

Presentation of the guidelines

Guidelines for Water Loss Reduction
A Focus on Pressure Management

Table of contents

Objectives of the guidelines

Components and structure of the guidelines

Target groups

Availability of the guidelines

Content of the guidelines

Objectives of the guidelines



Understanding water losses

Where?

How?

Why?

How much?



Objectives of the guidelines

**Reduced
operational &
capital
costs**

**Increased service
life of water
distribution
systems**

**Reduced
health
risks**

Understanding the need for water loss management

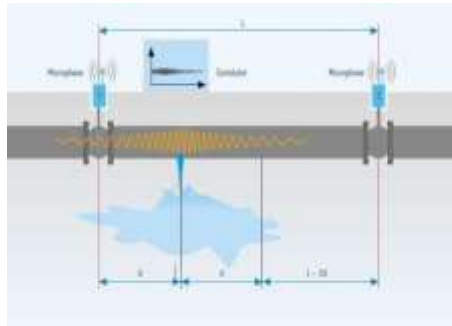
**Improved
customer
satisfaction**

**Reduced
ecologic
stress**

**Less infrastructure
damages & repair
efforts**

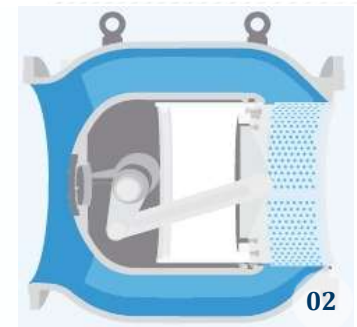
**Increased
security of
supply**

Objectives of the guidelines



Finding adequate solutions and methodologies

Operational release Q_0	Actual network consumption Q_1	Edible network consumption	Edible network consumption	Reserve water	
		Edible network consumption	Edible network consumption		
	Water losses Q_2	Apparent losses Q_3	Unaccounted consumption	Unaccounted consumption	Non-revenue water
			Leakage with associated distribution system	Leakage with associated distribution system	
		Leakage with associated storage tanks	Leakage with associated storage tanks	NDR	
		Leakage with associated water point of connection	Leakage with associated water point of connection		



Components and structure of the guidelines



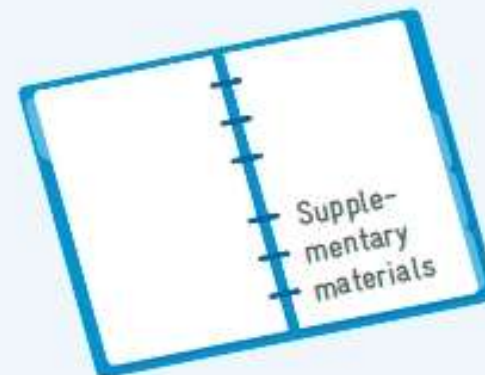
Awareness



Technical backgrounds & solutions



Examples



Components and structure of the guidelines



1 set of modular Training Materials
(PowerPoint presentations)

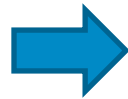


Target groups



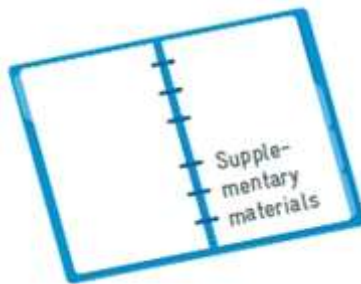
Group 1

Decision makers of national water ministries and / or authorities, water utilities and professional associations.



Group 2

Technical directors, planning & design engineers and technicians from water utilities.



Group 3

Engineers, technicians and operational personnel from water utilities.

Availability of the guidelines



As hardcopy (via GIZ) or download from the project website at www.waterlossreduction.com

Downloadable from the project website



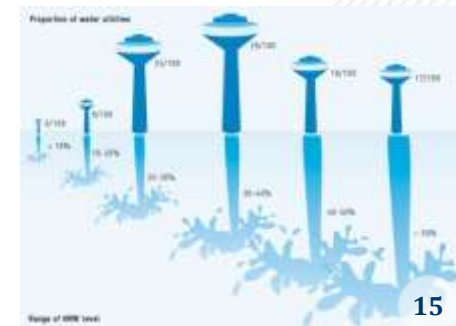
Training Materials



Content of the guidelines – Chapters 1 & 2

Preface and Introduction

- GIZ-VAG public-private partnership (PPP)
- Objectives of the PPP
- Raise the awareness for the importance of WLR
- Highlight the benefits of NRW reduction
- Emphasise the outstanding potential of pressure management for reduction of real water losses
- Produce interest in participating actively in the PPP (pilot projects, trainings, multiplication, etc.)



