GLOBAL SUSTAINABLE DEVELOPMENT REPORT

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Global Sustainable Development Report

Brief 1
The science-policy interface and the high-level political forum on sustainable development

Background

The United Nations Conference on Sustainable Development (Rio+20 Conference) held in June 2012 recognized that, while some progress had been made in the implementation of sustainable development since the Earth Summit in 1992, implementation was still a challenge for many countries. The establishment of the United Nations high-level political forum on sustainable development (HLPF) was a part of the response of the international community to this problem.

Among other functions, the HLPF was given the task to "strengthen the science-policy interface through review of documentation bringing together dispersed information and assessments, including in the form of a global sustainable development report, building on existing assessments". This mandate foresees a space for discussions on the science-policy interface in an intergovernmental forum dedicated to sustainable development.

UN Member States will have to determine how such a space can be structured, that is, what topics and issues it should cover, and in what format.. Chapter 1 of the 2015 Global Sustainable Development Report aims to inform this reflection by bringing together insights from the literature and practical knowledge and expertise of scientific communities, development practitioners and experts of the science-policy interface. The chapter provides a menu of concrete roles and actions that the HLPF could consider in order to strengthen the science-policy interface for sustainable development.

Science for sustainable development

An integrated understanding of sustainable development is one of the prerequisites of science for sustainable development. Such integration calls for interdisciplinary research, which entails integrating disciplines of the natural sciences and the social sciences, and bringing together people and ideas from those disciplines to jointly frame problems, devise methodological approaches and analyze data. Many sustainable development research questions also require integrating the humanities and the engineering sciences, with their very different methods and traditions.

The currently accepted paradigm for sustainable development science is that it also requires involving non-scientists – what is called transdisciplinarity. Transdisciplinarity combines interdisciplinarity and participatory approaches and requires reaching out to various communities and considering non-scientific knowledge (e.g. from local and indigenous communities, user groups, the general public, non-governmental organizations) in the research process. Other necessary conditions for science for sustainable development have been defined, inter alia, by the Scientific Advisory Board of the Secretary-General of the United Nations and include the need to consider the social responsibility of science (e.g. being oriented towards societal goals and values), and to ensure ethically acceptable, sustainable and socially desirable innovation processes.

The science-policy interface for sustainable development

The science-policy interface (also referred to as SPI) is a broad concept for which various definitions and typologies exist. SPIs are the many ways in which scientists, policy-makers and others link up to communicate, exchange ideas, and jointly develop knowledge to enrich policy and decision-making processes and/or research. SPIs involve exchange of information and knowledge leading to learning, and ultimately influencing decisions and changing behavior – i.e. doing something differently as a result of the learning. These changes may be made by policy-makers, local-level decision-makers, scientists, other stakeholders or citizens. As such, SPIs can lead to many practical impacts.

SPIs cover a very wide range of structures, communication forums, situations and methods. For example, they can be formal structures, designed for a specific purpose (e.g. scientific advisory bodies of international conventions, intergovernmental panels, scientific advisory boards, chief science advisors, national academies of science) or informal (e.g. policy workshops aiming to bring together scientists and policy-makers for discussing research results or issues). They can be recurring (global assessments such as the IPCC assessment reports) or one-off events (e.g. Millennium Ecosystem Assessment). Their common feature is the potential for exchange of information, joint knowledge production and learning.

Commonly accepted criteria for assessing the effectiveness, influence and impact of science-policy interfaces are credibility, relevance and legitimacy. Other criteria mentioned in the literature have included accessibility (of scientific findings) and iteration and evolution over time. The literature also provides numerous analyses of "factors of success" for SPI and suggestions on how to strengthen the science-policy interface.

Complex relationship between science and policy

As highlighted by the variety of roles that SPIs can play, the relationship between science and policy is not linear, but is better seen as a circular one or as a nexus. Science has different roles to play at the different stages of the policy process, from issue identification, to agenda setting and identification of goals and objectives, to the identification of tools, to monitoring and evaluation and subsequent changes in policies. However, science is only one of the actors in the policy process, and

various actors play different roles at different points in the cycle. For example, engaged individuals, civil society organizations and the media have often played a critical role in raising public awareness of important societal issues.

Communication between scientists and policy-makers is one of the critical factors impacting the effectiveness of SPIs. Gaps in effective communication can be identified between knowledge holders inside science, across regions, scales, disciplines and assessments; between science and traditional and practical knowledge holders; between science and policy; and between science and society. Improving communication between scientists and decision-makers is therefore a critical issue.

Possible roles of the HLPF for strengthening the science-policy interface: opinions from scientists and development experts

Decades of practice have resulted in a rich body of knowledge on the science-policy interface, going from the analysis of the roles it plays at various levels in society, to the way it impacts decision-making, to the design of effective science-policy interface mechanisms. The range of challenges that have been identified is vast, and concerns a range of actors operating across all geographical levels. Among the important issues identified in the literature, not all are equally relevant to intergovernmental discussions on sustainable development.

Possible roles that the HLPF could play in strengthening the science-policy interface can be grouped into three clusters that span the space between science and policy. A first group of actions relates to the provision of policy-relevant data, analysis and information. A second cluster relates to actions that the HLPF could take to support enhanced dialogue between science and policy. A third cluster of roles relates to the translation of the science-policy dialogue into policy. Among ideas considered by experts, providing improved access to the findings of existing assessments, highlighting synergies and trade-offs and tools to address them, and helping transpose the outcomes of global science-policy debates into regionally and nationally relevant frameworks for action were the most consensual. Many practitioners who provided inputs for this chapter emphasized the importance for the HLPF to consider a combination of actions, rather than any single action, recognizing potential synergies among them.

Highlighting trends and providing policy-relevant analysis

Possible roles for the HLPF in this category are directly linked to the mandates of the HLPF related to monitoring the implementation of the sustainable development agenda. Experts pointed out that the HLPF needs the capability to assess the significance of progress globally, i.e. the synthesis and interpretation across all goals and targets towards the overall outcome of global sustainability and human development. For many of these roles, the Global Sustainable Development Report could play a key role in making information available to the HLPF.

Specific actions for consideration include:

- Capture past and future sustainable development trends, lessons learnt and scientific findings, indicating potential areas for policy action.
- Highlight interlinkages among sectors and tools to address them in an intergenerationally equitable way.
- Provide improved access to the findings of existing assessments and highlight synergies and trade-offs.
- Identify new and emerging issues through sound scientific evidence, assessments and forward-looking projections.
- Provide a repository for recent assessments covering sustainable development goal areas.
- Assess the coverage, integration and coherence of international assessments in sustainable development goal areas.
- Highlight lessons learnt and best practices from public-private research collaborations.

Providing a platform for science-policy dialogue

Roles and actions identified in this cluster are directly linked to usual roles of science-policy interfaces, using the setting of the HLPF as a forum where international policy-makers meet with scientific communities and development experts. They include:

- Provide improved access to the findings of existing assessments and highlight synergies and trade-offs.
- Provide a forum for wide participation through multiple channels and feature a wide range of perspectives.
- Bring the work of independent scientific advisory groups and assessment initiatives to the intergovernmental arena.
- Involve scientists in specialized fields to engage in the broader science-policy interface through the production of science digests.
- Provide a platform for two-way interactions between international assessments and regional and national policy-making.
- Provide a platform for exchange of experience on how the science-policy interface at the national level has worked.
- Promote in-depth cooperation on integrated sustainable development scenarios.

Contributing to the agenda-setting functions of the Forum

Possible roles for the HLPF in this category are directly linked to roles described in the other two clusters; they aim at translating the result of assessment work and science-policy dialogue into agenda-setting in an intergovernmental context. They include:

- Help transpose the outcomes of global science-policy debates into regionally and nationally relevant frameworks for action.
- Provide political guidance on research needs of relevance to address sustainable development problems.
- Identify areas where research, data and science-policy interface mechanisms would need increased resources for developing countries.
- Request independent scientific bodies to carry out studies that address specific needs and questions raised by the forum.
- Agree on priority emerging issues that need addressing at the international level.
- Assess the effectiveness of the international science-policy interface mechanisms in sustainable development goal areas.
- Commission reviews on how international law in specific sustainable development areas reflects changes in scientific consensus.

More information

The GSDR 2015, its Executive Summary and other related briefs and documents are available on the following website: https://sustainabledevelopment.un.org/globalsdreport

Global Sustainable Development Report 2015

Brief 2

Integrated Perspectives on the Sustainable Development Goals

Sustainable Development Goals

In 2014, the intergovernmental Open Working Group (OWG) on Sustainable Development Goals proposed 17 Sustainable Development Goals (SDGs) and 169 associated targets to be achieved by the year 2030. Chapter 2 of the Global Sustainable Development Report (GSDR) 2015 explores these SDGs as an integrated system of goals. The chapter distinguishes integration across the three dimensions of sustainable development for any substantive issue; integration across substantive areas of what is to be developed or sustained; and integration across a wide range of geographic and time scales.

