United Nations
Educational, Scientific and
Cultural Organization

Natural Sciences Sector
Social and Human Sciences Sector

United Nations
Educational, Scientific and
Cultural Organization

From
the People
of Japan

Third Symposium on Sustainability Science: Towards Guidelines on Research and Education

UNESCO Headquarters - Room XIII (Bonvin Building)

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Report[1]

The Third Symposium on Sustainability Science, on 31 May and 1 June 2017 at UNESCO Headquarters in Paris, aimed to present the set of guidelines on sustainability science and interdisciplinarity in research and education to the representatives of Member States. This symposium was the third in a series in the context of a project generously supported by the Government of Japan on "Broadening the Application of the Sustainability Science Approach".

The 2-day symposium focused on presentations and discussions reflecting the different pillars of the guidelines on sustainability science. In parallel, the relevance of the Sustainable Development Goals (SDGs) and the 2030 Agenda for Sustainable Development was also highlighted in the symposium as a transversal matrix for guiding the guidelines.

The programme started with an opening session, attended by Ms Nada Al-Nashif, Assistant Director-General for Social and Human Sciences (UNESCO) and H.E. Ms Kuni Sato, Ambassador Extraordinary and Plenipotentiary, Permanent Delegate of Japan to UNESCO. The symposium, organized in four plenary sessions, focused on representing the main pillars of the guidelines and what role for implementing the SDGs. It also underlined with how to promote North-South-South cooperation on research and education in sustainability science. A joint Steering Committee (SC) and its Drafting Sub-Committee (DC) meeting were held during the symposium on 1 June 2017.

30 Member States attended the symposium and covered the UNESCO's five regions: Africa (10), Arab States (6), Asia and the Pacific (4), Europe and North America (8), and Latin America and the Caribbean (2). UNESCO Office in Jakarta, the Social and Human Sciences Sector, and Education Sector were also represented.

From the presentations of the many case studies the following main points emerged:

- Importance of "Glue money";
- Fundraising and research activity is synergetic;
- Sustainability science helps to avoid fragmentation in the implementation of the SDGs;
- How to approach funders - Framing the issues;
- Limitations of funding (sometimes money is not the most important factor for impact);
- North - South Cooperation is lacking and should be improved due to growth of scientific enterprise in the South, increasingly global scope of economic, environmental and social problems;
- The growing role of internet and e-based learning;
- Knowledge is not enough - convincing people why sustainability science is important;

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- The need for awareness-raising;
- How can developing countries take ownership of SDGs and sustainability science;
- Need to pay due attention to the issues of gender equality;
- Broadening appreciation for complementary evidence (Problem → questions → type of evidence → evaluation criteria);
- Provide scientific knowledge, solution oriented data and instruments for implementation of SDGs;
- Linking the quality research with relevant international initiatives, networks as Future Earth;
- Mainstreaming sustainability science approach and contributing to social transformation towards sustain in collaboration with various stakeholders including business sectors and policymakers.

The following sections present a brief overview of the insights that emerged from the presentations, case studies and discussions.

Key principles for Sustainability Science

SDGs are a fundamental framework for sustainability science and diversity and knowledge are key words. Sustainability science can be disciplinary, interdisciplinary or transdisciplinary, but it is user-driven and user-inspired, building from integrated knowledge and territories-based integrated experiences. Sustainability science specifically address dependencies and complexities, engaging scientists and practitioners, involving knowledge, attitudes, values, life forms and narratives, based on the diversity of cultures. Sustainability result from interdependencies between societal, economic, environmental and cultural drivers, and imply contradictions and dilemas, not only technical problems to solve.

Sustainability science is about knowledge, technology, innovation and convergent understandings of global and local challenges. Sustainability science can be disciplinary, interdisciplinary or transdisciplinary, but it is user-driven and user-inspired, building from integrated knowledge and territories-based integrated experiences. Sustainability science specifically address dependencies and complexities, engaging scientists and practionners, involving knowledge, attitudes, values, life forms and narratives, based on the diversity of cultures. UNESCO programmes, including academic chairs and category 2 Centres, are a major tool to foster Sustainability science, engaging sciences, humanities and society.

Sustainability Science is specifically responding to the interdependent, complex and mutually reinforcing character of natural, social and cultural ongoing, global and local challenges. Sustainable development, as expressed in the United Nations Agenda 2030, is exactly about the interplay of such challenges. Sustainability Science aims at mobilizing, generating, disseminating and implementing knowledge necessary to define and achieve sustainability as a response to such challenges in the concrete contexts of different geographical and temporal scales. Such knowledge includes new technologies and innovative processes.

