WHO/HSE/WSH/12.01

Global costs and benefits of drinking-water supply and sanitation interventions to reach the MDG target and universal coverage

Printed by the WHO Document Production Services, Geneva, Switzerland

Executive Summary

Globally, large numbers of people remain without access to basic levels of drinking-water supply and sanitation (WSS). According to data compiled by the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP), in 2010 783 million people continued to use unimproved sources to meet their drinking-water needs and 2.5 billion people continued to use an unimproved sanitation facility or defecate in the open. One of the UN Millennium Development Goal (MDG) targets is to halve, by 2015, the proportion of people without sustainable access to safe drinking-water and basic sanitation, with 1990 as the baseline year.

According to the JMP, the rate of progress towards achieving this target is such that the target will not be reached in its entirety by 2015. While the drinking-water target was met in 2010, sanitation is still considerably off-track. Based on the most recent estimates sanitation coverage must increase globally from 63% to 75% between 2010 and 2015. At the current rate of progress, sanitation coverage is predicted to be 67% in 2015, 580 million people short of the MDG target.

In 2010, the United Nations General Assembly and the UN Human Rights Council recognized access to safe drinking-water and sanitation as a human right. The concept of progressive realization inherent to the rights-based approach will result in intensified monitoring to be able to hold governments accountable for meeting their human rights obligations. Those still lacking access tend to be poor and marginalized groups. The JMP progress report showed that, in 2010, the poorest households, as measured by wealth quintiles, have significantly lower access than households in the two highest wealth quintiles.

In order to address these remaining challenges, further evidence is collected, compiled and analysed to support a greater allocation of resources to water supply and sanitation by decision makers and to select the most efficient interventions. The Sanitation and Water for All (SWA) partnership – launched in 2009 – is a global initiative to support countries in the scale-up of WSS services, especially those countries with low coverage or those most off-track to meet targets. To keep attention focused on meeting the MDG target, the "Sustainable sanitation: Five year drive to 2015" has been launched by the United Nations. Economic evidence is recognized as key for the achievement of the WSS goals – it helps justify increasing investment and expenditure, and it supports decisions to select efficient WSS options by explicitly comparing costs and benefits of a range of alternative WSS technologies and service delivery approaches.

The present study aimed to estimate global, regional and country-level costs and benefits of drinking-water supply and sanitation interventions to meet the MDG target in 2015, and to attain universal coverage. These economic data will provide further evidence to support investment in water supply and sanitation systems and services, with a focus on services that are both socially efficient and financially sustainable. The results will help donors and governments of low- and middle-income countries to justify allocation of adequate budgets for such systems and services.

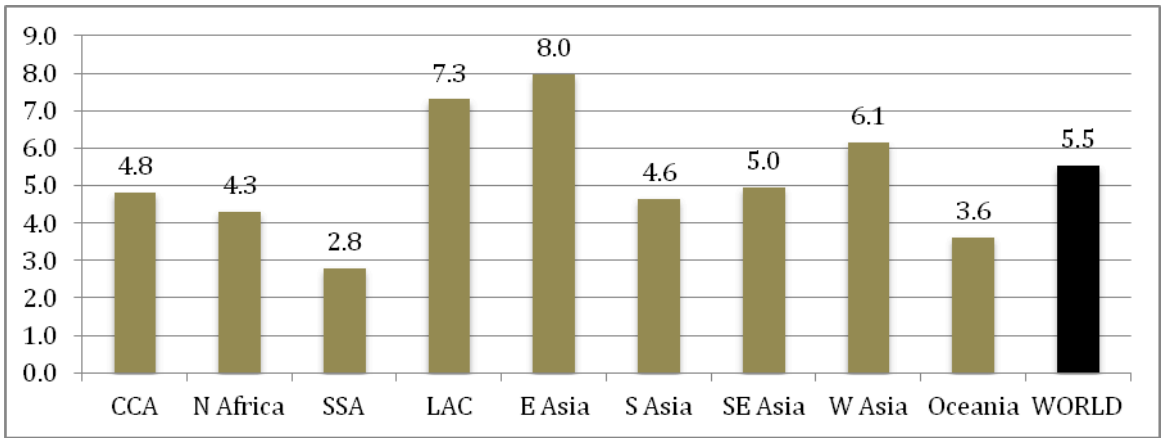
This report updates previous economic analyses conducted by the World Health Organization, using new WSS coverage rates, costs of services, income levels and health indicators. Benefit-cost ratios (BCR) and costs are estimated to meet the MDG drinking-

water and sanitation target and to attain universal access of basic services. Rural and urban areas are analysed as separate targets[1]. The analysis utilises WSS coverage definitions of the JMP. More low- and middle-income countries have been included, from under 100 countries in the previous analyses to a total of 136 countries in the current analysis. The quantitative model is run at country level, and the results aggregated to give the regional (nine MDG developing regions) and global averages, weighted by country population size. However, despite the improved data sources available, reliable data inputs on key variables are still lacking for many countries. To fill these gaps, cost and benefit data are extrapolated to neighbouring countries.

