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Findikakis, Angelos N.

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IAHR AND THE SUSTAINABLE DEVELOPMENT GOALS

BY ANGELOS N. FINDIKAKIS

The International Association for Hydro-Environment Engineering and Research (IAHR), as a worldwide independent organization of researchers and practitioners working on hydraulic engineering projects and environmental problems in a variety of water bodies, is conscious of how the work of its members can contribute to the welfare of people around the globe. For this reason, IAHR is committed to work for the success of Agenda 2030 of the United Nations for Sustainable Development.

To understand how IAHR contributes to efforts to achieve the goals of Agenda 2030, it is instructive to review how these goals are related to several water issues and then examine how the work of the IAHR technical committees supports the effort to reach these goals.

The role of water issues in Agenda 2030

In September 2000 the General Assembly of the United Nations adopted a resolution known as the Millennium Declaration which set several goals aimed at improving the welfare of people around the world within the following 15 years [1]. These goals, termed the Millennium Development Goals (MDGs), covered a broad range of subjects, including significant poverty reduction, improved public health, and ensuring environmental sustainability. Explicit references to water in the Millennium Declaration included the resolution *"to halve the proportion of people who are unable to reach or to afford safe drinking water"* by 2015, and *"to stop the unsustainable exploitation of water resources by developing water management strategies at the regional, national and local levels, which promote both equitable access and adequate supplies"*. Even though not all the specific targets within the framework of the MDGs were met, the mobilization to reach these goals had a positive impact on many social and environmental problems and contributed to improvements in the lives of billions of people.

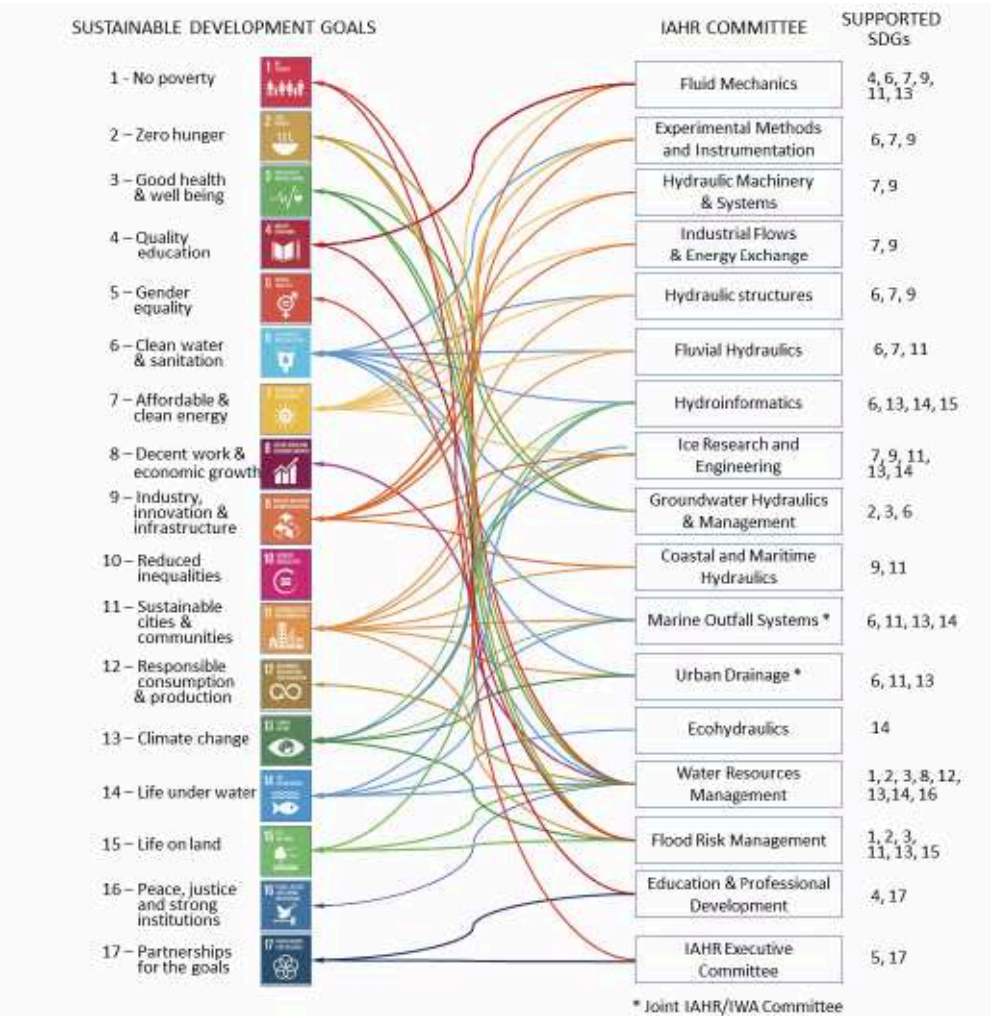
Following the success of the MDGs, the General Assembly of the United Nations adopted a broader and more ambitious action plan for the next 15 years, the Agenda 2030 for Sustainable Development, which included 17 Sustainable Development Goals (SDGs), each of which had several specific targets [2]. A total of 169 targets were set for the 17 SDGs. To monitor progress towards the SDGs and inter-agency and expert group developed 232 indicators designed to provide quantitative assessment of the status of the specific targets of the SDGs [3].