Recommendations by ICSU and ISSC

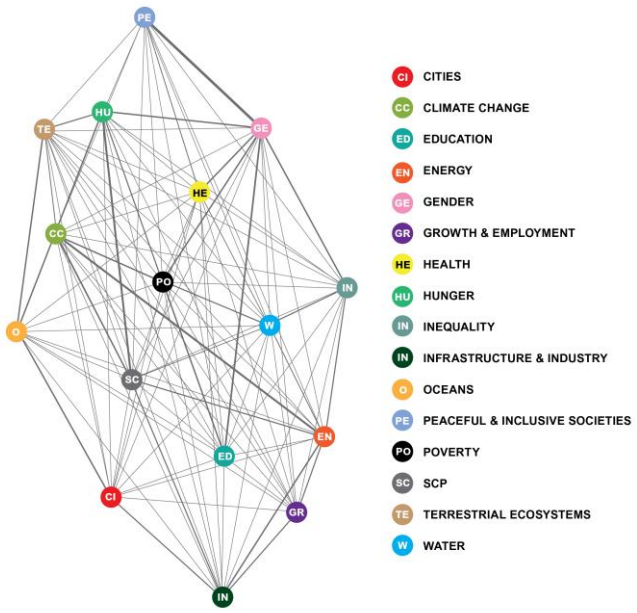
In early 2015, the International Council for Science (ICSU) and the International Social Science Council (ISSC) – which represent the scientific and technological community at the UN – presented a report entitled "*Review of Targets for the Sustainable Development Goals – The Science Perspective*".[1] In addition to specific suggestions on the SDG targets and potential aggregation of goals, the ICSU/ISSC report made three practical recommendations to promote an integrated perspective on the SDGs in the course of SDG implementation.

Firstly, the ICSU/ISSC report suggested that formulating an overarching goal could help communicating the SDGs to a wider public and tracking overall progress. It also provided an example of an overarching goal – "*a prosperous, high quality life that is equitably shared and sustainable*"[2] – and highlighted the need for new integrated economic metrics of progress beyond GDP and other established aggregate indices which were reviewed by the Prototype GSDR 2014.[3]

Secondly, while acknowledging that the proposed OWG formulation of the SDGs reflects important political and institutional realities and thus creates ownership indispensable for their implementation, the ICSU/ISSC report also proposed a composite framework to link interdependent targets that span different goals.[4] For example, efficiency, pollution intensity and access targets can be linked to many goals (e.g., water and energy efficiency targets can be linked to food security goals, energy access to industrial development, carbon intensity to most goals, etc.). Some targets must be realized in order for another one to be viable, some targets impose constraints, some targets reinforce each other, and trade-offs may also occur.

Thirdly, the ICSU/ISSC report proposed the development of scenario-based "narratives" of alternative pathways toward the SDGs. Such stories could explicitly link means of implementation to the goals and describe how the trade-offs would be overcome and synergies built on. They are expected to support the public discussion of the type of future we actually want and how to get there.[5] Scenario-based models could help assess the internal consistency and feasibility of the stories. While the Prototype Global Sustainable Development Report 2014 already included elements of a global pathway toward the SDGs and compared them with a dynamics-as-usual future pathway, a more in-depth and quantitative understanding will need to be developed from national to regional and global levels.

A scientific view of the SDG system



Data source: ISCU/ISSC report[Error! Bookmark not defined.]. *Notes*: The numbers on the links indicate the percentage of targets linking the two goals (number of links between two goals divided by the sum of targets under the two goals). SDG17 on "means of implementation" (which links to all other goals) was excluded from the analysis.

The figure above illustrates the network of goals as perceived by the ISCU/ISSC report. The width of lines between two goals indicates the number of links through SDG targets as suggested by the scientific literature. As the number of targets under each goal varies greatly, links between two goals are weighted by the total number of targets under the two goals. When SDG17 on "*means of implementation*" (which is linked to all other goals) is excluded from the analysis, SDG1 on poverty is the most central node for the system. In other words, in the view of scientists, progress on poverty eradication is central to other goals.

Complexity science can provide another integrated perspective on the SDGs, as the world we live in is a "*complex system*". Economic opportunities in one country are linked through the trading, investment, transport and communication systems to what goes on in other parts of the world. Many of the environmental issues are of regional (e.g., many types of air pollution) or even of global nature (e.g., climate change). Furthermore, many of the means at humanity's disposal to deal with the challenges have a strong global

element, e.g., science, technology, innovation, finance, and education. And most human aspirations are shared by humanity across the globe. It is an intrinsic feature of complex systems that sometimes small perturbations can lead to big impacts. And this can happen, even if all the information and skills are available. Adaptive decoupling strategies can be developed to deal with the resulting interconnected risks. The ultimate idea is improved systems design – to change the system to make it inherently more resilient, resource efficient, and equitable.

Integrated SDG perspectives in international assessments

A large number of international assessments are carried out in the UN system and beyond. Many of them take an integrated perspective on a subset of the SDGs. The Prototype Global Sustainable Development Report 2014 compiled a list of more than one hundred assessments, outlook reports and other flagship publications of the UN system and proposed a typology of these assessments. For the 2015 GSDR, a subsample of 36 international assessments was selected. Jointly, these assessments of 19 organizations in the ten-year period from 2004 to 2014 capture the full range of 17 SDGs. They tend to cover multiple SDG areas, either as stand-alone chapters of these assessments or as consistent cross-cutting dimension of the analysis therein. They typically capture three to five SDG areas in depth. Means of implementation, poverty, and growth and employment tend to be central concerns of assessments, whatever their main area of focus is. Assessments which focused on the themes of SDGs 1 to 9 (poverty, hunger and agriculture, health, education, gender, water, energy, growth and employment, infrastructure and industrialization) tended not to consider much the themes of SDGs 11 to 16 (urban development, SCP, climate change, oceans, terrestrial ecosystems and peaceful and inclusive societies). In contrast, assessments which focused on the themes of SDGs 11 to 16 tended to look at thematic areas under goals 1 to 10 more consistently and in more depth, even though both coverage and depth of treatment of these areas varies. Areas that were typically considered together include: energy and climate change; poverty and health; poverty and inequality; inequality and peaceful and inclusive societies; inequality and health; education and gender; and water and terrestrial ecosystems. Reports with a strong focus on energy showed greater diversity in terms of SDG coverage.

Global scenario models for integrated assessment of the SDGs

In taking an integrated perspective of the SDGs as a system, quantitative models and related tools can provide useful support. In view of the complexity of the interdependencies and the fact that many assumptions have to be made about the future, these models are typically used to create "scenarios", or internally consistent, plausible future pathways. The figure below provides an overview of the number of global scenario models that are covering each of the 17 SDGs. Many of the 72 surveyed models covered SDG13 on climate change (45 models), SDG8 on economic growth and employment (42 models), SDG7 on energy (35 models), SDG15 on terrestrial ecosystems and biodiversity (26 models), and SDG17 on means of implementation (25 models). In contrast, only 5 models considered governance aspects of SDG16 in one way or another, only a few explored SDG10 on inequality and no model considered SDG5 on gender equality. Only five scenarios were identified that explicitly addressed the SDGs on ending poverty, sustainable consumption and production, water, oceans, education, health, and reducing inequality. Most of the models that quantify SDG inter-linkages focus on assessing synergies and trade-offs between economic and environmental domains, such as energy and climate change. Inter-linkages to social issues focus primarily on employment.

