

## **CONSTRAINTS TO IMPROVING WATER AND SANITATION SERVICES**

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**Keywords:** Water supply, sanitation, sanitary infrastructure, developing countries

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### **Summary**

Water supply and sanitation are important elements in contributing to a good health status and life quality in a community. Unfortunately, the water supply and sanitation deficits are still very large, especially in developing regions. Overall water supply coverage in the predominantly developing continents and regions (Africa, Asia, Latin America and the Caribbean) ranges from 62 to 85% of the total population, representing a population of 1,071,000 inhabitants that do not have access to water. The statistics for sanitation coverage are worse than those for water supply. Overall sanitation coverage in the developing continents ranges from only 48 to 78%, representing a total of 2,346,000 inhabitants which do not have access to sanitation. Most of the unserved population lives in rural areas, but problems in urban areas are also of major concern.

The existing deficits in water supply and sanitation are due to a series of factors, whose degree of importance varies from country to country. The main intervening factors are summarized in a table format, listing the main constraints and the related consequences, according to the following aspects: (a) economical and financial, (b) institutional, (c) political, (d) bureaucratic, (e) public health and environmental legislation, (f)

technological, (g) cultural, (h) social, (i) educational, (j) information and data availability and (k) physical.

It should be recognized that each region presents a different combination of some of the listed constraints, thus requiring an in-depth knowledge of the specific situation whenever water supply and sanitation programs are to be implemented.

The prospects for the first quarter of the 21<sup>st</sup> Century in terms of water supply and sanitation are discussed. The aim is to reduce the deficit by half by the year 2015 and to have 100% of coverage by the year 2025. A huge effort is required, and many of the constraints listed here will need to be sorted out in order to achieve such an important target.

### 1. Introduction

The health status of a community, especially regarding environmental-related diseases, is associated with the existence and adequacy of the sanitary infrastructure. Regarding water-related diseases, the two major items in the sanitary infrastructure are water supply and sanitation.

Developed countries usually present a high level of health status, with only occasional disease outbreaks, which deserve much of the attention of the health and sanitary sectors. On the other hand, in many of the developing countries, health status is usually low, and the main objective is to raise it. Under the principle of equity, populations in developed and developing countries should aim at the same health status, regardless of current economic, social and cultural factors. Assuming that health status is linked to environmental conditions, these should be largely improved in developing countries in order to lead to the ascension of the current health level to the desired one. Among the measures to be undertaken, water supply and sanitation are usually very important in leading to improvements (see Figure 1).

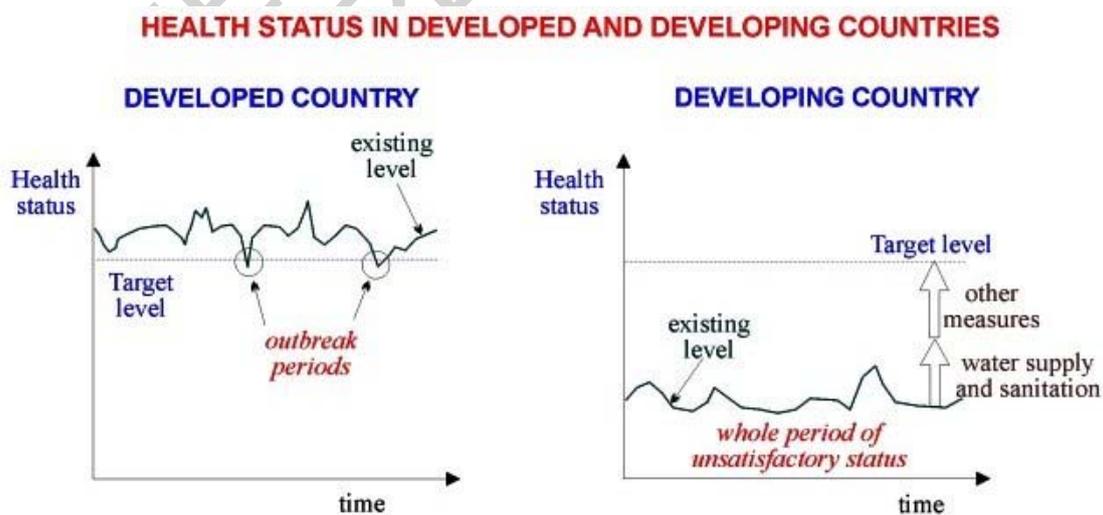


Figure 1. Comparison of typical health status in developed and developing countries

The present article discusses some of the main constraints to improving water supply and sanitation systems in the world. In order to understand the main limitations in the provision of sanitary infrastructure, the article initially presents the current situation in terms of coverage of water supply and sanitation, in each of the continents. As expected, the greater deficit is in the prevailing developing continents and regions: Africa, Asia and Latin America and the Caribbean.

