provide a wide range of views. Diversity of views can provide a wider range of options to decision-makers. Hence existing overlaps between United Nations assessment publications do have their benefits. Yet a loose coordination between assessments and especially the various outlook publications of the United Nations system could benefit decision-makers in making their choices. An assessment of these assessments in the form of the Global Sustainable Development Report could also illustrate the benefits as well as limitations of integrated approaches.

Assessments organized by scientists and their peers benefit from much greater flexibility than assessments driven by international organizations or Governments. On the other hand, United Nations- and government-driven assessments are more likely to be used in decision-making processes. Also, most international scientific assessments have been weak on the social aspects, including on multi-stakeholder contributions.

It has also been pointed out that most of the prominent assessments ignore important agreed commitments, such as those contained in *Agenda 21* and the *Rio Principles*, as well as those in conventions (e.g. UNFCCC and the Convention on Biological Diversity). This is apparent in the heavy reliance in their analysis on regional groupings, ignoring the groupings that have been intergovernmentally agreed (e.g. LDCs, Annex I in the UNFCCC, etc.).[56]

Assessments generally allow us to tackle broad and complex issues and support the discovery of solutions to address identified problems and challenges. Each assessment necessarily needs to weigh its ambition against the costs of multi-stakeholder engagement.

Social scientists have criticized the prevailing approach of environmental assessments to focus on technical knowledge. "*Approaching the world's environmental challenges as a question of technical knowledge, to be filtered through existing institutional government arrangements, is very much part of the problem.*"[57] Societies tend towards maintaining the status quo[58] and a key question for social scientists is how dominant institutions can change.[59]

While the need to link traditional knowledge and scientific knowledge has been particularly emphasized in biodiversity conservation, it is also evident with respect to other sustainable development issues. Indigenous and local communities have cultivated and used biological diversity in a sustainable way for thousands of years, and their skills and techniques provide valuable information to the global community and a useful model for biodiversity policies.[60] Advances have been made in the recognition of indigenous community conservation areas which replace the earlier conservation paradigm of protecting wilderness and excluding local people, often making them victims of conservation.[61]

Economic considerations are central to most policy analysis and instruments, but linkages with environmental, social and political aspects are still weak. While efforts have been made to improve how physical sciences inform sustainable development policy analysis, no commensurate effort has been made in economics. Deficiencies of mainstream economic approaches to sustainable development have become apparent, yet most assessments continue to rely on these approaches. Sustainability is mostly seen as a matter of including externalities in the long run and formally considering resources as finite. Cost–benefit analysis is widely used to inform sustainable development policy. Approaches are basically individualistic, non-complex, non-evolutionary and equilibrium-oriented, in contrast to the key systems analysed. As a result, recommendations can be potentially misleading. Alternative approaches are needed to analyse possible patterns of evolution (rather than "net benefits"), dynamic possibilities, and abrupt discontinuities or "extreme events", including the complex relations of environmental impacts with social aspects.

Global assessments may be less relevant for countries with special needs than subregional or national assessments. This is because global assessments might not necessarily reflect the unique situation of SIDS, LDCs and landlocked developing countries (LLDCs). Vulnerability factors that are most relevant for these countries do not always show up as "crucial" in global assessments. Similarly, smaller developed and developing countries do not necessarily see their particular challenges and action priorities reflected in the global sustainable development debate and related assessments. Hence, there may be a need to build global assessments on national ones. Such a view was emphasized in some of the United Nations expert group meetings that were organized in support of this report, and it is evident in the Dubrovnik Declaration, which provided a "regional perspective on science–policy interface for a sustainable future" (see Annex 1).

2.2.2. United Nations flagship publications and outlook reports

The Executive Committee on Economic and Social Affairs Plus (ECESA Plus) is the United Nations inter-agency coordination mechanism on sustainable development and the follow-up to Rio+20.[62] ECESA Plus alone brings together 53 United Nations entities working on sustainable development, including Funds, Programmes, Regional Commissions, Convention Secretariats, Specialized Agencies, International Financial Institutions, the World Trade Organization (WTO) and the International Organization for Migration (IOM). All these entities typically have their own flagship publications in which they report on major trends and suggest policy issues for consideration. Together with similar reports by non-United Nations intergovernmental organizations, there are hundreds of international flagship reports, all of which suggest policies in their own areas of expertise and within their institutional mandates.

Policy coherence among United Nations flagship publications

In the preparation of the present report, 125 flagship publications of the United Nations system and 23 outlook reports prepared by intergovernmental organizations were analysed in terms of scope, approach, diagnosis of trends and challenges, and policy recommendations. They are listed in Annex 2.

