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D.T1.3.1 Technical Training Manual on Urban Circular Water Management for Municipalities

fbr, Association for Rainwater Harvesting and Water Utilisation

MODULE 7: WATER LOSS REDUCTION

➢ Introduction

➢ What is Non-Revenue Water (NRW)?

➢ The International Water Organisation (IWA) „Water Balance"

➢ IWA leakage management

➢ Performance indicators for water loss

➢ Case studies: Aarhus and Milan

➢ Benefits and barriers to water loss reduction (WLR) programmes

➢ Conclusions & references

INTRODUCTION

➢ Water loss is defined as the difference between water pumped into system and billed water

➢ Water loss occurs in every water distribution system during its overall operational lifetime

➢ It causes not only additional operating costs but also has negative social and ecological impacts

25-50% of all distributed water globally is lost or never invoiced due to:

- Leakages
- Deteriorating infrastructure
- Incorrect water pressure management
- Inaccurate billing systems
- Inaccurate metering
- Illegal connections

INTRODUCTION

- The aim to eliminate water loss completely, despite their environmental benefits, is economically unprofitable

- Therefore, water utilities aim to limit water loss to an economically reasonable level, since further reduction would generate higher costs than profits made from water saved

- The estimated economically reasonable level of water loss is approx. 8 - 10% or 5 - 6%, depending on the water source

- Despite the increase in detection methods to reduce water losses, their exact evaluation is still impossible

- To reduce water losses more effectively, it is best to localise the sources which generate the biggest losses

- An estimated 80% - 100% of real water losses are caused by water leakages from pipes

Water loss reduction (WLR)

➢ Represents an efficient alternative to exploiting new and cost-intensive resources and measures (dams, deep wells, desalination), thus contributing to a sustainable and integrated water resources management

➢ Provides a starategic direction for utility managers to determine the best approach to reducing losses

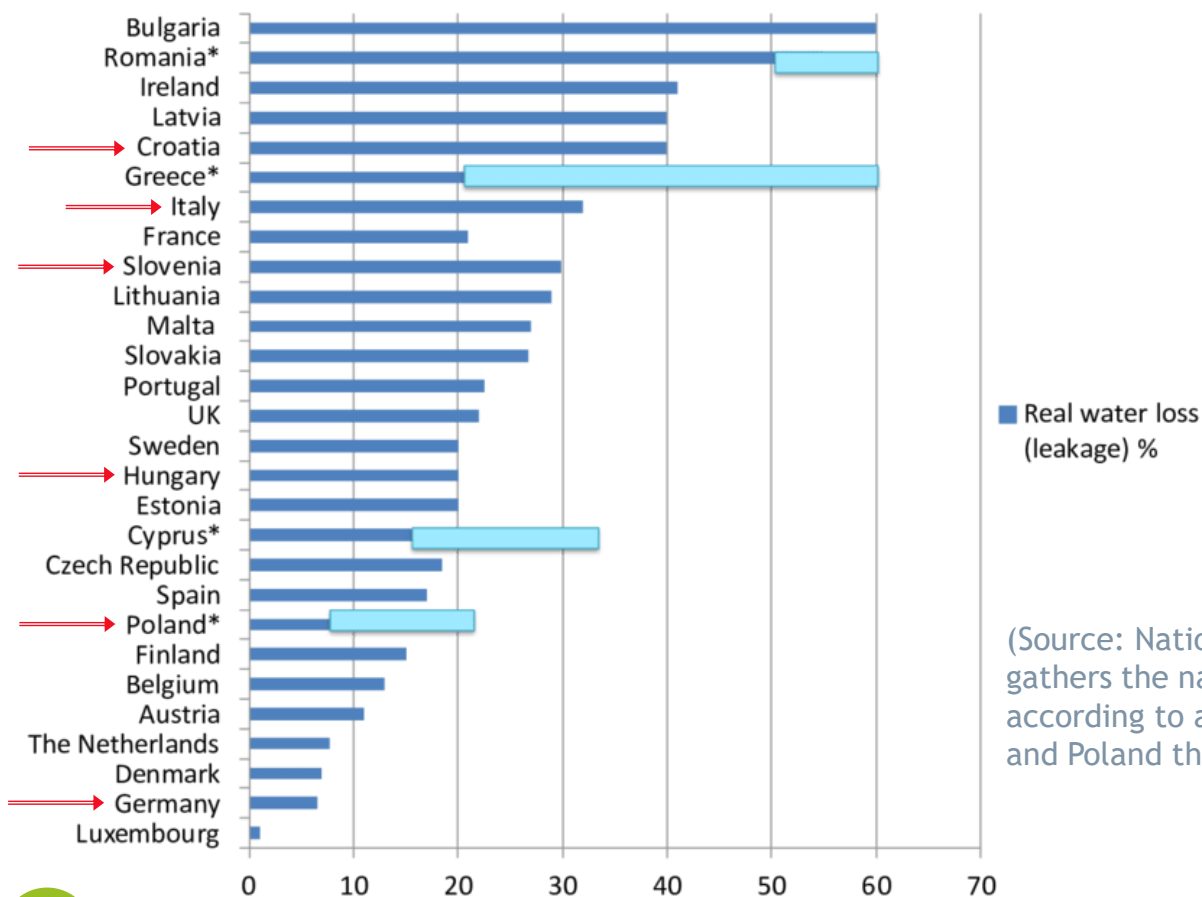A sound WLR strategy consists of:

1. An initial situational analysis to assess Non-Revenue Water (NRW)
2. Formulation of clear objectives and targets for the water distribution network
3. Setting an action plan for the implementation phase