Content of the guidelines – Chapter 3

Understanding water losses

- **Definitions and terminology**
- Key influencing factors
- Real losses
- Apparent losses
- Wastage

System input volume Q_I	Authorised consumption Q_A	Billed authorised consumption Q_{BA}	Billed water exported	Revenue water
			Billed metered consumption	
		Billed unmetered consumption		
	Unbilled authorised consumption Q_{UA}	Unbilled metered consumption	Non-revenue water	
		Unbilled unmetered consumption		
	Water losses Q_L	Apparent losses Q_{AL}	Unauthorised consumption	NRW
		Customer meter inaccuracies and data handling errors		
Real losses Q_{RL}		Leakage on transmission and distribution mains		
		Leakage and overflows at storage tanks		
		Leakage on service connections up to point of customer		

Content of the guidelines – Chapter 3

Understanding water losses

- Definitions and terminology
- **Key influencing factors**
- Real losses
- Apparent losses
- Wastage



Content of the guidelines – Chapter 3

Understanding water losses

- Definitions and terminology
- Key influencing factors
- **Real losses**
- Apparent losses
- Wastage



01

Content of the guidelines – Chapter 3

Understanding water losses

- Definitions and terminology
- Key influencing factors
- Real losses
- **Apparent losses**
- Wastage



03

Content of the guidelines – Chapter 3

Understanding water losses

- Definitions and terminology
- Key influencing factors
- Real losses
- Apparent losses
- **Wastage**



Content of the guidelines – Chapter 4

Developing a strategy for water loss reduction

- **The need for water loss management**
- Analysis of the present status
- Identification of appropriate measures
- Design and implementation of a water loss control programme

Extent of damages	Description	Potential of damages
Catastrophic	Fatal casualties or permanent health problems	> 10 Mio. \$
Critical	Injury to persons, infrastructure damages and interruptions of production, negative publicity	> 5 Mio. \$
Significant	Interference of population and clients, local supply failures	> 1 Mio \$
Minor	Short-term interference of supply and infrastructure, eventual media coverage	> 0.3 Mio \$
Insignificant	Temporary interference of supply	> 0.1 Mio. \$
Imperceptible	No direct interferences, limited local impacts	< 0.1 Mio. \$

Content of the guidelines – Chapter 4

Developing a strategy for water loss reduction

- The need for water loss management
- **Analysis of the present status**
- Identification of appropriate measures
- Design and implementation of a water loss control programme

	Data origin*	Volume [m ³]	Accuracy band		Standard deviation σ	Variance $V = \sigma^2$
System input Q_i	(M)	1,996,139	± 1.0	→	10,184	103,721,650
Revenue Water Q_{RW}	(M)	1,801,146	± 0.2	→	1,838	3,377,891
Non-Revenue Water Q_{NRW}	(D)	194,993	± 10.4	←	10,349	107,099,541
Unbilled authorised consumption Q_{UJA}	(E)	30,000	± 20.0	→	3,061	9,371,095
Water losses Q_{WL}	(D)	164,993	± 12.8	←	10,792	116,470,637
Apparent losses Q_{AL}	(E)	32,999	± 50.0	→	8,418	70,862,896
Real losses Q_{RL}	(D)	131,994	± 20.3	←	13,687	187,333,533

* With: (M) = metered, (D) = derived, (E) = estimated volumes.

