

Developing a Global Compendium on Water Quality Guidelines

Executive Summary



At the 2018 High Level Political Forum on Sustainable Development, Stefan Uhlenbrook (World Water Assessment Program of the UN Educational, Scientific and Cultural Organization (UNESCO)), discussed the current water quality problems: increases in freshwater pollution; climate change impacts; links between conflict and water-use; and the need for efficiencies in energy and agriculture, all contributing to his assessment that the world is not on track to achieve SDG 6 by 2030. Inadequate water resource management globally has come at a cost, particularly in relation to water quality. The way forward, addressing current challenges and building the foundation for a smarter and more sustainable approach to water resource management in the future, requires us to call into question current water governance paradigms and explore new pathways. This report provides an initial overview of one such management pathway.

Directing water of different qualities to their most appropriate use introduces greater efficiency and economy into the management of water resources across competing uses and aids in securing sustainability and security for future water use. It also reduces the extraction of new water which in turn increases environmental flows and the dilution effect, hence increasing water quality. As of 2018, there is no complete global overview of water quality guidelines from a user perspective to assess the usability of water of different qualities for various purposes. This report introduces the structure of a compendium providing a collection of concise but detailed information about existing water quality guidelines for several different uses, including a brief analysis and discussion.

About this report

This report, *Developing a Global Compendium on Water Quality Guidelines*, collects and examines examples of existing recommendations for influent water quality, as applied to various human and ecosystem uses. It provides examples and analysis of existing water quality guidelines, to demonstrate the type of content that should be included in a future larger online compendium. Building on the case studies, the report explores new perspectives, and raises pertinent questions for future work on the topic. Its primary objective is to lay the groundwork for an online compendium to improve access to examples of water quality guidelines and facilitate a better understanding of how water quality demand and supply can contribute to appropriate and economical multi-sectoral water resource management.

While there are many forms of regulatory requirements in the water sector and a number of reports that examine them, there are also water quality guideline documents that cover large geographical areas such as federal states, and international regions. These have not so far been well examined. Guidelines are tools that recommend a particular practice, allowing some discretion or leeway in its interpretation, implementation, or use. They can come in a variety of forms, ranging from strict guidance such as a directive that is not voluntary yet still needs to be transposed into a final product of regulation, to recommendations that are encouraged yet voluntary to the target audiences. Therefore, to avoid duplicating work already done, this report focuses on such guidelines.

Objectives

As stated above, the main objective of this report is to provide the proposed framework and initial content to supply an online compendium on global water quality guidelines according to water use. The report aims to provide the justification and outline for such a compendium.

It is expected that the specific aims of the proposed compendium will include;

1. Reducing water demand conflicts by encouraging consideration of differences in water quality needs when allocating water resources.
2. Supporting decision-making by water management authorities who are concerned with managing different uses and different water qualities.
3. Contributing to improving awareness and access to information on existing water quality guidelines, to increase efficient water use and support further development of water quality guidelines.
4. Improving knowledge concerning certain water uses where international guidelines for water quality do not yet exist.
5. Enriching the debate on water quality, particularly in relation to multidisciplinary aspects (technical, economic, legal, institutional, and social) and across different geographic scales (international, regional, national).

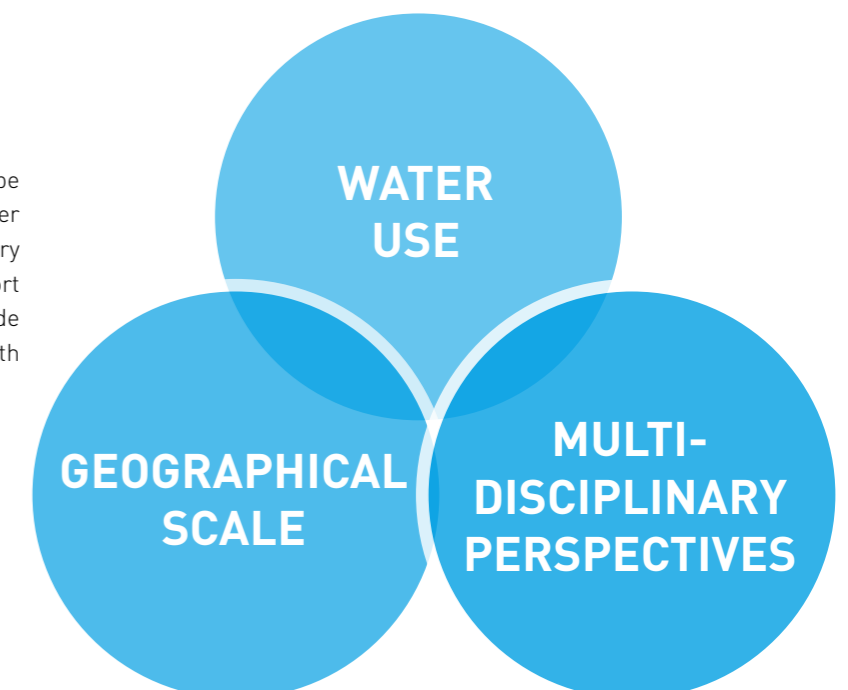
Target Audience

The primary intended audience for this report is national and international organisations working on water quality issues who wish to support water management decision/policy-makers, and regulators in both the public and private spheres. The audience of the future compendium would also include those who manage water in primary and secondary industries, as well as those monitoring and regulating drinking water and environmental water.

A wider audience in academia and water law may also find this report and proposed compendium useful, as well as students who wish to learn more on the subject of water quality guidelines that are fit for purpose.

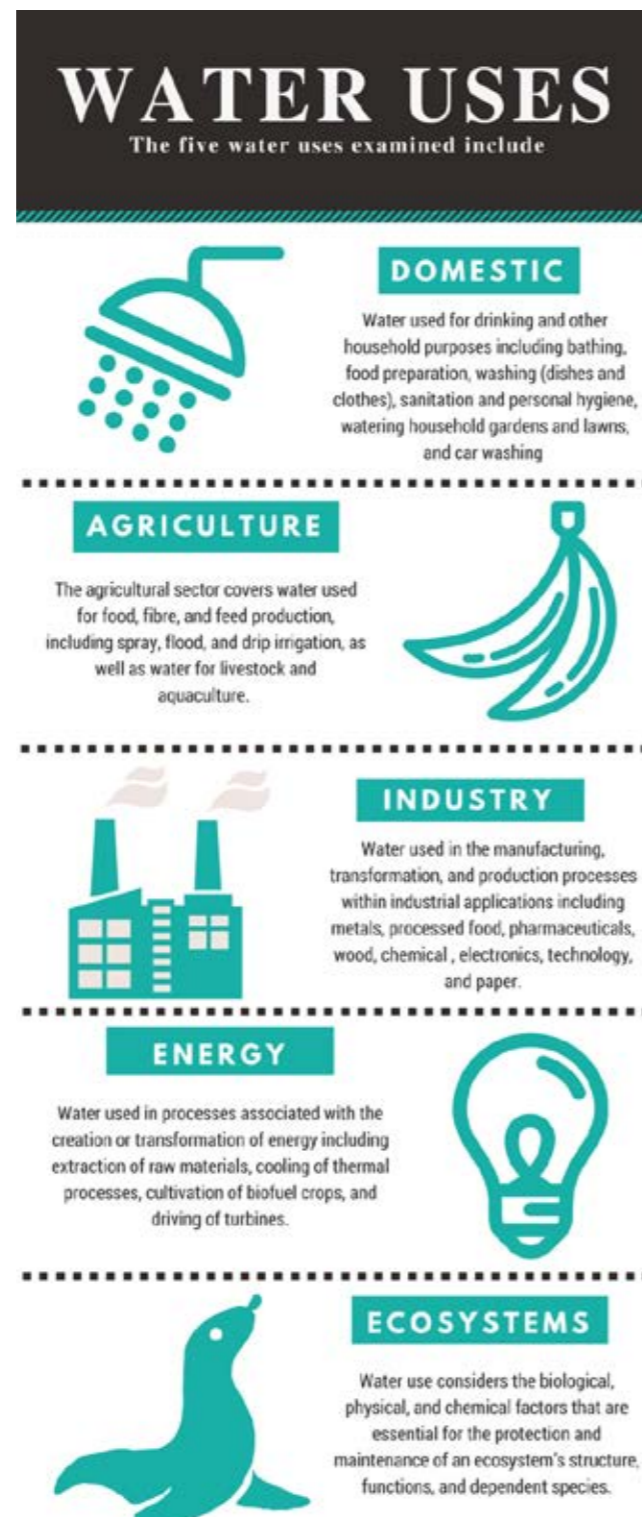
Structure

The contents and outputs of this report will be oriented around three overlapping domains: water use, geographical scale, and multi-disciplinary perspectives. It is important to realise that this report does not seek to create new guidelines, but to provide a reference on existing guidelines in alignment with these three domains.



Water Uses

Due to the nature of the resource, there are few water quality guidelines that address the full range of uses. This report is no exception, but focuses on five main categories of water use: domestic, agriculture, industry, energy, and ecosystems (it is noted that this is not an exhaustive list of all available water uses). These five sectors were chosen based on existing categories within water quality and management reports from international organisations including the United Nations (UN) and the European Environment Agency (EEA), offering a comprehensive range of sectors that are considered as essential when considering water quality applications.



List of Selected Guidelines

DOMESTIC WATER QUALITY GUIDELINES			
Scale	Name	Date	Location
International	WHO Guidelines for Drinking Water Quality (GDWQ) - fourth edition incorporating the first addendum	2017	All
International	Global Drinking Water Quality Index (GDWQI)	2007	All
International	RAIN Water Quality Guidelines: Guidelines and Practical Tools on Rainwater Quality	2008	All
Regional	EU Drinking Water Directive (with latest amendments)	2015	European Union
Regional	UNECE Protocol on Water and Health	2005	Europe
	Taking policy action to improve small-scale water supply and sanitation systems. Tools and good practices from the pan-European Region	2016	
	Guidelines on the Setting of Targets, Evaluation of Progress and Reporting	2010	
National	Guidelines for Canadian Drinking Water Quality (GCDWQ) (updated version)	2017	Canada
National	Code of Practice on Piped Drinking Water Sampling and Safety Plans	2008	Singapore
National	Australian Drinking Water Guidelines (ADWG)	2011	Australia
AGRICULTURAL WATER QUALITY GUIDELINES			
Scale	Name	Date	Location
International	FAO Water Quality for Agriculture	1994	All
International	WHO-FAO Guidelines for the Safe Use of Wastewater, Excreta and Greywater Volume 2: Wastewater use in Agriculture	2006	All
International	ISO Guidelines for Treated Wastewater use for Irrigation Projects	2015	All
International	Codex Alimentarius Code of Hygiene Practice for Fresh Fruits and Vegetables	2003	All
National	Guidelines for Water Reuse	2012	U.S.A.
National	Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses	1999	Canada
	Protocols for Deriving Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water)		
National	Guidelines on the Procedures and Technical Requirements for the Issuance of a Certification allowing the Safe Re-Use of Wastewater for Purposes of Irrigation and Other Agricultural Uses	2007	Philippines
INDUSTRIAL WATER QUALITY GUIDELINES			
Scale	Name	Date	Location
International	WHO-FAO General Principles of Food Hygiene	2009	All
International	WHO Good Manufacturing Practices: Water for Pharmaceutical Use	2012	All
Regional	Water Quality Demands in Paper, Chemical, Food and Textile Companies	2010	EU
National	South African Water Quality Guidelines Volume 3	1996	South Africa
National	Canadian Water Quality Guidelines (Chapter 5)	1987	Canada
ENERGY WATER QUALITY GUIDELINES			
Scale	Name	Date	Location
International	Efficient Water Management in Water Cooled Reactors	2012	All
National	Cooling Water Options for the New Generation of Nuclear Power Stations in the UK	2010	United Kingdom
ENVIRONMENTAL WATER QUALITY GUIDELINES			
Scale	Name	Date	Location
International	UNEP International Water Quality Guidelines for Ecosystems (IWQGES)	2016	All
Regional	EU Water Framework Directive	2000	European Union
National	Australian and New Zealand Guidelines for Fresh and Marine Water Quality	2000	Australia, New Zealand
National	Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG-PAL)	1999	Canada
National	South African Water Quality Guidelines for Aquatic Ecosystems	1996	South Africa

Key Findings

- Water quality guidelines in reference to the domestic sector (specifically for drinking water and other household uses) are well established internationally by the World Health Organisation (WHO), and case studies provided in this review indicate the existence of comprehensive drinking water quality guidelines on both regional and national levels.
- Most guidance for water used in the agriculture sector is directed at safe wastewater reuse, especially for irrigation practices.
- There is a distinct difference between agricultural water use between developed and developing countries, with developed countries requiring guidelines to encourage the use of reclaimed water, and developing countries requiring guidelines to assist in making their practices of unplanned water reuse safer.
- Defined water quality guidelines for the total industrial sector are not available.
- International guidelines on water inputs for secondary industries are aimed primarily at food processing, pharmaceuticals and high-tech industries, all of which require sophisticated water treatment facilities.
- Few international or national guidelines on energy water uses currently exist.
- Most water quality guidelines currently omit mention of emerging pollutants including pharmaceuticals, personal care products and disinfection by-products.
- The usefulness and success of guidelines developed for water quality recommendations could be reflected by the number of regulatory bodies which uptake the content during the creation of binding policies.