Water losses of water supply networks in the EU (%)
(as averages of volume supplied)
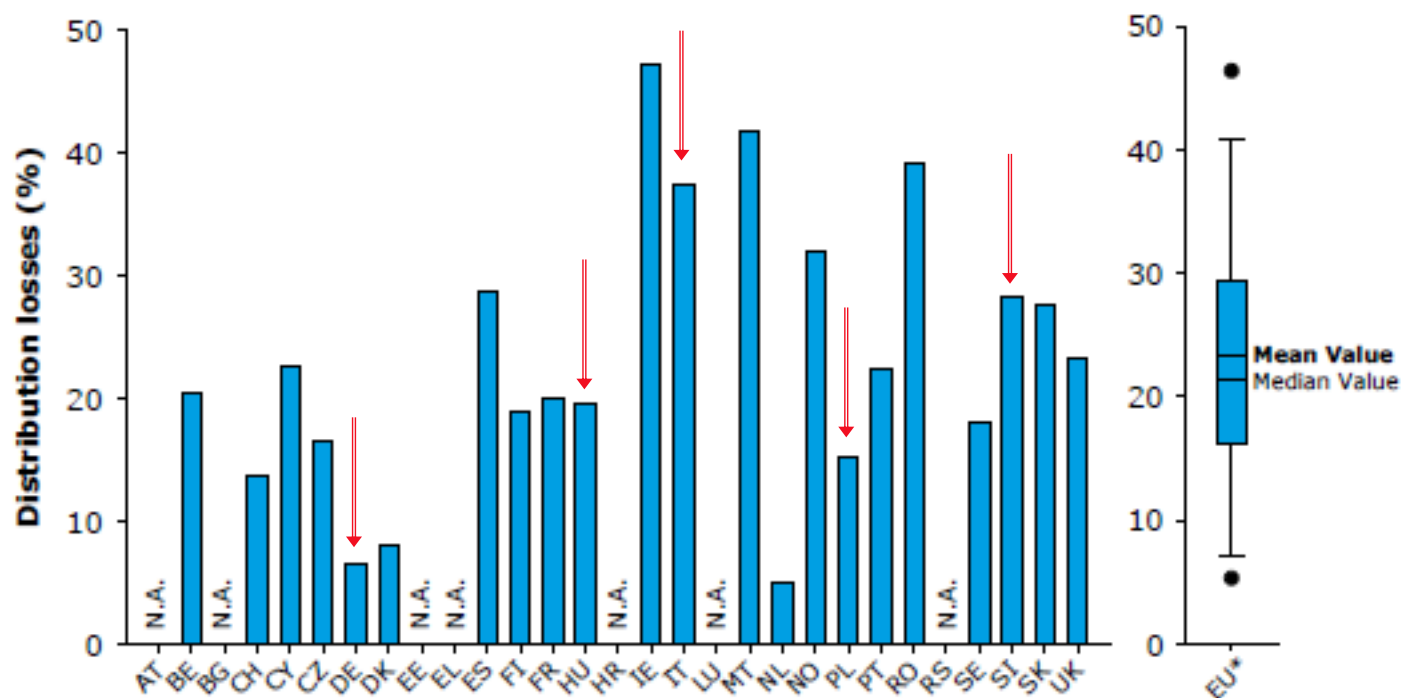

Real water loss (leakage) %

(Source: National sources (Country Fiches). This figure gathers the national data available for different years, according to availability. * For Romania, Greece, Cyprus and Poland the figure presents average ranges)

Average distribution losses in Europe in percentages
(Mean value for losses = 23%)

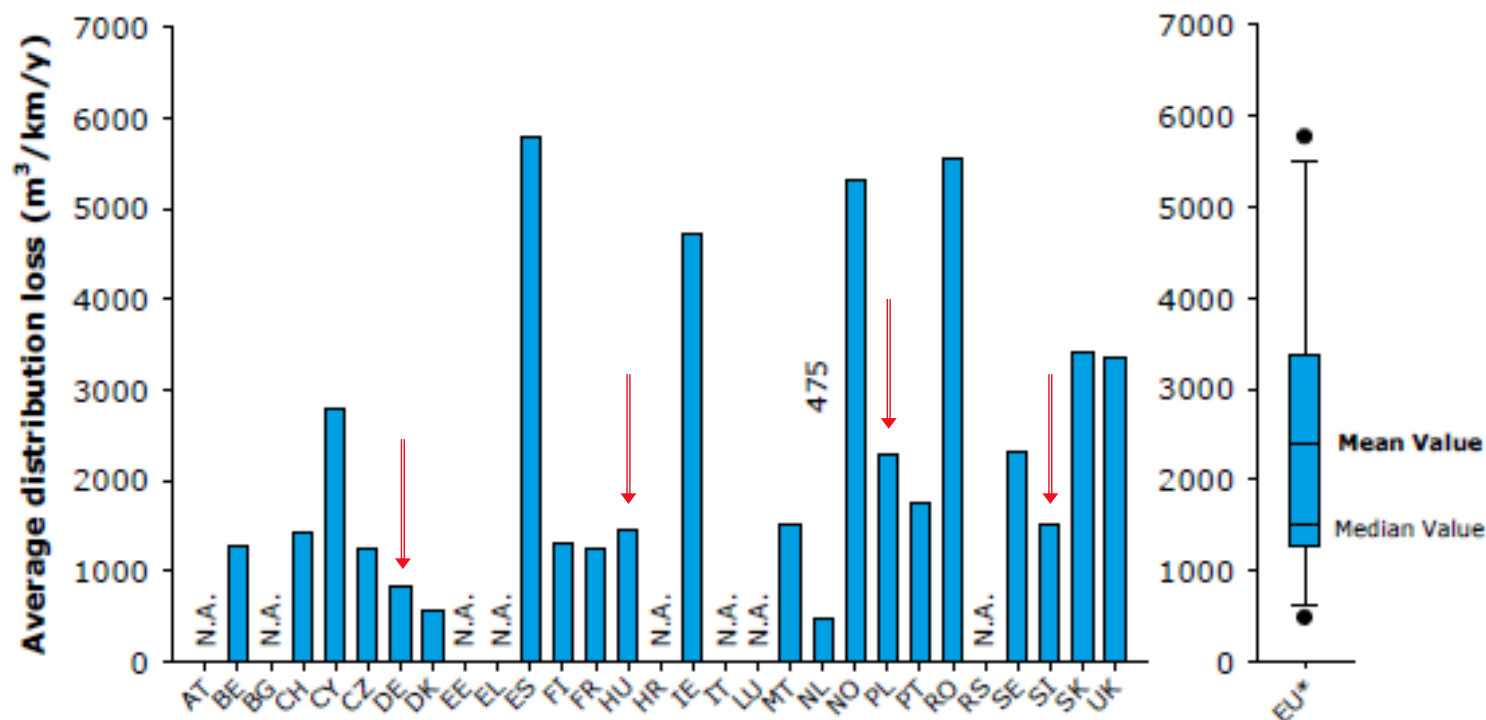(Source: http://www.eureau.org/resources/publications/1460-eureau-data-report-2017-1/file)

