



Benefits of Investing in Water and Sanitation

AN OECD PERSPECTIVE



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Please cite this publication as:

OECD (2011), *Benefits of Investing in Water and Sanitation: An OECD Perspective*, OECD Publishing.

<http://dx.doi.org/10.1787/9789264100817-en>

ISBN 978-92-64-10054-1 (print)

ISBN 978-92-64-10081-7 (PDF)

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Foreword

An adequate and dependable source of water is needed to sustain human life, future economic development, and the integrity of ecosystems. About 884 million people lack access to safe water supplies (although the number of people without access to water in their homes is considerably higher) and 2.6 billion are without access to basic sanitation (JMP, 2010). Approximately 10% of the global burden of disease worldwide could be prevented with improvements to water, sanitation and hygiene and better water resource management worldwide. The burden of water-related diseases falls disproportionately on developing countries and particularly on children under five, with 30% of deaths of these children attributable to inadequate access to water and sanitation. Wastewater from industrial and domestic uses often reach the environment untreated or insufficiently treated, resulting in major impacts on surface waters and associated ecosystems.

Investment in water supply and sanitation services (WSS) typically generates a number of economic, environmental and social benefits. Access to clean drinking water and sanitation reduces health risks and frees-up time for education and other productive activities, as well as increasing the productivity of the labour force. Safe disposal of wastewaters helps to improve the quality of surface waters with benefits for the environment (*e.g.* functioning of ecosystems; biodiversity), as well as for other economic sectors (*e.g.* fishing, agriculture, tourism).

However, the benefits of water and sanitation remain insufficiently documented, resulting in low political priority for water issues, and most likely, in sub-optimal levels of investment in water infrastructure. Where numbers are available (*e.g.* for health benefits), their reliability is a matter of debate between experts. More generally, information about the benefits of water and sanitation are usually hidden in various technical documents, where they remain invisible to key decision-makers in Ministries of Finance and Economy.

The purpose of the present report is therefore to draw together and summarise existing information on the benefits of investing in water and sanitation services and to present this information in a format that is informative for policy makers.

The report highlights that overall benefits from investing in water and sanitation are likely to be large, but that there are wide variations depending on the type of investments made along the water and sanitation services “value chain” and the local conditions (*i.e.* depending on the existing level of development of water and sanitation infrastructure, the prevalence of water-related diseases, availability of water resources, etc). The report throws light on the relative magnitude of the benefits emerging from various types of investment in water and sanitation. This should ultimately help with identifying areas of needed investment in the water and sanitation sector and with the prioritisation and sequencing of such investments.

The readers targeted by this report are policy makers in both OECD and non-OECD countries concerned with water, environmental policy, finance and development. The Report addresses specialists, but is also intended to be accessible to non-specialist readers. With this in mind, it tries to be jargon-free and sparing in its use of technical vocabulary.

Acknowledgements

This report was written by Sophie Trémolet (Trémolet Consulting, UK) with inputs from Peter Börkey from the OECD secretariat in Paris.

Research and early drafts were contributed by Diane Binder (Trémolet Consulting), Verena Mattheiß and Hélène Bouscasse (ACTeon, France). Pierre Strosser (ACTeon) contributed his experience and insights for the initial study design and extraction of key findings from the research.

People consulted included Sandy Cairncross (London School of Hygiene and Tropical Medicine, UK), Oliver Cumming (WaterAid, UK), Lise Breuil (Agence Française de Développement, France), Barbara Evans (Leeds University, UK), Ekin Birol (International Food Policy Research Institute, USA), Stefanos Xenarios (International Water Management Institute, India), Janis Malzubris (University of Latvia, Latvia), Bernard Barraqué (CIRED, France) and Jean-Philippe Torterotot (Cemagref, France). Guy Hutton (independent consultant, Switzerland) and Sheila Olmstead (Yale University, USA) acted as peer reviewers. Comments on the draft report were provided by participants at the Expert meeting on Water Economics held in Paris on 17th March 2010. We are particularly grateful to Jamie Bartram (University of North Carolina, USA), Jonathan Fisher (Environment Agency, UK), Steve White (European Commission), Roger Schmid (Skat, Switzerland), Sibylle Vermont (Federal Environmental Office, Switzerland), Jack Moss (Business and Industry Advisory Committee to the OECD) and Alan Hall (independent consultant, UK), for their additional written comments.

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Abbreviations and acronyms

3Ts	Tariffs, Taxes, Transfers
ACP	Africa, the Caribbean and the Pacific
BCR	Benefit-Cost Ratio
BOD	Biochemical Oxygen Demand
CBA	Cost-Benefit Analysis
CEA	Cost-Effectiveness Analysis
CVM	Contingent Valuation Method
DAC	Development Assistance Committee (OECD)
DALY	Disability-Adjusted Life Year
DFID	Department for International Development (United Kingdom)
ECAs	Export Credit Agencies
ELL	Economic Level of Leakage
EPA	United States Environmental Protection Agency
ESI	Economics of Sanitation Initiative
EU	European Union
IWRM	Integrated Water Resources Management
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Programme (WHO-UNICEF)
MDGs	Millennium Development Goals
NGO	Non-Governmental Organisation

O&M	Operation and Maintenance
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
USD	United States Dollars
WFD	Water Framework Directive
WHO	World Health Organisation
WSP	Water and Sanitation Program
WSS	Water and Sanitation Services
WTP	Willingness-to-Pay

Executive Summary

Key messages

The provision of water supply, sanitation and wastewater services generates substantial benefits for public health, the economy and the environment.

Benefits from the provision of basic water supply and sanitation services such as those implied by the Millennium Development Goals are massive and far outstrip costs. Benefit-to-cost ratios have been reported to be as high as 7 to 1 for basic water and sanitation services in developing countries.

Wastewater treatment interventions can generate significant benefits for public health, the environment and for certain economic sectors such as fisheries, tourism and property markets, although these benefits may be less obvious to individuals and more difficult to assess in monetary terms.

Finally, protecting water resources from pollution and managing water supply and demand in a sustainable manner can deliver clear and sizeable benefits for both investors in the services and end water users. Investments in managing water resources are going to be increasingly needed in the context of increasing water scarcity at the global level.

The full magnitude of the benefits of water services is seldom considered for a number of reasons. Non-economic benefits that are difficult to quantify but that are of high value to the concerned individuals and society, *i.e.* non-use values, dignity, social status, cleanliness and overall well-being are frequently under-estimated. In addition, benefit values are highly location-specific (depending on the prevalence of water-related diseases or the condition of receiving water bodies, for example) and cannot be easily aggregated.

Background

An adequate and dependable source of water is needed to sustain human life, future economic development, and the integrity of ecosystems. Around 884 million people lack access to safe water supplies and 2.6 billion are

without access to basic sanitation. Approximately 10% of the global burden of disease worldwide could be prevented with improvements to water, sanitation and hygiene and better water resource management worldwide. The burden of water-related diseases falls disproportionately on developing countries and particularly on children under five, with 30% of deaths of these children attributable to inadequate access to water and sanitation. Wastewater from domestic and industrial uses often reaches the environment untreated or insufficiently treated, resulting in major impacts on surface waters and associated ecosystems as well as economic activity that uses these resources.

Investment in water supply and sanitation services (WSS) typically generates a number of economic, environmental and social benefits. Access to clean drinking water and sanitation reduces health risks and frees-up time for education and other productive activities, as well as increases the productivity of the labour force. Safe disposal of wastewaters helps to improve the quality of surface waters with benefits for the environment (*e.g.* functioning of ecosystems; biodiversity), as well as for economic sectors that depend on water as a resource (*e.g.* fishing, agriculture, tourism).

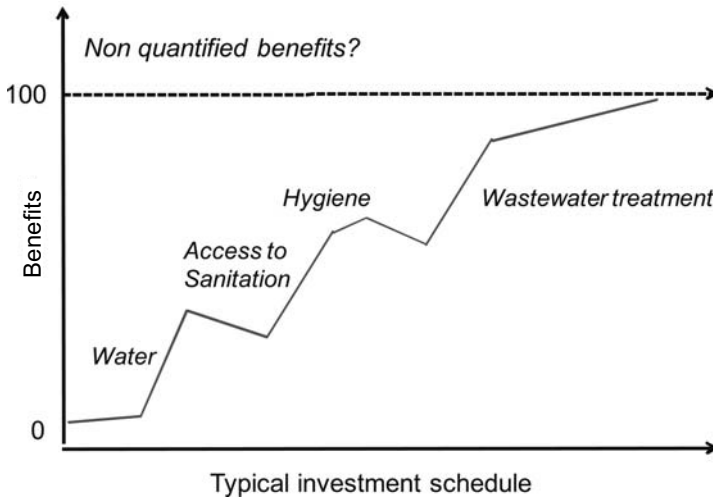
The benefits of water and sanitation remain insufficiently documented, however, resulting in low political priority for water issues and in sub-optimal levels of investment in water infrastructure. Where numbers are available (*e.g.* for health benefits), their reliability can be a matter of debate between experts. More generally, information about the benefits of water and sanitation are usually hidden in various technical documents, where they remain invisible to key decision makers in Ministries of Finance and Economy. This report draws together and summarises existing information on the benefits of investing in water and sanitation services and presents this information in a format that is informative for policy makers.

Key findings

Formulating a coherent message on the benefits of water services is difficult due to the fact that countries are at very different stages of developing their infrastructure, as shown on the WSS benefit curve in Figure 0.1. Whereas the least developed countries still need to make substantial investments in order to improve access to water, sanitation and hygiene, most developed countries are much further down the curve and are investing in wastewater treatment, usually to comply with regulations. Figure 0.1. shows a number of important points.

Firstly, whilst substantial benefits can be realised from providing access to water, sanitation and hygiene, there may also be some “disbenefits” along the way, depending on the sequencing of investments (for example, if access to water is provided without simultaneous access to sanitation). Secondly,

Figure 0.1. The water and sanitation benefits curve



wastewater treatment, which is usually provided last, can generate substantial benefits but those benefits are likely to tail away as there tends to be diminishing returns from further investments in improving quality. Lastly, measured benefits are usually under-estimated given that some significant benefits (such as pride and dignity with respect to access or amenity value with respect to wastewater treatment) are more difficult to quantify in monetary terms.

Benefits from access to basic water supply and sanitation

Benefits from the provision of basic water supply and sanitation services such as those implied by the Millennium Development Goals (MDGs) are massive and far outstrip costs. For example the achievement of the MDGs for water and sanitation would generate benefits of USD 84 billion per year with a benefit to cost ratio of 7 to 1. Three quarters of these benefits stem from time gains, *i.e.* time that is gained by not having to walk long distances to fetch water or to queue at the source. Most other benefits are linked to a reduction of water-borne diseases such as reduced incidence of diarrhoea, malaria or dengue fever. Almost ten per cent of the global burden of disease could be prevented through water, sanitation and hygiene interventions. Children are most affected, with 20% of disability adjusted life-years (DALYs)¹ in children under 14 attributable to inadequate water, sanitation and hygiene and 30% of deaths of children under 5.

In most OECD countries, these benefits have been reaped in the late 19th or early 20th century when basic water and sanitation infrastructure was extended to reach large parts of the population. For instance, the introduction of water chlorination and filtration in 13 major US cities during the early 20th century led to significant reductions in mortality with a calculated social rate of return of 23 to 1 and a cost per person per year saved by clean water of about USD 500 in 2003.

OECD experience shows, however, that the marginal rate of return of water and sanitation interventions diminishes with the increasing sophistication of measures. For instance, in the US experts estimate that the average cost per cancer case avoided due to tighter drinking water standards on certain pesticide and herbicide concentrations has been assessed between USD 500 million to USD 4 billion.

Benefits are probably systematically under-estimated due to a number of non-economic benefits that are difficult to quantify but that are of high value to the concerned individuals in terms of dignity, social status, cleanliness and overall well-being. A number of studies show that it is the non-health, non-economic issues that usually drive the intention to build a household latrine, such as having facilities for sick or old relatives, safety at night, convenience or because it is easier to keep the facility clean.

More broadly, adequate water and sanitation services appear to be a key driver for economic growth (including investments by firms that are reliant on sustainable water and sanitation services for their production processes and their workers). However, such links have yet to be adequately tracked and measured and are therefore not evaluated in detail in the body of the report.

Wastewater treatment

In contrast to water supply and sanitation services, the benefits of wastewater treatment are less obvious to individuals and more difficult to assess in monetary terms. The consensus on the need for increased urban wastewater treatment as well as safe disposal of its residues has therefore developed more slowly, probably also due to the relatively high costs of such interventions. In the United States, the 1972 Clean Water Act built an important legal basis for expanding wastewater treatment facilities. In Europe, the European Union Urban Waste Water Treatment Directive adopted in 1991 represented the policy response to the growing problem of untreated sewage disposed into the aquatic environment.

