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A Call for Synthesis of Water Research to Achieve the Sustainable Development Goals by 2030

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By adopting the United Nations (UN) Sustainable Development Goals (SDGs) in September 2015, the countries of the world identified goals and set targets to improve the human condition substantially by 2030.[1] Two of the 17 SDGs focus explicitly on (fresh)water – Goal 6 (Ensure availability and sustainable management of water and sanitation for all) and Goal 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development). Goal 6, in particular, calls for improving water quality as well as for protecting and restoring water-related ecosystems, while Goal 14 seeks to reduce marine pollution derived from land-based activities. Given the time frame of only 15 years, progress toward fulfilling the SDGs will require that we effectively translate *existing* knowledge into practical solutions.

Scientific synthesis can generate "otherwise unobtainable insight[s] from a combination of disparate elements" through data aggregation, reuse of results, methodological integration and conceptual synthesis.[2] With further translation, the insights gained through scientific synthesis can be made more accessible to policy makers or managers.

Synthesis activities can be characterized as driven by either opportunity or need. Opportunity-driven synthesis stems from rich databases or a critical mass of information that has developed in a certain problem area. In contrast, need-driven synthesis constitutes a response to an urgent problem and the pressing societal need for solutions (for example, to achieve the SDGs). Even though the data may not be extensive or compelling, judgment and (even) extrapolation are more important than certitude in such synthesis efforts. Integrating information from sparse data sets for decision makers is particularly valuable, especially if some measure of uncertainty and risk can be provided.

Such a need-driven synthesis effort was conducted to support the Millennium Development Goals (MDGs) for 2000–2015. An assessment of the risk of disease from microbially contaminated water was needed for implementation of the UN program "Water for Life". Without interpretation of the data by scientists, it would not have been possible to assess whether the goals and targets were reasonable or whether sufficient progress was being made to achieve them. Data were available but the quality, scale, scope, and methodologies differed vastly from country to country and case-to-case. A large, interdisciplinary team with members from academic, educational, governmental, and nongovernmental organizations (NGOs) was assembled under the leadership of Joan Rose (Michigan State University). The synthesis contributed by these scientists was reported to be highly instrumental to the success of the MDG for drinking water (i.e., to halve the number of people without access to safe drinking water by 2015), specifically by providing "significant contributions to setting meaningful and feasible goals, supported by scientific evidence".[3]

Future need-driven synthesis could address the indicators that will be used to assess progress toward the SDGs.[4] Some indicators for Goals 6 and 14 are still denoted as "grey" (Tier III), meaning that further discussion and possibly methodological development are needed before they can be applied (see Table 1). Scientific synthesis of water research could be directed toward clarifying the conceptual bases and identifying or developing applicable methodologies for indicators currently designated as Tier III. For most of the Tier III indicators in Table 1, further synthesis of existing knowledge is needed to reach agreement on international standards and to provide support for suggested, but untested, methodologies.

It will be even more challenging to synthesize scientific research so that it can be used to support implementation measures in accord with priorities set by national governments. Some synthesis activities may be broadly applicable; for

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Table 1. Targets and Indicators for SDGs Relevant to (Fresh)Water

targets[1]	indicators[4]
(6.1) universal and equitable access to safe and affordable drinking water	(6.1.1) proportion of population using safely managed drinking water services (Tier I)[a]
(6.2) access to adequate and equitable sanitation and hygiene	(6.2.1) proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water (Tier I)
(6.3) improve water quality··· halving the proportion of untreated wastewater	(6.3.1) proportion of wastewater safely treated (Tier III)
	(6.3.2) proportion of bodies of water with good ambient water quality (Tier III)
(6.4) increase water-use efficiency··· and ensure sustainable withdrawals and supply of freshwater	(6.4.1) change in water-use efficiency over time (Tier III)
	(6.4.2) level of water stress: freshwater withdrawal as a proportion of available freshwater resources (Tier I)
(6.5) implement integrated water resources management	(6.5.1) degree of integrated water resources management implementation (Tier I)
	(6.5.2) Proportion of transboundary basin area with an operational arrangement for water cooperation (Tier III)
(6.6) by 2020, protect and restore water-related ecosystems	(6.6.1) change in the extent of water related ecosystems over time (Tier III)
(6.a) expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes	(6.a.1) amount of water- and sanitation related official development assistance that is part of a government-coordinated spending plan (Tier I)
(6.b) support and strengthen the participation of local communities in improving water and sanitation management	(6.b.1) proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management (Tier I)
(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	(14.1.1) index of coastal eutrophication and floating plastic debris density (Tier III)

[a]Tiers I−III correspond to the feasibility of the indicator from most (Tier I) to least (Tier III) with regard to conceptual clarity, established methodology/standards and data availability. Tier III designations are based on: an identified need for workplan on methodology (6.3.1), suggested but untested methodology and lack of agreement on international standard (6.32, 6.4.1, 6.5.2 and 6.6.1) and lack of database or data coverage information (14.1.1).

example, an interdisciplinary effort is currently underway to update the classic text *Sanitation and Disease Health Aspects of Excreta and Wastewater Management*[5] with the new content to be available online (http://www.waterpathogens.org/). The Water Working Group of the UNEP (UN Environment Programme) International Resource Panel has assessed technologies that can support the decoupling of economic growth from the degradation of water resources from overuse or pollution, which would be crucial for sustainable development (http://www.unep.org/resourcepanel/KnowledgeResources/AssessmentAreasReports/Water/tabid/133332/Default.aspx).

To be most useful in specific contexts, however, scientific synthesis should be informed by local priorities, needs and opportunities. Since these local conditions are not likely to be known to individual water researchers or professionals, joining with an established organization or consortium could be an effective way for individuals to bring their special skills and expertise to the challenge posed by the SDGs. One such organization is the Sustainable Development Solutions Network (SDSN), launched in 2012 to "to mobilize global scientific and technological expertise to promote practical problem solving for sustainable development" (http://unsdsn.org/).

We call on water professionals and scientists to bring their expertise and skills—whether through synthesis, research to fill pressing gaps or technology development—to fulfill the "*great potential to complement sustainable development projects···with robust knowledge, tools and scientific methods*".[3]

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Notes

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