SDG coverage of the 72 selected global scenario models

Issues for consideration

Firstly, policy makers could learn much from a systematic synthesis of diverse perspectives arising from assessments for particular SDGs and from fully integrated perspectives on the SDGs. Integration is needed across the three dimensions of sustainable development, for any thematic issue, across substantive areas of what is to be developed or sustained, and across a wide range of geographic and time scales. In this context, the three recent ICSU/ISSC recommendations on integrated SDG perspectives, contained in their "Review of targets for the sustainable development goals: the science perspective", could be carried out jointly by scientific communities and the UN system. Secondly, an annual SDG scenario modellers forum could be instituted in support of the HLPF meeting. Such a forum might help exchanging experiences and building capacity, so that purpose-built SDG models would be developed and national planners, policy-makers, and delegates would be able to access all relevant scenario information. Some of the gaps identified in the coverage of existing models could also be addressed. The forum could also help bringing together sectoral outlooks prepared by UN entities and other international organizations. Thirdly, an online and open database of international assessments on sustainable development could be created. It would build on and integrate more specific collections of such assessments, preferably based on a common data standard. The full report and more information is available here:

https://sustainabledevelopment.un.org/globalsdreport/

[1] ICSU and ISSC, Review of targets for the sustainable development goals: the science perspective (ICSU, 2015).
[2] R. Costanza et al., Time to leave GDP behind(Nature, 2014), 283-285.
[3] United Nations, *Prototype Sustainable Development Report* (UNDESA, 2014), https://sustainabledevelopment.un.org/globalsdreport/2014
[4] Griggs, D., M. Stafford Smith, J. Rockström, M. C. Öhman, O. Gaffney, G. Glaser, N. Kanie, I. Noble, W. Steffen, and P. Shyamsundar, 2014, *An integrated framework for sustainable development goals*, Ecology and Society 19(4): 49. http://dx.doi.org/10.5751/ES-07082-190449.
[5] Costanza, R., and I. Kubiszewski (eds), *Creating a sustainable and desirable future: insights from 45 global thought leaders* (Singapore: World Scientific, 2014),

Global Sustainable Development Report

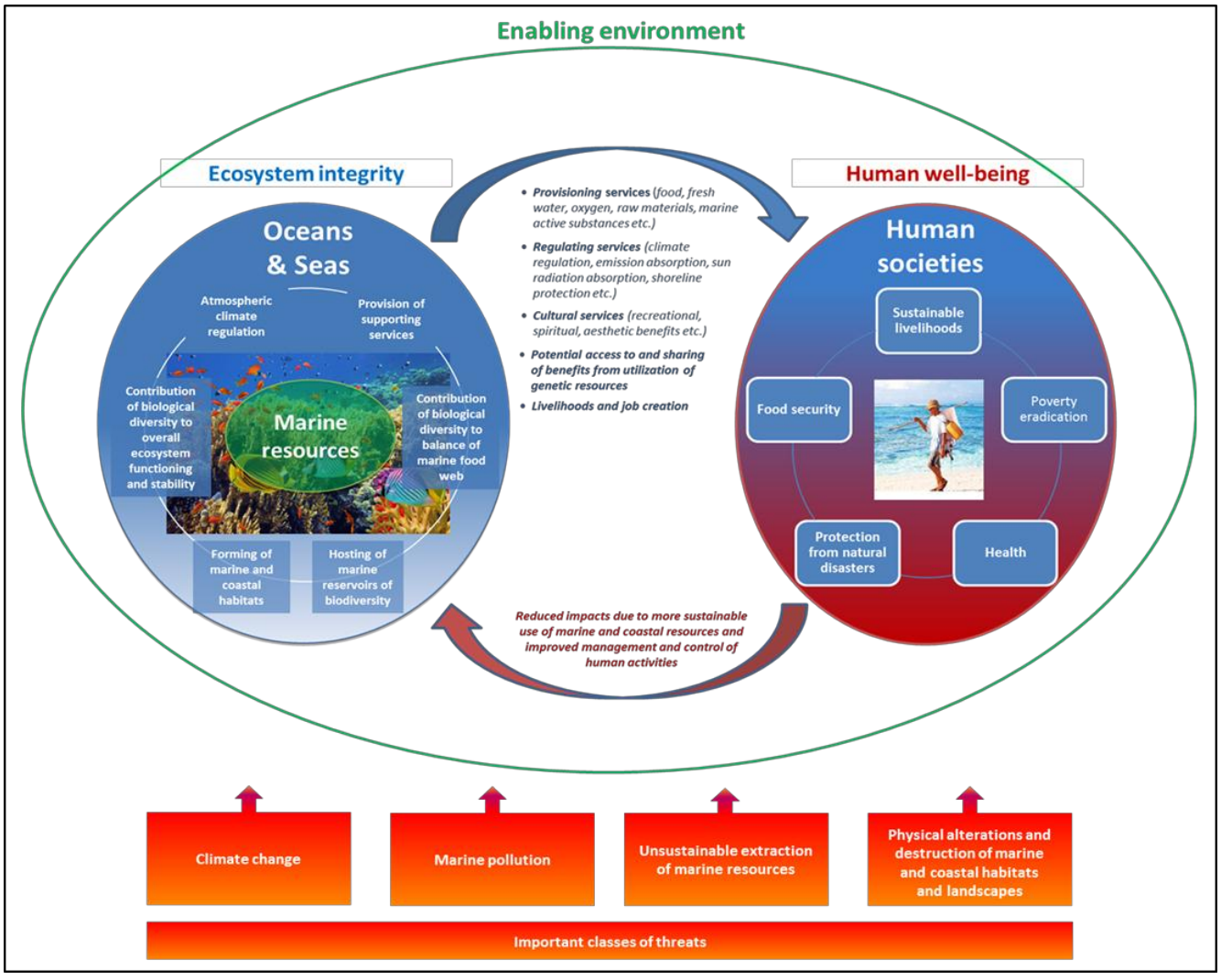
Brief 3

The Oceans, Seas, Marine Resources and Human Well-being Nexus

Interlinked issues: oceans, seas, marine resources and human well-being

In order for oceans, seas and marine resources to successfully contribute to human well-being, ecosystem integrity, with properly functioning biogeochemical and physical processes, is required. This does not require unperturbed systems, but systems that have not suffered serious or irreversible harm. Ecosystem integrity allows for the provision of so-called supporting ecosystem services which, in turn, are the bases of important regulating, provisioning and cultural ecosystem services that are of crucial importance for humans. Whereas the benefits provided by oceans, seas and marine resources are important to all people, vulnerable groups, including the poor and indigenous peoples, with a high dependency on natural resources and ecosystem services may have their well-being especially tied to these benefits. The link between oceans, seas and marine resources and human well-being is not one-sided. While an increase in human well-being is frequently generated at the cost of ecosystem integrity, it can also potentially reduce the negative anthropogenic impacts on the marine environment, for example due to a more sustainable use of resources, changes in production and consumption patterns and improved management and control of human activities. In order for this to happen, good governance and an enabling environment are required.

Oceans, seas, marine resources and human well-being nexus (Important inter-linkages and threats)



Contributing experts estimate the scientific coverage of oceans, seas and marine resources as being rather developed, notwithstanding the fact that large areas of the oceans are unexplored and unknown forms of marine life and their habitat remain to be discovered. The scientific coverage of the impact of ecosystem integrity on human well-being is seen as being rather developed with regard to the creation of jobs and sustainable livelihoods, but weak with regard to the evaluation of benefits derived from marine resources and ecosystem services. Despite some evidence provided by projects and case studies, contributing experts point to a lack of scientific information on the potential contribution of improvements in human well-being to reduced anthropogenic impacts on oceans, seas and marine resources. They suggest that further research needs to be undertaken on the effects of changes in lifestyle (e.g., production, consumption, social organization) on the sustainability of marine resource use.

Impact of important classes of threats on the oceans, seas, marine resources and human well-being nexus

Oceans, seas and marine resources are increasingly threatened, degraded or destroyed by human activities, reducing their ability to provide crucial ecosystem services. Important classes of threats identified by contributing experts were climate change, marine pollution, unsustainable extraction of marine resources and physical alterations and destruction of marine and coastal habitats and landscapes. The deterioration of coastal and marine ecosystems and habitats is negatively affecting human well-being worldwide, with more severe and immediate impacts on vulnerable groups, including the poor, women, children, and indigenous peoples, due to their often high dependency on natural resources, lack of alternative options, and inability to protect themselves from natural disasters and other threats. Coastal regions and SIDS are particularly vulnerable to these challenges as oceans, seas and marine resources play a central role in their culture, while at the same time being tightly linked to their economies.

While the scientific coverage of the different threats and their impact varies, contributing experts judge it indisputable that oceans, seas and marine resources are severely affected, with negative implications for human well-being. They found that the scientific coverage of the impact of marine- and land-based human activities on oceans, seas and marine resources is often better documented than the implications of the deterioration of oceans, seas and marine resources for human well-being. There is a therefore a need to improve further the scientific coverage of socio-economic impacts of threats affecting the nexus, particularly as they relate to human well-being.

Illustrative case studies – the need for an integrated approach when dealing with the nexus

The chapter contains a number of exemplary case studies illustrating how countries or regions have been addressing threats affecting the nexus, with benefits for both human communities and the environment. They underline the connection between ecosystem integrity and societal well-being, and the need for integrated approaches. Asked whether overall the sum of existing projects and programmes at various geographical levels "added up" to a more sustainable management of oceans, seas and marine resources and an increase in human well-being, contributing experts note that, despite a multitude of different programs and initiatives, there seems to be a lack of common vision and integration among them, which can lead to duplications, overlaps, gaps and possibly conflicting actions by different actors. The quantitative and qualitative level of projects and programmes across various geographical regions varies. Some programs and projects are not necessarily proportional to the needs on the ground. Contributing experts find that projects and programmes are often able to result in more sustainable oceans management at the local and community scales, but need to be scaled up to the national and regional level. A challenge perceived is the lack of sufficient resources – human, financial, and knowledge - coupled with a lack of political will to tackle issues at the scale that is required. The implementation of national action plans, strategies and policies aimed at sustainable development is seen as being important to support ongoing efforts.

