Mapping IUGG to Sustainable Development Goals

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Adopted by the UN General Assembly in 2015, the 2030 Agenda for Sustainable Development represents a new way of thinking about how to better link issues such as climate change, natural disasters and education. It intertwines social, economic, and environmental targets in 17 Sustainable Development Goals (SDGs; UN, 2015). Each of the SDGs is divided into several sub-goals. The interrelation between SDGs is not obvious, and one SDG can limit options or even clash with another SDG. The International Council for Science (ICSU) analyzed the complexity of interactions between different SDGs, and published a working paper that presents a tool to analyze and understand interactions between different goals[1]. "While the scientific community has emphasized the need for a systems approach to sustainable development, scientists, like policy-makers, are now facing the challenge of turning the goals into reality" (Nilsson et al., 2016).

Considering this issue important, I mapped IUGG and the Union Associations to the SDGs, to clarify how IUGG could contribute to the achievement of the goals. All the SDGs and sub-goals were divided into two groups: (i) those goals where IUGG can contribute, and (ii) goals where a potential contribution of the Union would be insignificant. Table 1 lists the 31 sub-goals to which IUGG could contribute. The sub-goals can be combined into several groups:

- air pollution (sub-goal 3.9),
- climate and environmental issues (1.5, 2.5, 3.9, 11.6, and 13.3),
- hazard and disaster risk (1.5, 2.5, 11.5, 11b, 13.1, and 15.3),
- education and capacity building (4.7, and 4b),
- energy (7a),
- gender (5.5),
- oceans and seas (14.1-14.3, 14a, and 14c),
- research and innovation (9.5, and 9b), and
- water issues (3.9, 6.3-6.7, 15.1, and 15.3).

From this mapping, it becomes clear that all Union Associations, the Union Commissions on Geophysical Risk and Sustainability (GeoRisk), Climatic and Environmental Change (CCEC), and Data and Information (UCDI) as well as the IUGG Committee on Capacity Building and Education could contribute to the sub-goals related to climatic change, natural hazards and risk, gender issues, education and capacity building, research and innovation. Particularly, the IAMAS Commission on *Atmospheric Chemistry and Global Pollution*[2] and the IAHS International Commission on Water Quality[3] could contribute to sub-goal 3.9 "to reduce the number of deaths and illnesses from … air, water … pollution and contamination". The IASPEI-IAVCEI-IAPSO's International Heat Flow Commission[4] could advance knowledge on geothermal energy. IAPSO and IAHS could contribute to the issues of oceans, seas and water. The next step is to analyze how IUGG and its Associations should work towards the implementation of the SDGs.

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[1] http://www.icsu.org/publications/reports-and-reviews/working-paper-framework-for-understanding-sdg-interactions-2016/SDG-interactions-working-paper.pdf

[2] http://www.icacgp.org/

[3] http://paramo.cc.ic.ac.uk/iahs

[4] http://www.iaspei.org/commissions/iaspei-iavcei-iaga-iapso-iamas-iahs-international-heat-flow-commission

References

Nilsson, M., Griggs, D. and Visbeck, M. (2016). Map the interactions between Sustainable Development Goals. *Nature*, **534**, 320–322.

UN (2015). Transforming our World: The 2030 Agenda for Sustainable Development. A/RES/70/1. United Nations, New York.

Table 1. Mapping IUGG and Union Associations to the UN Sustainable Development Goals

Goal	IUGG	IACS	IAG	IAGA	IAHS	IAMAS	IAPSO	IASPEI	IAVCEI
1.5	CCEC, GRC	✔	✔	✔	✔	✔	✔	✔	✔
2.4	CCEC, GRC	✔	✔		✔	✔	✔	✔	✔
3.9					✔	✔			
4.7	✔	✔	✔	✔	✔	✔	✔	✔	✔
4.b	CBEC	✔	✔	✔	✔	✔	✔	✔	✔
5.5.	✔	✔	✔	✔	✔	✔	✔	✔	✔
6.3, 6.7		✔				✔			
7.a					✔	✔	✔	✔	✔
9.5, 9.b	✔	✔	✔	✔	✔	✔	✔	✔	✔
9.6	✔	✔	✔	✔	✔	✔	✔	✔	✔
11.5	GRC	✔	✔	✔	✔	✔	✔	✔	✔
11.6	CCEC					✔			
11.b	GRC	✔	✔	✔	✔	✔	✔	✔	✔
13.1	CCEC, GRC	✔	✔	✔	✔	✔	✔	✔	✔
13.3	CCEC	✔			✔	✔	✔		
14.1-14.3							✔		
14.a, 14.c							✔		
15.1		✔			✔	✔		✔	
15.3	GRC				✔	✔			
16.6, 16.7	✔	✔	✔	✔	✔	✔	✔	✔	✔
17.6	✔	✔	✔	✔	✔	✔	✔	✔	✔
17.16	✔								
17.18	UCDI		✔	✔			✔		

Appendix 1. The SDGs and sub-goals related to IUGG activities

Note: only those SDGs and sub-goals related to IUGG activities are listed below, and the *italic font* highlights the topics of interest to IUGG.

Goal 1. End poverty in all its forms everywhere
1.5 By 2030, build the resilience of the poor and those in vulnerable situations and *reduce their exposure and vulnerability to climate-related extreme events and* other economic, social and *environmental shocks and disasters.*

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that *strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.*

Goal 3. Ensure healthy lives and promote well-being for all at all ages
3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and *air, water and soil pollution and contamination.*

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
4.7 By 2030, *ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development* and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development;
4.b By 2020, substantially *expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries*, for enrolment in

higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries.

Goal 5. Achieve gender equality and empower all women and girls
5.5 *Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making* in political, economic and public life.

Goal 6. Ensure availability and sustainable management of water and sanitation for all
6.3 By 2030, *improve water quality by reducing pollution,* eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally;
6.4 By 2030, substantially increase water-use efficiency across all sectors and *ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity;*
6.5 By 2030, *implement integrated water resources management at all levels*, including through transboundary cooperation as appropriate;
6.6 By 2020, *protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes*;
6.7 By 2030, *expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes*, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.

Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all
7.a By 2030, *enhance international cooperation to facilitate access to clean energy research and technology*, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
9.5 *Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries*, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending;
9.b *Support* domestic technology development, *research and innovation in developing countries*, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities.

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
11.5 By 2030, *significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations*;
11. 6 By 2030, *reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management*;
11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and *develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.*

Goal 13. Take urgent action to combat climate change and its impacts
13.1 *Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries*;
13.3 *Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.*

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

14.1 By 2025, *prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution;*

14.2 By 2020, *sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts,* including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans;

14.3 *Minimize and address the impacts of ocean acidification*, including through enhanced scientific cooperation at all levels;

14.a *Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity* to the development of developing countries, in particular small island developing States and least developed countries;

14.c *Enhance the conservation and sustainable use of oceans and their resources* by implementing international law as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of The Future We Want.

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

15.1 By 2020, *ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands*, in line with obligations under international agreements;

15.3 By 2030, *combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.*

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

16.6 *Develop effective, accountable and transparent institutions* at all levels;

16.7 *Ensure responsive, inclusive, participatory and representative decision-making* at all levels.

Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

17.6 *Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism;*

17.16 *Enhance the global partnership for sustainable development*, complemented by multi-stakeholder partnerships that *mobilize and share knowledge, expertise, technology and financial resources*, to support the achievement of the sustainable development goals in all countries, in particular developing countries;

17.18 By 2020, *enhance capacity-building support to developing countries*, including for least developed countries and small island developing States, *to increase significantly the availability of high-quality, timely and reliable data* disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts.