

## **Summary of the Expert Group Meeting on Science and Sustainable Development Goals** United Nations Headquarters, 20-21 March 2013

Co-organized by UNDESA, the International Council for Science (ICSU) and the International Social Science Council (ISSC)

### **Introduction**

One of the main outcomes of the United Nations Conference on Sustainable Development (Rio+20), held in Rio de Janeiro in June 2012, was the agreement by Member States to launch a process to develop a set of sustainable development goals (SDGs). A 30-member open working group (OWG) of the General Assembly is tasked with preparing proposals on the SDGs.

The Rio+20 outcome document provides that the OWG should develop modalities to ensure the full involvement of relevant stakeholders, including the scientific community, and recognizes the need to strengthen the science-policy interface in order to facilitate informed policy-making.<sup>1</sup> In this regard, it is crucial that the best available research informs the development of goals, targets and indicators at global, regional and national levels.

### **Objective and structure of the EGM**

The expert group meeting (EGM) on Science and SDGs provided an entry point for natural and social science communities to distill key scientific findings of particular relevance to the OWG task of framing and formulating the SDGs. It sought to leverage and build on the existing structured engagement with the scientific community through the Scientific and Technological Community major group, led by the International Council for Science (ICSU) and the International Social Science Council (ISSC). In addition, members of leading scientific assessment efforts were also invited to share their experiences.

The two-day meeting consisted of expert panel presentations and open discussion among more than 25 scientists from a diverse array of disciplines and countries. The group addressed themes of sustainability threats, irreversible events, societal impacts and responses; the role of science and scenario modeling in setting priorities for SDGs; and strengthening the science-policy interface. Participants spent a day collaborating on key messages pertaining to priority areas, monitoring progress, drivers of change, and promoting social and institutional change. On the afternoon of the second day, the broader UN membership benefited from an interactive dialogue led by OWG Co-Chair H.E. Mr. Csaba Körösi, following the presentation of the EGM's key messages.

### **Opening statements and keynote address**

David O'Connor, Chief of the Policy and Analysis Branch, Division for Sustainable Development, UNDESA welcome participants and provided a brief summary of the SDG process to date, highlighting the need to go beyond the Millennium Development Goals (MDGs), balance the three dimensions of sustainable development, and enlist the expertise of scientists of all types and from diverse disciplines to ensure that the SDGs and their associated targets and indicators are relevant and measurable.

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<sup>1</sup> [A/RES/66/288](#), paragraphs 48, 76, 85, 88, 204 and 276.

Gisbert Glaser, Senior Advisor on science for sustainable development and UN system cooperation, ICSU, pledged strong support for SDGs from the scientific community, noting the outcome of the Planet Under Pressure Conference convened in March 2012, the policy briefs and other provided by the scientific and technological community as input to the Rio+20 process, the and the launch of the new 10-year research initiative *Future Earth—research for global sustainability*. Stressing the challenges of ending poverty and hunger, protecting biodiversity, and transitioning to low-carbon societies, he said the first step is for policy makers to establish a unified environmental, social and economic framework for the SDGs.

David Griggs, Professor and Director of the Monash Sustainability Institute (MSI), provided the keynote address, entitled *From MDGs to SDGs: Key Challenges and Opportunities*. Recalling the Rio+20 agreement that SDGs should not divert focus or effort from the achievement of the MDGs, he highlighted recent research indicating that the stable functioning of the Earth system is a pre-requisite for a thriving global society, meaning that humanity can no longer separate development from environmental sustainability, and that we are now living in the Anthropocene, where humans dominate natural systems. The Great Acceleration of human enterprise, which began around 1950, has elicited responses from the biophysical Earth system to the point where natural life support systems are now being exceeded in the areas of climate change, biochemistry (nitrogen cycle) and biodiversity. In discussing the concept of planetary boundaries, he noted that the rate of biodiversity loss indicates that we are undergoing mass extinction, and climate projections based on existing data forecast a global mean surface warming of more than 2°C becoming the norm by 2060. He presented several evolved models of sustainability and proposed that global sustainability objectives could be added to the MDGs, presenting a unified framework for a set of six SDGs, including provisional targets for 2030 that would address thriving lives and livelihoods, sustainable food security, secure sustainable water, universal clean energy, healthy and productive ecosystems, and governance for sustainable societies.

