



Scientific Advisory Board

of the Secretary-General of the United Nations

hosted by the

United Nations Educational, Scientific and Cultural Organization

Science for Sustainable Development

**Policy Brief
by the Scientific Advisory Board
of the UN Secretary-General**

5 October 2016

Executive Summary

I. The UN Secretary-General's Scientific Advisory Board (UNSG SAB) calls upon scientists and policy-makers alike to promote a set of principles that underpin the crucial role of science for sustainable development, namely to:

- *Recognize science as a universal public good* that helps laying the foundation for a sustainable world and is therefore more than a tool for the achievement of the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs).
- *Acknowledge basic science as a principal requirement for innovation* and provide a productive scientific environment, including long-term investments, to advance fundamental knowledge about the world.
- *Enhance diversity in science for sustainable development* by realizing gender equity in science and by building on the entire spectrum of society, including underrepresented groups and minorities.
- *Strengthen science education* to increase science literacy and capacity-building in science at all levels.
- *Raise investments in science* by establishing national minimum target investments for science, technology and innovation for both basic and applied science.
- *Promote an integrated scientific approach* addressing the social, economic and environmental dimensions of sustainable development and respecting the diversity of knowledge systems.

II. The UNSG SAB recommends to the UN Secretary-General and the international community, including the scientific community, to maximize the contribution of science beyond being a 'means of implementation' with regard to achieving the 2030 Agenda and the SDGs through the following actions:

1. *Consider the 2030 Agenda for new research and integrate the SDGs into research agendas at all levels:* Sustainability needs to become the corner-stone for future research both in basic and applied science. It remains paramount to identify critical research priorities via national and international research agendas as well as new and interdisciplinary approaches. The integrative nature of the 2030 Agenda requires maximizing resources for and impacts of research towards sustainability.
2. *Anchor science as a reliable partner in the implementation and review process and thereby enhance the science-policy interface:* Effective mechanisms and modalities are required to allow the scientific community to contribute to the national and global follow-up and review processes of the 2030 Agenda and the SDGs. As a reliable partner, science and scientists can effectively contribute to problem (re-)definition, problem prioritization and assessing of policy choices. But to achieve this, high quality science – both basic research and applied science – needs to be adequately represented in the emerging implementation and review architecture, especially with regard to the High-Level Political Forum for Sustainable Development, Global Sustainable Development Report and the Technology Facilitation Mechanism.
3. *Establish independent scientific monitoring mechanisms and promote evidence-based decision-making for sustainable development:* In addition to the voluntary, state-based review process, the scientific community should simultaneously and independently monitor progress and evaluate success towards achieving the 2030 Agenda and the SDGs. As a constructive corrective, scientists need to take the initiative when identifying emerging risks as well as unsustainable paths and call for policy adjustments on the basis of scientific findings and evidence-based solutions.

1. Introduction: Bridging Science and Sustainable Development in the Context of the Agenda 2030 and the Sustainable Development Goals

Science – in its broader understanding as ‘science, technology and innovation’ (STI), including engineering as well as the social sciences and the humanities – plays a crucial role for sustainable development.¹ The 2030 Agenda for Sustainable Development, formally adopted in September 2015 and containing 17 Sustainable Development Goals (SDGs) and 169 targets, is universal and calls for action by all countries, poor, rich and middle-income to promote inclusive economic growth and social development while protecting the planet. It recognizes the need to mobilize science at multiple levels and across disciplines to gather or create the necessary knowledge and thus lay the foundations for practices, innovations and technologies needed to address global challenges today and in the future.

The 2030 Agenda attributes diverse roles to science with regard to the different areas of social, economic, and environmental goals. While there is no stand-alone goal on science, there is not a single SDG in the new agenda that will not require inputs from natural or social scientists and engineers. Indeed, for it to succeed, the implementation of the new development agenda needs to be based on an integrated scientific approach, guided by a holistic understanding of science and must be grounded in the best available knowledge.

Science will be one of the most critical means of implementation for the Agenda 2030. Its role, however, must not be limited to that of a tool only. Achieving the desired outcomes by 2030 will require acknowledging and maximizing the contribution of science beyond being a ‘means of implementation’. Indeed, science is a driver and enabler of inclusive and people-centered sustainable development.²

This policy brief presents six guiding principles for science for sustainable development, followed by practical recommendations aimed at both the scientific community and policy-makers on the role of science for sustainable development in general and the achievement of the 2030 Agenda and the SDGs in particular.

2. Guiding Principles: Science for Sustainable Development

The achievement of many SDGs will heavily depend on science. Drawing on earlier recommendations of the Board,³ the UNSG SAB calls upon scientists and policy-makers alike to promote a set of principles that underpin the crucial role of science for sustainable development, namely:

Principle 1: Recognize science as a universal public good

Science is universal and scientific knowledge in its pure form is a global public good: “a mathematical theorem is as ‘true’ in Russia as it is in the United States, in Africa as it is in Australia.”⁴ Science in itself is a way of crossing national, cultural and mental borders. It thus helps lay the foundation for a sustainable world and is therefore more than a tool for the achievement of the 2030 Agenda and its SDGs. For science to live up to its full potential, open and equal access to scientific data and knowledge is vital.

¹ Cf. “Science will play a key role in realizing Agenda 2030”, 2015 UNESCO Science Report, pp. 9-11.

² Cf. “Science, Technology and Innovation: Critical Means of Implementation for the SDGs, Reflections by the Scientific Advisory Board of the UN Secretary-General”, 9 July 2015.

³ Cf. “The Crucial Role of Science for Sustainable Development and the Post-2015 Development Agenda, Preliminary Reflections and Comments by the Scientific Advisory Board of the UN Secretary-General”, 4 July 2014.

⁴ Joseph E. Stiglitz (1999) ‘Knowledge as a Global Public Good’, in Inge Kaul, Isabelle Grunberg and Marc A. Stern (eds.) Global public goods: international cooperation in the 21st century, New York: Oxford University Press, pp. 308-325, here p. 310.

Principle 2: Acknowledge basic science as a principal requirement for innovation

Applied sciences and basic sciences are equally important for sustainable development and should not be played out against each other; they are two sides of the same coin. While curiosity-driven research may not be immediately utilized, it is indispensable for scientific innovation. In order to advance fundamental knowledge about the world, basic science requires a productive environment, which makes national, regional and international long-term investments necessary.⁵

Principle 3: Enhance diversity in science for sustainable development

Unleashing the full potentials of science for sustainable development requires promoting gender equity in science. Only by building on the entire spectrum of society, capitalizing on all talents, including women and underrepresented groups such as ethnic, racial and religious minorities, science can contribute to solving the greatest challenges of the future and building a sustainable world. Enhancing diversity in science also includes strengthening the scientific institutions in the South. In addition, providing equal participation and representation from the whole world in science will enhance democratic practices. All research must be conducted with integrity.

Principle 4: Strengthen science education

Science possesses a strong educational component. Science literacy provides the basis for solutions to everyday problems, generally, in uncontroversial ways. Access to and investments in science education and capacity-building in science at all levels need to be strengthened, especially where the appreciation of the benefits of science and the resources for sciences are less developed. Scholarships for scientific programs should be made available in each country.

Principle 5: Raise investments in science

Raising investments in science will contribute to economic development and scientific progress. Building up and expanding scientific infrastructure, i.e. schools, colleges and universities as well as centers of excellence for frontier science, will further support science education and scientific research. The international community should therefore aim at establishing minimum national target investments and according increasement mechanisms for STI. A balanced allocation of especially public resources in basic and applied science in line with respective national priorities is advisable to achieving sustainable growth and the implementation of the SDGs.⁶ In the long-term, special allotments for basic science will help break the cycle of dependency of low- and middle-income countries on scientific solutions from high-income countries.

Principle 6: Promote an integrated scientific approach

Building a sustainable world requires overcoming disciplinary boundaries. Inter-, trans- and multidisciplinary cooperation, both with regard to basic and applied science, can contribute to developing an integrated scientific approach. It should be based on a broad understanding of science, which covers the whole range of disciplines from natural sciences to engineering to social sciences and the humanities, and address the social, economic and environmental dimensions of sustainable development. In this respect, international cooperation among National Academies of Sciences needs to be expanded and intergovernmental research organizations, which play an important role in ensuring sustainability, need to be strengthened. To make the most of the transformational power of science, the diversity of knowledge systems within academia and society, including indigenous and local knowledge, must be respected.⁷

⁵ The UNSG SAB Delphi study “The Top Challenges for the Future of Humanity and the Planet” of December 2015 calls for a minimum of 0.2-1% of national Gross Domestic Product to-be-invested in basic scientific research and basic science education.

⁶ Cf. “Status and Trends of R&D and their relevance to the 2030 Agenda for Sustainable Development”, SAB/5/INF/3.

⁷ Cf. “Indigenous and Local Knowledge and Science, Policy Brief by the Advisory Board of the UN Secretary-General”

3. Science and the 2030 Agenda: Recommendations to Scientists and Policy-Makers

A strong science-policy interface will contribute to achieving the 2030 Agenda and the SDGs. Building on the guiding principles for science for sustainable development, the UNSG SAB wishes to propose the following recommendations to scientists and policy-makers:

Recommendation 1: Consider the 2030 Agenda for new research and integrate the SDGs into research agendas at all levels

The scientific community is called upon to acknowledge the 2030 Agenda and the SDGs. The new global development agenda should not only find its reflection in research programs, sustainability⁸ needs to become the corner-stone for future research both in fundamental and applied science. Scientists should systematically identify critical knowledge gaps and actively contribute to efforts aimed at formulating new research agendas at the subnational, national, regional and global levels oriented at questions of sustainability.⁹ The implementation challenges will also require strengthening interdisciplinary collaboration, effectively coordinating enormous datasets (big data), filling data gaps, and improving knowledge management.¹⁰ In addition, scientists should conduct their research in a sustainable way and actively disseminate their scientific findings.

Policy-makers, scientists and those responsible for priority-setting for research and research funding should build on lessons learnt from existing research agendas on sustainable development. After the adoption of the Agenda 2030 and the SDGs, it remains paramount to identify critical research priorities. The national research agendas will remain a major point of reference for guiding and funding research, however, particular attention is needed for supporting frontier research. In addition, new and interdisciplinary approaches need to be developed – not only for the next 15 years, but also beyond the horizon of the SDGs. Future Earth's "Strategic Research Agenda" provides a valuable example of how a multi-stakeholder process can result in a coordinated formulation of research strategies: The approach aims at fully integrating scientific disciplines and placing an emphasis on engagement with societal partners in co-designing and co-producing knowledge as well as on international cooperation.¹¹ Fostering collaboration and sharing of best practices among national and international agencies' research programs as well as extending international funding schemes will also contribute to maximizing resources for and impacts of research towards sustainability.

⁸ Sustainability and sustainable development has been defined in many ways, but the most frequently quoted definition is from the Report of the World Commission on Environment and Development "Our Common Future", also known as the Brundtland Report: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."

⁹ To allow for sufficient funding of such research, the UNSG SAB has already called upon the international community to establish national minimum target investments for STI. Cf. "The Crucial Role of Science for Sustainable Development and the Post-2015 Development Agenda, Preliminary Reflections and Comments by the Scientific Advisory Board of the UN Secretary-General", 4 July 2014.

¹⁰ Cf. "Data Revolution for Better Lives for All, Policy Brief by Scientific Advisory Board of the UN Secretary-General", 14 December 2015.

¹¹ The results are grouped under the themes of "dynamic planet, global sustainable development and transformations towards sustainability". Cf. Future Earth, Strategic Research Agenda 2014: Priorities for a global sustainability research strategy, [http://www.futureearth.org/sites/default/files/strategic_research_agenda_2014.pdf].

Recommendation 2: Anchor science as a reliable partner in the implementation and review process and thereby enhance the science-policy interface

Effective mechanisms and modalities will need to be developed to allow the scientific community, both at the individual and organizational level, to contribute to the follow-up and review processes of the 2030 Agenda conducted at the national and global levels, including thematic and country reviews.¹² It will be critical for the implementation of the SDGs to anchor science in these newly emerging structures. Science can become a reliable partner by effectively contributing to problem (re-)definition, problem prioritization, assessing of policy choices as well as review and monitoring, but therefore high quality science – both basic and applied science – needs to be adequately represented.