From this point onwards, the article focuses predominantly on developing countries, in which the main constraints and demands are present. The constraints are separated into the following aspects: (a) economical and financial, (b) institutional, (c) political, (d) bureaucratic, (e) public health and environmental legislation, (f) technological, (g) cultural, (h) social, (i) educational, (j) information and data availability and (k) physical. The main aspects are summarized in a table format, listing the main constraints and the related consequences.

Naturally each country will present a different combination of some of the listed constraints, thus requiring an in-depth knowledge of the specific situation whenever water supply and sanitation programs are to be implemented in the country. Moreover, substantial regional diversities are frequently found in many countries. In these situations, generalizations at country’s level should not be done, and the analysis at regional level is necessary.

Finally, the article discusses future trends, which are aimed to be achieved in the 21<sup>st</sup> Century.

**2. Current Status of Water Supply and Sanitation Coverage in the World**

Recognizing the large importance of water supply and sanitation, it is interesting to compare world coverage levels. Additionally, since reality is very different around the world, an analysis specifying the statistics in the various continents helps in understanding regional diversities and needs.

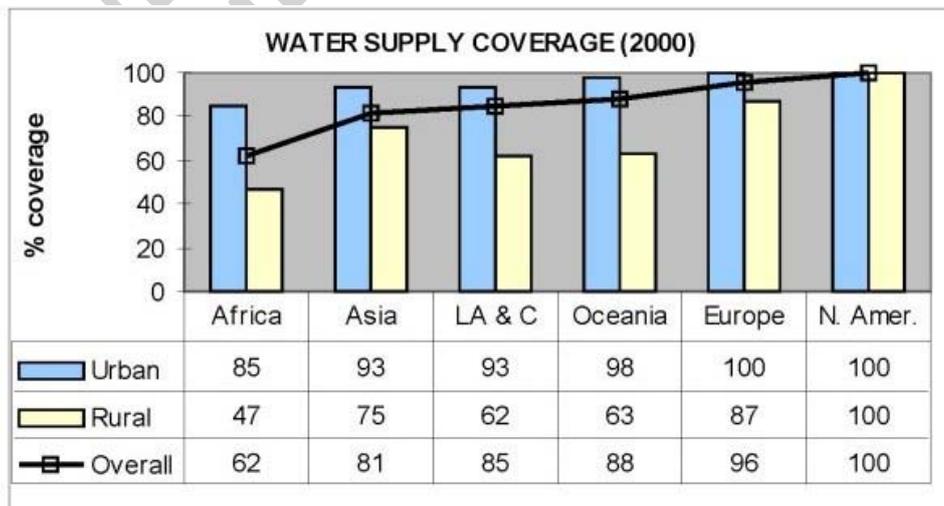


Figure 2. Water supply coverage, expressed as percentage of population (year 2000)

Figure 2 presents the percentage of water supply coverage in Africa, Asia, Latin America and the Caribbean, Oceania, Europe and North America. Overall coverage in the predominantly developing continents (Africa, Asia, Latin America and the Caribbean) range from 62 to 85%, whereas overall coverage in developed continents (Oceania, Europe and North America) are much higher, ranging from 88 to 100%. The statistics are also segregated in terms of rural and urban water supply. It is seen that urban coverage is greater than rural coverage, even in the developed continents.

Similar statistics are presented for the coverage in terms of sanitation (see Figure 3). The values are lower than those for water supply, and again rural coverage is much smaller than the urban one. Overall coverage in the developing continents (Africa, Asia, Latin America and the Caribbean) ranges from only 48 to 78%, whereas in the developed continents (Oceania, Europe and North America), the values range from 92 to 100%.

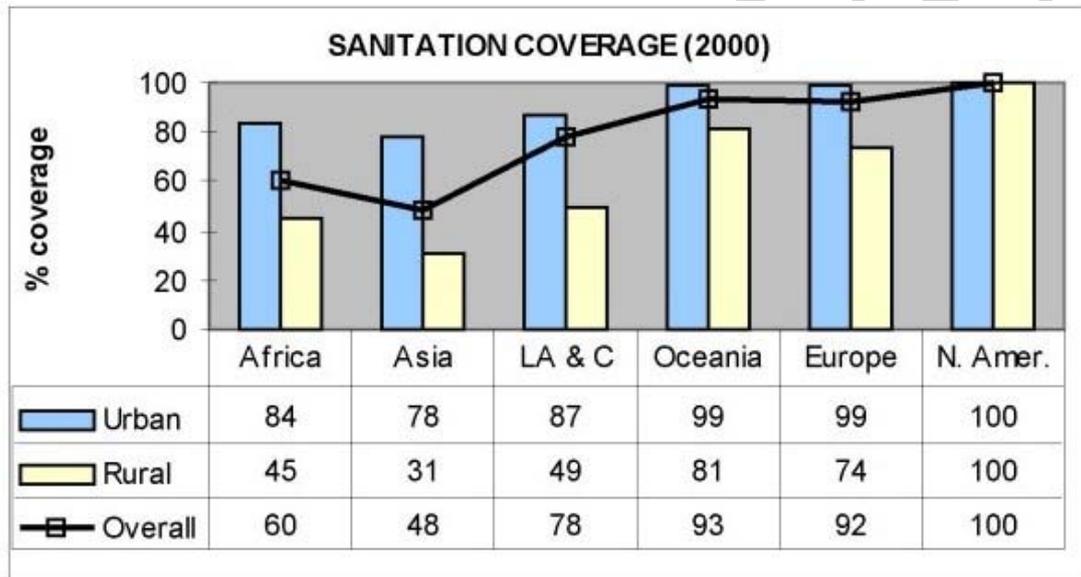


Figure 3. Sanitation coverage, expressed as percentage of population (year 2000)

Considering the large variation in population in the continents, it is also important to analyse absolute values (expressed in terms of inhabitants). Figure 4 presents the population **unserved** by water supply. In the developing continents, 1,071,000 inhabitants do not have access to water, 93% of which living in Africa and Asia. In these three continents, 900,000 unserved inhabitants live in rural areas (84% of the total unserved population in these three continents).

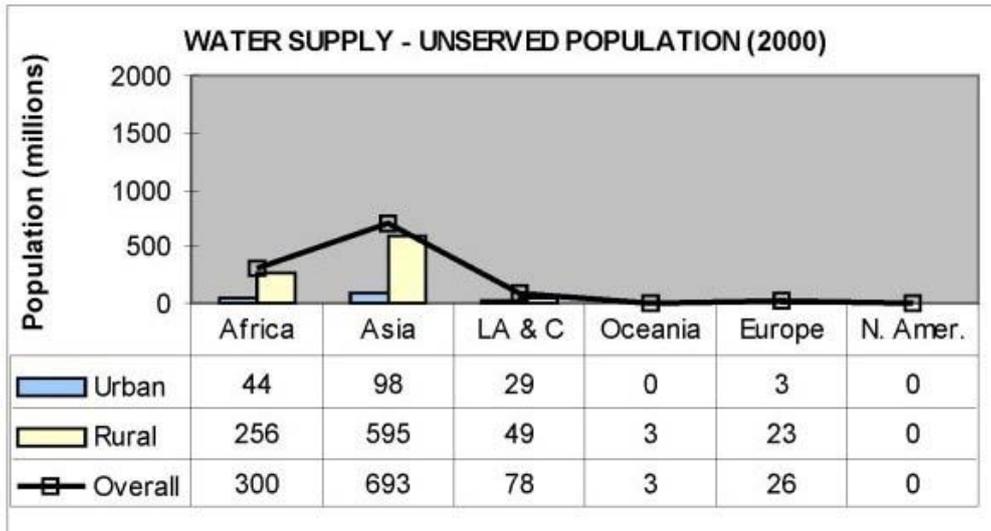


Figure 4. Unserved population in terms of water supply (year 2000)

The statistics of unserved population in terms of sanitation is even more dramatic. In the developing continents, 2,346,000 inhabitants do not have access to sanitation, 82% of which live in Asia. From the total unserved population in these three continents, 83% live in rural areas.

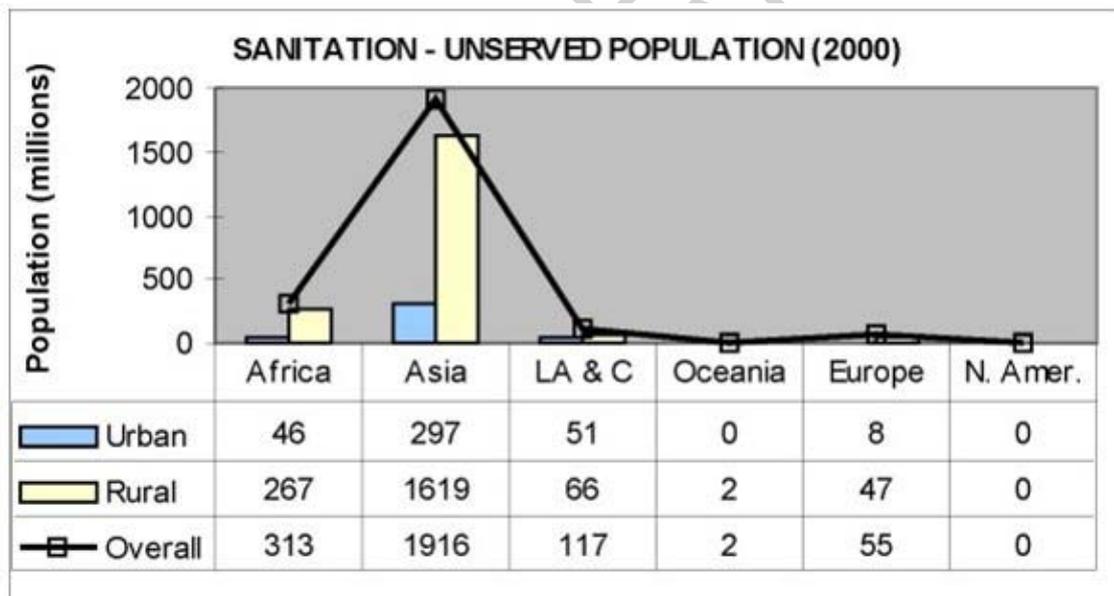


Figure 5. Unserved population in terms of sanitation (year 2000)

In order to understand the existing constraints and the directions in which to improve, it is interesting to analyze the category of access to water supply and sanitation. Figure 6 presents, for the three developing continents, the breakdown of water supply coverage, in terms of the two categories: (a) household connections and (b) other access (e.g. public taps, boreholes or hand pumps). Figure 7, illustrating sanitation coverage, has a similar structure, with the following two categories: (a) household connection to sewer and (b) other access (e.g. small bores, septic tanks, latrines or simple pits). It is seen that

in Africa and Asia, the minority of the served population has access to household connections; on the other hand, in Latin America, the majority of the served population has household connections.

It should be noticed, however, that connection to sewers in developing countries is not being properly complemented by sewage treatment, which is being largely discharged untreated in rivers, lakes and oceans. The treatment, where it exists, may also be only partial or inefficient. The consequences are water pollution and risk of public health deterioration via waterborne diseases for downstream users. Figure 8 presents mean percentage values of urban wastewater collected through sewerage systems that is reported to be treated in sewage treatment plants. It is seen that, even in the developed continents (Europe and North America), sewage is not universally treated. The available information on Oceania is insufficient to provide statistics for the region.