Susana Adamo, Earth Institute, Columbia University, chaired the morning's thematic panels and discussion, which focused on sustainability threats, irreversible events, societal impacts and responses; and discussions on the role of science and scenario modeling in setting priorities for SDGs.

### **Sustainability threats, irreversible events, societal impacts and responses**

Melissa Leach, STEPS Centre, Institute of Development Studies, University of Sussex, discussed the planetary boundaries concept within a social and political context, stressing that diverse pathways, alternative directions and varying distributional outcomes are necessary components of sustainable futures. The direction, diversity, and distribution of pathways to sustainability can either foster or impede social empowerment and equality of engagement. Interdisciplinary and transdisciplinary approaches, including integration of science and engagement, and inclusive debate and dialogue, all need to be involved in shaping scientific outcomes and fostering critical processes among scientists themselves.

Tim Lenton, University of Exeter, presented a wealth of scientific data on early warning climate tipping points illustrated by changes in Arctic sea ice, including examples of bifurcation tipping points where greater effort is required to reverse to original levels, reversible tipping points, and tipping elements in the climate system with melting, circulation change and biome loss. He

discussed interactions between tipping points and the phenomenon of a “critical slowing down” as thresholds are approached, where recovery is slower to happen, as with the end of the ice age in Greenland. Noting that several tipping elements could be triggered this century by anthropogenic forcing, he emphasized the need for improved communication and early warning systems to enable constructive responses.

Mark Swilling, University of Stellenbosch, South Africa, presented the work of the International Resource Panel, and discussed decoupling natural resource use and environmental impacts from economic growth. Categories of primary raw materials, including fossil fuels, construction minerals, metal ores and industrial minerals, and biomass were used to illustrate relative decoupling scenarios by 2050, with the caveat that there is also absolute need for resource reduction overall. He analyzed the contradictory story of economic dependence and diversification in Africa; outlining the challenges the continent faces and noting that a structural transformation is required for Africa to move away from being a net resource exporter. We must address the question of resource use in the SDGs, not only in terms of ecosystems but also with regard to extraction of metals and ecosystem services such as soils, in order to successfully decouple resource use from economic development.

In the ensuing discussion, participants affirmed the need to think about SDGs within the framework of a larger growth system that uses non-linear approaches to sustainability and incorporates social behaviors and perceptions, stressing the difference between growth and development. They also acknowledged that the conventional approach of the MDGs could have more traction and be more politically relevant, while the planetary boundaries concept risked losing some of the audience. All agreed that the scientific evidence portrays an undeniable reality that requires warning systems and adaptation mechanisms to be further developed. The SDGs must also draw in concepts of ethics, philosophy and theology, exploring what it means to pursue human aspirations. A closer integration of system must be addressed, and targets should enable nations to better manage within international spheres. Science should enable humanity to both anticipate the changes and identify potential consequences; in this regard the potential role of markets to provide stabilizing feedback was mentioned.

### **The role of science and scenario modeling in setting priorities for SDGs**

Youba Sokona, African Climate Policy Centre (ACPC), United Nations Economic Commission for Africa, discussed the prioritization of goals and indicators. He stressed that good goals mean different things to different people; for the majority of the poor, there is no sense of connection between international goals and actual improvements in their lives. Goals must lead to tangible improvements, and include an accountability mechanism. In examining the role of science and scenario modeling in setting the SDGs, he questioned whether they focused on measurable qualities, whether the challenges facing the poorest are the same as global challenges, and whether global goals are aligned with national goals and priorities.

Mark Howells, KTH, Stockholm, discussed the need for scenario modeling, highlighting issues of transparency, trust, and the need to develop an inclusive process. Credibility can become an issue when the review and decision making process is not open. Communicating a consistent message means being explicit about uncertainty; avoiding the mistake of assuming that the future will look like the past; and understanding that investments in the future will provide dividends

quantified in the same terms. Action items to build consensus include: a clear convening agenda, accessible and open toolkits and analysis, improved transparent assessments, multi-service delivery methodologies, and policy relevant evaluation of ecosystem services.

