

## Reducing system water loss and leakages

**Challenge:** Too little water      **Adaptation response:** Water efficiency and demand management

### Description

Leak detection and water loss control are important measures to improve efficiency in distribution systems and avoid unnecessary withdrawals. 'Real' water losses are defined as the amount of water lost between the supplier and the consumer, while 'apparent' losses are defined as those due to inaccurate consumption measurements by the consumer or utility.

Distribution network leakages, storage overflows and poor equipment maintenance can lead to real water losses, while apparent losses result from imprecise metering, data errors and unauthorized consumption by a third party. Implementing leak detection systems, pressure control, maintaining meters, and controlling against unauthorized use, are all measures that can help mitigate real and apparent water losses (also known as non-revenue water).

### Implementation

Distribution system and flow overview and assessment of real and apparent water losses informs responses to system loss. The assessments are typically funded and carried out by water utilities, and involve assistance from utility staff and technical experts. They also usually include system hydraulic modelling, water balance calculations, testing of meters, pipes and other equipment, billing record registration (to avoid unauthorized billing), and re-assessing data input and models for calculation inaccuracies. Based on the assessment, a water loss reduction program can be implemented, which may include repair of equipment (pipes, storage tanks, meters), installation of modern and high-efficiency systems such as leak detection systems, new data-handling software, etc. Implementation of one or more of these response measures can considerably reduce system losses.

### Environmental Benefits

- Reduces unnecessary water abstraction from the source.
- Requires less energy for water abstraction and treatment and transportation, thus reducing carbon footprint.

### Socioeconomic Benefits

- Decrease loss of non-revenue water, reducing abstraction and treatment costs while still meeting water demands.
- Mitigates water damages to infrastructure from leakages, in turn reducing risks of water pollution from seeping pipes.
- Improves revenue stream for water utilities, increasing revenue share.

### Opportunities and Barriers

#### Opportunities:

- Several environmental and socio-economic benefits result from investment in reduced system leakages
- Interventions can raise public awareness about water conservation, promoting water efficiency and sustainable behaviour

# Climate Change Adaptation Technologies for Water

A practitioner's guide to adaptation technologies for increased water sector resilience

WATER ADAPTATION TECHNOLOGY BRIEF

UN Environment-DHI Centre  
on Water and Environment



**CTCN**  
CLIMATE TECHNOLOGY  
CENTRE & NETWORK

**UNEP DTU**  
PARTNERSHIP

- Reduced pressures on freshwater sources and energy savings lead to climate change adaptation and mitigation benefits
- Reduced health risks and potential to increase consumer satisfaction

## Barriers:

- If water costs are relatively low, the incentive for saving may be low
- Identification of exact locations of leaks and system faults may be challenging in older supply and distribution systems, particularly in underground networks, and repair may be challenging in densely inhabited areas, for example, if pipelines are situated under roads, expenses may involve road re-construction.

## **Implementation considerations\***

Technological maturity: 4-5

Initial investment: 3-4

Operational costs: 2-3

Implementation timeframe: 2-3

\* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:

*Technological maturity:* 1 - in early stages of research and development, to 5 – fully mature and widely used

*Initial investment:* 1 – very low cost, to 5 – very high cost investment needed to implement technology

*Operational costs:* 1 – very low/no cost, to 5 – very high costs of operation and maintenance

*Implementation timeframe:* 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity

This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

### Sources and further information

Alliance for Water Efficiency (2016). Water Loss Control - What Can Be Done? NFP. Available at:

[http://www.allianceforwaterefficiency.org/Water\\_Loss\\_Control\\_-\\_What\\_Can\\_Be\\_Done.aspx](http://www.allianceforwaterefficiency.org/Water_Loss_Control_-_What_Can_Be_Done.aspx)

Armstrong, A., Bartram, J., Lobuglio, J. and Elliott, M. (n.d.). Leakage management in piped systems.

ClimateTechWiki. Available at: <http://www.climatetechwiki.org/content/leakage-management-piped-systems>

GIZ (2011). Guidelines for water loss reduction: A focus on pressure management. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and VAG Armaturen GmbH. Available at:

<https://www.giz.de/fachexpertise/downloads/giz2011-en-guideline-water-loss-reduction.pdf>

Lahlou, Z.M. (2001). Leak Detection and Water Loss Control. National Drinking Water Clearinghouse, West Virginia University. Available at:

[http://www.nesc.wvu.edu/pdf/dw/publications/ontap/2009\\_tb/leak\\_detection\\_dwfsom38.pdf](http://www.nesc.wvu.edu/pdf/dw/publications/ontap/2009_tb/leak_detection_dwfsom38.pdf)

NRDC (2015). Water Audits & Water Loss Control for Drinking Water Utilities: Costs and Benefits. Natural Resources Defense Council. Available at: [https://www.nrdc.org/sites/default/files/wat\\_15040301a.pdf](https://www.nrdc.org/sites/default/files/wat_15040301a.pdf)

Pedersen, J. Baadsgaard (Ed.) & Klee, P. (Ed.in C.). (2013). Meeting an increasing demand for water by reducing urban water loss — Reducing Non-Revenue Water in water distribution. The Rethink Waternetwork and Danish Water Forum White Papers, Copenhagen. Available at [www.rethinkwater.dk](http://www.rethinkwater.dk)

State of Green (2016). Reducing Urban Water Loss. State of Green and Danish Water Forum. Available at:

<https://stateofgreen.com/files/download/9809>