Towards an integrated approach when dealing with the oceans, seas, marine resources and human well-being nexus

Oceans, seas and marine resources support the human well-being of all people by contributing to poverty eradication, food security, the creation of sustainable livelihoods and jobs, human health and protection from natural disasters. They are the primary regulator of the global climate and an important sink for greenhouse gases, while also providing humans with water and oxygen. However, marine- and land-based human activities often threaten ecosystem integrity and hamper the provision of ecosystem services crucial to humans and sustainable development.

Good governance, an enabling environment, sustainable land- and marine-based human activities, and adequate measures will be required to reduce the negative anthropogenic impacts on the marine environment, for example due to a more sustainable use of resources, changes in production and consumption patterns and improved management and control of human activities. Projects and measures should ideally be designed and implemented in an integrated, cross-sectoral and cross-scale manner, in line with the ecosystem approach and involving all stakeholders.

Activities and policy-making should be guided by scientific information combined with relevant experiential knowledge. The scientific coverage of socio-economic aspects of the nexus and threats affecting it needs to be improved. Enhanced trans-/multidisciplinary research is required, with natural and social scientists working together with holders of relevant traditional and experiential knowledge, to better understand the nature of the complex interactions between humans and marine and coastal ecosystems.

Human well-being cannot be achieved without the protection and conservation of the Earth's ecosystem. To maintain the quality of life that the oceans have provided to humankind, a change will be required in how humans view, manage and use oceans, seas and marine resources. Science can play an important supporting role in this regard.

More information

The 2015 GSDR, its Executive Summary and other related briefs and documents are available on the following website:

https://sustainabledevelopment.un.org/gsdr2015.html

Global Sustainable Development Report

Brief 4
Disaster Risk Reduction: A Cross-cutting Necessity in the SDGs

Background

Since the year 2000, natural disasters have caused the loss of life of over 1.1 million and affected another 2.7 billion people. While improvements in disaster risk management have led to dramatic reductions in mortality in some countries in the last decade, economic losses are now reaching an average of US$250 billion to US$300 billion each year. The ways that disasters undermine sustainable development have been much discussed in two significant United Nations processes. During the intergovernmental negotiations of the General Assembly Open Working Group on Sustainable Development Goals (SDGs), many Member States stressed the need to weave disaster risk reduction (DRR) as a strong cross-cutting issue in several SDGs. As a result, the proposal of the Open Working Group on SDGs that was presented in July 2014 includes several targets directly related to resilience and disaster risk reduction. The third UN World Conference on Disaster Risk Reduction (WCDRR) organized on 14-18 March in Sendai, Japan, agreed on the Sendai Framework for Disaster Risk Reduction 2015-2030, a successor to the Hyogo Framework for Action (HFA). To support the assessment of global progress in achieving the outcome and goals of the Sendai Framework, Member States also agreed on seven targets that will be measured at the global level.

This brief provides a short overview of chapter 4 of the 2015 Global Sustainable Development Report: *Disaster risk reduction: a cross-cutting necessity in the SDGs.* The chapter takes the proposal of the Open Working Group as its reference point and focuses on DRR in the context of the SDGs. It first looks at the interlinkages between DRR and several SDGs, giving illustrative examples of links in order to position DRR in the framework. Second, it considers what setting DRR targets will mean for monitoring progress, highlighting issues related to data collection, methodologies and baseline setting. The chapter also showcases new solutions for data collection and measurement in the context of DRR. The chapter aims at serving as one example how the GSDR can help in capturing past and future sustainable development trends, lessons learnt and scientific findings, indicating potential areas for policy action, as set out in chapter 1 of the report.

Interlinkages

Due to its cross-cutting nature DRR is interlinked with various SDGs beyond the explicit DRR targets set out in the OWG proposal. With most of the issues the linkage is two-fold; if DRR is not given prominent focus, achieving several of the SDG targets, such as ones related to poverty eradication, water, education, slums, and health, will be extremely challenging for many, particularly developing, countries. Also, falling behind the set ambition level on many of the existing SDG targets that serve as underlying drivers of disaster risk, such as the ones related to poverty eradication, sustainable cities, food security, health, natural resources management, or climate change, will mean additional challenges in achieving the DRR targets. The DRR chapter of the GSDR aims at mapping out some of the key interlinkages between disaster risk reduction and several SDGs.

Disasters cause severe agricultural losses and hamper food security. According to FAO estimates, there has been a total of USD 4.9 billion in crop and livestock production losses caused by droughts in the Horn of Africa alone between 2003 and 2013.

For instance, disasters destroy critical agricultural infrastructure and assets, and they cause losses in the production of crops, livestock and fisheries, causing serious damage to livelihoods and food security of millions of small farmers, pastoralists, fishers and forest-dependent communities, particularly in developing countries. Case studies indicate that the impacts of drought, for example, can only be partly attributed to deficient or erratic rainfall, as drought risk appears to be constructed over time by a range of drivers. These include for instance poverty and rural vulnerability; increasing water demand due to urbanization, industrialization and the growth of agribusiness; inappropriate soil and water management; weak or limited governance; and climate variability and change. Reducing drought losses will be challenging without addressing also these underlying drivers.

Measuring progress – target 11.5

One of the disaster-related targets proposed by the OWG is the outcome target 11.5 that aims to “By 2030, significantly reduce the number of deaths and the number of people affected and decrease by [x] per cent the economic losses relative to gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations”. The chapter aims at moving the discussion

forward, showcasing several issues that will need to be taken into consideration both when considering appropriate target levels and when planning the monitoring of progress towards the target. There are several DRR related targets in the SDG proposal, but 11.5 is used as an illustrative example to showcase issues related to monitoring. At the same time, the chapter aims at highlighting monitoring issues that are relevant also for the implementation and planning of DRR measures, such as the importance of loss accounting, risk assessments and probabilistic modelling. The chapter also raises the question of how to combine global and national level target setting given countries' differing risk profiles. Due to very different country risk profiles, differentiation at the national level is inevitable with DRR. For countries with very low risks, DRR measures will not play a significant role in implementing the SDGs, while for others they will be a prerequisite for achieving not only the DRR targets but also many other goals. Also, for some countries significant reductions in mortality and economic losses will be easier to achieve than for others, depending on the hazards they face.

Monitoring of progress towards proposed goals and targets will require high quality loss data, which is also important for DRR planning. Disaster loss accounting is considered a backbone for setting the baselines and for measuring the progress towards targets. However, compiling, maintaining and updating disaster data is challenging, and lack of clear standards and definitions has led to inconsistency and poor interoperability of different data initiatives. While disaster loss data quality and coverage have significantly improved in recent years, data gaps are common in many databases at all levels. The chapter also highlights the importance of jointly used methodologies and definitions. Significant efforts have been undertaken to improve the interoperability of disaster loss data from national and global databases through the development of common data standards and methodologies, but much work remains to be done. The chapter showcases some of the issues to be taken into consideration and the ongoing efforts to address them.

Robust monitoring of the SDG targets will also require the use of sound baselines, numbers used as a starting point against which progress would be measured. As a very simplified categorization, three different options for baseline setting could be envisaged. These include the use of average losses derived from observed historical data over a certain period of time; measuring progress using simplified hazard, exposure and vulnerability to measure levels of risk and compare points in time; and measuring progress from expected losses based on catastrophe models. The two latter options compare the estimated risk at single points in time, such as 2015 to 2030, and the baseline numbers of risk would be based on the exposure and vulnerability in those particular years. The question of the method is also linked to the issue of target level setting, since enhanced data and use of risk assessments and probabilistic scenario models will directly contribute to countries' understanding of their risk profile and possible progress in the upcoming 15 years. Taking into account current coverage of data sets and the state of risk assessments, the use of baselines based on observed historical losses might prove to be the most feasible option for the moment. However, risk assessments and models based on scientific information also provide countries immensely useful tools in other spheres of DRR planning and are hence showcased in the chapter.

New solutions for measuring

As new technologies for data collection have become increasingly available and user-friendly, the disaster risk reduction community has been exploring these channels to complement and even by-pass often arduous and expensive traditional data collection methods. In particular, traditional and new data sources, including big data, could be brought together for better and faster data in several phases of the disaster cycle. These new ways of data collection can be used in the full disaster management cycle to guide preparedness and early warning, impact and response as well as mitigation, risk and vulnerability monitoring.