Claudia Ringler, Deputy Division Director of the Environment and Production Technology Division at the International Food Policy Research Institute (IFPRI) discussed research findings from IFPRI's program on water, land and ecosystems. She presented data on hunger, population, poverty, crop area, water scarcity, increasing meat demand, rising cereal prices, and a food-energy interface that show markets are increasingly interconnected. She highlighted the issue of food security relative to the climate tipping points illustrated in Tim Lenton's presentation, and outlined issues to keep in mind when modeling SDG scenarios.

Discussion following these presentations revolved around "process goals" including support for innovation systems, adaptability, respect for diverse values, national empowerment and planning processes, and governance. Scenario modeling is useful for many things, particularly with regard to disaster risk management and resilience, but a multitude of scenarios are necessary to show a diversity of inputs, which can define indicators and political actions. Indicators and scenarios are interlinked and related, and no one model is applicable to all situations.

Shifting to ecosystem-based management also shifts scenarios toward spatial planning and away from traditional models; yet ecosystem services are often undervalued or neglected entirely (e.g. soils). Participants highlighted the need to couple investment and finance from private sector sources with public policy, and called for donor alignment to national development goals and coordinated long-term investment that extends beyond political election cycles.

### **Breakout groups: discussions on key messages and recommendations**

On the first day of the meeting, the afternoon was devoted to discussions on a number of topics in two breakout groups comprised of both social and environmental scientists. The discussion in breakout group one was framed around two sets issues and questions: (a) perspectives from the sciences: priority areas for SDGs; and (b) monitoring progress: what needs to be measured, and how best to measure? What is both feasible and useful in guiding policy?

During the discussion, OWG Co-Chair H.E. Csaba Körösi explained that in its initial phase, the OWG would be mapping the existing knowledge base in order to gain a broad understanding of priorities. In this endeavor, the input of the scientific community could play a crucial role in identifying and contributing to the OWG's understanding of the most urgent challenges.

Discussion on priority areas for the SDGs from the scientific perspective emphasized the need to address two priority areas of concern: one related to poverty and underdevelopment, access to food, water and energy; and the second related to the scientific awareness that key life support systems are at risk, as well as measures to be taken to mitigate these risks. In this regard, it was generally recognized that human well-being depends on well-functioning ecosystems, and therefore meeting people's needs requires meeting ecosystems' needs. It was noted that the SDGs would need to clarify the interlinkages between the overriding concerns of poverty eradication and staying within planetary boundaries.

Among other things, the group emphasized the need to equip society to manage the systemic risks of a world likely to experience, across multiple domains, chokepoints, tipping points, and discontinuities in the coming two decades. Given systemic risks, there was a need for the SDGs to move beyond the MDGs with a conceptual framework that makes explicit both trade-offs and synergies.

In discussing question (b) on monitoring progress, the discussion took as a point of departure that there was a need first to look at what was already being measured, before assessing what needs to be measured. SDGs need measurable targets, in a limited number. One lesson learnt from MDGs is that monitoring fell short due to the lack of a built-in system for monitoring. In addition, measurable targets and monitoring ought to be specific and easy for governments to comprehend. It was also suggested that, in a departure from the MDG approach, a new framework should identify vulnerable systems—coasts, drylands, mountains, etc.—and then devise place-based measurement systems. Enablers of goals such as institutions, governance and funding also needed to be monitored and measured.

The discussion in breakout group two was framed around two sets of issues and questions: (a) drivers of environmental and social change: what are the key leverage points for government policy? and (b) how best to promote social change and institutional change to address environmental risks? What role for changes in technology, consumer preferences, behaviour, and values?

After discussing the framing of scientific advice in the context of the SDGs, the group took the view that political feasibility should not, at least initially, constrain the message from the scientific community. At the same time, it was recognized that communication with the public and policymakers was an area requiring greater attention from the scientific community. The group considered that scientists ought to support and track capabilities of society for change, both incremental and transformative. Some members of the group highlighted the need to couple output-type goals with the strengthening of societies' capabilities to innovate and respond to risks, with the latter aiming at a diversity of responses.

The group discussed the challenge of distributional and procedural justice in the face of high-impact events, distributed vulnerability, risk and loss, and need to address uncertainty and its communication. The role of technology was discussed at some length. It was argued that novel and existing technologies, including technology aimed at addressing existing risks, have “directionality”, i.e. can exceed boundaries, reinforce inequality as well as help solve problems. Technology can mitigate and create risks; as one participant put it, “all our present technology risks are past technology solutions.”