The wide range of policy recommendations contained in the United Nations publications is illustrative of the many different views and perspectives on key policy issues related to sustainable development. Hence, the fact that the messages of various publications are not

Table 7. Example of messages of United Nations systems publications on food, biofuels and land compared with integrated solutions

	Which status and trends are highlighted in United Nations system publications?	Which overall objectives are suggested in United Nations system publications?	Expected impacts on other sectors by 2030, from literature	Solutions proposed in United Nations system publications	Alternative, integrated solutions
Food production	Around 1 billion people will suffer from hunger by 2050 World population of 10 billion by 2050 40–50% of food does not even make it to the plate	Produce more food: +70% food by 2050 (FAO)	Increase in arable land as in the past: +15-30%? Increase in water use: +100% Additional nitrogen and phosphorous loadings (beyond safe global limits?)	Sustainable intensification (FAO) Zero food waste (Secretary-General)	Change diets Reduce waste in food chain Act on access to food Integrated land planning Reconsider first-generation biofuels Reforestation Investments in land regeneration
Biofuels	Current mandates by many countries imply large supply increases Carbon balance of biofuels ranges greatly and is uncertain Competition with food and water Land "grabbing" and social issues	Produce more biofuels to reduce GHG emissions	Increase in arable land as in the past: +3-10% Increase in water use: +50-70%? Loss of biodiversity due to mono-cropping Likely loss of forests Reduced biotic regulatory function leading to much higher GHG emissions	Sustainability criteria for biofuels Second generation biofuels in the future	
Land degradation	Continued loss of arable land during past decades	Loss of 0.1% per year to 2020-2030, then zero net loss target (proposed by many before Rio+20)	If historical land degradation is continued, +5-10%? Degraded water supply Degraded ecosystem services	Investments in land regeneration Climate change adaptation	

Source: Authors' elaboration.

consistent with each other is not a problem. However, they would be much more useful for policymakers if the various options and their implications across sectors and themes, as well as information on alternative integrated solutions, were accessible in an actionable format. The Global Sustainable Development Report might help in this respect. Table 7 illustrates the dilemma with an example of messages on food, biofuels and land.

At present, it appears that almost all outlook publications are being developed in isolation from each other and are supported by separate sectoral or issue-based communities. The resulting incoherence of assumptions means that these outlooks essentially describe slices of very different future worlds. And important interlinkages are not always taken into account adequately. In fact, some cases that are described may even be physically or socioeconomically impossible. For example, recent energy outlooks typically project massive global increases in biofuel use, and, while they will be within scientifically sound "potentials", they will typically not account for the changed patterns of water use and their implications, nor for the interactions with innovation systems and economic growth. While these omissions are not always a problem, they can be in some cases. Sectoral and issue-based outlooks are important and valuable exercises, but their credibility and usefulness could be greatly enhanced by systematic interaction between the various communities. A global sustainable development report could bring together outlooks in a coherent way and highlight issues where interactions should be taken into account. A United Nations home for global scenario models from various scientific communities might be very useful in this context.

Established United Nations publications containing environmental assessments

By far, the largest number of United Nations publications with scientific assessments are on environmental issues. In fact, the United Nations Environment Programme (UNEP) and convention Secretariats have established processes for these publications.

UNEP's *Global Environment Outlook (GEO)* has been produced every five years.[63] GEO-5, the latest in the series, released in June 2012, provides an assessment of the state and trends of the global environment in relation to internationally agreed goals; evaluates the gaps and barriers in their implementation; and provides policy options that have the potential to speed up the realization of these goals. Through an integrated environmental assessment approach, a series of GEO reports have analysed environmental state and trends at the global and regional scales, described plausible outlooks for various time frames and formulated policy options. Each GEO report builds on the assessment findings of its predecessor and also draws from lessons learned on process. The elaborate multi-year assessment process, which is detailed in Annex 3, aims to bridge environmental science and policy.[64]

Under the Convention on Biological Diversity (CBD) there are established assessment processes. The Global Biodiversity Outlook (GBO)[65] provides a global overview of the status and trends of biodiversity and highlights key implications for sustainable development and human well-being. The GBO-3 was a key source of information in the development of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets. In addition, focused assessments have been prepared under the Convention. The most important 13 of these are detailed in Annex 3, which provides information on the characteristics of the assessment processes and their outcomes, the use of scenarios and other tools, the policy impact of the assessment, and the capacity needs identified and addressed. The systematic assessment framework under CBD may hold lessons for a systematic assessment of assessments on sustainable development.

2.3. National assessments

2.3.1. National sustainable development reports and related processes

For the present report, an inventory of national sustainable development reports not older than 10-15 years was created, and the reports and associated national processes were assessed against the following criteria:

- scientific or thematic topic(s) addressed by the assessment
- assessment tools and indicators
- geographical scope of the assessment
- time period covered by the assessment
- total number of editions completed
- methodology employed to prepare this assessment
- funding arrangements

- peer review arrangements
- innovative or noteworthy approaches.