A large range of economic and social benefits can result from improved WSS services. Reductions in cases and deaths associated with diarrhoeal disease and in indirect adverse health impacts (e.g. through malnutrition), as well as time benefits resulting from the proximity of improved WSS services are expected to account for a large share of total benefits. Economic benefits related to savings from the health improvements of upgraded WSS services relate to seeking less health care, to reduced losses of productive time due to disease and to a reduction in premature mortality.

Summary results for attaining universal access to sanitation are shown in Figure A. The benefit-cost ratio (BCR) for the necessary interventions varies from 2.8 in the SSA region to 8.0 in E Asia. The global economic return on sanitation spending is US$ 5.5 per US dollar invested.

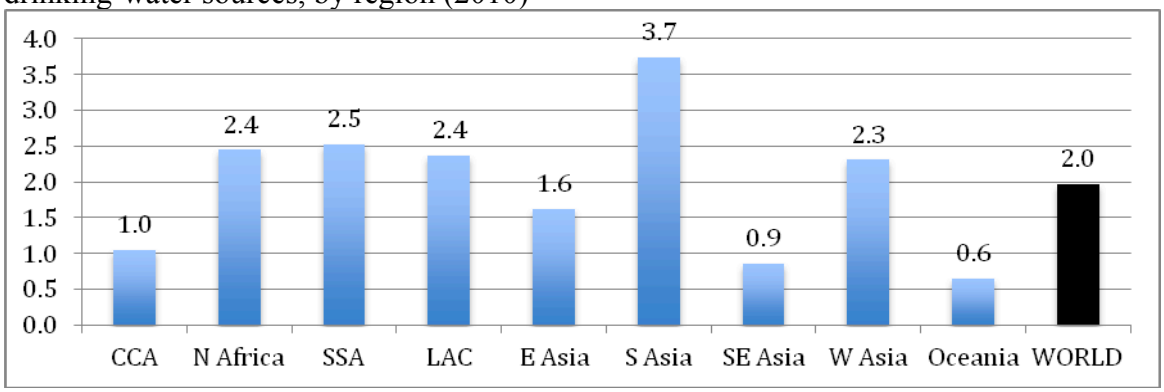
Figure A. Benefit-cost ratios of interventions to attain universal access of improved sanitation, by region (2010)



Summary results for attaining universal access to drinking-water are shown in Figure B. The benefit-cost ratio (BCR) for the necessary interventions varies from 0.6 in Oceania to 3.7 in S Asia. The global economic return on water spending is US$ 2.0 per US dollar invested. Combined water supply and sanitation interventions have a benefit-cost ratio of 4.3 at the global level, ranging from 2.0 in Oceania to above 5.0 in the LAC and E Asia regions.

[1] For example, if a country has surpassed its MDG target for urban sanitation but is off-track to meet the target applied to rural areas, the excess urban coverage does not balance out the rural deficit.

Figure B. Benefit-cost ratios of interventions to attain universal access of improved drinking-water sources, by region (2010)



The total global economic losses associated with inadequate water supply and sanitation were estimated at US$ 260 billion annually, or 1.5% of Gross Domestic Product of the countries included in this study. The total economic benefits of meeting the MDG target amount to US$ 60 billion annually. The benefits are dominated by sanitation, accounting for US$ 54 billion. The three regions where benefits are greatest are S Asia, E Asia and SSA. Attaining universal sanitation will more than triple the benefits compared with current coverage, to US$ 220 billion annually. Other regions contributing importantly to global benefits for universal access are LAC, SE Asia and W Asia.

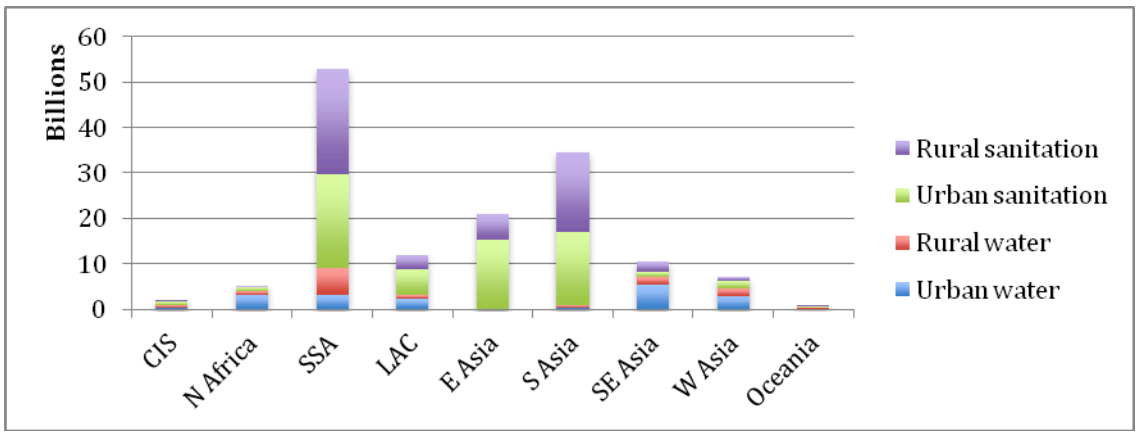
The main contributor to overall benefits of sanitation is the value of time savings which accounts for more than 70% of total benefits in all regions, and is as high as 80% to 90% of total benefits in most regions. In SSA and S Asia an important contribution comes from health benefits, especially the value of saved lives. Health care savings – which tend to be financial in nature – vary across regions between 5% and 13% of total benefits. In terms of overall value, the global picture on sanitation benefits is dominated by E Asia and S Asia, with over US$ 30 billion combined benefits. SSA contributes an important saving with US$ 10 billion annually.

The main contributor to overall benefits of drinking-water systems and services is the value of time savings which accounts for almost 70% of total benefits in all regions, and is as high as 80% in the CCA, LAC and N Africa regions. In SSA, S Asia and E Asia the health improvements contribute to at least 35% of overall benefits. Health care savings account for more than 10% of total benefits in all regions, rising to as high as 25% in E Asia. In terms of overall value, the global picture of drinking-water benefits is dominated by the SSA region, with over US$ 3.2 billion, followed by N Africa with US$ 1 billion, W Asia with US$ 0.6 billion and LAC with US$ 0.5 billion. The economic benefits of extending services to the unserved in E Asia are negligible because two of the three East Asian countries (China and Republic of Korea) have already met the MDG target for water.

Figure C shows the total financial capital costs of achieving the drinking-water and sanitation MDG target. The sanitation costs are estimated at US$ 115 billion, or US$ 23 billion per year from 2010 to 2015, and 54% of these costs are for urban areas. The majority of global costs are incurred in three regions: SSA, S Asia and E Asia. The

drinking-water costs are estimated at US$ 30 billion, or US$ 6 billion per year from 2010 to 2015[2]. 59% of these costs are for urban areas. The regions with the greatest drinking-water spending needs are SSA, SE Asia, W Asia, and LAC. In SSA the greatest investment needs are in rural areas, while in other regions urban areas dominate these investment needs. Looking at drinking-water and sanitation investment needs together, global costs of US$ 145 billion over the period 2010-2015 are dominated by SSA with US$ 53 billion – which represents over one-third of the global investment needs.

Figure C. Total financial capital costs to expand coverage to achieve the WSS MDG target, from 2011-2015 (in billions of US$)



The overall expenditure needs presented are dominated by capital costs. The global recurrent costs, including those incurred by operation and maintenance, are estimated at US$ 13 billion for sanitation and US$ 3 billion for water, over the period 2010-2015. Therefore, US$ 16 billion out of the total WSS costs of US$ 161 billion to meet the MDG target – that is, 10% – are estimated to be for operation and maintenance costs.

Achieving the MDG target is a stepping-stone in the process to attaining universal coverage. However, attaining the goal of universal coverage will have different time horizons in different countries. The cost estimation of attaining universal coverage in this report ignores the timescale and simply estimates the costs of reaching the unserved by using current unit costs of water and sanitation services. Recurrent costs are excluded. The incremental (i.e. additional after the achievement of the MDG target) capital costs of attaining universal coverage are presented in Figure D. Globally, they amount to US$ 217 billion for sanitation and US$ 174 billion for drinking-water, over the five-year period 2010-2015. E Asia accounts for almost US$ 120 billion of the global combined water supply and sanitation spending requirements of almost US$ 400 billion. While globally sanitation capital requirements exceed those of drinking-water, in some regions water capital requirements dominate. Regions with capital investment needs exceeding US$ 40 billion are SSA, S Asia and LAC. SE Asia and W Asia represent important costs at over

[2] Note that for the estimation of benefit-cost ratios, a direct comparison of annual economic benefits should **not** be made with annual financial costs, given that the investment lasts longer than the 5 year MDG period 2010-2015. Instead, the benefits are compared with annualized financial cost, using a depreciation method taking into account the duration of life of the infrastructure, and adding recurrent costs.

US$ 25 billion each. Urban investment needs dominate rural ones across all regions in both water and sanitation.