Water is at the center of SDG 6. Its targets for the year 2030 include achieving universal and equitable access to safe and affordable drinking water, sanitation and hygiene for all, improving water quality by reducing pollution, substantially increasing water use efficiency across all sectors and ensuring sustainable withdrawals, implementing integrated water resources management, protecting and restoring water-related ecosystems, expanding international cooperation in water issues and capacity building support to developing countries, and supporting and strengthening the participation of local communities in improving water and sanitation management. UN Water (of which IAHR is a partner) has prepared guidance proposing specific methodologies that can assist national governments in monitoring each of the 11 global indicators under SDG 6 [7].

Besides SDG 6, water and especially its management, has a direct effect on several SDGs and affects indirectly others. As pointed out in another article published earlier in Hydrolink[4], Agenda 2030 includes explicit references to water in SDG 3.3 (end water-borne diseases), SDG 3.9 (reduce the number of deaths and illnesses from water contamination), SDG 11.5 (reduce the economic losses and the number of people affected by water-related disasters), SDG 12.4 (sound management of chemicals and waste to reduce their release in to water, and SDG 15.1 (conservation, restoration and sustainable use of inland freshwater ecosystems). Besides these explicit references to water in different SDGs, there are many other interlinkages between SDG 6 and several other SDGs.

The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) developed a matrix identifying all the direct and indirect relationships between the eight targets of SDG 6 and the individual targets of all other SDGs, and providing the rationale for the characterization of each relationship [6]. The UNESCAP matrix describes a large number of interrelationships between individual targets. As an example, SDG 6, target 5, the implementation of integrated water resources management (IWRM), directly supports and benefits the following SDG targets:

SDG 1, target 1.3 - social protection systems and measures for all
SDG 1, target 1.5 - resilience of the poor and reduction of their exposure and vulnerability to climate-related extreme events
SDG 2, target 2.4 - sustainable food production systems
SDG 6, target 6.6 - protection and restoration of water-related ecosystems
SDG 8, target 8.4 - resource efficiency in consumption and production; decoupling of economic growth from environmental degradation
SDG 9, target 9.1 - reliable, sustainable and resilient infrastructure
SDG 11, target 11.3 - inclusive and sustainable urbanization
SDG 11, target 11.4 - protection and safeguarding of the world's cultural and natural heritage
SDG 12, target 12.2 - sustainable



management and efficient use of natural resources

SDG 13, target 13.1 - resilience and adaptive capacity to climate-related hazards and natural disasters