Approaches, methodologies and outcomes vary greatly between countries; this does not allow for direct cross-country comparisons. The vast majority of the Rio+20 reports submitted were funded by the United Nations and undertaken in developing countries. Developed countries that have established national sustainable development report processes mostly did not submit their reports to the United Nations in preparation for Rio+20. Many countries have produced additional thematic reports with no link to the Rio process on themes such as water, GHGs, and social equity.

The following sources were considered in this report:
- 69 national sustainable development reports prepared for Rio+20 in 2012[66]
- Six other recent national sustainable development reports for China, Turkey, Vietnam, India, Thailand, and South Africa[67]
- National reports, strategies, indicator profiles, statements, and voluntary initiatives, prepared for sessions of the United Nations Commission on Sustainable Development (CSD) by 193 Member States[68]
- SIDSNet documents on SIDS[69]
- National assessment reports prepared by many Governments for the World Summit on Sustainable Development in 2002[70]
- 148 national progress reports on the MDGs[71]
- The website of the Global Network of National Councils for Sustainable Development which lists 53 national sustainable development offices[72]
- A selection of national government websites.

Table 8 summarizes the availability of national sustainable development assessment reports.[73] They exist for roughly half of all developed countries, but only four such reports had been submitted to Rio+20 in 2012. The overwhelming majority of the national reports submitted to Rio+20 were from developing countries in Africa and Latin America and the Caribbean. The country coverage of MDG progress reports has been three times better than for CSD progress reports and twice better than for Rio+20 reports. These data are

Table 8. Summary of national sustainable development documents, by region

Regions	Number of States with reports submitted to the United Nations (per cent of all United Nations Member States)					Total number of States
	CSD Indicator Profiles[1]	CSD National Strategy Profiles[1]	CSD National Reports[1]	MDG Progress Reports[2]	Rio+20 National Assessment Reports[3]	
Developed	25 (50%)	28 (56%)	29 (58%)	21 (42%)	4 (8%)	50
Northern Africa	1 (20%)	1 (20%)	1 (20%)	5 (100%)	2 (40%)	5
Sub-Saharan Africa	7 (15%)	6 (13%)	8 (17%)	43 (92%)	34 (72%)	47
South-Eastern Asia	1 (9%)	1 (9%)	1 (9%)	9 (82%)	4 (36%)	11
Eastern Asia	2 (50%)	2 (50%)	3 (75%)	4 (100%)	0 (0%)	4
Southern Asia	0 (0%)	0 (0%)	1 (13%)	8 (100%)	4 (50%)	8
Western Asia	1 (8%)	2 (15%)	2 (15%)	10 (77%)	3 (23%)	13
Caucasus and Central Asia	0 (0%)	0 (0%)	1 (13%)	8 (100%)	3 (38%)	8
Oceania	2 (15%)	2 (15%)	2 (15%)	11 (85%)	1 (8%)	13
Latin America and the Caribbean	4 (12%)	5 (15%)	8 (24%)	29 (85%)	14 (41%)	34
TOTALS	**43 (22%)**	**47 (24%)**	**56 (29%)**	**148 (77%)**	**69 (36%)**	**193**

1. This accounting only includes reports posted on United Nations websites for CSD12 through CSD19.
2. This accounting includes United Nations Member States, not associate members of the regional commissions.
3. Note that this accounting includes only national assessment reports submitted to Rio+20.

Source: Brinkmann et al. (2013)[73].