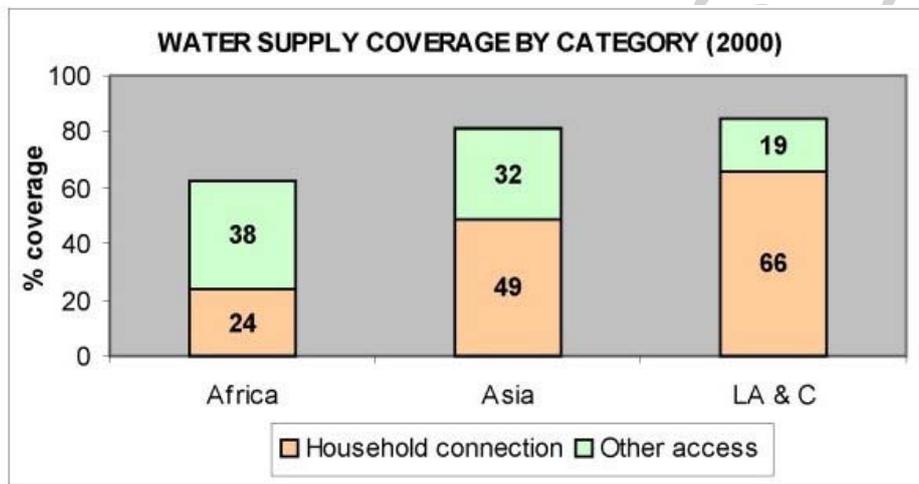


Figure 6. Water supply coverage by category (year 2000)

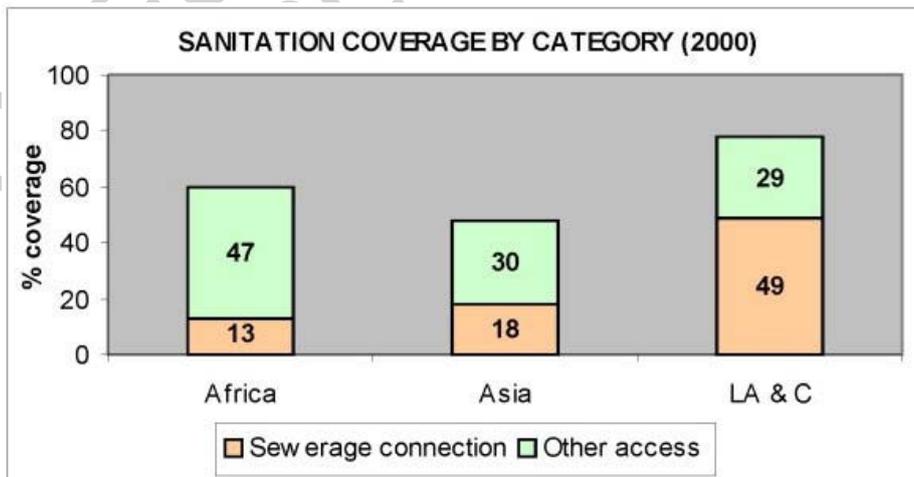


Figure 7. Sanitation coverage by category (year 2000)

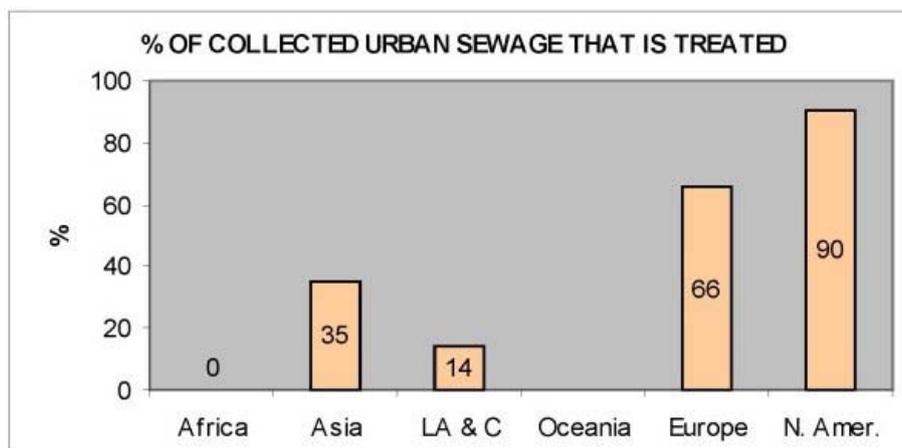


Figure 8. Mean percentage values of urban wastewater collected through sewerage systems that is treated in sewage treatment plants

### 3. Main Constraints and their Consequences

#### 3.1. Economical and Financial Aspects

Economical difficulties are usually the first ones to be mentioned when looking for possible causes of poor water supply and sanitation. Although they are undoubtedly very important, they are frequently overestimated, in order to cover other more structural problems.