The chapter provides examples of new sources and ways of utilizing data for assessments and measuring. Recent innovations have for example increased the utility of spatially-referenced video obtained with GPS-enabled cameras, since these can be much quicker for damage assessments than deploying staff to the field. Such georeferenced videos involve attaching a camera to a vehicle or small aircraft and recording a damage-affected area, possibly later isolating individual frames to use as static images. It has been used to track damage after tornadoes in Tuscaloosa, Oklahoma, and to track recovery of New Orleans neighbourhoods after Hurricane Katrina. New individual datasets that help understand disaster impacts include sources such as phone call detail records (CDR) and airtime expense records. The former are anonymized records of caller and receiver phone IDs and cell towers, and call date and time. Airtime expense records detail the amount and nearest tower location of cell minute purchases. This data has been used by researchers to understand broad human mobility and population response across many contexts such as measurements in post-earthquake Haiti in 2010, and in 2009 floods in Tabasco, Mexico.

Although all these new types of data have the potential to fulfil current data gaps, socio-economic, infrastructural, data management, and educational barriers to using the data in many developing countries remain for big data to truly transform disaster monitoring.

Monitoring progress

The chapter makes the case that effective disaster risk reduction measures will need to play a key role for disaster-prone countries in implementation of the post-2015 development agenda in order to prevent the hard-won development gains from being eroded by disasters. Several questions related to definitions of terms and the target scope, accounting methods, baselines and data sources will need to be answered when setting up the monitoring framework for SDGs. There lies a golden opportunity to align the work being done for the post-2015 agenda with the post-Sendai DRR monitoring framework in order to avoid duplication, and to ensure that progress in disaster risk reduction can be reported as an integral part of progress on sustainable development. This will spare precious resources and allow countries to focus on implementation in order to make development sustainable and resilient.

More information

The GSDR 2015, its Executive Summary and other related briefs and documents are available on the following website:
https://sustainabledevelopment.un.org/globalsdreport

Global Sustainable Development Report

Brief 5
Economic Growth, Inclusive and Sustainable Industrial Development and Sustainable Consumption and Production

Background

Historically, industrialization has been a proven path for countries to raise the living standards of their populations towards high-income status. During the 20th century, industrialization was driven to a significant degree by low-cost carbon-based energy sources. Such an industrialization path is increasingly problematic if the international community is to slow climate change.

Also, technological advance – particularly ICTs – applied to industrial production has in recent decades had noticeable impacts on the availability of different types of jobs. In the course of structural transformation of economies, the share of industrial employment in total employment appears to be peaking at lower levels than in the past. This raises concerns regarding how far industrial development can be relied upon to provide productive jobs for the large numbers of new labour force entrants in parts of the developing world, notably in sub-Saharan Africa.

Policies to promote industrial development today will need to be responsive to these two sets of concerns: how to make industrialization more environmentally sustainable? how to make it more socially inclusive?

Sustainable consumption and production (SCP) is an approach to addressing both the demand and the supply side not just of industrial output but of all economic activities. Yet, the fact remains that the industrial sector, if unregulated and poorly managed, has the potential to impose the greatest damage on the environment and human health, including indirectly through its demand for fossil fuels. It also has the potential to achieve the highest rates of productivity growth in the economy which, if accompanied by broad-based employment growth, including among SMEs, offers the prospect of steadily rising household incomes and a growing middle class.

Industrial policy for the 21st century

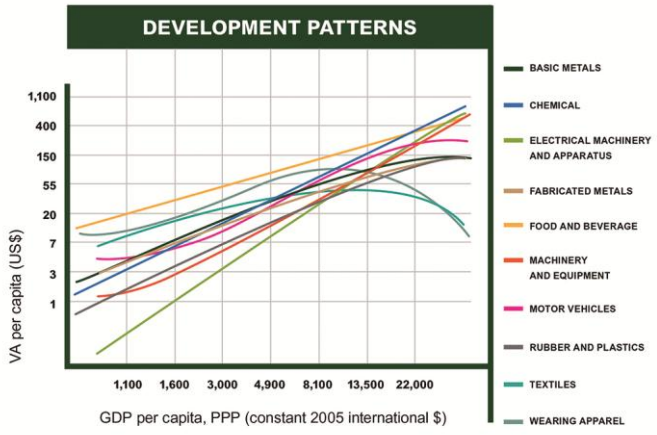
Historically, industrial promotion policies have been used by many governments as an instrument of broad economic policy. Primary motivations have been to accelerate productivity growth and to stimulate creation of relatively well-paid industrial jobs.

Industrial policies can take many forms. To the extent that they have in the past been associated with favouring certain industries and/or firms over others, they have been roundly criticized by mainstream economists and international organizations on the grounds that governments should not attempt to 'pick winners', that that is better left to markets.

In contrast, economists working with international institutions have generally argued for generic policies – education in training, vocational and tertiary education, a favourable and predictable business climate, and where appropriate support for scientific research and early stage R&D as means of encouraging industrial sector growth and productivity growth more generally. They have also generally favoured economic openness to expose domestic enterprises to the forces of international competition and ensure specialization follows comparative advantage.

New thinking on industrial policy's role focuses on promoting individual and collective forms of learning and innovation dynamics within manufacturing and broader production systems. A more sophisticated understanding is emerging of industrial eco-systems that encompass interlinkages among producers along the supply chain, technology infrastructure and service providers, the financial community and sophisticated users.

With globalization, many countries are linked into global supply chains for which their domestic industries may supply only a few links of a given chain. Economic diversification can occur through vertical integration along the chain towards more technologically sophisticated processes and components, or through horizontal migration towards related products of comparable or greater sophistication. What is important for industrial policies in this context is to encourage evolution of an economy's production structure towards tasks and products of increasing complexity requiring ever more advanced technological capabilities. This is the essence of the process of industrialization which has underpinned economic convergence in the past decades.



Source: based on UNIDO INDSTAT2 database.

Sustainable consumption and production

Economic growth, even of the most energy and resource efficient variety, still creates energy and resource demands. For the most part, current patterns of economic growth are far from the most energy and resource efficient attainable, even with currently available technologies. A shift towards more sustainable consumption and production patterns involves making best use of

existing technologies and incentivizing development of new technologies to delink as far as possible economic output from energy and natural resource use as well as from environmental degradation. It also involves changes in consumer behaviour and in producers' methods of managing and organizing not just individual production processes but production systems and globally distributed networks, or supply chains.

Consumers may be the last link in global supply chains, but they are a key one. They can exert – via their purchase decisions – tremendous leverage over production decisions made all along the chain, as well as on the kinds of products manufactured (e.g., their materials content, energy efficiency in use). With growing global awareness of sustainability threats like climate change, biodiversity loss, and degradation of marine and terrestrial ecosystems, consumer preferences are noticeably changing and producers are having to adapt to meet those preferences. Producers which are publicly-held companies also face growing pressures from shareholders who want to know how the company manages material risks such as climate change.

A growing number of governments are putting in place strategies to support a shift towards sustainable consumption and production patterns. SCP offers a holistic perspective to align society and economy with environmental sustainability as well as concrete operational approaches targeting different sectors, stages of the life cycle and market players. SCP also encompasses policies to support technological and social innovation. The main leverage points of SCP-oriented policies include:

UNEP's six key types of SCP actions

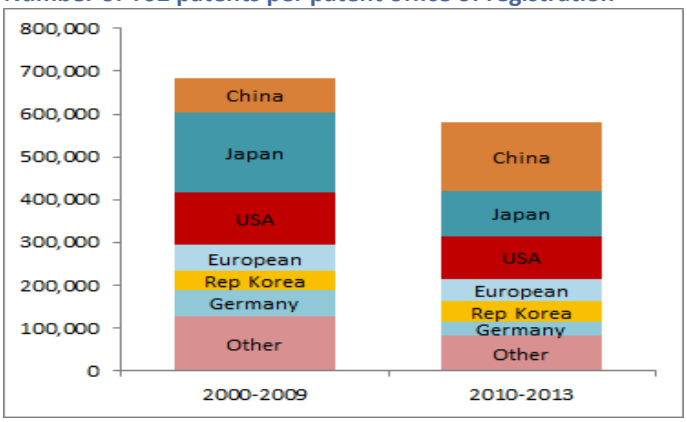
Supply-side key actions	Demand-side key actions
Reducing material/energy intensity of economic activities and reducing emissions and waste from extraction, production and consumption through resource efficient production methods	Promoting a shift of consumption patterns towards goods and services with lower energy and material intensity without compromising quality of life, including through behaviourally informed policies
Implementing Extended Producer Responsibility (EPR) to improve efficiency of and reduce public expenditures on waste management as well as promoting more recyclable goods	Increasing quality of and access to consumer information, including through ecolabelling, and addressing consumer well-being in consumer protection laws, in line with the UN Guidelines on Consumer Protection
Applying life cycle thinking, which considers the social and environmental impacts through all stages of production and consumption	Guarding against the re-bound effect, whereby efficiency gains are cancelled out by resulting increases in consumption

International co-operation for SCP-oriented industrialization

Promoting sustainable and inclusive industrialization calls for alignment of industrial policies as conventionally understood with SCP policies broadly conceived. In recent years, the promotion of the renewable energy industry and related technologies by several emerging economies represents a good example of such policy convergence. Work undertaken by UNEP, UNIDO, ILO and other UN entities on the green economy, and by the OECD and World Bank on green growth, is guided by a perception that internalizing environmental externalities and enhancing opportunities for decent work can create positive growth opportunities, in contrast to the conventional view that both are cost-augmenting constraints on producers.