The UNSG SAB hence recommends considering the following opportunities for promoting evidence-based decision-making and enhancing the science-policy interface:

- The *High-Level Political Forum for Sustainable Development (HLPF)* will have the central role in overseeing a network of follow-up and review processes. The regular and voluntary country-led reviews of progress at the national level will feed into reviews at the regional and global levels in addition to thematic reviews. Meeting under the auspices of the Economic and Social Council and every four years at the level of the General Assembly, the HLPF should have sessions dedicated to science, technology and innovation. Convening a regular scientific conference in advance of HLPF sessions, regular side events involving scientific input and creating a platform for scientific dialogue would be as important as engaging science or scientific bodies such as the UNSG SAB as an advisor by creating a formal seat for science on the HLPF.¹³
- The *Global Sustainable Development Report (GSDR)* will be central for monitoring the state of sustainable development and identifying ways to advance the implementation of the 2030 Agenda. By building on already existing reports and dispersed analyses, future versions of the GSDR should provide cross-cutting assessments of the implementation of the 2030 Agenda, including successes, challenges, gaps, lessons learned and emerging trends. By reflecting the integrated nature of the new development agenda, the GSDR should complement the annual SDG Progress Report's goal-by-goal review of progress based on the global indicator framework. Designed as a multi-stakeholder, multi-level approach, the GSDR should aim at integrating key relevant findings from across a wide range of scientific fields in addition to input from the UN system, governments and stakeholders at all levels. The methodology of the GSDR, following its mandate to strengthen the science-policy interface, needs to ensure both sufficient scientific credibility as well as maximal relevance of the report for policy-makers. International science organizations – such as the International Council for Science (ICSU) and The World Academy of Sciences for the advancement of science in developing countries (TWAS) – or the UNSG SAB, if provided with appropriate resources, could help arrange peer reviews of the draft report. At the national level, National Academies of Sciences or similar institutions that draw on an interdisciplinary body of scientists could be integrated into the drafting and reviewing processes of national sustainable development reports. As a result, the GSDR would be elevated to a major platform for interaction between scientists and policy-makers, providing a strong, evidence-based instrument to support sustainable development.
- The *Technology Facilitation Mechanism (TFM)*, launched in September 2015 to promote science, technology and innovation in the context of the 2030 Agenda and to support the implementation of the SDGs, consists of the UN Inter-Agency Task Team on Science,

¹² Voluntary national reviews will focus on experiences and results in implementing the 2030 Agenda and the SDGs at the national level. Thematic reviews will build on inputs from relevant UN platforms as well as other functional commissions and intergovernmental bodies. Their aim is to reflect the integrated nature of the SDGs as well as the interlinkages between them.

¹³ Cf. "Strengthening the High-Level Political Forum and the UN Global Sustainable Development Report, Policy Brief by the Scientific Advisory Board of the UN Secretary-General", 9 July 2015.

Technology and Innovation; the annual Multi-Stakeholder Forum on Science, Technology and Innovation for the SDGs; and an Online Platform as a gateway for information on existing STI initiatives, mechanisms and programs.

The TFM is intended to be a solution-oriented platform. Therefore, it will be important that the topics of the annual STI Forum reflect specific and technical features of the rather broad and policy-oriented theme of the HLPF, which it will inform by a summarizing report. The co-chairs responsible for organizing the STI Forum should consult with scientists and scientific advisory bodies to identify the annual agenda and should invite scientists both from basic and applied science to formally participate in the STI Forum. Furthermore, the STI Forum should promote the establishment of new cross-thematic international initiatives that will drive evidence-based change across the SDGs.

Certainly, the two days of the face-to-face forum will be not enough time to exhaust discussions. This is why the Online Platform should also serve to facilitate networking, discussions and knowledge sharing in between annual STI forums among scientists, policy-makers and members of UN entities. It should become customary practice that a member of the UNSG SAB serves on the Group of 10 Representatives from civil society, private sector and science providing guidance and recommendations to the work of the TFM.