In addition to generating knowledge, Sustainability Science focuses on solving problems, understanding dilemmas and conflicts of goals and interests, with a view to move towards more integrated and coherent policy agendas, policy options and foresight scenarios, also encompassing short and long terms needs. Sustainability Science tends to become a crosscutting disciplinary science, but its demands typically call for an inter- and transdisciplinary cooperation of natural and social sciences, humanities and also involving the arts and non-academic stakeholders, taking into account cultural diversity, through a collaborative process of co-design, co-production and co-management. Sustainability Science is based on both academic freedom and academic responsibility.

Sustainability Science requires important new capacities of individual scientists for critical analysis, for foresight, to cope with systems thinking, changing environments, risks and insecurity, to recognize and address diverse values as well as conflicts of goals and interests, to empathize and work responsibly and collectively in diverse partnerships. Such capacities need to be strengthened through

all education.

Funding strategies of Sustainability Science

Funding strategies should be based on competitive frameworks to ensure scientific excellence. Implement through same funding agencies in charge of other scientific fields/methods to avoid impression of different value of Sustainability Science is important. Sources should be diversified, e.g. international organizations, government departments, academies, other science-based bodies, public and private foundations and development agencies, both national and multilateral. Crowdfunding could be a future option.

Adapt to the requirements of sustainability science

- Co-design needs time to build understanding and trust
- In particular, co-design between the North and the South needs time
- Co-production needs time, in order to understand approaches, to test and verify knowledge
- In particular, co-production between the North and the South needs time
- Co-implementation needs time, in comparison to “end-of-pipe”

The reality of research funding today that calls for proposals often

- are open only for some weeks
- only cover projects of 1-3 years
- do not cover preparatory work
- do not cover implementation, evaluation and „transfer“
- are very prescriptive in terms of disciplines
- are very restrictive in terms of who can benefit from funding
- do not allow real co-operation at eye level (North-South)

It is recommended that

- Calls for proposals with sufficient time, to allow co-design
- Provide funding for preparing project proposals and possibly require co-design elements
- Funding periods of more than 3 years, to allow co-production
- Provide funding for implementing and evaluating research and possibly require co-implementation elements
- Requiring co-operation at eye level in international partnerships (North-South)
- Provide for methodological diversity
- Support the development of new indicators for the impact of Sustainability Science

Elements in fund raising strategies for sustainability science that will contribute to SDG implementation

- Takes a long term view
- Contribute to building partnerships
- Long term support for partnerships helps STI initiatives move in right direction for SDGs
    - Avoid unintended consequences
    - Promote flexibility
    - Make adjustments in response to new knowledge
- Ripe for private sector and philanthropic support because SS is ACTION oriented
- Involvement of multiple stakeholders
    - Diverse strategies needed to engage investors from diverse institutions
    - Promotes development of holistic policy-making
    - Builds legitimacy for research results

How sustainability science contributes to implement the SDGs

- The SDGs and targets are integrated and indivisible – qualities that lie at the heart of and are well-understood in sustainability science
- The 15 year horizon for attainment of the SDGs is in keeping with the long term research goals in sustainability science, which is intended to address the complex problems that stem

from the inter-connectedness of the world's social, environmental, and economic systems
- SDG implementation requires quality, timely and accessible data for priority setting as well as policy- and decision-making. Inclusive research process of SS can contribute to ensuring access to relevant data.
- Sustainability science supports capacity building (also necessary for implementation) through its broad participatory process which serves as a forum for mutual learning between and among scientists and non-scientist stakeholders

