

Achieving universal access to clean water and sanitation in an era of water scarcity: strengthening contributions from academia

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As the Millennium Development Goals did earlier, the Sustainable Development Goals have mobilised the international community into what can be the most important, although the most challenging, development goals of the 21st century. However, a main limitation has been that the SDGs considered as a baseline the inaccurate figures that were presented by the UN at the end of the MDGs. These figures were not challenged, not even by the academic community, who in many cases has used them uncritically. As a result, innovative proposals that would improve management of water resources in general and of water supply, sanitation and wastewater management in particular did not emerge, with the consequent negative health and environmental impacts for billions of people globally.

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Current Opinion in Environmental Sustainability 2018, 34:21–25

This review comes from a themed issue on Sustainability science

Edited by Lorenza Fontana, Ira Martina Drupady, Johan Oldekop, Ken Giller and Sue Parnell

Received: 12 February 2018; Accepted: 06 August 2018

<https://doi.org/10.1016/j.cosust.2018.08.001>

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Introduction

Sustainable Development Goal (SDG) 6 is dedicated to clean water and sanitation. It aims at ensuring availability and sustainable management of water and sanitation for all, and achieving quality and sustainability of water resources worldwide. Together with the rest of the SDGs, it is intended to help to improve the quality of life of billions of people all over the world.

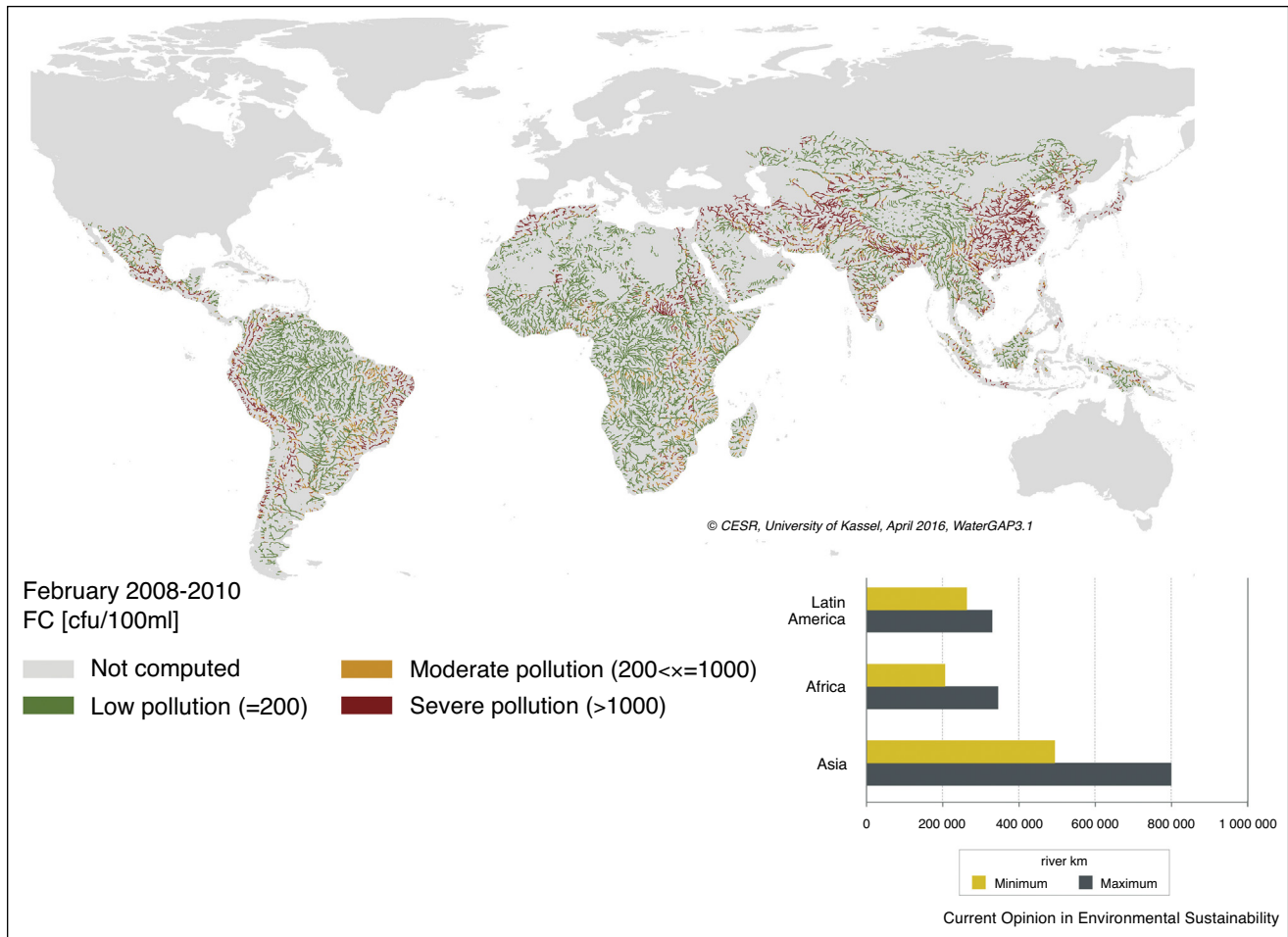
Its baseline parameters are those where the MDGs left off in 2015. Among other things, 2.6 billion people are said to have gained access to improved drinking water sources since 1990, while 663 million still lacked it, and 2.4 billion people did not have access to basic sanitation, defined as access to toilets and latrines [1,2]. A significant problem, however, is that the achievements reported by the UN agencies at the end of the MDGs did not reflect the global situation accurately at that time. In the MDGs, access to safe drinking water was measured using access to improved sources of water with no consideration of water quality. As a result, the statistics missed that, in 2012, at least 1.8 billion people were exposed to drinking water sources contaminated with faecal matter [3]. In addition, the population without access to safe drinking water at baseline in 1990 was greater than estimated as several sources of water considered as improved were in fact unsafe. This also means that the proportion of population that would need to get access to drinking water by 2015 was higher than considered in the MDGs [4].

Regarding improved sanitation, this focused on hygienic separation of human excreta from human contact (e.g. sewer connections, septic system connections, pour-flush latrines, ventilated improved pit latrines and pit latrines with a slab or covered pit) [5]. Treatment and disposal of wastewater was not considered. The statistics on sanitation thus failed to provide an indication of the complexities and magnitudes of the social, economic and environmental related problems.

According to the World Bank, 68% of the world's population has access to basic sanitation. However, only 39% of this global population has access to *safely managed sanitation* (emphasis of the authors), which includes its safe collection, treatment, and end use and/or disposal [6]. Wastewater systems that are inadequate and septic tanks that are generally poorly designed and maintained have resulted in pollution of surface and groundwater with serious health impacts [7].

Overall, pollution with pathogens resulting from disposal of non-treated wastewater affects approximately one-third of all rivers in Africa, Asia and Latin America (Figure 1) [8], transforming them into open sewers.

Figure 1



Estimated in-stream concentrations of faecal coliform bacteria (FC) for Africa, Asia and Latin America (February 2008–2010)* [8]. Notes: Low: Suitable for primary contact; Moderate: Suitable for irrigation; Severe: Exceeds thresholds. *Bar charts show minimum and maximum monthly estimates of river stretches in the severe pollution class per continent in the period from 2008 to 2010.

The baseline: where did it go wrong, and how has this affected universal access to clean water and sanitation?

The lack of progress on providing clean water, sanitation and wastewater management for all has constrained overall development and quality of life for a significant proportion of the world population. The MDGs for water and sanitation were intended to address the immense-related challenges and try to improve the situation for billions of people, mainly in the developing world.

On 18 September 2000, the United Nations Millennium Declaration was presented during the General Assembly to the international community and accepted by 189 countries [9]. Regarding development and poverty eradication, the Declaration aimed, among many other objectives:

19. To halve, by the year 2015, the proportion of the world's people whose income is less than one dollar a

day and the proportion of people who suffer from hunger and, by the same date, to halve the proportion of people who are unable to reach or to afford safe drinking water.