All benefits from wastewater treatment are linked to an improvement in water quality through the removal of different polluting substances, generating withdrawal benefits (*e.g.* for municipal water supply as well as irrigated agriculture, livestock watering and industrial processes) and in-stream

benefits (benefits that arise from the water left “in the stream” such as swimming, boating, fishing). This can have a substantial impact on the economy as a whole. In South East Asia, for example, the Water and Sanitation Program estimated that due to poor sanitation, Cambodia, Indonesia, the Philippines and Vietnam lose an aggregated USD 2 billion a year in financial costs (equivalent to 0.44% of their GDP) and USD 9 billion a year in economic losses (equivalent to 2% of their combined GDP).

For instance, the health benefits of quality improvements of recreational waters in south-west Scotland have been calculated at GBP 1.3 billion per year. In the Black Sea, the degradation of water quality due to an enrichment in nutrients led to an important increase in algal mass affecting aquatic life. The mass of dead fish was estimated at around 5 million tons between 1973 and 1990, corresponding to a loss of approximately USD 2 billion.

Water quality is also an essential factor for certain tourism activities and sewage treatment leads to enhanced tourist attraction. In most countries, non-compliance with certain norms for bathing water leads to the closure of beaches and lakes for recreational purposes and therefore influences strongly the local tourism economy.

In Normandy (France), it has been estimated that closing 40% of the coastal beaches would lead to a sudden drop of 14% of all visits, corresponding to a loss of EUR 350 million per year and the potential loss of 2 000 local jobs.

Benefits for property have also been shown to be significant. People living in the surroundings of water bodies benefit from increased stream-side property values when wastewater treatment measures ensure a certain quality of water bodies. Several studies show that in proximity of areas that benefited from improved water quality, property values were found to be 11 to 18 per cent higher than properties next to water bodies with low quality.

More aggregated, economy-wide assessments of benefits of water quality improvements are very few and far between. The US Environmental Protection Agency estimates the net benefits of water pollution legislation in the last 30 years in the United States at about USD 11bn annually, or about USD 109 per household. In the UK, several studies estimating benefits and costs of measures to implement the EU Water Framework Directive have been showing a net benefit in England and Wales of USD 10 million. In the Netherlands, similar cost-benefit analyses showed that monetisable benefits were significantly less than estimated costs (but an important range of benefits could not be monetised) and that costs increase disproportionately with growing environmental ambition, suggesting decreasing marginal net benefits.

Protecting the quality of the resource and balancing supply and demand

For water services to be provided sustainably over time, it is critical to ensure that the raw material, clean water, is adequately protected and managed. This will become increasingly relevant with increasing pressures on the resource exerted by economic and demographic growth as well as the potential impacts of climate change on the water cycle.

Protecting water catchments and reducing pollution to water resources result in similar benefits to end-customers as those described from access to safe water. Protecting water resources directly at the source by limiting pollution from catchments also generates indirect benefits, such as avoided (investment and treatment) costs and can be overall more cost-effective. Increasingly, countries are recognising the benefits of managing water resources using a whole of basin or river basin approach, given that reducing pollution at the source tends to be a cheaper option than treating water before supplying it to consumers.

In order to ensure a reliable water supply there is a need to balance water supply and demand. The degree of certainty with which water is supplied is an important factor in determining the benefit that water users derive from the service and strongly influences their willingness-to-pay. Increased reliability of water supplies avoids the need for households to store water for shortage situations and therefore induces cost savings. Water reliability is also an important parameter for economic activities (industries, but also agriculture and services) which use water in their processes or as a non-substitutable input.

Using benefit values to allocate funds to the sector

There is a clear demand from policy makers for information on the benefits of investing in water resource management in general and in water and sanitation services in particular. Reliable benefit information could be used to support critical policy and investment decisions, such as:

- ***To define investment strategies and prioritise investments***, so that funds can be better targeted where net benefits are likely to emerge for the largest group or the low-income or both.
- ***To evaluate how benefits are shared between users and inform tariff-setting policies***. Benefits from WSS investments are not equally shared amongst users, whereas benefits from water services are usually experienced at household level, benefits from sewerage services are shared by a community as a whole. Benefit information can provide information on willingness-to-pay for given service