International forums that support the sustainability science
- United Nations organizations and the UN Partnerships for SDGs initiative https://sustainabledevelopment.un.org/partnerships/
- Future Earth (www.futureearth.org) A 10-year international research platform to advance sustainability science and to promote international engagement in transformation to a sustainable world.
    - Supports through provision of seed funding and management collaborative frameworks to facilitate highly integrative sustainability science research
    - Example of diverse funding landscape with a 4.6 m USD budget provided by private and public foundations, government agencies, universities and other groups
- The International Council for Science (ICSU) recent proposal for a Global Funding Forum https://www.icsu.org/events/meeting-on-supporting-science-for-the-sustainable-development-goals
- The International Social Science Council (ISSC)(currently the ICSU and ISSC are pursuing a merger with a view to developing a new integrated pathway for international science): Transformation to Sustainability (T2S) program provides seed grants to help advance transformations to more sustainable and equitable societies around the globe. By generating knowledge that produces a broader and deeper understanding of the conditions, processes, outcomes and impacts of transformative social change in the context of global environmental change http://www.worldsocialscience.org/activities/transformations/
- The Belmont Forum, an international group of funders of global change research including national science foundations and research alliances (including the US NSF and Japan's MEXT). The Forum is now supporting the Transformations to Sustainability project (T2S) among other initiatives https://www.belmontforum.org
- CRDF Global: an independent non-profit working in 40 countries to promote international scientific and technical collaboration through grants, technical resources, training and services (capacity building) http://www.crdfglobal.org/
- Newton's List: an on line tool for funders and grand seekers interested in international cooperation. Sponsored by crdfGlobal http://newtonslist.crdfglobal.org/
- National Science Foundations participating in the international initiatives to leverage support for long-term complex sustainability research
- The European Union's Horizon2020 initiative which provides support for research on climate change (35% of budget) and the SDGs (60%) open to participants from all over the world. The largest EU research and innovation programme ever with nearly 80 billion Euros funding over a seven year period (2014 – 2020). Participation is open to everyone and in many cases the EU will fund in part the participation of international partners, including eligibility in developing countries. https://ec.europa.eu/programmes/horizon2020/en/h2020-sections

Business and industry support for sustainability science
- Global R&D expenditures on the rise (most from private sector)
- World Business Council on Sustainable Development (Guide for CEOs to the SDGs)
- Business and Sustainable Development Council:
    - Committed to supporting transition to a sustainable economy
    - Support transdisciplinary research/partnerships

Diverse funding landscape supports diverse research
- Research funding agencies
- Development aid agencies
- Foundations

- National governments/STI budgets/national science foundations
- Private sector business and industry
- Private philanthropists
- Charitable organizations,
- Social media and “crowd-funding”

Challenges for fundraising for sustainability science
- Limited funders especially at national levels for transdisciplinary research
- Difficulty raising funds for long-term projects
- Insufficient co-ordination/cooperation and inclusivity in fund raising
- Lack of identification/testing and sharing of fundraising strategies
- Institutional constraints on cross-border support

Work within the international forums that advocate sustainability science. Join and expand global knowledge networks. Develop flexible strategies that can benefit from the diversity of funding sources and increase transnational funding. Ensure broad-based participation and include support for capacity building for successful implementation of research actions. Share data, progress and results liberally including through social media.

Mainstreaming Sustainability Science in higher education

Cultural dimension of sustainability is conceptually and strategically indispensable, for both research and education. Valuing and deliberately addressing the regulative core of sustainable development and its implications for education are an asset for (science) education. Interrelatedness of science and sustainable development deserves educational attentiveness by every professor and lecturer and his/her students. To this end, it is essential to make (sustainability) science a tangible experience for students (to familiarize with and practice value-laden conflicts, tensions and incompatibilities of knowledge etc.)

Guidelines can give guidance for decision makers to broaden the approach of Sustainability Science and inter- and transdisciplinarity in education.
- Higher education institutions, due to academic autonomy in many countries, are key stakeholders to advance the crucial role of Sustainability Science
- Individual researchers and teachers can have a substantial contribution to make for fostering sustainability in higher education
- Governments could ensure enabling environments for institutions of higher education to promote Sustainability Science
- Society and community play an important role, since they are both relevant co-producers of knowledge and the target group of Sustainability Science results.

Mainstreaming sustainability science in higher education
- Sustainability Science also requires additional approaches within higher education and even a fundamental reconceptualization of teaching and learning.
- The goal is to academically educate sustainability experts (young students as well as professionals in continuing education) to develop the power of critical thinking and relevant competences to being able to tackle the challenges facing the society from local to global levels.
- Based on the principles of academic freedom, higher education provides a protected space for independent and historically informed reflections, which is both, oriented towards the generation of new knowledge and contributing to meeting societal challenges.
- Progress has been made over the past two decades towards establishment of Sustainability Science in higher education. There is still a lack of bundling together academic expertise in higher education, particularly an insufficient learning from good practice.