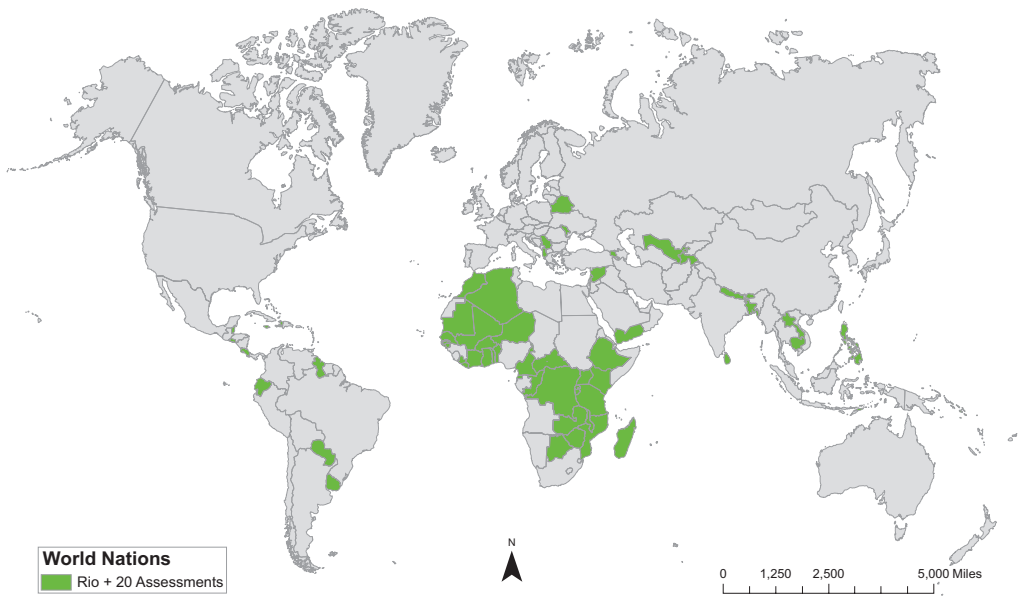


Figure 5. United Nations Member States that submitted national sustainable development reports in preparation for Rio+20

Source: Brinkmann et al. (2013)[73].

Table 9. List of topics, cross-sectoral issues, and themes maintained by the United Nations Division for Sustainable Development

• Africa	• Forests	• Mining
• Atmosphere	• Gender equality and women's empowerment	• Mountains
• Biodiversity and ecosystems	• Green economy in the context of sustainable development and poverty eradication	• National sustainable development strategies
• Biotechnology	• Health and population	• Oceans and seas
• Capacity-building	• Indicators	• Poverty eradication
• Chemicals and waste	• Industry	• Rural development
• Climate change	• Information for decision-making and participation	• Science
• Demographics	• Institutional arrangements	• SIDS
• Desertification, land degradation and drought	• Institutional framework for sustainable development	• Sustainable cities and human settlements
• Disaster risk reduction	• Integrated decision-making	• Sustainable consumption and production
• Education	• International cooperation for an enabling environment	• Sustainable tourism
• Employment, decent work for all and social protection	• International legal instruments and mechanisms	• Sustainable transport
• Energy		• Technical cooperation
• Finance		• Technology
• Food security and nutrition and sustainable agriculture		• Trade
		• Water and Sanitation

Source: United Nations Sustainable Development Platform http://sustainabledevelopment.un.org/topics.html

indicative of the relative low importance attached to sustainable development to date by United Nations entities and Member States.

The United Nations Division for Sustainable Development maintains 43 topics that were contained in *Agenda 21* or the Rio+20 outcome document, or that had been chosen for the CSD implementation cycles (Table 9). Some 405 thematic topic national assessment reports had been submitted to the CSD for implementation cycles 2004 through 2011 (CSD12 through CSD19). The coverage illustrates big differences in terms of national priorities under the sustainable development agenda. The top three topics on which reports were submitted include chemicals and waste; desertification, land degradation and drought; and sustainable consumption and production. Topics in the mid-range were mining, rural development, sustainable transport, water and sanitation, sustainable cities and human settlements; and atmosphere. Climate change had the fewest reports by countries.

There is a set of 134 CSD agreed sustainable development indicators. They are internationally comparable, also as a composite index. Some of these indicators have been used in national reports, but the overall set has generally not been used to measure progress. The list of 57 MDG indicators was not originally designed to measure sustainable development. However, they are typically being used in national assessment reports of developing countries.

2.3.2. National/subnational environmental assessments

Integrated environmental assessments have become increasingly common at national and subnational levels, and the practice of project-level assessment (e.g. environmental impact assessment) has become almost universal - even mandatory in most countries and sectors.[74] In fact, a complex hierarchy of environmental assessments has emerged (see also chapter 4). In contrast to international sustainable development assessments, in their early days these national and subnational assessments focused narrowly on environmental issues but have widened their scope ever since. Yet most national assessments of resources, such as of land, energy and water, continue to be carried out in isolation by separate and disconnected institutional entities.[75]

Among the approaches and instruments used to carry out national assessments, attention has increasingly been given during the past 40 years to strategic environmental assessment (SEA).[76] Lessons learned from SEA are summarized next.

Strategic environmental assessment (SEA)

SEA has been used worldwide at national and subnational levels. SEA definitions and practices are context specific and vary widely. They typically refer to a range of qualitative and quantitative, analytical and participatory approaches to support public policymakers in systematically taking into account environmental considerations and their interlinkages with economic and social considerations.[77]

In the early days of SEA, it only captured the environmental impacts of already formulated policies, plans and programmes. Today, it serves as an entry point for broader, integrated or sustainability assessments.[78] In fact, a continuum of SEA approaches exists with various degrees of integration - from environmental integration to cross-sectoral and cross-disciplinary integrated assessments. SEAs take an "upstream", long-term approach, exploring the potential environmental risks and opportunities of policies, plans and programmes and their interactions with social and economic issues long before individual projects are designed. SEAs set the context for "downstream" decisions and projects which have a more

narrow focus.[79] Coordination of assessments across the hierarchy (called "tiering") is being implemented the Netherlands and being considered in other countries.