SDG 13, target 13.2 - integration of climate change measures into national policies, strategies and planning

SDG 14, target 14.1 - reduction of marine pollution

SDG 14, target 14.2 - sustainable management and protection of marine and coastal ecosystems

SDG 15, target 15.1 - conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems

SDG 15, target 15.2 - sustainable management of forests, afforestation and reforestation

SDG 15, target 15.3 - combatting desertification and restoring degraded land and soil

SDG 15, target 15.4 - conservation of mountain ecosystems, including their biodiversity

The UNESCAP matrix also shows that several SDG targets have a direct positive impact on the effort to implement IWRM (SDG target 6.5), including the following targets:

SDG 4, target 4.7 - knowledge and skills needed for sustainable development

SDG 6, target 6.a - international cooperation and capacity-building in water- and sanitation

SDG 6, target 6.b - participation of local communities in improving water and sanitation management

SDG 7, target 7.b - infrastructure and technology for modern and sustainable energy services for all in developing countries

SDG 11, target 11.a - positive economic, social and environmental links between urban, peri-urban and rural areas

SDG 13, target 13.3 - awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

SDG 15, target 15.9 - integration of ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

SDG 15, target 15.b - financing of sustainable forest management and provide adequate incentives to developing countries for conservation and reforestation

SDG 16, target 16.6 - effective, accountable and transparent institutions at all levels

SDG 16, target 16.7 - responsive, inclusive, participatory and representative decision-making at all levels

SDG 17, target 17.4 - long-term debt sustainability in developing countries

SDG 17, target 17.5 - investment promotion regimes for least developed countries

SDG 17, target 17.7 - development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries

SDG 17, target 17.8 - science, technology and innovation capacity-building for least developed countries

In addition to these direct relationships, the UNESCAP matrix identifies several indirect relationships between SDG 6.5 and other SDG targets.

Another recent study identified interlinkages between the SDG targets and used data from nine Asian countries on the proposed indicators for 108 out of the 169 targets to quantify the strength of the relationship between individual targets. The analysis of these data helped distinguish between positive and negative linkages, i.e. those where achieving a target contributes to or conflicts with the achievement of another target [5]. An online tool for the visualization of the interlinkages identified in this study is available at https://sdginterlinkages.iges.jp/visualisationtool.html. It is noted that some of the linkages that the study concluded that indicate negative relationships are counterintuitive, which suggests that the indicators used to describe the status of the targets involved may not capture the true essence of these targets.

The work of the IAHR Technical Committees in support of the SDGs

IAHR promotes and facilitates the advancement and exchange of knowledge through 17 Technical Committees (TCs) supported by its Council, Executive Committee and Secretariat. Key activities are specialty symposia, conferences and congresses, the publication of five journals, one magazine, and monographs on selected topics. Each of the TCs focuses on a

sub-discipline of hydro-environment engineering and research. Because of the important role of water in many SDGs the work of each TC supports several SDGs. Figure 1 shows the relationship between the work of the IAHR TCs and the 17 SDGs.

The **Fluid Mechanics Committee** focuses on fundamental and applied environmental fluid mechanics, leading to better understanding of fluid processes and their interaction with the natural and human-made environment. This contributes to the solution of problems related to several SDGs including clean water and sanitation (SDG 6), affordable and clean energy (SDG 7), industry and infrastructure (SDG 9), sustainable cities and communities (SDG 11), climate change (SDG 13) and quality education (SDG 4). More on the work of this committee can be found in the article by Harindra Joseph Fernando included in this issue.