It is recommended that
- cultural dimension of sustainability is conceptually and strategically indispensable, both for research and education

- valuing and deliberately addressing the regulative core of sustainable development and its implications for education are an asset for (science) education
- interrelatedness of science and sustainable development deserves educational attentiveness by every professor and lecturer and his/her students
- To this end, it is essential to make (sustainability) science a tangible experience for students (to familiarize with and practice value-laden conflicts, tensions and incompatibilities of knowledge etc.)

North-South cooperation on education in sustainability science

- Always policies and strategies furthering scientific cooperation between North and South move forward at the same time with sustainable development.
- Sustainability science aims to strengthen cooperation between North and South as a critical driver for how science gets done.
- A decade ago, policy forecasters and makers emphasized the deficit of North-South share in science that adversely impacted South countries in African sub-Saharan and Islamic world.
- As scientific expertise in South countries continues grow and critical economic, environmental and social problems became more global in scope, it is likely that North-South scientific cooperation would be exaggerated.
- North-South cooperation would continue to evolve from its modest beginnings, where the focus was on building basic scientific capacity, to its current quest for full and equal partnership in the global scientific community.
- Some South countries such as Brazil, China and India initiated unprecedented opportunities for North-South cooperation in science and education to achieve sustainable science approach.
- North countries are now strengthened by e-learning, as the internet afforded an excellent tool for students and educators worldwide to interact, exchange experiences and learn from each other.
- Advanced courses and lectures developed by world-class universities should be made available free of charge to anyone, anywhere and at any time.
- Today, at least potentially, we are at the dawn of a new era in global science in which scientific capacities are reaching beyond the United States and Europe to Asia, Latin America and Africa.

Education in sustainability science in southern countries

- Most southern countries too often view science as a luxury that only Northern countries could afford its high expenses.
- Some Southern countries are now displaying a growing proficiency in science and technology associated with a primary obligation to their economic and social well-being. For instance, China is now a world leader in nanotechnology, India in information technologies and computer software, Brazil in space science and technology.
- Over the past few years, a number of African countries including Nigeria, South Africa, Tanzania, and Uganda had unprecedented science capacity building programs in education and research that have helped advance their agendas for sustainable development.
- Bilateral and institutional cooperation in sustainability science in education are now witnessed in China, India Brazil, Turkey, UAE, Malaysia, Islamic development bank and Arab bank for development in Africa.
- Nigeria raised the budget allocated for science three-folds over the past five years and launched its first remote sensing satellite in 2003. It is now planning to launch a communications satellite in collaboration with China.
- South Africa, with Africa's strongest scientific capacity and infrastructure, just installed the Southern African Large Telescope which is the largest single optical telescope in southern hemisphere.
- Tanzania doubled its budget for science and technology last year.
- Uganda set an ambitious program for building centers of excellence in science, technology and innovation.
- Egypt significantly increased the budget allocated for scientific research and is now starting the construction of nuclear plant for generating energy in Burg-el-Arab in cooperation with

Russia.

- Intergovernmental organizations in S&T such as NEPAD in Africa and COMSTECH in Islamic world serve as both public advocates and strategic policy centers for the evolution of scientific research and education in southern countries.
- During the past two decades, TWAS for instanced supported South-South cooperation in scientific research and education.
- Today, South-South cooperation, build up by TWAS, came out as a powerful force for change in southern countries due to the growing scientific capabilities of research centers and universities in some southern countries such as Brazil, China and India. These three countries have now universities and research centers capable of meeting the requirements of not only for their own scientists, but also for scientists from other southern countries.
- TWAS played a key role in the transformation of scientific knowledge and innovation originated in the North, where 80% of all active scientists live and work, to the south.

Mainstreaming of sustainability science in education

- Challenges of mainstreaming sustainability science in education must be efficiently confronted.
- Mainstreaming of sustainability science in education requires specific actions to be taken mainly by local governments.
- Attainment of mainstreaming sustainability science in all education stages requires not only going beyond the integration of key ideas in existing curriculum but requires also a new systemic view of sustainability science to transform the educational experience of teachers and students and lead social changes for sustainability.
- Mainstreaming sustainable science in education sector needs it to renovate itself in a long-lasting and ambitious process which would not only require strong leadership but also abundant time.
- Development of the necessary interfaces between science, policy and society help in advancing mainstreaming of sustainability in terms of knowledge, adaptive management and societal learning as well as providing scientific stands to policy and decisions makers in the civil society.
- Still, many countries are not investing what is needed to bridge the gaps required to achieve mainstreaming of sustainability science in education.
- Mainstreaming of sustainability science in education entails a fundamental reconceptualization of teaching and learning.