SEA has been applied to transport, mining, forestry, land-use planning, agriculture, energy, waste and water management, natural resources and tourism, climate change and more broader encompassing strategies such as national development plans, Poverty Reduction Strategy Papers (PRSPs) (Box 3), and trade negotiations and agreements.

In 2005, the Paris Declaration on Aid Effectiveness called upon donors and partners to "*develop and apply common approaches for strategic environmental assessment at the sector and national levels*". International, legally binding instruments on SEA have been adopted in the last few years, including the European Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. The Directive applies to the European Union Member States and the Kyiv Protocol (on Strategic Environmental Assessment) to the Espoo Conventions, which is open to all United Nations Member States.[80]

Several thousand SEAs were carried each year by the end of the 2000s at national and local levels In the European Union.[81] Legal and administrative provisions requiring SEA also exist in Australia; Canada; Hong Kong, China; New Zealand and the United States of America. An increasing number of developing countries are applying SEA. China, Ghana, Guatemala, the Dominican Republic, South Africa, and Viet Nam have introduced SEA provisions in their legislation and/or policies. A survey carried out in 2010 indicated that at least 120 SEAs and related activities were under way in developing countries.[82]

Box 3. Strategic environmental assessment and Poverty Reduction Strategy Papers

Poverty Reduction Strategy Papers (PRSPs) were introduced in 1999 by the World Bank and the IMF as an instrument to help fulfil the need for countries to strategically examine current and planned macroeconomic structural policies and programmes to specifically identify opportunities to promote long-term growth, reduce poverty and achieve the MDGs.

SEA has been applied to PRSPs in Benin, Ghana, Rwanda and Tanzania. They followed different approaches and helped to:

- More systematically integrate environmental considerations those strategies;
- Link these considerations with national socioeconomic issues;
- Balance competing concerns relating to natural resources and economic conditions;
- Provide a framework for integrating sustainable development considerations in sectoral and districts plans and programmes;
- Improve governance and raise awareness of environmental issues in macro policy and planning advocacy representatives;
- Build capacity for integrating the environment into strategies;
- Improve cooperation and collaboration between key stakeholders (planners, Ministry of Environment, Ministry of Finance);
- Define national targets and priorities to achieve the MDGs.

Sources: Ghanimé et al. (2010), Ghanimé and Risse (2007)[83].

Integration of environment issues can help to enhance the overall social and economic goals of a policy, plan and programme.[84] Benefits of using SEAs include the identification of cost-effective alternatives or options (e.g. various corridors or transport modes in the case of a transportation policy); introduction of interventions that reduce pollution and increase competitiveness, such as environmental technology; avoidance or mitigation of environmental risks and liabilities such as habitat loss; support for wider socioeconomic goals such as energy or food security; integration of measures to manage climate change risks; and increased stakeholder involvement in decision-making. Box 4 lists lessons learned from a review of SEA applications that may also be relevant for other sustainable development assessments.

Box 4. Lessons learned from strategic environmental assessments

Reviews of SEA applications worldwide have identified the following key lessons:

- Integrate SEA as part of the policy, plan or programme development process (and not consider it as a parallel process) at an early stage of this process to inform decisions;
- Understand the strengths and weaknesses of the institutional framework in which the policy, plan or programme is set to ensure that the SEA has impact;
- Ensure adequate government ownership of the process;
- Prioritize recommendations and prepare a plan that clearly outlines how and when SEA recommendations can be implemented;
- Improve availability and quality of data (several SEAs identify a lack of data as a constraint and cause of uncertainty);
- Promote transparency and establish consultation mechanisms with key stakeholders (including the public) at different steps of the process;
- "Demystify" SEA to decision-makers and staff of organizations where it is applied through trainings and other capacity-building initiatives;
- Estimate, as part of the SEA process, human and financial resources necessary for implementing its recommendations, and plan for a follow-up mechanism to ensure implementation;
- Systematically highlight trade-offs and synergies between environmental, social and economic components of the policy, plan or programme on which SEA is applied and present conclusions in a language that captures the attention of decision-makers.

Source: Authors' elaboration.