In terms of protection of the common environment:

23. 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.

The aims were laudable, and international organisations were enthusiastic about contributing to their realisation. In order to record the progress towards the commitments made, a set of goals and targets were developed to 2015. However, the indicators that were chosen to measure progress were inappropriate and the way on which they were reported was misleading. While the target for

water was to 'halve, by 2015, the proportion of the people without sustainable access to safe drinking water and basic sanitation', progress was reported in terms of the proportion of the population using *improved sources of drinking water* and *improved sanitation facilities* (emphasis of the authors) [2].

Improved sources of drinking water are 'sources that, by nature of their construction or through active intervention, are protected from outside contamination, particularly faecal matter. It comprises piped water on premises such as piped household water connection located inside the user's dwelling, plot or yard. Other improved drinking water sources include public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection.' Improved sanitation facilities include connections to public sewers or septic tanks, and latrines that are pour-flushed, simple or ventilated [10]. They do not reflect sustainable access to safe drinking water and basic sanitation.

By 2015, not only had populations not acquired access to clean and safe water and sanitation in the numbers reported, but based on anecdotal evidence, the actual number of people without access to these basic services had increased. Even at present, in South Asia, with 1.7 billion inhabitants, access to clean water and sanitation on a sustained basis is still a serious constraint [11].

In Africa, effective coverage of safe and reliable water supplies to rural communities remains relatively low in many countries: 23% in Angola, 32% in Mozambique, 63% in Namibia and South Africa, and 66% in Lesotho. In South Africa, municipalities with large proportions of poor households face numerous problems. Financial limitations make it very difficult to increase supply capacity beyond the basic minimum provision subsidised by the central government [12]. Regarding effective sanitation and wastewater systems in urban areas, the highest levels are in South Africa and Botswana, with 77% and 76%, respectively. The lowest are in Lesotho, Malawi, Mozambique and Zambia with coverages between 46 and 49%. Services in rural areas are even lower, varying from 12% in Mozambique to 69% in South Africa.

In Latin America, coverage of water supply services in urban areas increased from 40% to 90% from 1950 to 2010, when population grew by approximately 400 million. Quality of water supply and sanitation services is still low and does not meet international standards for some two-thirds of the population, mainly in small towns, slums of large and medium-size cities and rural areas [13].

With the SDGs on clean water and sanitation, a crucial development has been that they have taken into account accessibility, availability and quality of services as well as quality of water that is provided for human consumption.

Regarding sanitation, they have considered disposal and treatment of excreta as well as infrastructure type and accessibility [14]. In addition, a robust Indicators and Monitoring Framework has been proposed to measure progress made [15]. As noted earlier, however, a serious limitation has been that the baselines for the SDGs provided by the MDGs for both clean water and sanitation are not accurate.

A question the academic world has failed to discuss except for few cases [11,16,17] is whether the choice of indicators for the MDGs on safe water and sanitation, and, most important, the way to report them, have affected access to clean water, sanitation and wastewater management. For example, the millions of toilets now available in India (the country with the highest number of people practicing open defecation globally) represent an immense improvement in terms of sanitation. Nevertheless, that is only part of the solution. The other part is the treatment of the wastewater that is produced and that, so far, is disposed with no proper treatment.

Since the above services are said to have improved so much, less attention is likely to be paid to them not only within academia but also by governments, donors and NGOs. With so many pressing problems all over the world, once it was announced that access to clean water and sanitation was steadily improving, attention and funds could seemingly be better allocated elsewhere. Therefore, the billions of people who still do not have access to these basic services on daily basis will continue to lack access to them and their health, in particular, will continue to be affected negatively. Further, it is important to consider that this is a problem not only in developing countries but also in less affluent areas in developed countries, such as Canada and the United States. In the case of Canada, First Nations still lack access to improved water, wastewater and stormwater management [18]. In United States, there are serious disparities in the access to safe drinking water of low-income, minority populations [19] and those living in small communities [20] and Tribal lands [21].

