Ecosystem for Sustainable Innovation: International Similarities and Differences UNESCO's Role in Supporting Young Researchers, Governments, Industry, and Public Engagement

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Open Science @ Making science more accessible inclusive and equitable for the benefit of all



UNESCO Regional Office for East Asia

About UNESCO Regional Office for East Asia



- Established in 1984, UNESCO Beijing Office is one such regional focal point connecting five Northeast Asian countries.
- In the five countries it serves, UNESCO Beijing Cluster Office has helped:
 - Builds capacities of key decision-making institutions
 - Helps strengthen policies, standards, and practices in UNESCO's areas of work
 - Promotes cooperation between countries within and outside the sub-region, especially South-South Cooperation with Asia and Africa
 - -Makes a lasting impact on people's lives



UNESCO Mission and Mandate

"Since wars begin in the minds of men and women, it is in the minds of men and women that the defences of peace must be constructed." <u>UNESCO Constitution</u>

COMMUNICATION NATURAL&SOCIAL CULTURE &INFORMATION **SCIENCES EDUCATION Ensure Transmission** of heritage and **Defend Freedom of** Strengthen Scientific Train new teachers embrace cultural cooperation to expression and and ensure diversity to access to protect our planet education for all understand and information and oceans respect one another

UNESCO constitution: "UNESCO seeks - by means of promoting inter alia, <u>the scientific relations of</u> <u>the peoples of the world - to advance the objectives of international peace and of the common</u> <u>welfare of humankind</u> for which the United Nations Organization was established and which its Charter proclaims"

"Building Peace in the Minds of Men and Women"



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UNESCO Natural Science Sector





Science for a LANET Sustainable Development Sustainable ARTNERSHIP PEACE 2024-2033 as Futu the International Decade of Sciences for **Sustainable Development IDSSD** 11/ 11/





United Nations Climate Change

Sendai Framework for Disaster Risk Reduction 2015 - 2030

2024 • 2033 International Decade of Sciences for Sustainable Development



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SCIENCE

REPORT

Global shares of GDP, research spending, researchers, publications and patents for the G20 (2014/2018)

32 UNESCO SCIENCE REPORT



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Challenges to Sustainable Innovation Ecosystems

•Global Challenges:

- Unequal access to resources and technology
- Overreliance on quantitative metrics in academia
- Funding gaps for foundational research

•Regional Challenges (East Asia):

- Balancing industrial growth with sustainability
- Strengthening local stakeholder engagement

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UNESCO



Specialization and average of relative citations for cross-cutting strategic technologies by country and region, 2011–2019 Among countries with at least 1 000 publications in this broad field over 2011–2019. The size of the circle is proportionate to the volume of publications



JAPAN

Top five topics by growth rate

- Impact on health of soil, freshwater & air pollution (1.63)
- Eco-industrial waste management (1.60)
- Geothermal energy (1.48)
- National & urban greenhouse gas emissions (1.46)
- Eco-construction materials (1.43)

Top five topics by specialization

- Nuclear fusion (1.88)
- Radioactive waste management (1.60)
- Regenerative medicine (1.31)
- Hydrogen energy (1.21)
- Photovoltaics (1.21)

CHINA

Top five topics by growth rate

- Floating plastic debris in the ocean (40.86)
- Transboundary water resource management (2.85)
- Help for smallholder food producers (2.78)
- Water harvesting (2.74)
- Ocean acidification (2.69)

Top five topics by specialization

- Greater battery efficiency (2.12)
- National & urban greenhouse gas emissions (1.73)
- Coastal eutrophication (1.72)
- Hydropower (1.53)
- Cleaner fossil fuel technology (1.52)

REPUBLIC OF KOREA

Top five topics by growth rate

- Impact on health of soil, freshwater & air pollution (2.02)
- Agro-ecology (1.84)
- Tackle invasive alien species (1.77)
- National integrated water resource management (1.67)
- Eco-industrial waste management (1.65)

Top five topics by specialization

- Photovoltaics (2.50)
- Greater battery efficiency (2.34)
- Hydrogen energy (1.91)
- Sustainable transportation (1.63)
- Radioactive waste management (1.59)

USA

Top five topics by growth rate

- Floating plastic debris in the ocean (3.62)
- Help for smallholder food producers (2.12)
- Sustainably manage marine tourism (1.84)
- Local impact of climate-related hazards & disasters (1.71)
- Local disaster risk reduction strategies (1.67)