Finally, it should be noted that there are different views as to the usefulness and cost-effectiveness of the thousands of environmental assessments of different types that are being carried out every year throughout the world. Historically, with international support, developing countries have adopted these assessment approaches at a much earlier development stage than developed countries. Good practises and successful examples that exist in developing countries are typically showcased, yet there is also much evidence for the overall unsustainability of many countries' development trajectories (see chapter 3). Hence, a sustainable development report might want to also assess the overall effectiveness of the present hierarchy of assessments.

Environmental Performance Reviews

An environmental performance review (EPR) is an assessment of the progress a country has made in reconciling its environmental and economic objectives and in meeting its international environmental commitments. The EPR programme aims to: assist countries to improve their management of the environment by making concrete recommendations; promote the exchange of information; help integrate environmental policies into sector-specific economic policies; promote greater accountability; and strengthen international cooperation.

The EPRs are evidence- and fact-based, relying on national and international data. The performance approach of EPRs has given priority to identifying national objectives (i.e. goals and targets); international commitments of the reviewed country; and use of statistics and indicators to measure the achievement of targets. The EPR programme emphasizes the use of economic analysis: the polluter pays principle, the user pays principle, economic efficiency, integration of environmental, financial and fiscal policies, as well

as integration of environmental and sector policies (e.g. energy, transport, agriculture) are constant features of EPR reports. An EPR is undertaken at the request of a country and supported by the Organisation for Economic Co-operation and Development (OECD) and UNECE.

The OECD Environmental Performance Reviews provide independent assessments of OECD countries' progress in achieving domestic and international environmental policy commitments. They aim to promote peer learning, enhance countries' accountability to each other and improve Governments' environmental performance - both individually and collectively. The analyses are supported by a range of economic and environmental data. Targeted recommendations are designed to reinforce national environmental policy initiatives. The EPRs identify good practices and make recommendations to improve the reviewed country's environmental policies and programmes. Since 1992, over 60 EPRs have been conducted in OECD member countries. Most OECD member countries have been reviewed twice. Some OECD non-member countries have also been reviewed, including China. The second cycle of EPRs (2001-2009) consisted of three substantive blocks of issues: (a) environmental management (air, water, nature/biodiversity and waste management); (b) sustainable development (integration); and (c) international commitments and cooperation on environmental matters. The third cycle, which started in 2009, aims to enhance policy advice and implementation by focusing on a few selected issues in each country review, while maintaining basic comprehensive coverage and accountability for the major environmental challenges. It also aims to speed up the review cycle by increasing the number of country reviews carried out per year, reducing the period between reviews of individual countries from between eight and nine down to five-to-six years.

UNECE undertakes Environmental Performance Reviews in countries that are not OECD members. First-cycle EPRs established baseline conditions regarding trends, policy commitments, institutional arrangements and capabilities for carrying out national evaluations. From 1994, the first cycle of reviews was performed in 20 countries of the UNECE region.[85] Second-cycle EPRs assess progress and help stimulate greater accountability. Emphasis is placed on implementation and financing of the environment policy, integration of environmental concerns into economic sectors, and promotion of sustainable development. Since 2000, UNECE has carried out 18 second EPRs. The third-cycle EPRs will include environmental governance and financing in a green economy context, countries' cooperation with the international community, and environmental mainstreaming in priority sectors. Since 2012, UNECE has cooperated with other United Nations Regional Commissions to carry out EPRs in other parts of the world.[86]

Trade Sustainability Impact Assessments

Trade Sustainability Impact Assessments (TSIAs) are a policy tool for the prior assessment of the economic, social and environmental implications of a trade negotiation. They are carried out during the negotiation phase, and help integrate sustainability into trade policy. These assessments were first developed in 1999 for the WTO-DDA negotiations. Since then they have been applied to all the European Union's major multilateral, regional or bilateral trade negotiations.

TSIAs are independent studies conducted by external consultants. Studies involve comprehensive consultation of stakeholders to ensure a high degree of transparency and to take account of the knowledge and concerns of relevant interest groups both in the European Union and in the partner country/region.

These assessments help to integrate sustainability into trade policy by analysing the issues covered by a trade negotiation from a sustainable development perspective; informing negotiators of the possible social, environmental and economic consequences of a trade agreement; providing guidelines for the design of possible flanking (complementary) measures, the scope of which can extend beyond trade policy (e.g. internal policy, capacity-building, international regulation), and which are intended to maximize the positive impacts and reduce any negative impacts of the trade negotiations in question. The assessments study the likely impacts of trade liberalization in areas such as income, employment, capital investment, equity and poverty, health and education, gender inequality, environmental quality of air, water and land, biological diversity and other natural resource stocks.