Content of the guidelines – Chapter 4

Developing a strategy for water loss reduction

- The need for water loss management
- Analysis of the present status
- **Identification of appropriate measures**
- Design and implementation of a water loss control programme

Non-revenue water by volumes



Unbilled authorised consumption



Apparent losses



Real losses

Non-revenue water by financial losses



Unbilled authorised consumption



Apparent losses



Real losses

Content of the guidelines – Chapter 4

Developing a strategy for water loss reduction

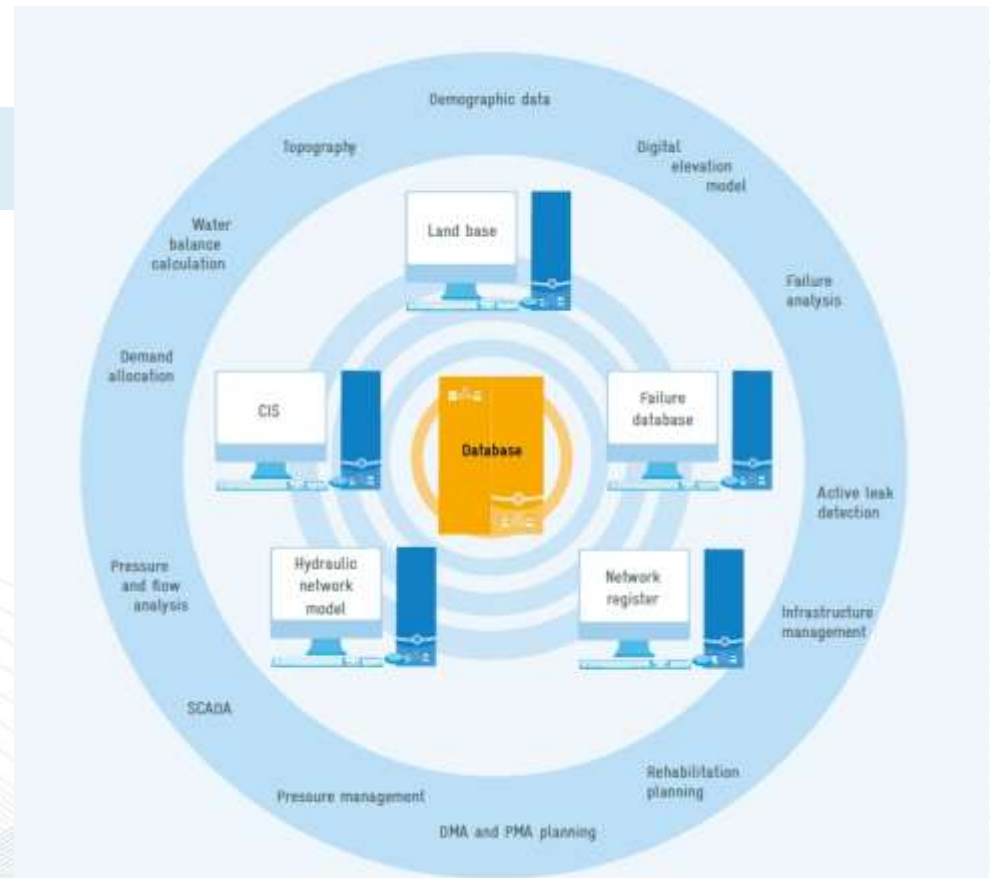
- The need for water loss management
- Analysis of the present status
- Identification of appropriate measures
- **Design and implementation of a water loss control programme**



Content of the guidelines – Chapter 5

Basic prerequisites for sustainable NRW management

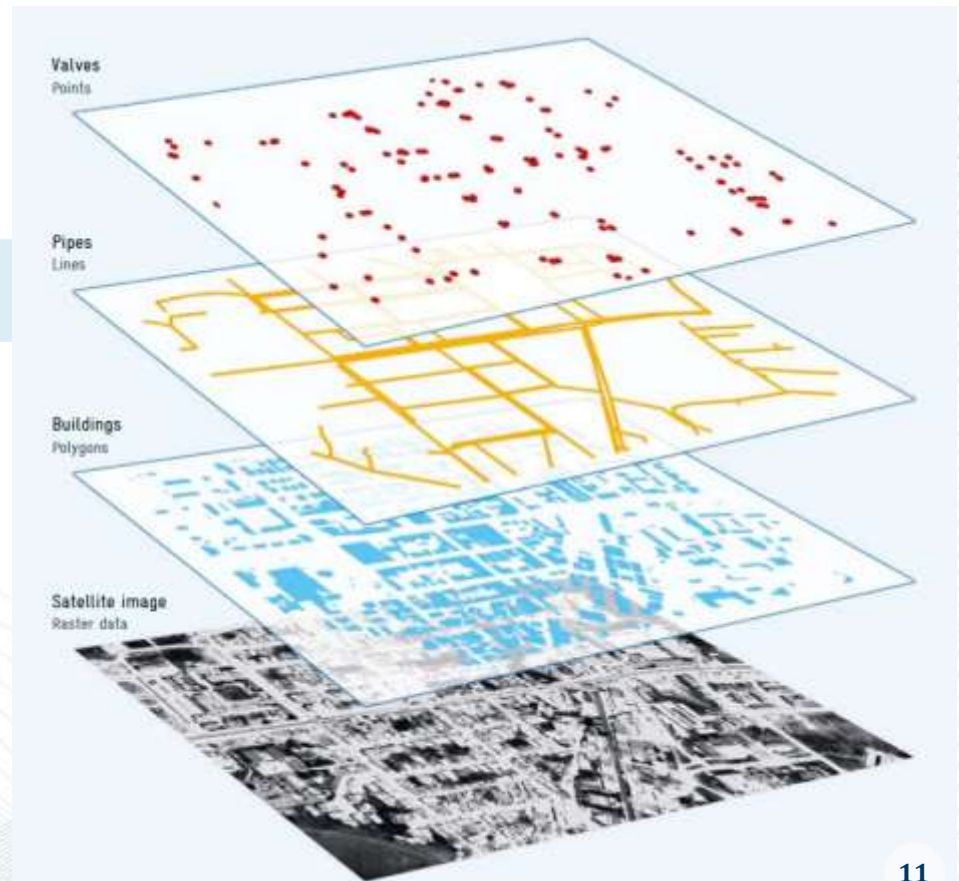
- **Information systems and water loss management**
- GIS basics
- Land base
- Network register
- Hydraulic network model
- Failure data base
- Customer information system



Content of the guidelines – Chapter 5

Basic prerequisites for sustainable NRW management

- Information systems and water loss management
- **GIS basics**
- Land base
- Network register
- Hydraulic network model
- Failure data base
- Customer information system



Content of the guidelines – Chapter 5

Basic prerequisites for sustainable NRW management

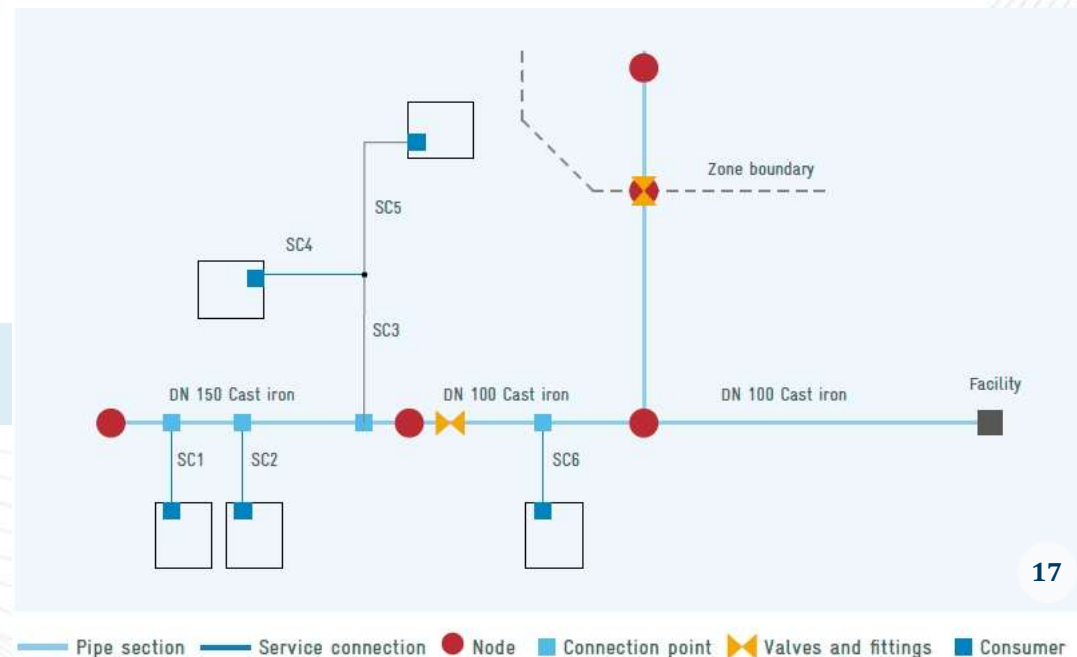
- Information systems and water loss management
- GIS basics
- **Land base**
- Network register
- Hydraulic network model
- Failure data base
- Customer information system



Content of the guidelines – Chapter 5

Basic prerequisites for sustainable NRW management

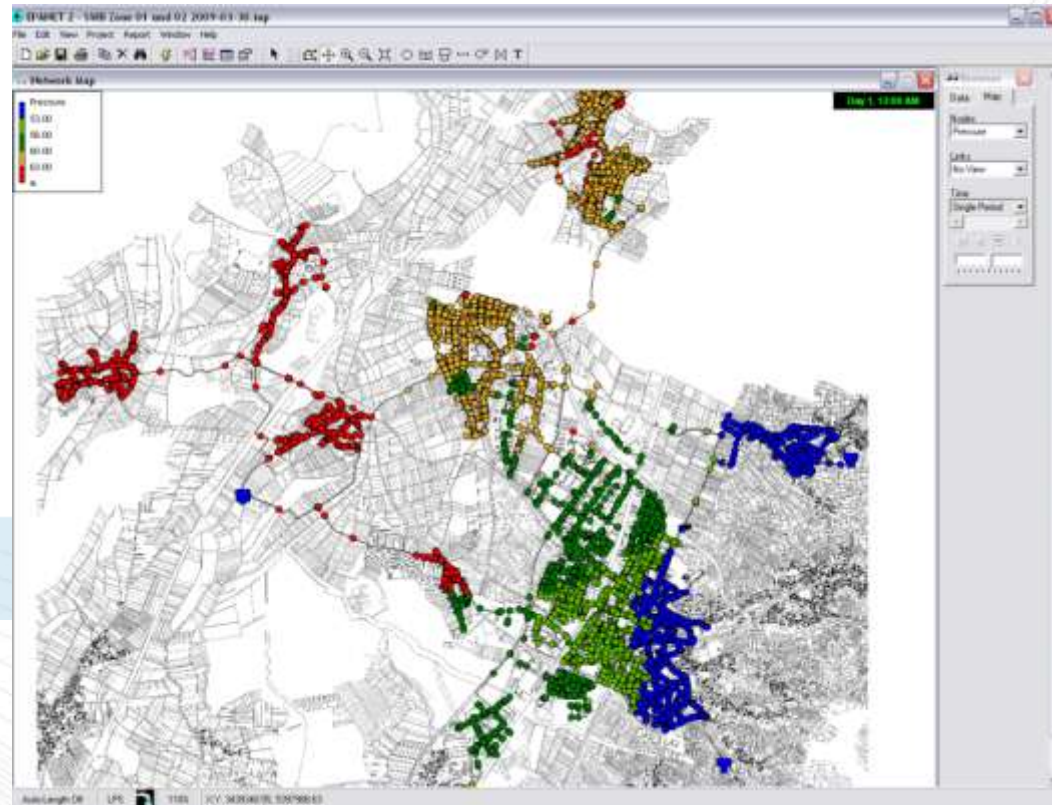
- Information systems and water loss management
- GIS basics
- Land base
- **Network register**
- Hydraulic network model
- Failure data base
- Customer information system