Recommendations

- Define water quality requirements based on both application and geographical setting allows water resources to be applied more effectively.
- Encourage refining the quality of outflow from treatment facilities to match the needs of uses such as agriculture, landscapes, recreational areas and sports grounds.
- Given the innovations and requirements for the energy sector in biofuel, tidal power generation, hydropower, nuclear, solar and wind, as well as the continued use of non-renewable sources, develop guidelines for water quality used for these purposes.
- This is a sectoral analysis of water qualities; however, it is clear that a nexus exists between water and all the main sectors explored. Decision-makers must collaborate with other sectors for an integrated and broader approach.
- Water inflow into ecosystems consists increasingly of water discharges from the four other water uses examined in this report. Water is cyclical so a cross-sectoral perspective including water discharges from domestic, agriculture and industry sectors needs to be considered to safeguard environmental systems.
- As the global community works towards meeting the Sustainable Development Goals for 2030, further widespread use of the guidelines compiled within this report will contribute to meeting the key performance indicators:
 - 6.3.2 Proportion of bodies of water with good ambient water quality
 - 6.4.1 Change in water-use efficiency over time
 - 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
 - 6.5.1 Degree of integrated water resources management implementation
 - 6.6.1 Change in the extent of water-related ecosystems over time.

Proposed Database Structure

The first part of the report outlines a selection of water quality guidelines according to water use; however it is acknowledged that there are many more available guidelines and regulatory frameworks for directing management behaviour according to water quality. A compilation of the provided material, as well as a more comprehensive list or database would provide a complete picture of the water quality guidelines available at national, regional and international scales. The full compendium would also include regulations as an additional category of content. It is proposed that this information be stored and available on an online website, in a format that is user-friendly and easily accessible. The added benefit of an online compendium is the ease of access of information and analysis. This will contribute to increased access and sharing of data and tools, which in turn helps lead to sustainable development.

Key considerations for the proposed database development and structure are presented here, to encourage and assist in its development. While there are several possible ways to create and structure an online database, this proposal has been identified by IWRA as one structure that would be able to meet the set outcomes for ease of information retrieval.

As a minimum functionality, the online database of water quality guidelines and regulatory frameworks should include an appropriate, current and comprehensive content base covering each water use sector, and a broad range of

geographical regions. Further to the listing the guidelines themselves, there should be brief summaries of each document as well as sector analysis, such as the example key findings and recommendations given in this report. The inclusion of a glossary of key terms, news, events and contact information would add value to the online platform. Key functional requirements for the public interface include convenient search tools to find the content needed, a responsive website (display adapts to different supports: screens, mobile phones), and various paths to obtain data from the system. Figure 1 outlines this structure.

One must acknowledge key challenges that should be addressed in order to overcome potential limitations to an online database. First, funding arrangements need to be made for the creation and upkeep of the proposed database, either through the public sector, grants or from users of the database through subscription. Proper maintenance is essential for any database to remain relevant and classified as a "living document". As such, it is recommended that the database be managed on a regular basis (at least annually) through review of previous examples and hyperlinks to ensure they are still accurate and up-to-date, followed by scanning for new guidelines and regulations, and subsequently adding commentary. A further challenge is ensuring the available guidelines and analysis cover more than the Anglo-saxon region. While this report uses mostly English guidelines, it is acknowledged that a compendium of water quality guidelines should include a broader scope of regulations and guidance from other languages.