Top five topics by specialization

- Human immunodeficiency virus (HIV) [1.92]
- Tackle invasive alien species (1.61)
- Ocean acidification (1.50)
- New or re-emerging viruses that can infect humans (1.46)
- Extent of water-related ecosystems (1.39)

EUROPEAN UNION

Top five topics by growth rate

- Floating plastic debris in the ocean (5.29)
- New tech to protect from climate-related hazards (1.90)
- Greater battery efficiency (1.76)
- Minimize poaching & trafficking of protected species (1.75)
- Local impact of climate-related hazards & disasters (1.75)

Top five topics by specialization

- Floating plastic debris in the ocean (1.74)
- Ecosystem-based approaches in marine environments* (1.58)
- Eco-construction materials (1.56)
- Nuclear fusion (1.41)
- New tech to protect from climate-related hazards (1.30)

Figure 2.10: Top SDG-related topics based on specialization and growth in selected regions and countries, 2011–2019

For topics with at least 100 publications over 2011–2019 The growth rate and specialization index are given within brackets





Poplitics/Current Situations	Challenges	
Investment in S&T below 1% of GDP	A gap between research outputs and SDG goals limits the impact of research in addressing global challenges.	
Sustainable development indicators	Less than 50% of indicators are fully disaggregated, leading to insufficient data-driven policy-making for SDGs.	
Policy influenced by external factors	Policy decisions often prioritize political and economic interests over evidence-based decision-making for SDGs.	
Limited open access to research	Open access is available for only 50% of research papers, and infrastructure is lacking in many fields, hindering knowledge-sharing and citizen science engagement.	
Data-driven decision- making gap	Less than 50% of sustainable development indicators are fully detailed, signaling a lack of data integration in policy-making	
Underrepresentation of women in science	Women make up less than 50% of researchers globally, especially in Information/AI fields (23%).	
Low global science literacy	Only 15% science literacy, with less than 50% of researchers in higher education in most countries and limited R&D expenditure.	
Declining government researchers	The declining share of government researchers reduces capacity to address global crises like climate change and inequality.	



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Vision

The sciences and a science culture required for a sustainable world developed and accessible to all.

Mission

To engage all societal actors to further advance science and equally benefit from it.

Objectives

With the aim of advancing scientific knowledge and fostering a culture of science, the Decade has two key objectives:

Objective 1: To enhance scientific endeavors to deepen our understanding of nature and humanity, and the intricate interplay between them, and to generate and leverage actionable scientific knowledge to accelerate the achievement of the Sustainable Development Goals (SDGs) and beyond.

Objective 2: To nurture a robust culture of science in line with Article 27, Paragraph 1 of the Universal Declaration of Human Rights, i.e. science is a global public good; everyone could engage in the scientific process and access the science benefits.





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UNESCO Recommendations 41st General Conference

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UNESCO Recommendation on Open Science

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Intelligence

The importance of **open science** as:

a vital tool to improve the quality and accessibility of both scientific outputs and scientific process,

- to bridge the science, technology and innovation gaps between and within countries and
- to fulfill the human right of access to science.
- **UNESCO's Ethics Frameworks:**
- Recommendation on the Ethics of AI: Fairness and inclusivity
- **Bioethics programs: Promoting sustainable practices**
- Applications in East Asia:

https://unesdoc.unesco.org/ark:/48223/pf0000381137 AI for disaster management and education

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INESCO

Global standards now exist for a healthy ecosystem of research and innovation

- II. Scientific researchers in the context of national policymaking
 - 5. In order to have a sound science, technology and innovation system integrated to their effort, Member States should establish and substantially strengthen human and institutional capacities, including by:
 - (f) giving recognition to the key role of research and development in the acquisition of knowledge, in addressing the root causes and impacts of conflict, and in achieving sustainable development; and
 - (g) **using** scientific and technological knowledge **in decision-making** and policies.