Figure D. Total financial capital costs to expand coverage to attain universal access of improved drinking-water sources and sanitation (incremental costs after achieving MDG targets), from 2011-2015 (in billions of US$)

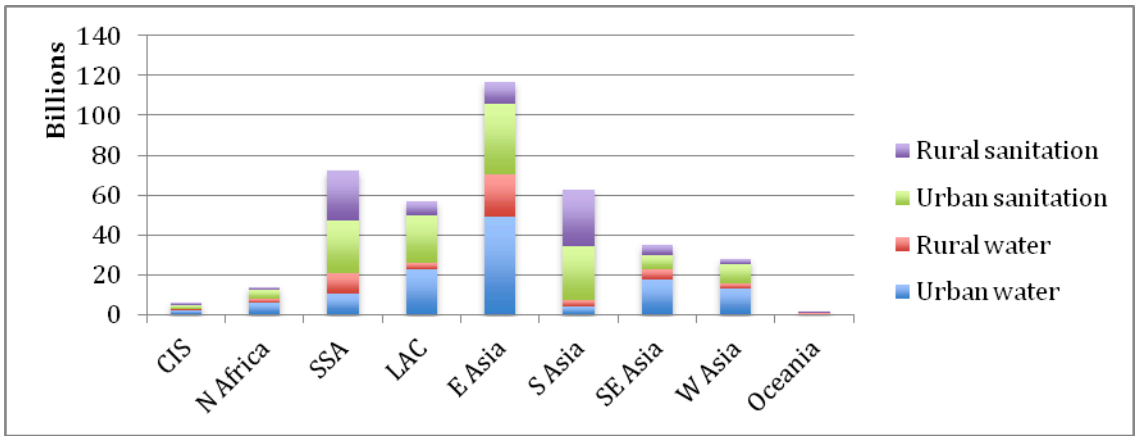


Table A presents the total costs of attaining universal coverage over the 2010-2015 period. In total, investment requirements are in excess of US$ 535 billion, consisting of US$ 332 billion for sanitation and US$ 203 billion for water. Urban costs dominate rural with US$ 339 billion for urban and US$ 197 billion for rural, for water and sanitation combined.

Table A. Total financial capital costs to expand coverage to achieve MDG targets and attain universal access of improved drinking-water sources and sanitation[1], from 2011-2015 (in millions of US$, 2010)

Region	Water supply			Sanitation		
	Urban	Rural	Total	Urban	Rural	Total
CCA	2,009	1,836	3,845	2,729	833	3,562
N Africa	8,842	3,057	11,898	5,036	1,333	6,369
SSA	13,620	16,010	29,629	47,026	48,198	95,224
LAC	24,745	4,364	29,109	29,144	10,188	39,332
E Asia	48,902	21,346	70,248	50,812	16,607	67,419
S Asia	4,187	3,644	7,831	43,736	45,460	89,197
SE Asia	22,835	6,712	29,547	8,250	7,602	15,852
W Asia	15,746	4,624	20,370	11,010	3,765	14,775
Oceania	163	700	864	182	480	662
All	**141,049**	**62,293**	**203,341**	**197,925**	**134,466**	**332,392**

[1] Table A is the sum of the data presented in Figure C and Figure D. Totals may not equal exactly sum of components due to rounding.

A global economic analysis of this nature has a number of uncertainties and weaknesses. One-way sensitivity analysis illustrates the sensitivity of the base-case results to key areas of uncertainty, shown in Figure E. The analysis shows that the results are most sensitive

for the approach chosen to value time. When time is valued at 100% of the GDP per capita instead of 30%, the global benefit-cost ratio increases to 16.6 for sanitation and 5.5 for water supply. This variable is important because a large proportion (>80%) of the quantified economic benefits are the opportunity costs of time spent to access WSS services. The BCR results are also sensitive to the unit costs of WSS services, varying between 4.8 and 10.9 for high and low sanitation costs and 1.6 and 4.1 for high and low drinking-water supply costs. Varying the value of life between half the baseline assumption (human capital approach) to a high value using value-of-statistical life, a smaller impact on the benefit-cost ratios is observed, from 5.4 to 6.6 for sanitation and from 1.9 to 2.7 for drinking-water supply. Variations in the discount rate for future costs and benefits from 3% to 12% have an even smaller impact. In no cases does the uncertainty in a single parameter lead to a BCR of below 1. However, given that several potential benefits have been omitted from the calculations (e.g. nutrient reuse, educational impacts, cleaner environment, tourism and intangibles such as privacy, dignity and security), it is unlikely – even under pessimistic values for several parameters simultaneously – that the interventions would become economically unviable.

Figure E. Global benefit-cost ratios under high and low parameter values