The figure here indicates how far China, through its investments in R&D for environmentally sound technologies, has advanced in the league of global patent registrations. The novel meta-class Y02 is a patent category proposed by the European Patent Office for climate change prevention and mitigation technologies, and in the period 2010-13 China led the world in such patent registrations.

Number of Y02 patents per patent office of registration



Source: A.J.O. Silva and S. Mendoza (2015, forthcoming). The Grand Green Challenge: Assessing Progress in Eco-Innovation through Y02 Patents.

In general, developing countries are not technology leaders and continue to rely on acquired foreign technologies, whether through foreign direct investment, licensing, or imports of embodied technologies. Thus, timely access to affordable environmentally sound technologies through these channels, coupled with efforts to strengthen local capacities, will have an important bearing on how successful they are in pursuing sustainable industrial development, including through factoring environmental costs into infrastructure investment decisions.

Conclusion

Delivering the required improvements on the supply and demand sides for sustainable industrial development and SCP will require a set of changes in the public policy agenda. Governments will need to set the rules of the game to foster private investment toward more sustainable products and production methods. Governments will require enhanced capacity to identify and deploy policy tools for promoting sustainable and inclusive industrialization as presented in Chapter 5 of the Global Sustainable Development Report 2015.

More information

The GSDR 2015, its Executive Summary and other related briefs and documents are available on the following website: https://sustainabledevelopment.un.org/globalsdreport

Global Sustainable Development Report

Brief 6
Countries in special situations

Strengthening the science-policy interface in countries in special situations[1]

Strengthening the science-policy interface is a challenge for all countries, but countries in special situations: least developed countries, landlocked developing countries and small island developing states[2] face particular challenges and difficulties in this regard. Evidence-based policymaking is not generally well institutionalized in these groups of countries, and many countries lack formal mechanisms for the integration of scientific knowledge into policies. A prerequisite for a functioning SPI is that there be a solid domestic scientific infrastructure and thriving scientific research community. While science is a global enterprise and where scientific knowledge is generated has no bearing on its validity, it can have an important bearing on its utility, especially in the case of applied science.

Thus, for the SPI to become effective in countries in special situations and play more of its potential role in policymaking, their science, technology and innovation (STI) systems need to be strengthened. As science and technology are instruments for improving human well-being, strong links are needed not only to policymakers but also to the productive sectors of the economies of these countries, which generate the jobs and incomes that make rising living standards possible and sustainable. Scientists of countries in special situations also need to be more systematically linked into global research initiatives and scientific communities.

By virtue of these country groupings' sharing certain structural characteristics, they also share problems on which collaborative research and knowledge sharing can shed light. In the context of SIDS, for example, inter-regional collaboration on the science-policy interface is an area that can be enhanced for the mutual benefit of countries facing similar challenges even if they are on opposite sides of the globe.

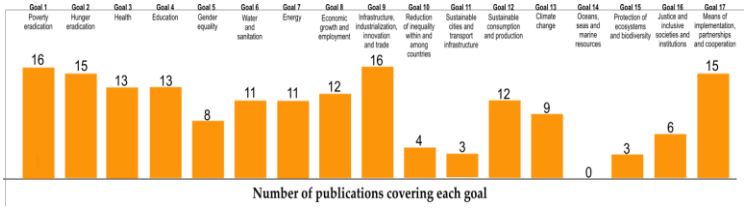
[1] This is not to the exclusion of other groups with special challenges recognized in different agreements, for example, African countries, middle-income countries, and countries in situations of conflict, all of whom are mentioned in *The Future We Want*.

[2] The three categories of countries in special situations are determined by United Nations criteria and are treated as such in the United Nations as well as by donors, regarding eligibility for various forms of development assistance in particular, and sometimes in other areas of international law. These categories have given rise to specific UN processes with outcome documents and plans of action that serve as their respective development frameworks.

Data and monitoring

There exists no easily accessible repository or resource book containing relevant documentation on various SDGs for these three groups of countries. Most of the data-heavy international publications are done by the United Nations system or related entities like the World Bank. Their findings are often referenced in publications done by the scientific community. Likewise, United Nations flagship reports across the board engage scientific sources outside the United Nations for their research and reports. Based on the samples of publications analysed for this report, there are more United Nations publications that cover LDCs and LLDCs than SIDS; on the other hand, SIDS seem to stimulate significant academic research and publications. Both types of publications often take a sectoral rather than an integrated, cross-sectoral approach. Analysis found that most publications cover one or two proposed SDGs and very few cover more than three or four. Generally, the publications analysed here tend to cover better SDG areas that were already included in the scope of the MDGs, with a focus on social issues.

Coverage of SDG areas by a sample of publications

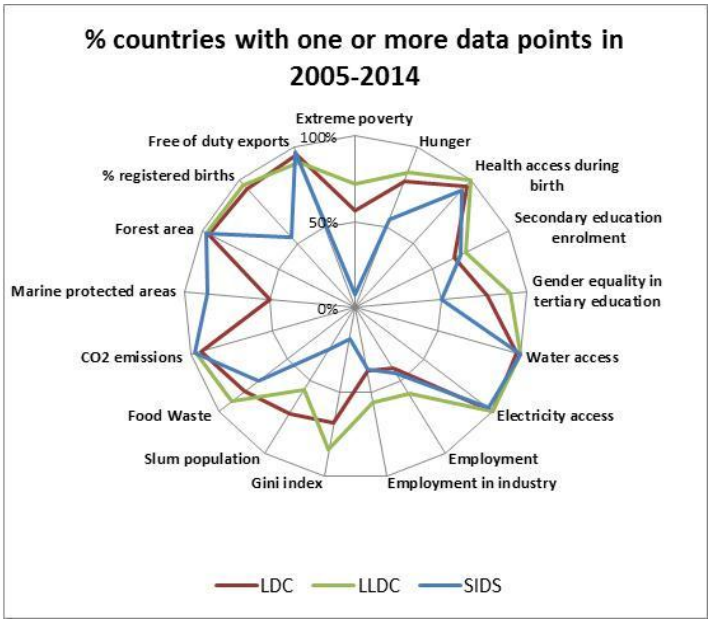


Looking at international commitments for these countries in special situations and comparing their emphasis with those of proposed sustainable development goals (SDGs), it can be seen that many areas of correspondence exist, even though, as is to be expected, priorities of these countries are dealt with greater ambition and elaboration in their respective international commitments. Nevertheless, if SPI is strengthened, it could be assumed that future publications might show more interlinkages and integration which are shown in both proposed SDGs and the international commitments for these countries. This would, thus, be more useful for policy makers to be able to make their decision making more evidence-based. Future research in this area will show whether this assumption will prove to be correct.

The lack of accurate and adequate data and statistics is a major challenge that has been recognized within these countries. In spite of the importance of reliable data to pilot development strategies, crucial data is often missing. Thus, for example, although most of these countries are able to conduct censuses, data from those are typically available only every ten years. In many countries, reliable administrative records do not exist and

surveys are scarce. Data in areas such as water and electricity access are more widely available, because international agencies often produce estimates to fill data gaps. Administrative data systems that require substantial resources – such as lists of enrolled students and their gender, or registered births – are not so widely available.

Although models can produce informative estimates to guide policymaking, it is unclear if countries in special situations have the capacity to develop their own models and use these estimates to inform their policy decisions. With cheap cell phones and increasingly cheaper satellite images, indicators based on big data may also be explored to complement survey data gaps.



Way forward

Going forward, the monitoring and review of progress will need to take advantage of synergies between the IPoA, VPoA and SAMOA Pathway, on the one hand, and the SDGs, on the other.

However, the question of monitoring highlights a major challenge that has been recognized by these groups of countries: the lack of accurate and adequate national data and statistics. In addition, another challenge in some cases is that the data does exist, having been collected by national and regional entities, but is not *used* for international assessments and analysis.

Intra- and inter-regional scientific and policy research collaboration to examine shared sustainable development challenges could be further encouraged. In the context of SIDS, such collaboration is perhaps most advanced but still could be further developed.

Proactive engagement of a variety of stakeholders is another aspect of integrated and evidence-based policymaking and both scientists and policymakers need to engage effectively with stakeholders by communicating their aims and priorities clearly and persuasively. A three-way dialogue among scientists, civil society and policy-makers is a fruitful way of bringing different perspectives on the implications of emerging scientific findings for broader societal well-being, as a basis for a conversation on how those findings might shape policy.

The research for this chapter has shown specifically that it would be important for LDCs to strengthen their science-technology-innovation (STI) systems and carry out capacity-building activities for both scientists and policymakers.