Content of the guidelines – Chapter 5

Basic prerequisites for sustainable NRW management

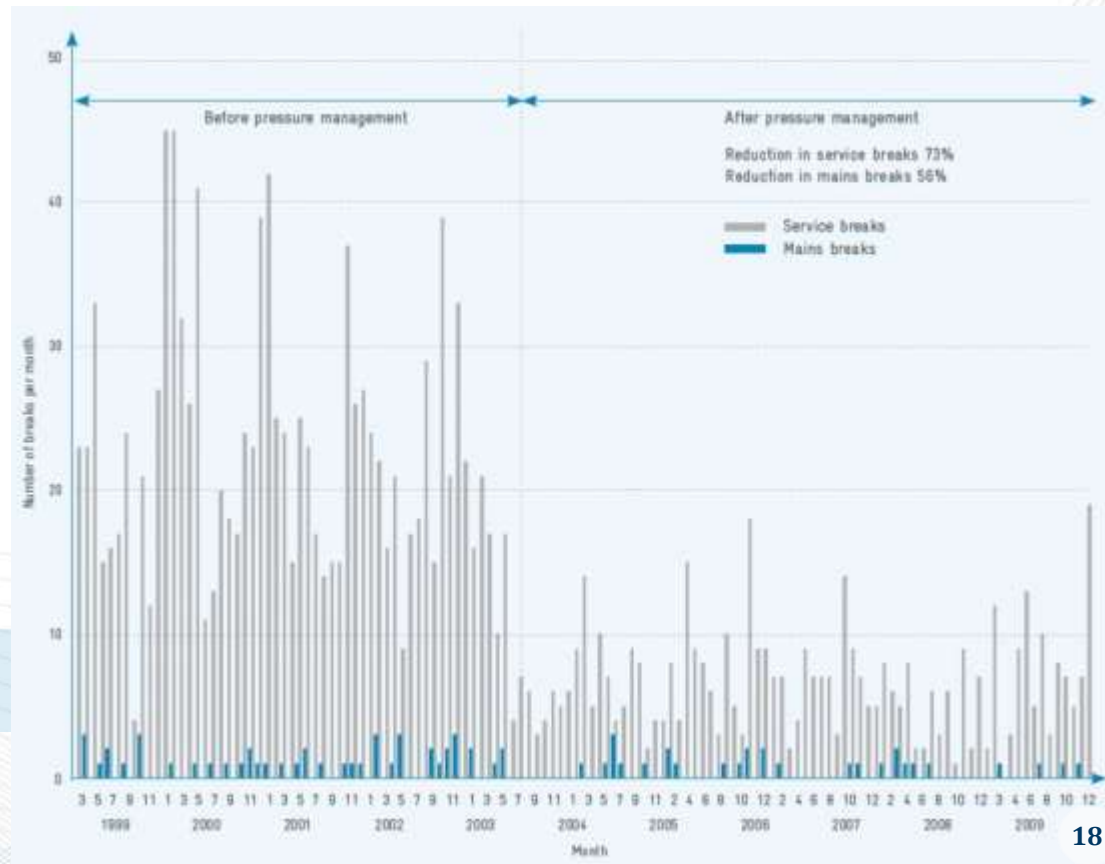
- Information systems and water loss management
- GIS basics
- Land base
- Network register
- **Hydraulic network model**
- Failure data base
- Customer information system