Average distribution losses in Europe in $m^3/km/y$
(Mean value for losses = 2,171 $m^3/km/y$)

(Source: http://www.eureau.org/resources/publications/1460-eureau-data-report-2017-1/file)

INTRODUCTION

Water losses in the public water supply in Germany since 2001
(in percent based on the gross volume of water)
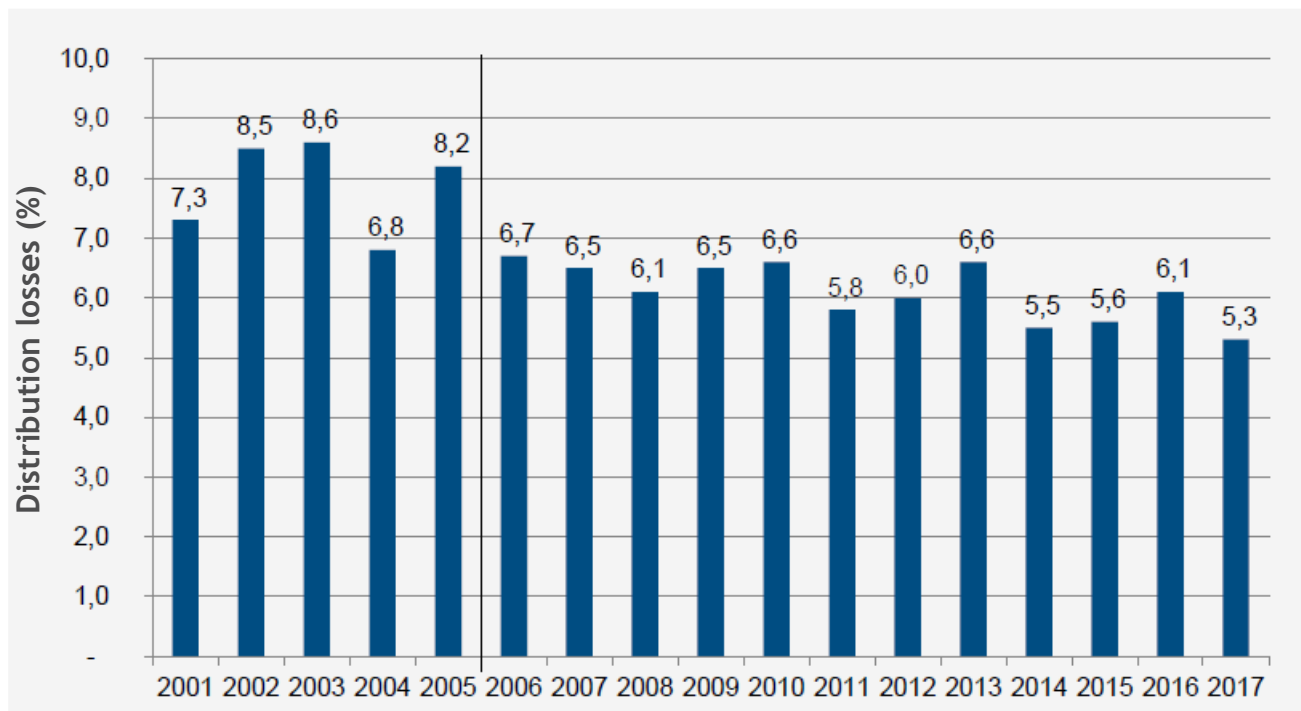
(Source: German Federal Statistical Office)

Water losses in Denmark

Non-Revenue Water, 2011-2016*
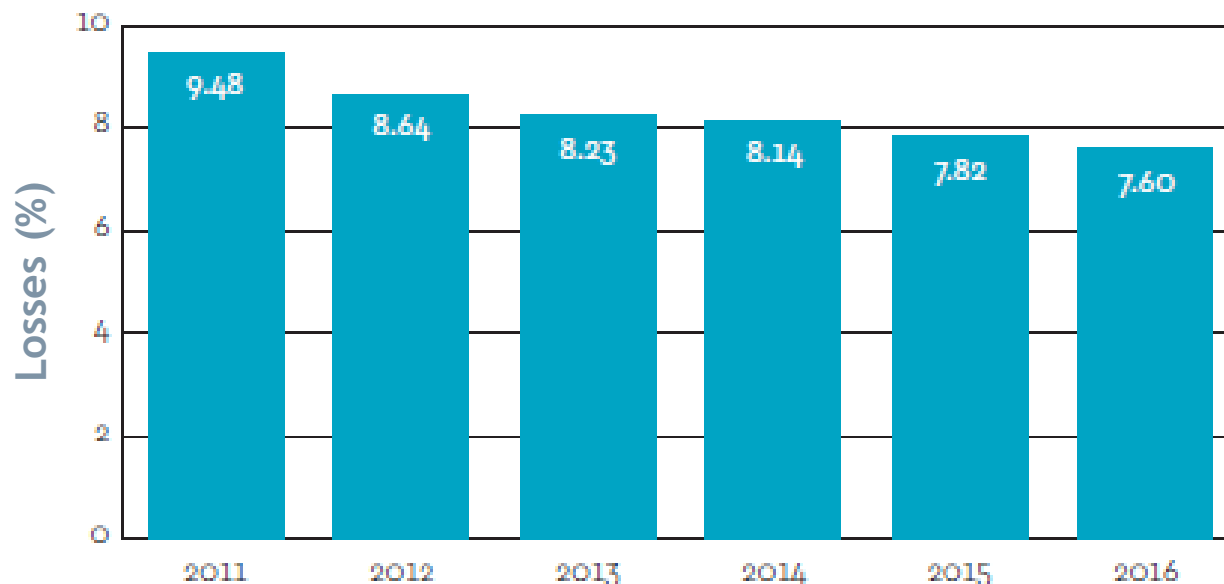
*Simple average (%) based on 52 drinking water companies which have participated in DANVA Benchmarking for the past 6 years (Source: https://www.danva.dk/media/4662/water-in-figures_2017.pdf)

INTRODUCTION

Croatia – very high water losses

➢ Croatia has the largest supply of drinking water in the European Union, <u>but</u> also the highest losses of water

➢ Up to **80%** of the drinking water from the domestic water supply systems is lost mainly due to leakages from old pipes

https://www.thedubrovniktimes.com/news/croatia/item/6060-largest-drinking-water-supply-in-europe-and-largest-losses-through-leakage

Milan / Italy – Wide range of water losses!

➤ Milan is one of the most virtuous provincial capitals in Italy with a percentage of network losses of **11.5%**, well below the national average of **39%.** This is due to:

- o Constant commitment to reducing water losses
- o Use of more efficient intervention and management technologies
- o Adoption of new instruments for financing the investments

➤ **Water losses: 26%** in Northern Italy – **46%** in Central Italy – **45%** in Southern Italy

➤ The high water losses are mainly due to the poor condition of the water infrastructure

Sources: Utilitalia – Istat; https://www.mmspa.eu/wps/portal/mmspa/en/home

INTRODUCTION

Importance of water loss reduction

- ➢ Ecological aspects
- ➢ Hygienic aspects
- ➢ Economic aspects (water export, production costs)
- ➢ Security of supply:
  (for example, a 5 mm hole and 5 bar pressure can induce 32,000 litres of daily water losses. This corresponds to a daily drinking water demand for 266 persons at an average consumption of 120 l/P*d)

What is Non-Revenue Water (NRW)?

Non-Revenue Water (NRW) is the difference between the amount of water a water utility pumps into the distribution system and the amount of water that is billed to its consumers. It includes:

1. **Real losses** (physical losses): comprise leakage from all parts of the system and overflows at storage tanks. Real losses are caused by poor operations and maintenance, lack of ative leakage control and poor quality of infrastructure

2. **Apparent losses** (commercial losses): caused by inaccurate metering, data handling errors and illegal water tapping

3. **Unbilled authorised consumption**: water used by the utility for operational purposes, such as water for flushing, firefighting, and water provided for free to certain consumer groups

NON-REVENUE WATER

Interreg
CENTRAL EUROPE
CWC
European Union
European Regional
Development Fund

```
                        Non-Revenue Water
                             (NRW)

    Real loss            Apparent loss        Unbilled authorised
  (physical loss)      (commercial loss)         consumption

  Leakages and          Inaccurate              Unbilled
  pipe breaks            metering               metered
                                               consumption

    Storage            Data handling            Unbilled
    overflows             errors               unmetered
                                               consumption

    House             Illegal tapping
  connection
    leaks
```

IWA Water Loss Specialist Group (IWA-WLSG)

- The **International Water Organisation (IWA) WLSG** has developed a water audit methodology ("Water Balance") accounting for all water entering a water supply system, which has been accepted worldwide

- The **IWA Water Balance** provides a standardised approach using a common international terminology based on best practice for many countries

- An **annual** water balance is normally used to assess NRW and its components

- It is a useful tool to analyse the various components of water production, storage and distribution processes

- This analysis helps identify water loss problems and set priorities

- A provision for entering 95% confidence limits for all data entry items also exists to indicate the reliability of calculated NRW and leakage volumes

IWA WATER BALANCE

Internationally recognised best practice approach to calculate water balance according to IWA

System Input Volume Q_i	Authorised Consumption Q_A	Billed Authorised Consumption Q_{BA}	Billed metered consumption (including water exported)	Revenue Water
			Billed unmetered consumption	
		Unbilled Authorised Consumption Q_{UA}	Unbilled metered consumption	Non-Revenue Water (NRW)
			Unilled unmetered consumption	
	Water Losses Q_L	Apparent Losses Q_{AL}	Unauthorised consumption	
			Customer metering inaccuracies and data handling errors	
		Real Losses Q_{RL}	Leakage on transmission and/or distribution mains	
			Leakage and overflows at utility's storage tanks	
			Leakage on service connections up to point of customer metering	

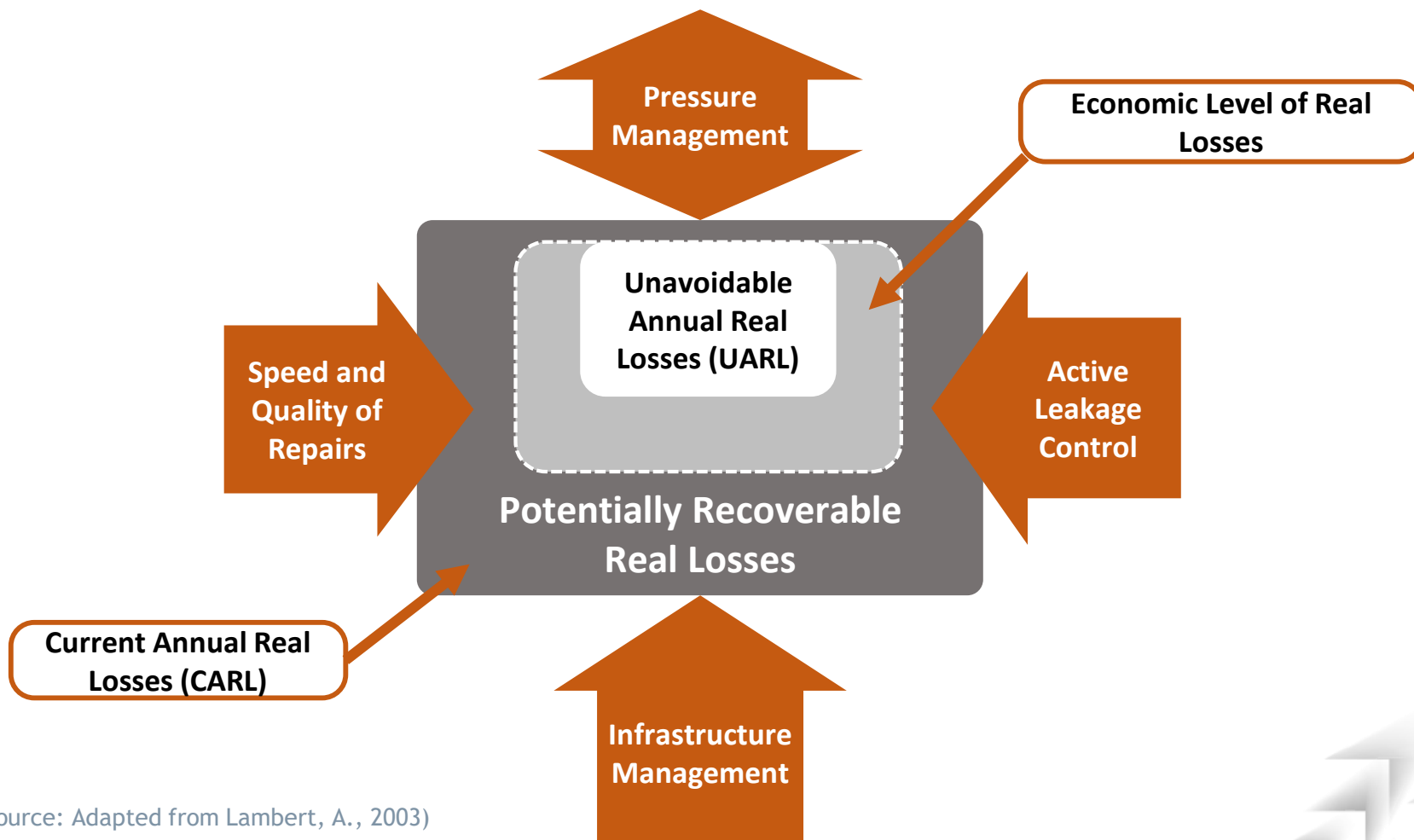(Source: Lambert, A. and W. Hirner, 2000)

Intervention strategies of leakage management

The IWA-WLSG group has also identified <u>four</u> intervention strategies to reduce real water losses:

1. **Pressure management (PM)**
2. **Active leakage control (ALC)**
3. **Infrastructure and asset management**
4. **Speed and quality of repairs**

IWA intervention strategies to reduce water losses

(Source: Adapted from Lambert, A., 2003)

IWA LEAKAGE MANAGEMENT

Intervention strategies of leakage management

➢ The four leakage management strategies interact with each other. For example, pressure management reduces real losses since decreasing pressure directly diminishes leakage from pipelines and household connections

➢ A single method or a combination of different methods will constitute the most efficient and economic instrument for water loss reduction depending on the local situation

➢ The separation of NRW into its components should always be attempted

➢ The components of the water balance should always be calculated and expressed as volumes (usually in m^3) over a given period of time (usually per year)

➢ NRW expressed as a percentage of system input volume is not very useful when comparing the water loss performance between utilities. The most correct figure for NRW is **m³/km of pipe/day** or **litre/service connection/day**

Terminology

➤ Real Losses cannot be eliminated totally. The lowest technically achievable annual volume of Real Losses for well-maintained and well-managed systems is known as **Unavoidable Annual Real Losses** (**UARL**)

➤ UARL is the most reliable predictor yet of „how low could a utility go" with real losses for a specific system

➤ Each system has a different UARL base level, which varies widely depending on density of connections, length of connections (main to meters) and average pressure

➤ Using the four recommended strategies of leakage management, Real Losses can be controlled but cannot be reduced any further than the URAL (at the current operational pressure)

➤ The difference between the UARL (small rectangle) and the **Current Annual Real Losses (CARL)** is the **Potentially Recoverable Real Losses**

PERFORMANCE INDICATOR FOR WATER LOSS

The adoption of a sound performance indicator system is essential for improving a water utility's performance and quality of service.

The most widely used performance indicator for water loss performance is the percentage of NRW as calculated by dividing total volume of NRW by the total system input. Although an obviously important figure, many practitioners tend to overlook its shortcomings for properly assessing water losses:

➢ It does not indicate the ratio between physical and commercial losses
➢ It is dependent on utility-specific distribution network characteristics (e.g. network length, number of connections)
➢ It is highly dependent on supply time (intermittent supply) and average operating pressure
➢ It is highly dependent on the level of consumption

Infrastructure Leakage Index (ILI)

➢ The ratio of the Current Annual Real Losses (CARL) to the Unavoidable Annual Real Losses (UARL) is the **Infrastructure Leakage Index (ILI):**

$$ILI = \frac{CARL}{UARL}$$

➢ The International Water Association (IWA) uses ILI as a **performance indicator** for leakage which adjusts the measured loss, taking into account the service pressure and the length of the network

➢ ILI, is the current annual real losses expressed as a multiple of each system's specific UARL

➢ ILI measures how effectively the infrastructure activities such as repairs, active leakage control and pipeline/assets management are being managed at current operating pressure

Physical loss assessment matrix

A simple matrix was published in 2005 which provides insight into typical ILI values for different situations. This approach can be used to classify the leakage levels for utilities in developed and developing countries into four categories:

➢ **Category A**: Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost-effective improvement

➢ **Category B**: Potential for marked improvements; consider pressure management; better active leakage control practices and better network maintenance

➢ **Category C**: Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyse level and nature of leakage and intensify leakage reduction efforts

➢ **Category D**: Highly inefficient; leakage reduction programs imperative and have high priority

Physical loss assessment matrix

Technical Performance Category		ILI	Litres/connection/day (when the system is pressurised) at an average pressure of:				
			10 m	20 m	30 m	40 m	50 m
Developed Countries	A	1 - 2		< 50	< 75	< 100	< 125
	B	2 - 4		50-100	75-150	100-200	125-250
	C	4 - 8		100-200	150-300	200-400	250-500
	D	> 8		> 200	> 300	> 400	> 500
Developing Countries	A	1 – 4	< 50	< 100	< 150	< 200	< 250
	B	4 – 8	50-100	100-200	150-300	200-400	250-500
	C	8 - 16	100-200	200-400	300-600	400-800	500-1000
	D	> 16	> 200	> 400	> 600	> 800	> 1000

(Source: R. Liemberger and R. McKenzie, 2005)

1. Pressure management (PM)

➢ Pressure management "is the practice of managing system pressures to the optimum levels of service ensuring sufficient and efficient supply, while

- o reducing unnecessary or excess pressures
- o eliminating transients and faulty level controls
- o reducing the impact of theft

all of which cause the distribution system to leak unnecessarily" (IWA WLSG definition).