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Global standards now exist for a healthy ecosystem of research and innovation

• II. Scientific researchers in the context of national policy-making

- 6. Member States should treat public funding of research and development as a form of public investment the returns on which are, for the most part, necessarily long-term, and take all appropriate measures to ensure that the justification for, and indeed the indispensability of such investment is held constantly before public opinion.
- 7. Member States should use scientific and technological knowledge in decision-making and policies for international relations, for which they should strengthen capacities for science diplomacy.
- 8. Member States should cultivate opportunities for scientific researchers to participate in developing national science, technology and innovation policy. In particular, each Member State should ensure that these policy processes are supported by appropriate institutional mechanisms enjoying adequate advice and assistance from scientific researchers and their professional organizations.
- 9. Member States should create the environment to ensure that scientific researchers, who give policy advice to policy-makers and other public officials, can do so in an accountable manner in which conflicts of interest are disclosed.
- 10. Each Member State should institute procedures adapted to its needs for ensuring that, in the performance of research and development, scientific researchers respect public accountability while at the same time enjoying the degree of autonomy appropriate to their task and to the advancement of science and technology. It should be fully taken into account that creativity of scientific researchers should be promoted in national policy on the basis of utmost respect for the autonomy and freedom of research indispensable to scientific progress.
- 11. With the above ends in view, and with respect for the principle of freedom of movement of scientific researchers, Member States should be concerned to create that general climate, and to provide those specific measures for the moral and material support and encouragement of scientific researchers.





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Global standards now exist for a healthy ecosystem of research and innovation

- V. Conditions for success on the part of scientific researcher
 - 24. Member States should:
 - (a) provide material assistance, moral support and public recognition conducive to successful performance in research and development by scientific researchers;
 - (b) ensure that scientific researchers enjoy equitable conditions of work, recruitment and promotion, appraisal, training and pay without discrimination on the basis of race, colour, descent, sex, gender, sexual orientation, age, native language, religion, political or other opinion, national origin, ethnic origin, social origin, economic or social condition of birth, or disability;
 - (c) support individuals from underrepresented groups entering and developing careers in research and development.
 - 25. Member States should develop policies for the protection and preservation of research objects, scientific infrastructure and scientific archives, including in instances of conflict.
 - 26. Member States should establish as a norm for any scientific publishing, including publishing in open access journals, that peer review based on established quality standards for science is essential.

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Global standards now exist for a healthy ecosystem of research and innovation

- V. Conditions for success on the part of scientific researcher
 - Adequate career development prospects and facilities
 - Lifelong learning
 - Mobility
 - Participation in the international scientific and technological community
 - Protection of health; social security
 - Performance appraisal
 - Expression by publication
 - Recognition
 - Reasonable flexibility in the interpretation and application of texts setting out the terms and conditions of employment of scientific researchers
 - The advancement of their various interests by scientific researchers in association







Challenges to Sustainable Innovation Ecosystems

•Global Efforts:

- Open Science Recommendation for accessible, inclusive knowledge
- International Geoscience Programme (IGGP) for global research collaboration

•Regional Example:

• East Asian Biosphere Reserve Network (EABRN): Collaborative research in China, Japan, Korea, and Mongolia



https://www.unescoeabrn.org/post/the-first-regional-youth-forum-for-asia-and-the-pacific-for-man-biosphere-mab-2023



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https://www.unesco.org/en/iggp https://www.unescoeabrn.org/



Empowering Youth and Building Capacity



Professor Nieng Yan, laureate of the 2024 L'Oréal-UNESCO For Women in Science International Awards for Asia and the Pacific © Fondation L'Oréal



https://www.unesco.org/en/mab https://www.unesco.org/en/prizes/women-science/awards

Global Programs:

- L'Oréal-UNESCO For Women in Science: Gender equity in STEM
- MAB Young Scientists Programme: Supporting early-career researchers

Regional Efforts:

• Youth workshops and hackathons in East Asia



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•Global Applications:

 Testing grounds for renewable energy, conservation, and community innovation

•Regional Example:

Jeju Island (Korea):
Sustainable tourism

innovation https://whc.unesco.org/en/list/

https://www.unesco.org/en/iggp/geoparks?hub=67817 https://en.unesco.org/mab



Biosphere Reserves	759 in 136 member states	10 in Japan
UNESCO Global Geoparks	213 in 48 member states	10 in Japan
World Heritage sites	952 cultural, 231 natural and 40 mixed properties in 168 state parties	26 in Japan (5 Natural) 1910 - Statural (1910) 1910 - Statural (1910



https://oecd-opsi.org/innovations/carbon-free-island-jeju-by-2030/

•Recommendations:

- Strengthen regional research networks
- Scale Open Science initiatives in East Asia
- Prioritize ethics in innovation
- Empower youth and interdisciplinary research

•Invitation:

Collaborate with UNESCO for a sustainable future.



Thank you

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