Our conjecture is that discussion of the SDG goals for clean water and sanitation and their inconsistencies is inadequate. Additionally, that academia could play an important role in advancing their proper implementation by rigorously analysing the reliability and accuracy of the information put forward by international organisations and development banks and challenging it whenever appropriate.

Universal access to clean water, sanitation and wastewater management

Access to clean water and sanitation services as well as wastewater management depend on numerous factors. These include institutions that are oriented to the needs

and demands of the population and that have the means to invest for the long-term. Those that are functional, accountable, transparent, inclusive and free of corruption, and able to coordinate with each other, are likely to be the ones that will be able to provide services to their populations efficiently and effectively over the coming decades.

Provision of efficient and equitable services also depends on legal and regulatory frameworks; policies, management and governance; infrastructure development, technological innovations and their adoption as well as access to financial support. Financial aspects are a main limitation, mainly as there seem to be significant gaps in the understanding of, funds available and tracking of financing for water, sanitation and wastewater management [22]. Last but not least, given the strong social context of water, politics are also a major factor in access and upgrading of service provision.

Water quantity and quality concerns are also affected by external drivers. Among others, these include economic growth, urbanisation, demography, environmental, social and perceptual changes, climate variability and change, and water-related thinking that influences the paradigms used in the management of water resources.

Paradigms in the water sector require a major reconceptualisation by the international community. Paradigms used at present, such as Integrated Water Resources Management (IWRM) or Integrated River Basin Management (IRBM) have not rendered the expected results in spite of over half a century of efforts to implement them [23,24]. In the case of IWRM, the concept has been included in laws, regulations and/or policies of many countries but it has not driven expected outcomes. Difficulties in implementation, illustrated by the case of South Africa, suggest a need for fundamental rethinking [25,26].

Globally, challenges have expanded beyond conceptual frameworks. Paradigms must thus be applicable and become relevant at the level of policy implementation. Unfortunately, theoretical frameworks and scientific contributions often focus on situations at the global scale, and local needs tend to be forgotten. Yet, solutions to clean water, sanitation and wastewater management are always local.

More is required from international organisations if implementation of the SDGs for clean water and sanitation has the objective to achieve the desired outcomes. As discussed by the Global Taskforce [27] for the SDGs, to have an influence on development policies at the national levels, they have to be given priority consideration by national and local governments. As difficult as it may be, the international development community can help to expedite planning processes to put in place the necessary human, institutional, budgetary and technological resources to make them a reality.

Coming back to academia, scholarship at present focuses mainly on impacts of water scarcity (many times without actual data) and poor water quality, management and governance; impacts of megatrends on water availability and their effects on water security at local, regional and global levels [28]. Further areas of study include the relation between availability of natural resources and development [29]; water's relation to energy, food, the environment, and peace and poverty alleviation [30,31]; climate variability and change and extreme events such as floods and droughts, and their impacts on the human and natural environments [32–34]. Other areas of knowledge on which a body of literature is being built include information systems and management; investment needs and insurance losses; technological innovation; recycling stormwater and wastewater, and development of non-conventional sources of water. SDGs for clean water, sanitation and wastewater management do not seem to be among the priorities of the academia.

Concluding remarks

When the MDGs were presented to the international community, it was argued that water was a prerequisite for each one of the goals, because of its direct relation, and impacts, on them. The same is true for the SDGs. Now more than ever, despite water's obvious importance for overall development and quality of life, ecosystems, food, energy production, etc., provision of clean water, sanitation and wastewater services are in an appalling state in many parts of the world due to mismanagement and pollution, issues that have been identified as some of the most pressing global concerns for decades. Lack of water resources in quantity and quality and inadequate provision of services affect not only poor countries but also developed ones, making efficient and effective water management a global priority.

Academia must step in, challenge prevailing wisdoms rather than endorsing what can clearly be improved, contribute with more realistic objectives, criteria and indicators for measuring the performance of clean water, sanitation and wastewater services in the context of the SDGs. This will help to focus efforts over the lifetime of the SDGs.

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