➢ It is widely accepted that pressure management reduces leak flow rates and the frequency of leaks in older mains and services, which in turn can extend infrastructure life

➢ Reduction of excess pressure and pressure transients assists all other interventions of leakage management

➢ Active leakage control without pressure management is often ineffective

➢ Service reservoirs are an excellent way of controlling pressures in the network as well as providing storage, but they can be a source of water loss from leakage and overflows, necessitating continuous monitoring

2. Speed and quality of repairs

- Repairing known leaks promptly and effectively is one of the simplest and most cost effective ways of reducing leakage

- Known leaks are leaks which have been found by active leakage control. These have to be repaired at some point in time. However, the aim should be to avoid excessive repair time

- The quality of repairs should be monitored by utility staff to minimize the risk of a repeat leak. Valve operations to isolate a section of main for repair should be carried out in a manner that reduces the risk of introducing pressure transients, which could cause additional leaks

- If there are contracts for leakage repairs, there should be a service level agreement (SLA) which provides an incentive to the contractor to conduct repairs within a set time period, and/or a penalty for failing to do so

3. Active Leakage Control

➢ Active leakage control (ALC) is the monitoring of network flows on a regular basis to identify occurrence of new leaks or bursts earlier, so that they can be repaired as soon as possible

ALC consists of two stages:

- o **Leak monitoring and localisation**
- o **Leak location and pinpointing**

Leak monitoring and localisation

➢ The purpose is to identify the area of the network in which leakage is occurring in order to prioritise field survey

➢ A popular approach is to divide the network into **District Metered Areas (DMAs)** by shutting valves permanently and installing meters equipped with **telemetry data loggers**, allowing continuous monitoring of zone consumption from which an estimate of leakage can be made

➢ Another method, the **mobile waste metering**, involves valves being shut temporarily and mobile meters installed in vans and connected via flexible hoses to permanent connections in the network, being used to measure flows

➢ A **hybrid system** involves permanently installed meters with the boundary valves being closed temporarily to measure a night flow

➢ Recent developments in software linked to hydraulic network models or artificial intelligence routines use **flow and pressure data** to identify new leaks and suggest hot spots where field surveys should be carried out

IWA LEAKAGE MANAGEMENT

➤ In areas where it is not practical or economic to install DMAs or waste meter areas, such as in city centres or within larger DMAs, leaks may be localised using **acoustic data loggers** which can be installed permanently or temporarily. There are various systems on the market, some of which automatically send an alarm when a new leak occurs

➤ Another alternative to DMAs is the use of so-called **virtual DMAs** (or virtual zone monitoring) which monitor flow only or combinations of flow and/or pressure and/or noise at strategic points, with software identifying any changes from the normal pattern which could indicate a new leak (**"multi-parameter measurement"**)

➤ Within a DMA, the leak can be further localised by shutting valves inside the DMA to isolate sections of main, or by operating valves to move the boundary of the DMA temporarily, in a process known as **step testing**. When the section of network containing the leak is isolated the drop in flow rate into the DMA will be greater than that which would be expected due to isolating customer consumption alone

IWA LEAKAGE MANAGEMENT

District Metered Areas (DMAs)

A hydraulic model can be used to calculate the optimal design of a DMA.

The optimum size of a DMA depends on a number of factors including:

- The operating environment, whether it is urban, sub-urban or rural
- The configuration of the distribution network taking into account natural breaks created by rivers, major roads and open spaces
- The balance between a preference for single feed DMAs and the need to include multiple feeds for added security of supply
- The rate of rise of unreported leakage and the required economic frequency of ALC intervention
- The method of data collection and analysis

IWA proposes in its DMA Guidance Notes a zone size of **500** up to **3,000** connections. In large zones, leakage-related flow rate changes are difficult to detect.

Leak location and pinpointing

- Once a leak has been localised it can be located and pinpointed using a variety of techniques to indicate the general leak location, or to pinpoint it prior to excavation in order to conduct repairs

- As well as being used for un-reported leaks, these techniques are also used for reported leaks, around where water is present on the surface

- Location and pinpointing techniques include **acoustic** and **non-acoustic techniques**

IWA LEAKAGE MANAGEMENT

Leak detection methods and their suitability for types of mains

Leak detection methods		Suitability for		
		Service pipes	Distribution mains	Trunk mains
Acoustic techniques	Basic Listening stick	Yes	Yes	
	Electronic listening stick	Yes	Yes	
	Leak noise correlator		Yes	Yes
	Noise loggers		Yes	
	Multi acoustic sensor strip	Yes	Yes	
	In pipe sounding			Yes
Non-acoustic techniques	Gas injection	Yes	Yes	
	Ground penetrating radar	Yes	Yes	Yes
	Infrared photography			Yes
	In pipe hydraulic plug	Yes		

(Source: EU Reference document good practices leakage management WFD CIS WG PoM)

TAKING **COOPERATION** FORWARD   34

4. Infrastructure management

➢ Infrastructure management includes asset renewal to reduce the rate of occurrence of new leaks and investment in facilities such as DMAs and telemetry to improve the efficiency of ALC operations

➢ Good infrastructure management (asset renewal policy and strategy) supports the leakage management programme and the associated operational activities

➢ In areas with high burst frequencies and/or rates of rise of leakage, an economic decision can be taken to continue repairing the assets or whether to replace them

➢ As an option for reducing leakage, asset replacement is an expensive option compared to active leakage control (ALC) and pressure management (PM). However, in some systems, the condition of the underground assets is so poor that ALC and PM are not sustainable solutions

CASE STUDY: AARHUS, DENMARK

Measures taken by Aarhus water utility to reduce water loss

➢ Aarhus Water (Aarhus Vand) - the utility in Denmark's second largest city supplies 250,000 customers with water and produces 16 million m^3 of drinking water a year

➢ Efforts to reduce water losses have been ongoing since the mid 70's

➢ Over the last 10 years, Aarhus Water managed to reduce its NRW to **6%** and the real pipe loss is only **1.4 m^3/km/day**