Since 2002, the European Union had launched several TSIAs for bilateral negotiations (Chile 2002, Ukraine 2007, Korea and China 2008, India and Libya 2009, Canada and Georgia 2011, Armenia, Morocco and Tunisia 2013, Jordan, Egypt and the United States of America are under implementation) and those undertaken with regional groups (Arab States members of the Gulf Cooperation Council 2004, African Caribbean Pacific 2007, Mercosur Association, ASEAN countries, Central America Association, Andean Community Association 2009). Also, the Euro-Mediterranean Free Trade Area was subject to TSIAs. TSIA in support of negotiations on a multilateral trade in services agreement had been launched since 2013 by the European Union.

2.4. Designing assessment processes to link knowledge with action

A synthesis of research from the World Academy of Sciences (TWAS) and from the Sustainability Science Program of the United States Academy of Sciences found many different barriers to effective mobilization of knowledge to support action for sustainable development, including mutual incomprehension between scientists and decision-makers of all types (from farmers to ministers), fragmentation of the knowledge system, and lack of flexibility in a world of uncertainty and surprises.[87] Proponents of sustainable development assessments suggest designing these assessments in a way to overcome these barriers.

Many suggestions have been made to improve assessments and ultimately the science advice to Governments. New Zealand's chief science adviser recently suggested 10 principles for organizing science advice that appears to capture many of the suggestions on the topic (Box 5). He further suggests a complementary role of science advisers, advisory groups and academies of science. A one-on-one trusted relationship between a science adviser and a policymaker may be most geared to addressing rapid crises and disasters, whereas an advisory group and academies may be the better solution for tackling complex and chronic issues, such as many sustainable development issues. Devising a process for the preparation of future editions of a global sustainable development report may consider these principles as a base.

Box 5. Ten principles for organizing science advice, suggested by New Zealand's Chief Science Adviser

Poverty Reduction Strategy Papers (PRSPs) were introduced in 1999 by the World Bank and:

1. *Maintain the trust of many*: the public, the media, policy-makers, politicians and the science community;
2. *Protect the independence of advice*: from both political interference and premature filtering in the policy process;
3. *Report to the top:* scientific advice to be made available directly and uncensored to the head of department or government;
4. *Distinguish science for policy from policy for science:* Science advising must be clearly separated from the role of administering the system of public funding for science, to avoid a potential conflict of interest and the perception of science advice as self-interested lobbying;
5. *Expect to inform policy, not make it:* Science advice is about presenting a rigorous account of what we do and do not know. Science is one of several stakeholder inputs to policy. Other inputs include fiscal considerations and public opinion. It is the policymakers' job to choose between options with different trade-offs;
6. *Give privilege to science as an input into policy:* Despite being only one of several types of knowledge inputs into policy, scientific knowledge should be given a privileged space, due to its lower-value intensity compared to traditional and local knowledge and beliefs;
7. *Recognize the limits of science:* Science advisers must not overstate what is or can be known. Instead, it is essential that they are clear about the limits of what science can say and achieve. Uncertainties should be made explicit to decision-makers. "There is a dangerous temptation to use science to justify value-based beliefs and a lack of literacy about what science is (a process)";
8. *Act as a broker, not an advocate:* Trust can be earned and maintained only if the science adviser or advisory committee acts as a knowledge broker, rather than as an advocate. The Japanese Council of Science published a "Code of Conduct for Scientists" that provides a good basis for this;[88]
9. *Engage the scientific community:* The science adviser must reach out to scientists for their specific expertise, encourage them to make their knowledge accessible and understandable, and help them recognize when they cross the threshold to advocacy;
10. *Engage the policy community:* This engagement is important to change attitudes and ultimately enhance both demand for and supply of evidence for public policy.

Source: Adapted from Gluckman (2014)[89].

2.5. Emerging issues identified by science

The United Nations crowdsourcing platform registered 1,115 contributions from scientists around the world who voted on each other's ideas and contributed a total 96 issues they would like decision-makers to consider for action. Table 10 lists the top-15 most popular issues identified.

The World Economic Forum, in preparation for its *Global Risks Report 2014*, carried out a survey among stakeholders on global risks, i.e. global issues that, due to their potentially large impact and high probability of occurrence, should be taken into account by decision-makers. In contrast to the survey among scientists conducted for this report, in the WEF survey respondents had to choose from 31 given risks (Table 11).

Some of the issues were identified as highly important by both scientists and the WEF stakeholders, such as water and food, income disparity, unemployment, and sociopolitical instability. However, WEF stakeholders also highlighted issues that are currently high on the global political agenda, in particular fiscal crises, systemic financial risks, climate change and global governance. Scientists, on the other hand, also highlighted other issues such as regional conflicts over resources, persistence of poverty, child labour, human appropriation of net primary productivity, environmental justice, human genetic mutations due to exposure to toxics, weak family structure, asteroid threats, school violence and ethnic violence. In other words, open crowdsourcing among scientists might be one way to support agenda-setting for the HLPF for sustainable development.