Recommendation 3: Establish independent scientific monitoring mechanisms and promote evidence-based decision-making for sustainable development

Science can be a powerful actor and a constructive corrective for achieving the SDGs. In addition to the voluntary, state-based review process, where countries should be asked to provide two to three reports in the next 15 years, the UNSG SAB calls upon civil society in general and scientific community in particular to simultaneously and independently monitor progress and evaluate success towards achieving the 2030 Agenda and the SDGs. It would be very beneficial if scientists provided assessments of assessments, defined challenges and predicted scenarios for future success and achievements as well as failures of SDG implementation. When identifying emerging risks, scientists need to take the initiative and call for evidence-based policy adjustments. This is especially true when scientific data and analysis show that current policy choices conflict with a sustainable development path.¹⁴

Science has already played an important role for sustainable development by informing the formulation of evidence-based targets and indicators. However, in those cases where SDG indicators are based on minimum consensus among governments or too narrowly focused, science should provide comprehensive assessments aimed at examining overall success or identifying the need for political action. Against this backdrop, data collection and processing will need to be strengthened and ensured as a sound basis for scientific findings and evidence-based solutions, encompassing all three dimensions of sustainable development: the social, economic and environmental. The SDG indicators should be disaggregated where relevant by income, sex, age, race, ethnicity, migratory status, disability and geographic location, or other characteristics necessary to evaluate success.

Independent scientific monitoring mechanisms at the national and global levels should not be limited only to an analysis of progress achieved. Science also plays an important role for identifying emerging risks and opportunities, testing solutions as well as providing recommendations on how to move forward. Furthermore, developing implementation

¹⁴ In past decades, the relationship between human action and global environmental change has been a significant feature of scientific inquiry with regard to sustainability. The academic and political discussion on 'planetary boundaries' for instance has contributed to establishing the idea of preserving a 'safe operating space for humanity'. Whenever identifying unsustainable patterns, for example with regard to population and resource-use where a continuation of current trends might entertain the possibility of reaching an overshoot or even societal collapse, science and scientists should offer ideas and mechanism to reach sustainable levels. See Safa Motesharrei, Jorge Rivas and Eugenia Kalnay (2014) 'Human and nature dynamics (HANDY): Modeling inequality and use of resources in the collapse or sustainability of societies', *Ecological Economics*, Vol. 101, pp. 90-102.

roadmaps – at the national and global level – for each of the 17 SDG from a scientific point of view, including time-bound targets for reaching the scientific recommendations, would promote evidence-based policy-making. Due to the interrelatedness of many SDGs, science can contribute to understanding social, economic and environmental change in its general context (“bigger picture”).

4. Conclusions and Outlook: Sustainability – Towards a Unifying Aspiration of Humankind

Science plays a significant role for sustainable development. It is more than a ‘means of implementation’ of the Agenda 2030 and the SDGs as well as a provider of sustainable technological solutions. The UNSG SAB calls upon scientists and policy-makers to recognize science as a universal public good, to acknowledge basic science as a principle requirement for innovation, to enhance diversity in science for sustainable development, to strengthen science education, to raise investments in science as well as to promote an integrated scientific approach.

The UNSG SAB recommends that science should be anchored prominently in the follow-up and review processes of the new development agenda by including scientific assessments, participation, and representation.

- Sustainability needs to become the corner-stone for future research. On the way to a sustainable development, not only applied science is crucial, but also fundamental research as the latter is the driving force for high impact science. The integrative nature of the 2030 Agenda requires strengthening interdisciplinary cooperation and it remains paramount to identify critical research priorities via national and international research agendas as well as new and interdisciplinary approaches.
- Effective mechanisms and modalities are required to allow the scientific community, both at the individual and organizational level, to contribute to the national and global follow-up and review processes of the 2030 Agenda for Sustainable Development. As a reliable partner, science and scientists can effectively contribute to problem (re-)definition, problem prioritization and assessing of policy choices: but to achieve this, high quality science – both blue-skies research and applied science – needs to be adequately represented in the emerging implementation and review architecture, especially with regard to the High-Level Political Forum for Sustainable Development, Global Sustainable Development Report and the Technology Facilitation Mechanism.
- In addition to the voluntary, state-based review process, the scientific community should simultaneously and independently monitor progress and evaluate success towards achieving the 2030 Agenda and the SDGs. As a constructive corrective, scientists need to take the initiative when identifying emerging risks and call for policy adjustments on the basis of scientific findings and evidence-based solutions.

The UNSG SAB is deeply convinced that sound, independent scientific advice on the national and international level as well as the formal inclusion of science in the implementation and monitoring architecture of the 2030 Agenda and the SDGs will largely improve the quality of policy-making at all levels – especially with regard to sustainable development. The momentum created by the adoption of the 2030 Agenda for Sustainable Development could significantly contribute to making sustainability a unifying aspiration of humankind and providing an environment for science to push new frontiers, for humankind and the planet.