The **Experimental Methods and Instrumentation** Committee works to promote new experimental methods, instruments, measurement techniques, and data analysis routines for both laboratory and field hydro-environment studies. Remote and in-situ measurement techniques, including real-time data acquisition, provide the means to monitor the condition of different water bodies to ensure that it is safe to use them and develop proper management strategies (SDG 6), but also improve and monitor the performance of hydropower (SDG 7) and other water infrastructure including those that serve cities and other communities (SDG 9). The use experimental methods and different types of instrumentation contributes also to SDGs 2, 12, 13, 14. An article by Alessio Radice, Rui Aleixo and Rui Ferreira that discusses the work of this committee will be published in the next issue of Hydrolink.

The Committee on **Hydraulic Machinery and Systems** deals with the advancement of technology associated with steady and unsteady flow characteristics in hydraulic machinery and conduit systems connected to the machinery. This work helps improve the performance of hydraulic machinery and systems, contributing this way to more clean hydroelectric energy production (SDG 7) and more efficient energy use in several industries (SDG 9).

The **Industrial Flows and Energy Exchange** Committee works to advance the knowledge of fluid behavior and thermal transfer in industrial facilities, and especially in power generation stations to ensure their economical and safe operation, contributing this way to SDGs 7 and 9.

The **Hydraulic Structures Committee** facilitates the sharing of new knowledge between researchers and practitioners related to the planning, designing, construction, and life cycle maintenance of hydraulic structures. Hydraulic structures play an important role in water supply, energy production and general hydraulic infrastructure. Current research is related to dam rehabilitation under changing hydrological conditions and the sustainable design of eco-friendly structures among other topics. Given these focuses, the work of this committee contributes to SDGs 6, 7 and 9.

The research agenda of the **Fluvial Hydraulics** Committee includes topics related to flow and transport processes in rivers, risk analysis and mitigation in fluvial systems. The work of the committee contributes to the protection and restoration of water-related ecosystems (SDG 6), sustainable management and efficient use of natural resources (SDG 12), resilience and adaptive capacity to climate-related hazards and natural disasters (SDG 13) and conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems (SDG 15)

The IAHR/IWA Joint Committee on **Hydroinformatics** focuses on the synergy, between information and communications technologies and water science and technologies with the objective of satisfying social requirements. As among other topics, Hydroinformatics deals with the interpretation and availability of knowledge and results for non-specialist stakeholders, its work relates to the topics of several SDGs, including water supply and water resources management (SDG 6), climate change (SDG 13), aquatic ecosystems (SDG 14) and terrestrial ecosystems dependent on water (SDG 15).

The efforts of the **Ice Research and Engineering** Committee are mainly directed toward advancing the understanding of ice and how best to manage it, and includes research topics such as the formation and evolution of

Special session on the SDGs during the 37th IAHR Congress in Kuala Lumpur

various types of ice, the movement and accumulation of ice in surface waters and around structures (SDGs 7, 9, 11), and the effects of ice on the environment and ecology, in particular life under ice (SDG 14). This work can contribute to the development of climate change mitigation measures in parts of the world (SDG 13). More on the work of this committee can be found in the article by Matti Leppäranta included in this issue.

The scope of the **Groundwater Hydraulics and Management** Committee includes a broad range of subjects including the monitoring and management of aquifers, groundwater remediation, and coupled flow, transport and bio-geochemical processes. Because of the wide use of groundwater for irrigation and domestic and industrial water supply, the work of this committee is important for food production (SDG 2), public health (SDG 3), water, and sanitation (SDG 6). More on the work of this committee can be found in the article by Zhongbo Yu and Alberto Guadagnini included in this issue.

The **Coastal and Maritime Hydraulics** Committee covers all aspects of maritime, coastal and estuarine problems including coastal morphology, waves, tides, currents, sedimentation, and pollution. Its work contributes to the design of resilient maritime infrastructure (SDG 9) and the sustainability of coastal cities and communities (SDG 11).

The work of the IAHR/IWA Joint Committee on **Marine Outfall Systems** and its contribution to the SDGs is discussed in detail in the article by Phil Roberts, Jim Bradley, Robin Morelissen, Daniel Botelho included in this issue. Outfalls play a role in all targets of SDG 6, but also in energy production (SDG 7), sustainable cities (SDG 11), climate change (SDG 13), and sustainable use of the oceans, seas and marine resources (SDG 14).