Overall, on the issue of institutions the group underlined that the international community faces a massive crisis but there is no concomitant process for the necessary re-structuring of institutions at all levels. Institutions to address global public goods in the environmental area were underfunded, e.g. GEF. There was, however, an acknowledgement by the group of the very considerable amount of work done in terms of international agreements of various kinds, some regarded as successful, e.g. Montreal Protocol, and others less so. Considering how the SDGs could “add value”, it was argued that they ought in the first place to concentrate on the class of

issues that cannot be managed nationally and which existing private/market mechanisms are ill-suited to address.

The group took the view that transformation would either be chosen or forced upon the international community. Going forward, there was a need for a judicious balance of incrementalism, using the existing toolbox with deliberate/deliberative transformative change. In this regard, science would be doing society a disservice if it did not also present options for transformative change. In the words of one participant, “it would be a pity to waste a good crisis.” One element of a way forward could be to better articulate a space for experimentation and flexibility in the face of a more variable world. A number of things could be done to foster and promote such experimentation, in including building an architecture for global systematic monitoring and evaluation of transition/transformation

Melissa Leach, Institute of Development Studies, chaired a late afternoon Plenary that convened to discuss the outcomes of the two breakout groups and to hear a presentation on the *Future Earth* research platform given by Stephen Zebiak, International Research Institute for Climate and Society, Columbia University. He explained the conceptual framework for *Future Earth*, a global platform to deliver solution-oriented research for sustainability, effective interdisciplinary collaboration and timely information for policymakers, including participatory processes for increased capacity building. The ensuing discussion addressed possible links to the SDGs, including a role for the Future Earth Committees, providing scientific statements and digests, and establishment of a broad SD assessment body.

### **Strengthening the science-policy interface**

On the second day of the meeting, a morning panel discussion on strengthening the science-policy interface was chaired by Måns Nilsson, Deputy Director and Research Director at the Stockholm Environment Institute (SEI).

Richard Alex Roehrl, UNDESA, presented the concept of a Global Sustainable Development Report, as mandated by the Rio+20 outcome. He discussed the problem of selective use of scientific evidence for political purposes, and outlined the differences between the scientific and policy communities with respect to goals, results, quality control, knowledge and time frames. The scope of the Global Sustainable Development Report was analyzed, including potential values, what is to be sustained, for how long, and what is to be developed. Roehrl called for an integrated approach closely related to the role of the science-policy interface, and noted that a substantive starting point would not be an assessment of assessments, but rather a list including other data and reports and initiatives. He further noted areas for discussion planned for upcoming meetings and consultations, including the climate-land-energy-water-development nexus as a special theme. He encouraged contributions and submissions, noting that the comprehensive output would include a report by the UN Secretary-General, in-depth background reports, a database of briefs of assessments, and synthesis chapters.

Holger Rogner, International Atomic Energy Agency (IAEA) led the response to the concept of the report, recalling that indicators are the best way to review progress and highlighting an absence of accounting for geopolitical conflict and social unrest in scientific research and modeling, which should be factored in carefully and diplomatically.

He showed that a disparity among scientific findings can cause inaction among policymakers because of the lack of clarity, and said that studies must show drivers of change, e.g. carbon intensity, energy intensity, GDP per capita, population, and total change. Other agreed, adding that shifts in the science-policy interface, including transdisciplinary and policy-relevant research from the perspective of developing countries, should be recognized. The science of communication and studies on how to reach policymakers are needed, particularly in developed countries where awareness needs to be raised. One speaker observed that the linear model of science to policy is a myth; they symbiotically shape each other. The value of dissent and consensus is not to eliminate uncertainty, but to illuminate the plurality of views and be more explicit about differences. Co-production and transdisciplinary issues merit further discussion.

### **Plenary discussion of key messages and recommendations to the OWG**

The remainder of the morning Plenary session was devoted to further shaping and deciding the outcome of the EGM based on the previous day's work. Some of the salient points that emerged included the need to build consistent coherent measures for ecosystem services, as with GDP; and to develop a roadmap of intermediate times within the longer time horizons, acknowledging the time lag in producing scientific results as policy demands immediate actions.