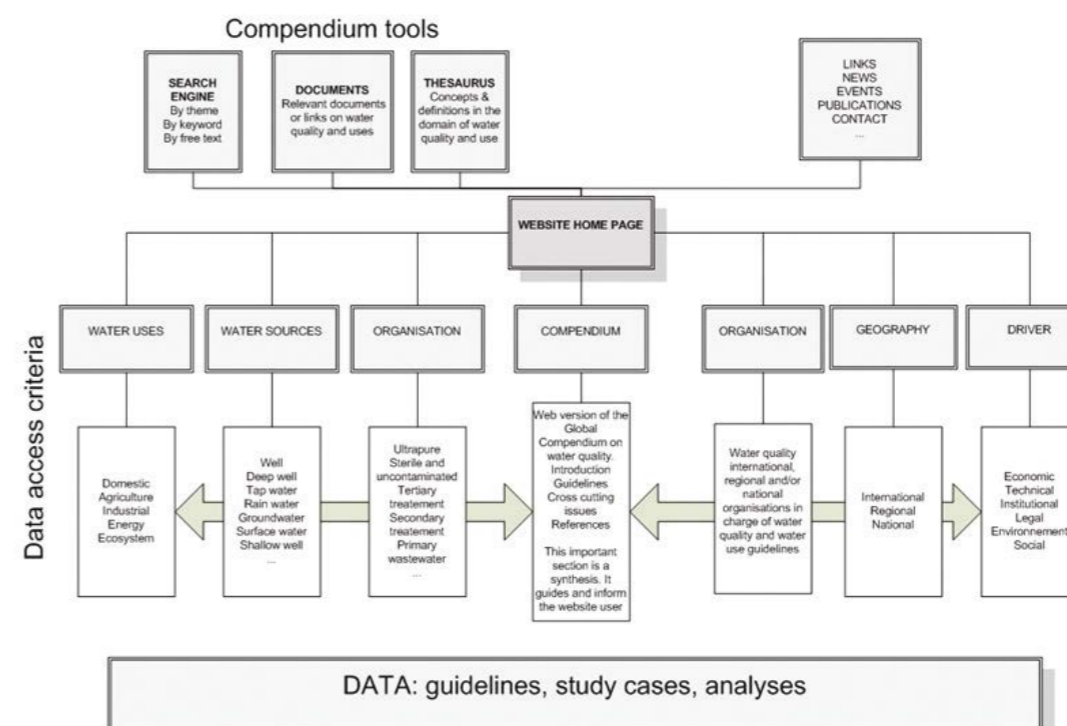


Figure 1: The proposed water quality compendium structure of content for an online database.

Conclusion

Water quality remains a key consideration for global water management, not only for addressing low quality discharges that affect other uses and have environmental impacts, but also for examining the most efficient water quality for a specific purpose. The expansion of water quality criteria and references to more adequately consider five central applications of domestic, ecosystem, agriculture, energy and industry water uses has been reviewed and identified as an essential component of future management practices. This report identifies a number of existing guidelines directing water quality on an international, regional and national scale. The report also sets the structure for a more comprehensive online compendium of water quality guidance according to water use. Promoting the integrated use of these guidelines, while acknowledging the water cycle as a whole and that all outputs are eventually released to the environment, will contribute to smarter water management. This will help relieve stress on water scarce resources and ensure adequate water quality inputs to various applications, with the end goal of contributing to water security.

Web Links

The full document Developing a Global Compendium on Water Quality Guidelines and related materials will be published in 2018 on the IWRA website, and a link will be added to the project webpage. For more information on any of these water quality activities that IWRA is involved in, please visit the Water Quality Projects page on the IWRA website: www.iwra.org/waterquality.

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Acknowledgements

This report was developed by staff of the Executive Office of IWRA, with the support of ONEMA/AFB and the World Water Council. IWRA thanks ONEMA and the World Water Council for their financial support in completing this report and executive summary.

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IWRA

The International Water Resources Association (IWRA) is a non-profit, non-governmental, educational organisation established in 1971. It provides a global knowledge based forum for bridging disciplines and geographies by connecting professionals, students, individuals, corporations and institutions who are concerned with the sustainable use of the world's water resources. The aims of IWRA to facilitate knowledge generation and sharing are accomplished through publications, events and networking.

ONEMA/AFB

ONEMA, the French National Office of Water and Aquatic Environments, is a reference institution under the French Ministry of Ecology, Sustainable Development and Energy, initiated in 2007. ONEMA conducts research and knowledge distribution of public policies relating to water, as well as promoting the preservation of biodiversity. In 2017, AFB, the French Agency for Biodiversity was created, bringing together four existing organisations including ONEMA. It has a similar, yet expanded role, as ONEMA, supporting the implementation of public policies concerning biodiversity of terrestrial and aquatic environments.

World Water Council

The World Water Council (WWC) is an international multi-stakeholder platform, established in 1996 in response to an increasing concern about world water issues from the global community. It addresses the political dimensions of water issues at all levels, including the highest decision-making level. The three main activities of the WWC are in conducting hydro-politics to increase awareness of water security and sustainability on the political agenda, tackling emerging challenges in this field and co-organising the triennial World Water Forum. This is the world's largest event on water.