➢ The Infrastructure Leakage Index (ILI) is down to **0.83**
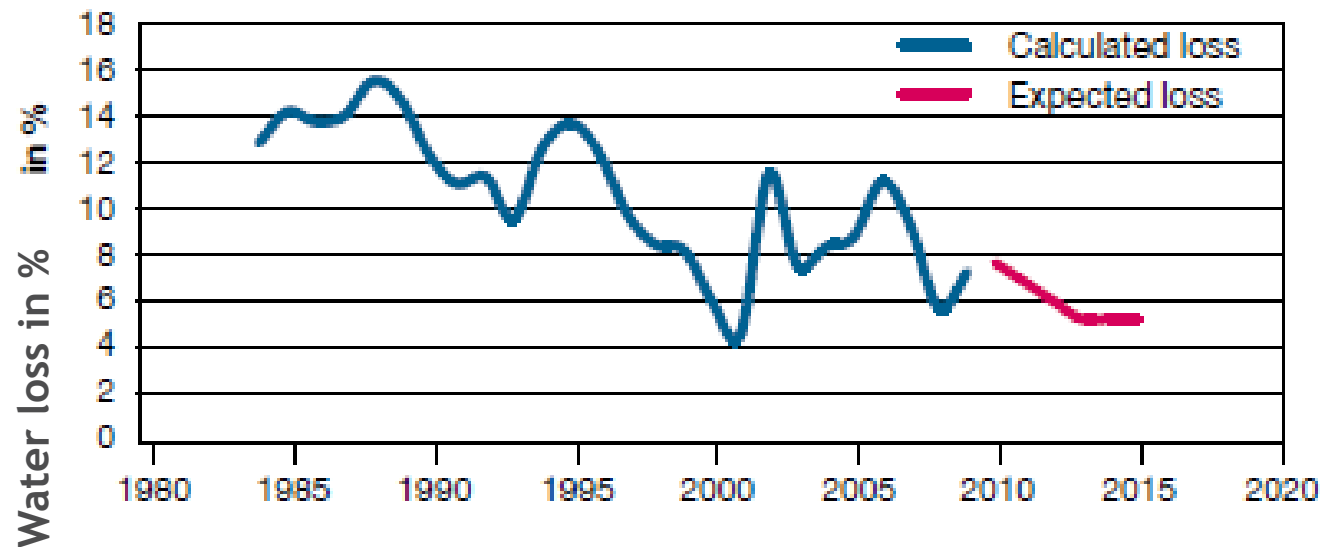
Adopted methods:

o Infrastructure management

o High quality construction work

o Leakage detection

o Pressure management

o Monitoring DMA night flows

o Intelligent pipe replacement programme
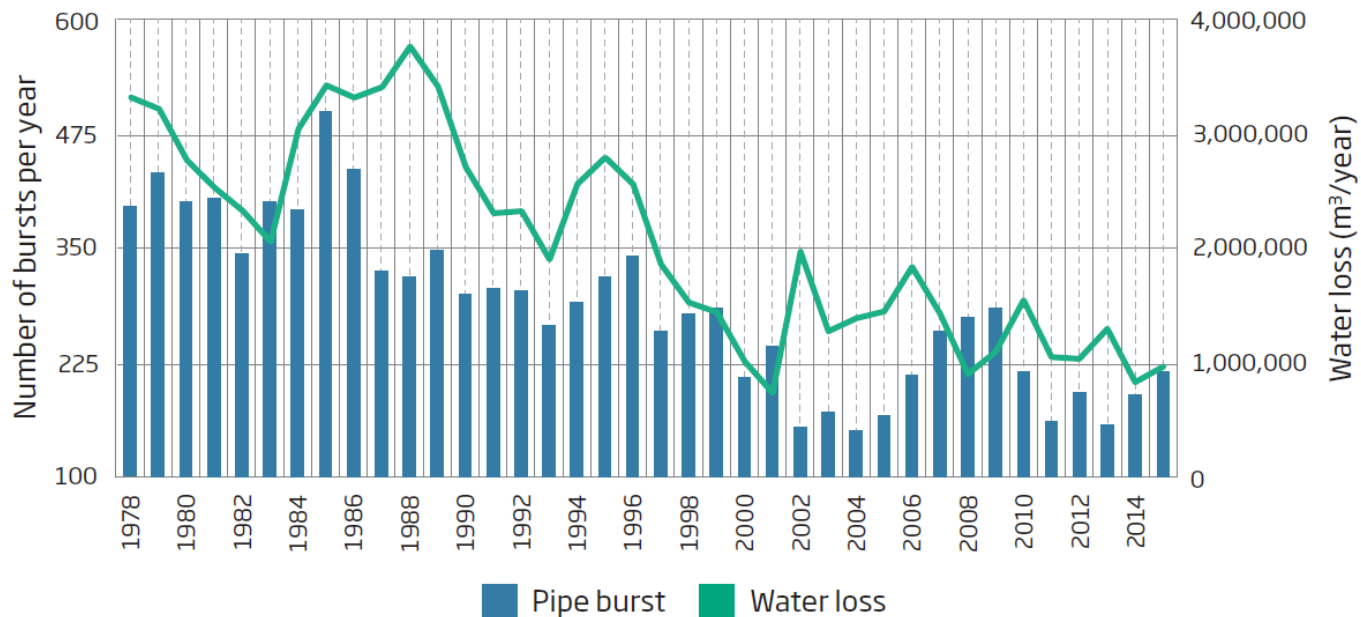
Water losses in Aarhus

(Source: http://www.vpu-aarhus.dk/globalassets/filer/om-os/publikationer/profilbrochure_aarhus_water.pdf)

CASE STUDY: AARHUS, DENMARK

Pipe bursts in Aarhus 1978 - present

(Source: https://stateofgreen.com/en/publications/)

CASE STUDY: MILAN, ITALY

Measures taken by MM to reduce water losses

Since 2003, **MM (Metropolitan Milanese SPA)** manages the Water Service of Milan, handling groundwater withdrawal, purification, distribution, wastewater collection and treatment and the maintenance and investment plan of the water supply and wastewater networks (230 million m^3 of drinking water distributed annually).