All agreed that if the anthropocene is indeed upon us and differs radically from the previous world then the scientific community is obligated to communicate a strong message to the OWG, to call for a paradigm change and alert them to the consequences for food security, energy, and disasters. They will need to think about governance systems that can be effective within the settings where they operate, giving attention to process goals as well as output goals. Some wondered how to best create and organize an effective scientific-policy dialogue with the OWG. Others felt an obligation to also provide positive language on opportunities within approaching changes, e.g. on food security. Systems may move non-linearly and abruptly, and amplifiers in the system need to be identified.

Suggestions abounded on how to best inform and support the OWG, including creation of a list of tipping points, provision of experimental games as modeling tools that OWG members could use to foster consensus, development of an institutional mechanism to guide decisions informed by science, and generation of models when data is not available. An institutionalized dialogue could take advantage of crowd sourcing, with active outreach into stakeholder communities. Some speakers also stressed the need to generate gender-disaggregated data on poverty, food security and health, and build overall capacity for managing uncertainty. The importance of education was also underlined, with a call that new challenges must be communicated not only to governments but also to universities, who must also shift their priorities and institutions.

### **Presentation of recommendations and interactive dialogue with member States**

On the afternoon of Thursday 21 March, the expert group meeting presented its key findings and recommendations to UN member States and observers. Five participants from the meeting served as panelists who transmitted the group's key messages. OWG Co-Chair H.E. Mr. Csaba Körösi introduced the panel speakers and invited the group's continued participation in future discussions of the OWG. Nikhil Seth, Director of the Division for Sustainable Development/UNDESA, highlighted the importance of bringing research-based evidence to the

OWG, fostering collaboration between the natural and social sciences, and extending partnership to policymakers and other stakeholders.

Keynote speaker David Griggs, Director of the Monash Sustainability Institute (MSI), presented the EGM's primary message, alerting the OWG that we have entered a new era where population and economic activity have increased to the point where humankind dominates the planet, and Earth's life support systems are breaking down, giving rise to new risks and vulnerabilities. The latest research illustrates that human, social and natural systems are all interconnected; thus functioning natural systems are a prerequisite for the human development agenda. Approaches that have worked in the past will not work in the future, but potential solutions and opportunities do exist and should be recognized and seized.

Charles Perrings, Arizona State University and Director of the Ecoservices Group, stated that the unprecedented nature of our current challenges demand a shift to a new paradigm. The goals we set should define new pathways to human well being, while respecting environmental constraints and natural processes. Choosing such pathways is a political process, but one that should be informed by science which can use scenarios to trace through the implications for environment, economy and society of different policy choices. To successfully navigate the future, we must harness rapidly advancing science and seek new ways of organizing our policies and institutions to foster transformation. Place-specific measurement is needed to identify threats and analyze systemic risks. Sustainability requirements and interventions have to be considered at appropriate scales; some problems will require global cooperation, others local action.

Claudia Ringler, IFPRI, stressed that new priorities for goal setting will advance the work of the MDGs in several new directions. These include: building human capabilities and resilience in a world of accelerating changes; recognizing key interdependencies, e.g., among food, water, energy, land and climate systems; valuing natural capital and ecosystem services appropriately. Awareness of driving forces such as global integration, consumption of finite or constrained resources, social fragility and insecurity should underpin the goals. Systemic risks such as food security breakdowns and worsening disaster vulnerability will need to be taken into account.

Norichika Kanie, Tokyo Institute of Technology and Senior Research Fellow at United Nations University Institute of Advanced Studies (UNU-IAS), said that new processes to support the change we need will recognize that effective governance pathways to desirable futures can be different for different countries, and must be flexible. Governance institutions are currently not adequate to the global challenges and will need strengthening. There is need for more timely engagement between science and policy, modes of rapidly identifying and spreading solutions, and investment in a new generation of measurement systems. Finally, certain global sustainability challenges call for goals with a longer timeframe than 15 or 20 years; some goals might usefully extend to 30 years—perhaps marking the 2045 UN centenary—to be able to sustain needed effort, with interim goals set to be able to measure progress.

Youba Sokona, ACPC/UNECA, recalled that despite progress in many fronts, poverty and employment are fundamental problems, and noted that poor countries paradoxically have an advantage in shifting to sustainable development as they adopt newer technologies and systems without having to overcome outdated institutions and infrastructures. Ensuring a sense of

ownership is important in moving from MDGs to SDGs, including good leadership, new governance and new types of institutions. He called for innovation in the social dimension as a key opportunity to move toward more sustainable pathways.