Content of the guidelines – Chapter 5

Basic prerequisites for sustainable NRW management

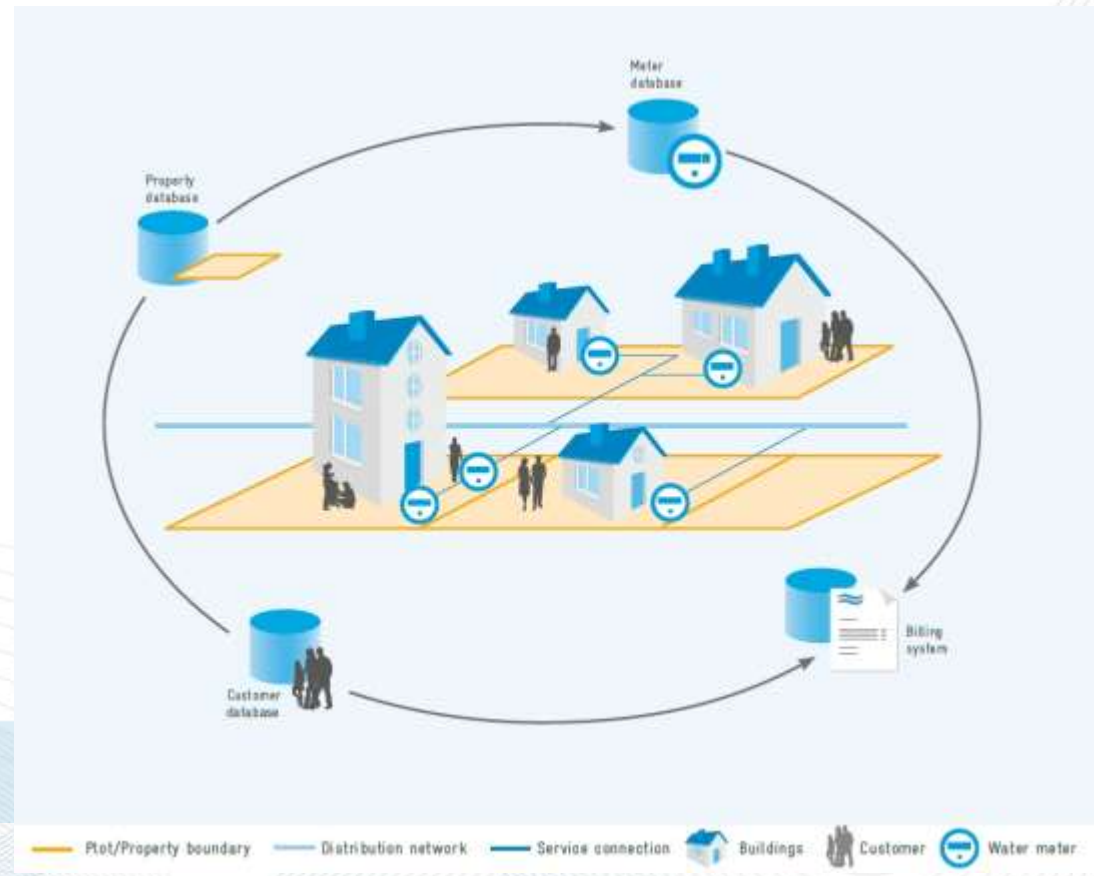
- Information systems and water loss management
- GIS basics
- Land base
- Network register
- Hydraulic network model
- **Failure data base**
- Customer information system



Content of the guidelines – Chapter 5

Basic prerequisites for sustainable NRW management

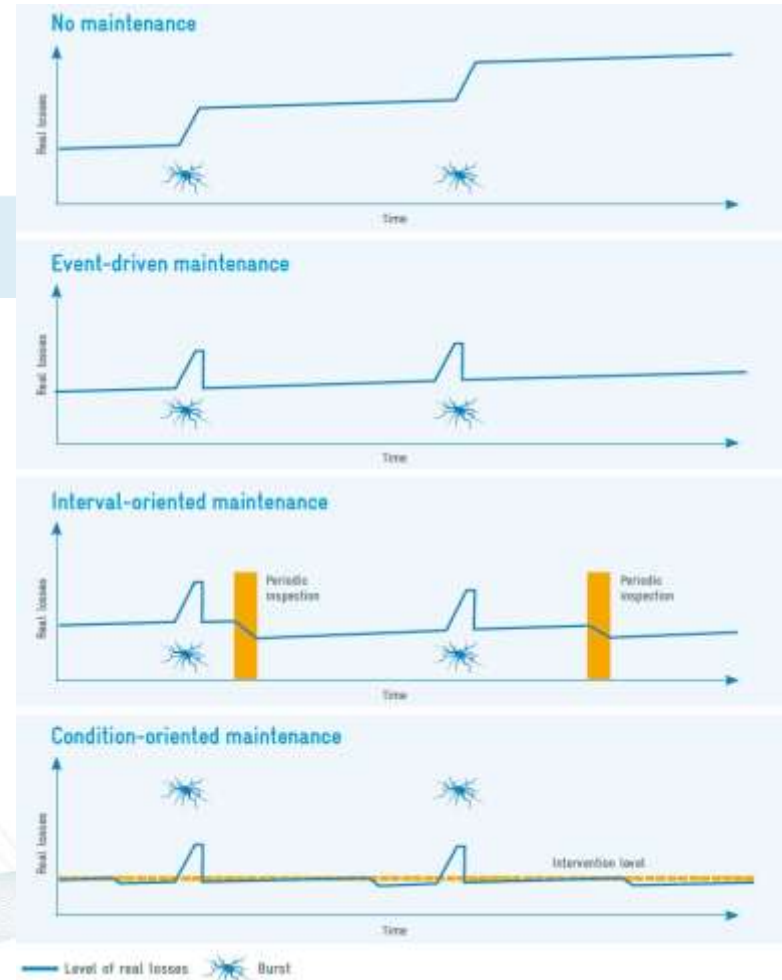
- Information systems and water loss management
- GIS basics
- Land base
- Network register
- Hydraulic network model
- Failure data base
- **Customer information system**