A comprehensive, high-level midterm review of the IPoA taking place in June 2016 will assess progress and strengthen the global partnership for LDCs and would also represent a possibility to look at SPI.

The LLDCs need to institute new and strengthen existing channels and mechanisms for interaction and dialogue between policymakers and researchers on a long-term basis, while looking at their geographical specificities and putting emphasis on priorities like trade and infrastructure.

High quality data and statistics are not always readily available in SIDS. This makes scientific collaboration and shared learning especially important, especially because in many cases SIDS from all three regions share priorities and challenges.

The institutionalization of long-term planning can contribute to the convergence of the time horizons of policymakers and scientists, which are usually in conflict due to the former's short-term political cycle and the latter's longer-term work cycle.

More information

The 2015 GSDR, its Executive Summary and other related briefs and documents are available on the following website:

https://sustainabledevelopment.un.org/gsdr2015.html

Global Sustainable Development Report

Brief 7
Science issues for the attention of policy makers

Introduction

The identification of new and emerging issues, drawing on scientific evidence, assessments and projections, is a function of the science-policy interface. An issue can also be understood as emerging where the scientific community considers it important, but the policy community has not given it "adequate" attention. Others argue that an issue becomes "emerging" as soon as scientific confidence in causality is established.

A range of approaches can be applied to identify a set of emerging issues; a common way is expert consensus, using criteria to collect an initial list of issues, which is then whittled down in the course of discussions among experts. The involvement of experts tends to enhance the credibility of the process.

Criteria are explicit, and the process of selection and elimination of issues can be transparently recorded and justified. The overall exercise can be characterized as systematic. However, while observers can scrutinise the process, initial choices about the framing and articulation of criteria, as well as the selection of experts, may significantly affect what issues are identified as "emerging". Related to this, the perceived legitimacy of such exercises will depend on the extent to which the process has been unbiased and fair in the treatment of views. These weaknesses may be overcome by combining the structured process with crowd-sourcing.

"Crowd-sourcing" to help identify emerging issues

An open call for science briefs for the GSDR 2015 yielded 187 accepted contributions, which provide a bottom-up, "*crowd-sourced*" sample of sustainable development issues from a diversity of perspectives around the world. The briefs cover topics ranging from antibiotic resistance, karst and caves, through to the health of the oceans.

While the "*crowd-sourced*" approach adopted for the GSDR lacks the systematic character of more formal exercises designed to identify emerging issues, it also meant that very few issues were foreclosed from the beginning. In a sense the approach can be compared to the first, scoping stage of an expert-led process, when the "raw" list of issues is compiled. But for the GSDR the process of scoping was decentralized with expert contributors from diverse disciplines and a range of countries. As a result, policy-makers gain access to a bottom-up, largely unfiltered science perspective, with the freedom to judge the policy-relevance of the issues identified. Many inputs were received from younger scientists and scientists from developing countries who previously had not been typically involved in UN-related activities and debates.

The result is a wealth of information that scientists would like policy makers to consider in their deliberations at the United Nations, in particular in relation to the mandate of the High-level Political Forum on Sustainable Development (HLPF) to strengthen the science-policy interface. However, it must be emphasized that the crowd-sourcing exercise is presented as a complement to more formal assessment exercises in the context of the science-policy interface. This is in keeping with one of the overall objectives of the GSDR to feature a wide range of perspective from multiple channels.

Some key messages

The submitted briefs differed greatly in terms of their nature and focus. Taken together they provide a mosaic glimpse of a system of inter-dependent challenges. Most briefs focussed on particular aspects or interlinkages and took a bottom-up perspective, in contrast to the top-down approach typically used by integrated global assessments. The geographic scope of the briefs ranged from local projects at the village level to the world as a whole. Important interlinkages between geographic scales were typically identified, too. Authors also made the case that some local concerns (e.g., exotic forest tree disease) can have regional and global impacts. It should also be noted that a near and medium-term perspective was dominant in the briefs, while implications for the longer-term were typically pointed out.

Not surprisingly, many briefs emphasized knowledge production and the need to improve our understanding of the various subsystems. They addressed various aspects of measurement (including indicators) – providing a scientist's rather than an official statistician's perspective on measuring sustainable development progress. Many of the briefs follow the spirit of transdisciplinary approaches and are firmly located within sustainability science.

Big data approaches for sustainable development

So-called "big data" is another area in which scientists have applied new tools to provide information and analysis on aspects of sustainable development. The table below provides an overview of the wide range of emerging big data applications and how they could support the whole range of SDGs at various geographical and time scales.

Recent deliberations at the UN have focussed on the question of whether big data could contribute to the monitoring of progress and the effectiveness of policies, programmes and activities. They are envisaged as complements to official statistics.

More information

The 2015 GSDR, its Executive Summary and other related briefs and documents are available on the following website:
https://sustainabledevelopment.un.org/gsdr2015.html

Selected big data applications in areas covered by the SDGs and in topics relevant for sustainable development

SDGs	What is measured?	Data source	Geographic scope of application (current)
Poverty (SDG1)	Poverty	Satellite images (night-lights)	Global map
		Cell phone records	Côte d'Ivoire
	Price indexes	Online prices at retailers websites	Argentina
	Socio-economic levels	Cell phone records	City in Latin America; UK
Hunger and food security (SDG2)	Food price crises	Tweets	Indonesia
	Money spent on food	Cell phone data and airtime credit purchases	A country in East-Central Africa
	Crop productivity	Satellite images	Africa
	Drought	Remote sensing	Australia; Afghanistan, India, Pakistan; China
Health (SDG3)	Influenza	Online searches	US; China
		Twitter	Japan; US
		Voluntary reporting through the internet	Belgium, Italy, Netherlands, Portugal, United Kingdom, United States
	Malaria	Cell-phone records	Kenya
	Population movements during an epidemic	Cell-phone records	West Africa
	Cholera	Social and news media	Haiti
	Dengue	Web search queries	Argentina, Bolivia, Brazil, India, Indonesia, Mexico, Philippines, Singapore, Thailand, Venezuela
	Flu, gastroenteritis and chickenpox	Online searches	France
	Vaccine concerns	Media reports (e.g., online articles, blogs, government reports)	144 countries
	Illnesses	Twitter	US
	Vaccine concerns	Twitter	US; Indonesia
	HIV	Twitter	US
	Drug use	Twitter	US
		Wastewater analysis	Europe
		social media and web platform scans; emergency room and poison centre calls; arrestee drug testing; listservs	US
	Perceptions towards contraception methods	Facebook and U-report	Uganda
Education (SDG4)	Literacy	Cell phone call and SMS records	Senegal
Women (SDG5)	Women's well being	Twitter	Mexico
	Discrimination of women	Twitter	Indonesia
Water and sanitation (SDG6)	Water flows, quality of drinking water	Precipitation measurements, water level and water quality monitors, levee sensors, radar data, model predictions as well current and historic maintenance data from sluices, pumping stations, locks and dams.	Netherlands
	Leaks, clogs and water quality issues	Sensors	Singapore
Infrastructure, industrialization and innovation (SDG9)	Map with internet devices by location	Internet tools to scan all addresses of the fourth version of the internet protocol	World
Inequality (SDG10)	Wealth and inequality	Airtime credit purchases	Cote d'Ivoire
	Migration	Social media, online searches	Several countries
Cities (SDG11)	Urban extent and population	Satellite images	Global
	Transport use and journeys; Subway flows	Transport cards data	London, UK
	Travel patterns	Cell phone records	Cote d'Ivoire
	Commuting time	Traffic sensors	Finland
		Cell phone records	Cote d'Ivoire, Portugal, Saudi Arabia, USA (Boston)
	Flood hazard and risk	Satellite images	Namibia; Global; Nigeria, Niger-Benue River; Chamoli district, Uttarakhand, India
	Flood impact	Cell phone records	Mexico
Oceans (SDG14)	Vessels conducting illegal fishing	Satellite data	Worldwide; covers 75% of the globe;
	Ocean measurements		Worldwide
Terrestrial ecosystems (SDG15)	Forest cover	Satellite images	Costa Rica, Mexico
Peace, justice, institutions (SDG16)	Crime	Mobile phone and demographic data	London, UK
	Violent events	News stories database	Syria

Global Sustainable Development Report 2015

Brief 8
New Data Approaches for Monitoring Sustainable Development Progress: The Case of Africa

Background

The 2015 Global Sustainable Development Report includes a chapter on data innovations in Africa, presenting novel approaches in generating, collecting, analysing and using data which can be useful to monitor sustainable development progress and that can provide benefits compared to traditional data approaches. This brief provides a short summary of that chapter, including a way forward to promote further data innovations in Africa.