Bad/best practices and lessons learned

- Over the past few years, a number of African countries including Nigeria, South Africa, Tanzania, and Uganda have all embarked on unprecedented science capacity building programs in education and research that have helped advance their agendas for sustainable development.
- Structuring knowledge and networking are a prerequisite step in the efforts to acquire a comprehensive view of sustainability issues which are both complex and interconnected.
- Better understanding of the links between social, economic, and biophysical systems is urgently needed.
- Improve our understanding of factors triggering North-South cooperation on education in sustainability science is a must.
- Full understanding of science sustainability implications avoids unintended consequences.
- Mainstream partnership for education should involve all concerned national foundations.
- Mitigate and adapt challenges and constrains confronting North-South cooperation on education in sustainability science.
- Encourage capacity building program able to confront challenges and constrains related to North-South cooperation on education in sustainability science.
- Application of the current state of scientific knowledge to achieve both short-term continuity and long term ecological integrity.
- The scientific community in southern countries must actively convince both decision-makers and the public at large that science plays a vital role in a society’s well-being.
- Prominent merit scientists should advise their governments on critical policy issues related to

scientific research and education.
- North scientific communities should be encouraged to devote part of the research and education agenda to critical problems facing southern countries.
- To uplift the scientific capabilities in northern regions, it would also be necessary to provide more support for UN organizations such as UNESCO, FAO and WHO that has focused on issues of education and sustainable development.
- A broad framework for collaboration among countries in the political, economic, social, cultural, environmental and technical domains is now urgent.
- Democracy and good governance might have moral reasons for helping southern countries in building their research and education capacities.
- Southern countries are expected to take ownership and establish a national framework for achieving the UN 17 goals of sustainable management.

Optimum mechanisms for open data and knowledge sharing
- Sharing knowledge and experience, training, technology transfer, financial and monetary cooperation and in-kind contributions.
- Developing skills for science education for sustainable development.
- Intensifying programs in training on innovative teaching and learning.
- Sharing responsibility in both South-South and North-South cooperation, in education and research might be the best way to ensure success.
- The best ways for building successful initiatives in North-South cooperation in education and research is through the enactment of political reforms based on sincerity, transparency and liability.
- Ease free access to latest scientific knowledge and R&D out puts.
- As scientific research advances at an ever faster pace in Northern world, the gap between South and North countries is expanding. The Northern world's 'research monopoly' initiated a biased research agenda that is heavily biased towards challenges of particular importance and interest to the north, but of little consequence to the south.
- On the international front, a sustained commitment from both donor nations and international financial institutions is essential to ensure that all nations participate in the world of science movement and that all nations enjoy the benefits of science-based development.
- Most significantly is uplifting the scientific capabilities of the 77 countries that are lagging in science and technology. To achieve this goal, it is necessary to establish and support a number of regional and/or international centers of excellence in these countries. Such centers would act as a magnet and attract talented students and researchers, and therefore facilitate fruitful regional and international cooperation in research areas relevant to poor countries.
- Science sustainability programs are still lacking satisfying experience in the South.
- Political strength in the Southern implementing institutions is still feeble.
- Ineffectual participation and/ or complete absence of NGO's.
- Limited institutional mandate.
- Restricted available budgets.
- Lack of proper indicators for sustainable management.

Mainstreaming Sustainability Science in research

Developing capacity building in Sustainability science is fundamental through a "bottom-up" approach: development of core training modules; adaptable to context, topics, and audiences; trainings in different countries and regions; development of an international pool of trainers and creation of web-based platform of resources.

Skills building initiative:
- Development of core training modules, incl. methods, case studies, exercises, M+E component
- Adaptable to context, topics, and audiences
- Trainings in different countries and regions
- Development of an international pool of trainers
- Web-based platform of resources

Research in Sustainability Science

- Distinct scientific endeavor, with it own methods and approaches over the years
- Diversified core fields, from education to engineering, to business management and across the social and natural sciences
- Formation of networks of research communities to enable transdisciplinary approach to tackle highly complex issues such as climate change and biodiversity loss

Key directions for Sustainability Science for the next 10 years

- Provide scientific knowledge, solution oriented data and instruments for implementation of SDGs
- Linking the quality research with relevant international initiatives/networks such as the Future Earth
- Mainstreaming sustainability science approach and contributing to social transformation towards sustainability in collaboration with various stakeholders including business sectors and policy makers