Economical problems in developing countries are at the individual or family level, and also at regional and nation-wide level. The main constraints are related to the difficulty in fund raising for implementation of new systems and for maintenance of existing systems. Funds for both items usually come from different sources: implementation is generally financed by international banks, funding agencies, government, private sector or the water company itself. On the other hand, resources for operation and maintenance usually are derived from the tariff paid by the served population. A reasonable tariff scheme, sufficient for the sustainability of the system, but also respecting the population's economic level, is essential for guaranteeing long-term services with good quality.

Privatization of the system, which is a trend in many countries, needs to be looked at very carefully. Private companies should also be responsible for investing in low-profit areas, which, from the market point of view, would seem unattractive for the investors, but which, from the social point of view, would mean the exclusion of the most demanding areas. Concentration of investments in profitable cities will only increase the gap between poor and rich, especially in developing countries.

Table 1 presents a summary of important constraints and related consequences associated with economical and financial aspects.

Constraint	Consequence
<ul style="list-style-type: none"> <li>Low income level of the population</li> </ul>	<ul style="list-style-type: none"> <li>Low health status</li> <li>Low educational status</li> </ul>

	<ul style="list-style-type: none"> <li>• Low quality of life</li> <li>• Low priority to basic needs</li> </ul>
<ul style="list-style-type: none"> <li>• Low availability of governmental or private funds for sanitation infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Little implementation of sanitation services</li> <li>• Poor operation and maintenance of implemented services</li> </ul>
<ul style="list-style-type: none"> <li>• Difficulty of water companies in raising funds</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of implementation of infrastructure systems</li> </ul>
<ul style="list-style-type: none"> <li>• Difficulty of water companies in paying financing debts, due to unavailability of resources, high interest rates or unsustainable systems</li> </ul>	<ul style="list-style-type: none"> <li>• Difficulty in undertaking new investments for water and sanitation services</li> </ul>
<ul style="list-style-type: none"> <li>• Inadequate cost recovery</li> </ul>	<ul style="list-style-type: none"> <li>• Poor operation and maintenance of implemented services</li> <li>• Less financial resources for expanding the system</li> <li>• Little or no profit, which could be used in the financing of new systems</li> </ul>
<ul style="list-style-type: none"> <li>• Low capacity from poor segments of the population for tariff paying for the services provided</li> </ul>	<ul style="list-style-type: none"> <li>• Poor operation and maintenance of implemented services</li> <li>• Less financial resources for expanding the system</li> </ul>
<ul style="list-style-type: none"> <li>• Inadequate privatisation of the water and sanitation sector</li> </ul>	<ul style="list-style-type: none"> <li>• Little investment in low profit areas, which are usually the most demanding in social and infrastructure terms</li> </ul>

Table 1. Economical and financial aspects

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### Bibliography

Heller L. (1997). *Saneamento e saúde*. OPAS/OMS (Organização Panamericana de Saúde / Organização Mundial de Saúde). [This book, available in Portuguese and in Spanish, presents a consolidated literature review on the relationship between health and environmental sanitation measures]

Johnstone D.W.M. and Horan N.J. (1996). Institutional developments, standards and river quality: A UK history and some lessons for industrialising countries. *Wat. Sci. Tech.*, Vol. 33, No. 3, p. 211-222. [This paper discusses limitations in setting up environmental standards, comparing developed and developing countries, and emphasizing institutional aspects]

Mara D.D. and Feachem R. (2001). *Taps and toilets for all – two decades already, and now a quarter century more*. *Water 21 - International Water Quality Magazine*, August 2001. p. 13 – 14. [This short article discusses the tasks and difficulties in implementing the water supply and sanitation targets for 2025, based on the WHO report: Global water supply and sanitation assessment 2000 report]

Von Sperling M. and Fattal B. (2001). Implementation of guidelines. Practical aspects for developing countries. In: Fewtrell L and Bartram J. (ed). *Water quality: guidelines, standards and health*. IWA

Publishing, 440 pp. [This article analyses a series of constraints to implementing water quality guidelines and standards, with a focus on developing countries]

World Health Organisation (2000). *Global water supply and sanitation assessment 2000 report*. Geneva. [www.who.org](http://www.who.org) [This report is a major source of information, data, statistics and concepts used in the present article]

### **Biographical Sketch**

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