In preparation for the current report, a number of young researchers provided briefs on the issues that they would like to bring to the attention of policymakers at the global level (Table 12). Interestingly, most of the issues identified not only pose a challenge, but are also promising solutions. Future editions of the global sustainable development report may thus provide a means for inputs by young scientists, who arguably will be decisive in the world's endeavour to address its most pressing global challenges in the coming decades.

Table 10. Top-15 sustainable development issues scientists worldwide would like decision-makers to consider for action

Emerging issues identified by scientists	Score
Regional conflicts due to global competition for natural resources (oil and minerals)	92
The climate–land–energy–water–development nexus	91
Political instability and social unrest from increased income and wealth inequalities	89
Child labour	87
Non-existent or decreasing environmental justice in developing and developed countries	84
Youth unemployment	84
Persistence of poverty in poor and even in rich countries	83
Anthropogenic reductions in net primary productivity[90]	71
Weak family structures	79
The poor and the weak everywhere are the losers of increasingly market-based solutions	79
Large-scale increases in genetic mutations in humans due to accumulation of toxic chemicals in our environment and in food chains	79
Human appropriation of net primary production	79
Asteroid threat to human civilization	78
Violence in schools	77
Ethnic violence	76

Source: Results of crowdsourcing issues from scientists, conducted by the United Nations for the present report.

Table 11. Top-10 global risks identified by a stakeholder survey of the World Economic Forum

"Global risk" identified by World Economic Forum stakeholders	No.
Fiscal crises in key economies	1
Structurally high unemployment/underemployment	2
Water crises	3
Severe income disparity	4
Failure of climate change mitigation and adaptation	5
Greater incidence of extreme weather events (e.g. floods, storms, fires)	6
Global governance failure	7
Food crises	8
Failure of a major financial mechanism/institution	9
Profound political and social instability	10

Source: Global Risks Perception Survey 2013-2014, as reported in WEF's Global Risks Report 2014[91].
Note: From a list of 31 risks, survey respondents were asked to identify the 5 they are most concerned about.

Table 12. Issues identified by young researchers

Issues identified by young researchers
Ocean acidification
Microbial marine life and application of bioreactors
Use of biocatalysts (enzymes) in the chemical industry for more sustainable production
Producer responsibility for electronic waste
Protein substitutes for feed and food in the livestock sector
Phosphorus security, agricultural inputs, reserves and recycling
Rapid increase of large-scale land investments

Source: Report produced by young researchers in preparation of the current report.[92]

Table 13. Top-10 emerging environmental issues identified by UNEP

Issues	No.
Aligning governance to the challenges of global sustainability	1
Transforming human capabilities for the 21st century: meeting global environmental challenges and moving towards a green economy	2
New challenges for ensuring food safety and food security for nine billion people	3
Broken bridges: reconnecting science and policy	4
Social tipping points? Catalysing rapid and transformative changes in human behaviour towards the environment	5
New insights on water-land interactions: a shift in the management paradigm?	6
Beyond conservation: integrating biodiversity across the environmental and economic agendas	7
Accelerating the implementation of environmentally-friendly renewable energy systems	8
New challenges for climate change mitigation and adaptation: managing the unintended consequences	9
Greater risk than necessary? The need for a new approach for minimizing risks of novel technologies and chemicals	10

Source: UNEP (2012)[100].
Note: Ranking based on scoring by the UNEP Foresight Panel and after considering the polling results of more than 400 scientists.

It should be noted that for some sustainable development issues there are established processes to identify emerging issues based on scientific knowledge. For example, the CBD has such a process, which is based on a set of globally agreed criteria for the identification of new and emerging biodiversity issues.[93] Recently identified and/or assessed issues under this process include synthetic biology, geoengineering,[94] marine debris,[95] biofuels,[96] ocean acidification,[97] ocean fertilization[98] and underwater noise.[99]

Similarly, UNEP established a foresight process with inputs from 400 scientists, in order to rank emerging global environmental issues. The UNEP process suggested "21 issues for the 21st century" to its Governing Council Meeting in 2012.[100] The UNEP-identified issues are rather broad environmental areas rather than specific issues identified through crowdsourcing in support of the present report (Table 13). This illustrates the impact of process design on the types of identified issues. Crowdsourcing allows the submission of ideas by all participants, whereas traditional approaches start with a list of issues identified by a smaller group of experts.

UNEP and UN DESA organized a similar expert-based foresight process to identify the top emerging issues for SIDS,[101] the results of which differed significantly from UNEP's general foresight process. Hence, there may be a need for systematic channels of input from countries in special situations, and from smaller economies and subregions that are not well represented in the global debate.