The work of the IAHR/IWA Joint Committee on **Urban Drainage** is mainly carried out by its nine working groups (Data & Models, Real Time Control; Sewer Processes; Source Control; Urban Rainfall; Cold Climate; Water Sensitive Urban Design; Urban Streams; Stormwater Harvesting). These groups develop, provide and apply tools and concepts that improve urban stormwater and wastewater drainage, thus contributing to better access to sanitation (SDG 6, target 2), to improved water quality by reducing pollution (SDG 6, target 6.3), to the restoration of water-related ecosystems (SDG 6, target 6.6), to international cooperation, capacity building, and the strengthening of local community participation (SDG 6, targets 6.a and 6.b). Their work also helps reduce the effects of water-related disasters leafing to more sustainable cities and communities (SDG 11). The activities of most of the working groups of the Joint Committee are closely related to climate change (SDG 13).

The **Ecohydraulics** Committee works on different problems of aquatic ecosystems involving hydraulics, such as the hydraulic modelling of aquatic ecosystems, fish passes, and eutrophication in lakes and reservoirs. Its work is important for ensuring the health of aquatic ecosystems (SDG 14).

The members of the **Water Resources Management** Committee are involved in interdisciplinary research, management under increasing uncertainty, conflict resolution in water management, and non-structural water management. As discussed earlier, integrated water resources management, which is part of the scope of this Committee, has a direct impact on specific targets of several SDGs, including SDG 1, 2, 6, 8, 9, 11, 13, 14 and 15. More on the work of this committee can be found in the article by Carlos Galvão, Young-Oh Kim, Elpida Kolokytha, Arpita Mondal, Pradeep Mujumdar, Daisuke Nohara, Satoru Oishi, Roberto Ranzi, and Ramesh Teegavarapu included in this issue.

The research agenda of the **Flood Risk Management** Committee includes a range of issues related to floods, such as damage prevention, protection from flooding through both structural and non-structural measures, preparedness, emergency response, recovery and resiliency of communities and ecological systems. This Committee is integrating hydraulic processes with many other areas involved in defining risk and vulnerability to flooding, helping reduce vulnerability of the poor to climate-related extreme events such as flooding (SDG 1, target 5), and supporting sustainable food production systems (SDG 2, target 4) and the goal of achieving a land degradation-neutral world (SDG 15, target 3). Considering flood risks is critical for the sustainability of many cities and communities (SDG 11) and the health and safety of their people (SDG 3), and should be assessed in the context of climate change (SDG 13).

Angelos Findikakis **is functional Head of Hydraulics - Hydrology for Bechtel in San Francisco, California. He is also Adjunct Professor in the Department of Civil and Environmental Engineering of Stanford University. He is currently serving as editor of the Hydrolink magazine.**

The Committee on **Education and Professional Development** works to enhance knowledge sharing through technology transfer (SDG 17). Its activities include the IAHR Media Library which contributes to SDG 4, IAHR's Young Professionals Networks and online collaboration with HydroWeb. More on the work of this committee can be found in the article by Michael Tritthart included in this issue.

Finally, the IAHR Executive Committee develops partnerships in support of the goals (SDG 17) through collaboration with other sister water associations (e.g. IWA, IAHS, IWRA, ICOLD) and involvement in international programs (e.g. UNESCO, WMO, IDNDR, GWP, ICSU). It also works to increase the representation of women in the leadership of the association (SDG 5).

Closing remarks

The intent of this article has been to raise awareness about the relevance of the work of IAHR to sustainable development as defined in Agenda 2030. It is important to recognize that academic researchers and practicing engineers, who are members of the Association, do not work in isolation from society. They care deeply for the well-being of humanity and all life on the planet and try through their work on different water-related issues to contribute to this end. ■

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