In the ensuing discussion, the participants of the EGM answered numerous questions submitted by member States and transmitted through live social media. OWG Co-Chair H.E. Mr. Csaba Körösi moderated the dialogue.

While the crux of the group's recommendations focus on strengthening the science-policy interface, speakers highlighted that the key overall message conveyed to policymakers is that we live in a world where environment can no longer be separated from development, and the science-policy interface must devise better early warning systems and risk management approaches that will give societies a chance to respond to rapid and sudden changes.

Regarding a question requesting clarity on how science can guide and ground the OWG in shifting to new forms of governance and institutions, panelists highlighted that a synthesis body of research and knowledge can guide OWG, noting that studies are now being developed specifically for the SDGs, including identifying trade-offs and synergies. Science can ground the SDGs by modeling the consequences of policy options in ways that capture human reactions and environmental repercussions, which was not possible ten years ago. New institutions would address sustainable development not as "pillars" but as more integrated dimensions from local to global levels, using a bottom-up approach. Interlinkages would be brought to bear in institutions, overcoming the weakness of "silo thinking". Strengthening the science-policy interface can also simply mean more interaction among scientists and policymakers. One member State observed that national ministries and UN entities currently operate in silos, and agreed with the need for new approaches and increased cooperation. Engagement between scientific and statistics committees within the EU region was highlighted, and was called for within the UN system.

Addressing the connection between trade and science, panelists noted that trade has been the institution that has traditionally helped to buffer risks, and plays an important role, but new mechanisms for trade must be developed for the future. One of the main drivers of environmental change is the movement of species around the world, and there is a need to better synergize international phytosanitary agreements, health regulations, and trade regimes. Payments for ecosystem services, environmental taxes, or tighter markets could provide incentives, and SDGs could potentially also trigger changes in funding schemes, which can increase coordination. The SDGs could create new frameworks for measuring economic progress with sustainable development at its core using national income accounts and natural capital accounting; and potentially tracking progress including measurement, monitoring and reporting on changes in assets over time.

One speaker noted that climate change affects all aspects of sustainable development, and asked how the SDGs should address its impacts. Respondents said that the SDGs should take climate change into account as a driver of change, and underscored the need to develop and improve resilience, ensure that climate mitigation is embraced. Goals being set now must also account for a future that will include a climate that is measurably different from what exists currently. In this regard, some participants expressed concern over how to ensure the SDGs address both present

and future challenges, ensuring that the needs of future generations are protected and reflected. Responses from the scientific community reiterated the need to set longer time horizons for some SDGs, including 30 or 50 year targets; and to create new mechanisms that can overcome traditional separations between science and political decision making so that the two spheres relate more effectively.

Promoting social and institutional change will be increasingly impacted more by prices than by technology; markets can be increasingly used to move in a more sustainable direction using social opportunity costs and subsidies. Ensuring sustainable consumption and production requires behavioral change, and within the paradigm of free markets it is difficult to change behavior. One speaker highlighted the concept of “nudging” to change circumstances and move consumers in a more sustainable direction; for example, discarding dietary habits that lead to poor health in developed countries could potentially free arable land for biomass production, without curtailing consumer freedoms.

The scientific community can also help to encourage technology transfer and capacity building between developed and developing countries through interdisciplinary studies and cross-departmental work; the *Future Earth* global platform for research collaboration was highlighted in this regard as connecting scientists in the North and South and supporting South-South cooperation. A wide array of innovative niches are opening up, for example through cell phone and smartphone technologies, and opportunities for innovation need to be translated into incentives for entrepreneurs to further develop and diffuse these technologies. Donor governments and IFIs still need to invest more overall in science and capacity building.

On questions regarding how culture and faith should be reflected in the SDGs, panelists stressed the need for locally based interpretations to achieve the goals, and the need for a diversity of pathways that respond to variations of culture, knowledge, and communities, including a space for knowledge that develops through nature and as a part of culture, e.g. indigenous communities.

At the close of the meeting, Ambassador Körösi emphasized the need to continue the dialogue with the scientific community. It is anticipated that the work program of the OWG, to be further developed, will provide for further scientific input on priority areas.