MM regularly monitors the losses in network and adopts a strategy for reducing them, which consists of:

➢ **Analyses of losses** using common methods and terms, recognized and approved at an international level (IWA – Water Balance)

➢ **Corrective actions** through field inspections and checks, electroacoustic measures (correlator, noise logger, geophone, acoustic water leak detector, etc.), advanced meter management and pressure control

(Source: https://www.mmspa.eu/wps/portal/mmspa/en/home/mm-for-milan/the-water-service/water-losses/)

With regard to **real (physical) losses**, MM carries out the following activities:

- Statistical analysis and georeferencing of hidden and evident losses
- Analysis of network pipes subject to several consecutive breakages
- Drawing up of water balances using standard methods
- Management of leak location and repair campaign (asset management system)
- Pressure management
- Leak detection: location of hidden leaks in the distribution system
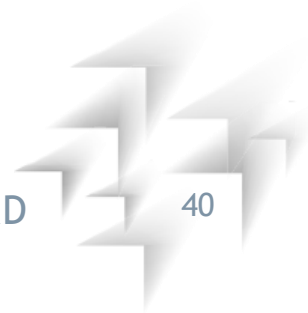
CASE STUDY: MILAN, ITALY

With regard to **apparent losses**, MM deals with meters management:

➢ Analysis of the age of the meters and user consumption values

➢ Laboratory tests on a sample of meters

➢ Data logging of the user consumption values (recording, transmission and analysis of the consumption profiles of specific types of user)

The use of a **smart metering system** ensures an efficient water management and enables pipes to be replaced and repaired quickly. Customers also profit from additional services, which include:

➢ Daily communication of the consumption levels and data recorded through identification of abnormal behaviour (high consumption levels, losses, etc.)

➢ More accurate and regular reading of the user device through a bill based on actual consumption, reducing the number of disputes

➢ Drawing up of network and area reports through a continuous, synchronous loss monitoring

BENEFITS OF WLR PROGRAMME

Benefits of a water loss reduction (WLR) programme for consumers and utilites

- ➢ Reduced water losses and increased revenues
- ➢ Reduced stress on local water resources
- ➢ Reduced energy consumption for abstraction, treatment and distribution
- ➢ A more stable water supply
- ➢ Better support for decision making and customer service due to new management systems
- ➢ Improved water quality due to optimised water distribution
- ➢ A strong basis for setting up a long-term rehabilitation and investment plan for the network

Overcoming barriers and creating political awareness

➢ Failure to successfully reduce NRW is often casued by:

  o An underestimation of the technical difficulties

  o Complexity of the NRW management

  o Lack of understanding of the potential benefits of taking actions

➢ Subsidised water prices may also act as barriers (costs and benefits of investing in NRW reduction will be less transparent)

➢ Overcoming barriers requires involvement of several stakeholders (politicans, water utilities, consumers), as well as new partnerships

➢ The right framework conditions can create incentives for innovation and optimisation as well as increase public awareness on the value of having a stable and efficient water supply

Barriers to WLR reduction in a water utility

➢ Lack of political awareness

➢ Inaccurate data

➢ NRW is ususally not connected to overall sustainability goals

➢ Focus on purchasing price rather than Total Cost of Ownership

➢ Fear of a negative image

➢ Corruption leads to inefficent NRW projects

CONCLUSIONS

How to achieve and maintain a low level of NRW?

➤ Develop a holistic NRW master plan based on the analysis of the current NRW and the state of the water distribution network, which can serve as the basis for upcoming investment plans and their projected returns

➤ This is followed by a continuous focus on monitoring and optimising the water distribution to maintain a low NRW level

➤ Ongoing monitoring and pressure management are best carried out by breaking down the distribution system into smaller DMAs

➤ The quality of installed components such as valves, pumps, pipes and metres etc. also play a key factor in reducing the water loss, since operating costs and repairs are often more expensive than the product itself

➤ Carrying out a successful NRW programme requires commitment from all organistional levels as well as trained staff, who work continuously on keeping NRW levels low

➤ Capacity building at all staff levels in the utility is a key element

REFERENCES

EU Reference document good practices in leakage management WFD CIS WG PoM. Main Repor.t European Commission, 2015
https://circabc.europa.eu/sd/a/1ddfba34-e1ce-4888-b031-6c559cb28e47/Good%20Practices%20on%20Leakage%20Management%20-%20Main%20Report_Final.pdf

Europe's water in figures. An overview of the European drinking water and wastewater sectors (2017) EurEau The European Federation of National Associations of Water Services, Belgium
http://www.eureau.org/resources/publications/1460-eureau-data-report-2017-1/file

Grundfos (2014) Pressure management – An effective way to reduce Non-Revenue Water, improve energy efficiency and reduce operation and maintenance costs. White paper
http://www.studiomarcofantozzi.it/w/wp-content/uploads/2015/03/Whitepaper_English.pdf

Capacity Development for Drinking Water Loss Reduction: Challanges and Experiences (2011) UN-Water Decade Programme on Capacity Development (UNW-DPC). Editors: Hani Sewilam and Karl-Ulrich Rudolph. United Nations University. UN Campus, Bonn
https://www.uni-wh-ieem.de/download/dwlr-unw-dpc-2011.pdf

REFERENCES

Hamilton, S. and R. McKenzie (2014). Water Management and Water Loss. IWA Publishing

Hamilton, S. and B. Charalambous (2013) Leak Detection – Technology and Implementation, IWA Publishing

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2011) Guidelines for water loss reduction – A focus on pressure management. Eschborn, Deutschland. On behalf of Federal Ministry for Economic Cooperation and Development
https://www.researchgate.net/profile/Emmanuel_Oertle2/publication/318792810_Guidelines_for_water_loss_reduction_-_a_focus_on_pressure_management/links/5ad5bb32458515c60f54c66c/Guidelines-for-water-loss-reduction-a-focus-on-pressure-management.pdf

REDUCING URBAN WATER LOSS - How water utilities can improve efficiency and meet future demand for water by reducing Non-Revenue Water (2016). Think Denmark. White papers for a green Transition. State of Green and Danish Water Forum (DWF)
https://stateofgreen.com/en/publications/

REFERENCES

R. Liemberger and R. McKenzie, "Accuracy Limitations of the ILI: Is It an Appropriate Indicator for Developing Countries?" Conference Proceedings, IWA Leakage 2005 Conference in Halifax, Nova Scotia, Canada

https://pdfs.semanticscholar.org/672a/e37afa679d2b7b612d864b689aada58acbfe.pdf

Lambert, A. (2003) Water 21 - Article No 2 Assessing Non-Revenue Water and its Components: A Practical Approach. IWA Water Loss Task Force. International Water Association (IWA)

http://www.pacificwater.org/userfiles/file/Water%2021%20-%20Article%20No_%202%20-%20Assessing%20NRW.pdf

District Metered Areas (DMAs) – Guidance Notes. International Water Association (IWA), 2007

https://iwa-network.org/learn_resources/district-metered-areas-guidance-notes-version-1/