New technologies for data collection

Mobile devices and internet are being used in Africa to collect data more efficiently and to access populations which would not be reached through traditional means of data collection. In some cases, the data collection still takes place through face-to-face interviews but mobile devices are used to input the data faster. Mozambique used mobile devices in its agricultural census as far back as 2009. Cape Verde was the first country in Africa to use mobile devices with geo-positioning for data collection in a population census in 2010, but since then the technology has expanded to official surveys and censuses in other countries. By using mobile devices, preliminary results of the 2013 census in Senegal were available in just three months as opposed to one year in previous censuses. Apart from reducing time, the use of mobile devices is paper smart and reduces costs by eliminating printing, transportation and storage of questionnaires. It also eliminates the cost of entering the data recorded on paper into a digital form, since with mobile devices the data is directly transmitted to central servers. Two other beneficial features of using mobile devices for census/survey data collection is the less propensity of data entry errors and possibility of doing quick data validations. Another advantage of using this technology is that georeferenced data can be collected on the spot to provide location-specific information.

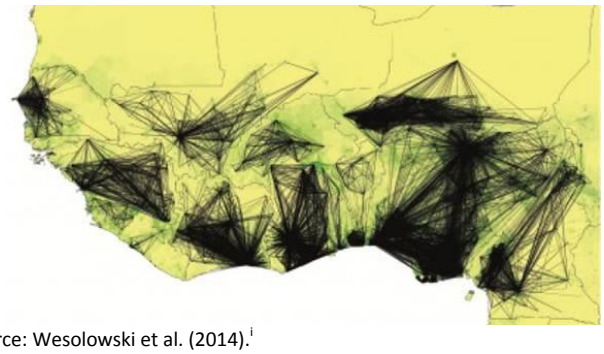
Since face-to-face interviews are expensive, the data is sometimes collected through cell-phones, SMS or the internet. SMS surveys in particular are being increasingly used due to their low cost. Several platforms for SMS-based surveys are currently being used in Africa such as U-Report in Uganda (Box 3); FrontlineSMS in Malawi and Burundi; Ushahidi in Kenya, Uganda, Malawi, and Zambia; and RapidSMS in Senegal, Mauritania, Uganda, Somalia, Zambia, Kenya, Nigeria, Malawi, and Ethiopia.

Tapping into big data

Big data has been called the "data breadcrumbs", i.e. the data people leave behind as they go about their daily lives. These can provide fine granular data in space and time, as long as privacy of the individual is protected.

Cell phone and satellite data have been used In Africa to monitor development issues. Cell phone records have been used to produce estimates of poverty in Côte d'Ivoire and literacy rates in Senegal; to determine travelling patterns to better manage public transportation in Côte d'Ivoire; to identify population flows to inform the Ebola response in West Africa and assist malaria prevention in Kenya. Despite concerns on the lack of representativeness of these data – which leaves those without cell phones out – studies have succeeded in obtaining reliable estimates. Satellite images have become one of the key resources to assess vulnerability to natural disasters, including droughts and floods. In Africa, satellite images have been used to identify flood risk areas in Namibia, Senegal and Sudan; and data from satellite imagery has been combined with GIS and precipitation data to produce a flood risk map along the Niger-Benue River.

Mobility patterns in West-Africa according to cell phone records



Source: Wesolowski et al. (2014).[i]

New approaches to integrate data

Methods to integrate diverse data sources, such as census and surveys, satellite and ground information, have been in existence for some years. These methods attempt to fill data gaps and/or improve the timeliness and geographical resolution of data, by pulling together information from various sources. A case in point is the production of poverty maps at sub-national level by combining census and survey estimations – which has been done for Guinea in 2002/3. Satellite, census and cell phone data have also been combined to create population maps for most African countries, even those for which census data is very old and official population figures are inexistent or unreliable. Several data sources, including ground survey data and satellite imagery, have recently been used to produce maps of terrestrial ecosystems in Africa at a 90m resolution – the finest ever in Africa.

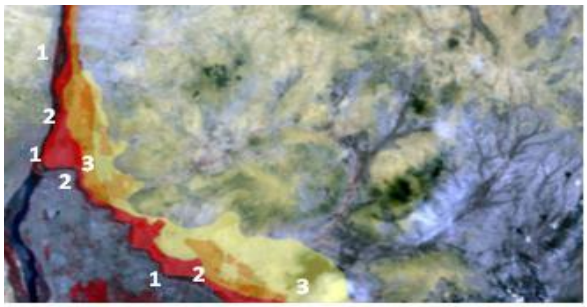
Past and present climate information is critical to inform climate resilient development, but climate data in Africa is often not available. To fill data gaps, quality-controlled ground station measurements from Ethiopia, Madagascar, Rwanda and Tanzania

are being combined with satellite rainfall estimates to produce rainfall and temperature time series of 30 or more years for every 4Km grid across these countries.

Countries in Africa are increasingly integrating geospatial information in data collections. This expansion of geospatial initiatives has been grounded on the spread of mobile devices with geo-positioning for data collection and an enhanced accuracy of GPS data in Africa. For instance, the Ghana Statistical Service digitised the geospatial information using GIS in the 2010 Population and Housing Census and Living Standard Survey.

A few African countries are also developing a System of Environmental-Economic Accounting, which is a framework to integrate environmental and economic information: four countries currently have a programme on environmental-economic accounts; six countries have plans to begin a programme on environmental-economic accounting in the future.

Flood zone levels and the related risk in Sudan: (1) high risk, mainly from the river Nile; (2) high risk, mainly from the Valleys; (3) rarely affected by the Valleys.



Source: Alhussein (2014).[ii]

Innovative means of data sharing

More and more online platforms in or covering African countries are disseminating free data. The Open Data for Africa portal provides free online data to monitor development, at national and sub-national levels. The Famine Early Warning System Network developed a dedicated African Data portal giving access to spatial data, satellite imagery, and other data as well as graphic products in support of famine monitoring. Open Data for the Horn facilitates access to geospatial information and data, about the ongoing response to the drought in the Horn of Africa. Several websites disseminate free maps, GIS datasets and satellite images to assist the monitoring and management of natural resources and agriculture in Africa, like the African Platform for Knowledge and Data sharing on Earth Observation, ENDELEO and the Global Monitoring for Food Security.

Data First is a free online data platform hosted by the University of Cape Town and dedicated to making African survey and administrative microdata available to researchers and policy analysts. USAID created a free online repository of the data from the agency's funded projects, which covers several African countries. AidData-Open Data for International Development provides free online information on development finance with visualization tools, which can retrieve data for African countries. In Senegal and Côte d'Ivoire, cell phone carriers in collaboration with government ministries, made anonymous data, extracted from the mobile network of these countries, available to international research laboratories.

Countries in Africa are also coming up with their own initiatives for data sharing. Under the Africa Information Highway initiative, data portals with common IT platforms have been developed in all 54 African countries and in 16 African regional and sub-regional organizations. For instance, the Nigeria MDG Information System is an online interactive data platform with data on MDG indicators by province. In addition, all government health and education facilities as well as water access points across Nigeria are mapped – for instance, internet users can use this data platform to know which water points are improved and functional. Rwanda and Kenya are making their census and survey microdata available through an online National Data Archive.

Improving the data-policy interface

Impact-evaluation studies aim at providing evidence on which policies do and do not work. Although many projects are still undertaken without a planned evaluation of impact, there are also well-grounded examples of impact evaluation studies that have informed policy in African countries on issues as varied as the impact of cook stoves to the impact of youth wage subsidies. Some impact evaluation studies are already using big data. For instance, satellite images have been used to evaluate the impact of large dams on agricultural productivity in Africa. They use established methodology for determining impact evaluation and rely on the integration of evaluation into the programme and planning cycle, timely delivery, involvement of stakeholders and creation of formal mechanisms to inform policy makers.

Scaling up innovation in Africa: the way forward

Innovative approaches are being applied in Africa to improve the timeliness, availability, and use of data for monitoring of progress towards sustainable development. Use of SMS and cell phones to collect data are expanding fast in the continent. Some initiatives exist to integrate data sources and there is an increasing awareness of the need to share data more widely.

Many data innovations in Africa are developed by research institutes and have not yet been used in channels influencing national policy-making. Also, most innovations are being carried out by experts outside of Africa. To empower African countries to produce quality frequent data with good coverage, capacity building will be critical. African countries would also benefit from access to independent advice on new technologies and tools and their relative strengths and drawbacks – a catalogue of innovations and a repository of users' reviews by theme/area of application may be useful to inform countries on different alternatives. Such a catalogue and users' reviews could also provide information on how well freely available innovations are an adequate substitute for commercial ones.

More information

The 2015 GSDR, its Executive Summary and other related briefs and documents are available on the following website:
https://sustainabledevelopment.un.org/gsdr2015.html

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[ii] A.E.A. Alhussein (2014). Geoinformation technology applications and practice in Sudan. Presentation given at the Third UN-GGUM Forum, 22-24 October 2014, Beijing, China.