Content of the guidelines – Chapter 6

Methods and instruments for water loss reduction

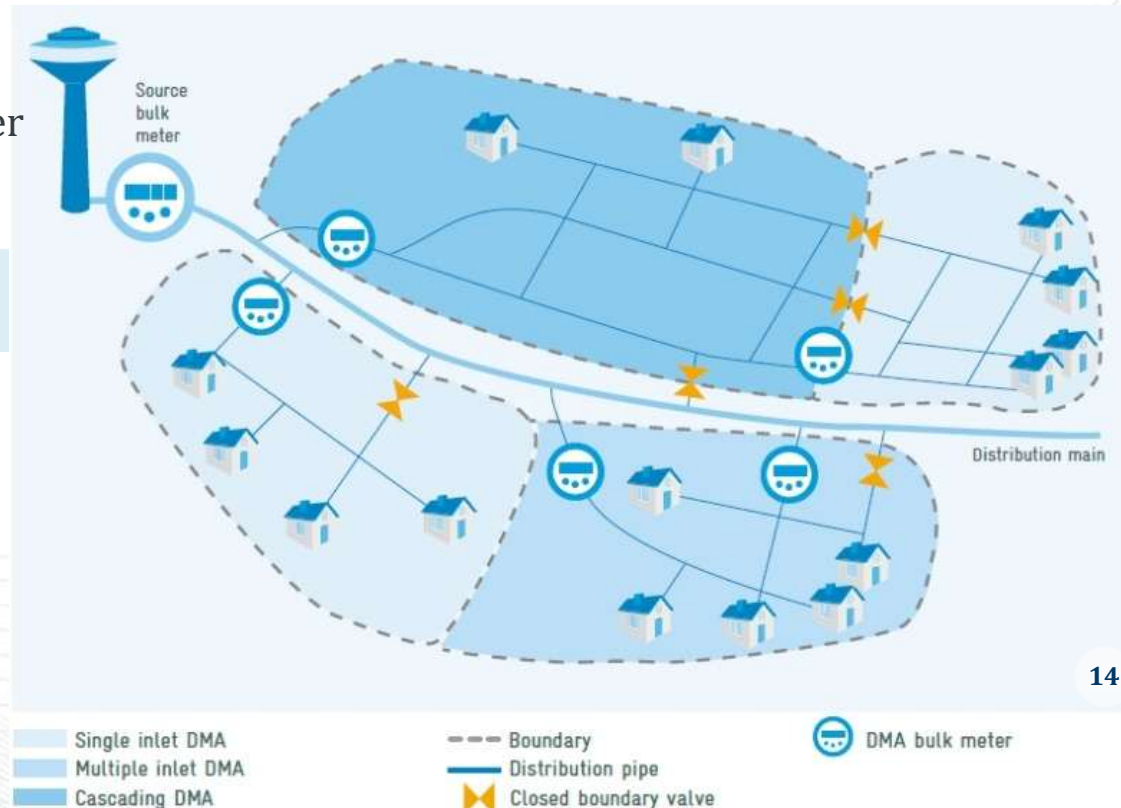
- Taking action against real water losses
- District metered areas (DMAs)
- Pressure management
- Active leakage control (ALC)
- Leak repair
- Infrastructure management



Content of the guidelines – Chapter 6

Methods and instruments for water loss reduction

- Taking action against real water losses
- **District metered areas (DMAs)**
- Pressure management
- Active leakage control (ALC)
- Leak repair
- Infrastructure management



Content of the guidelines – Chapter 6

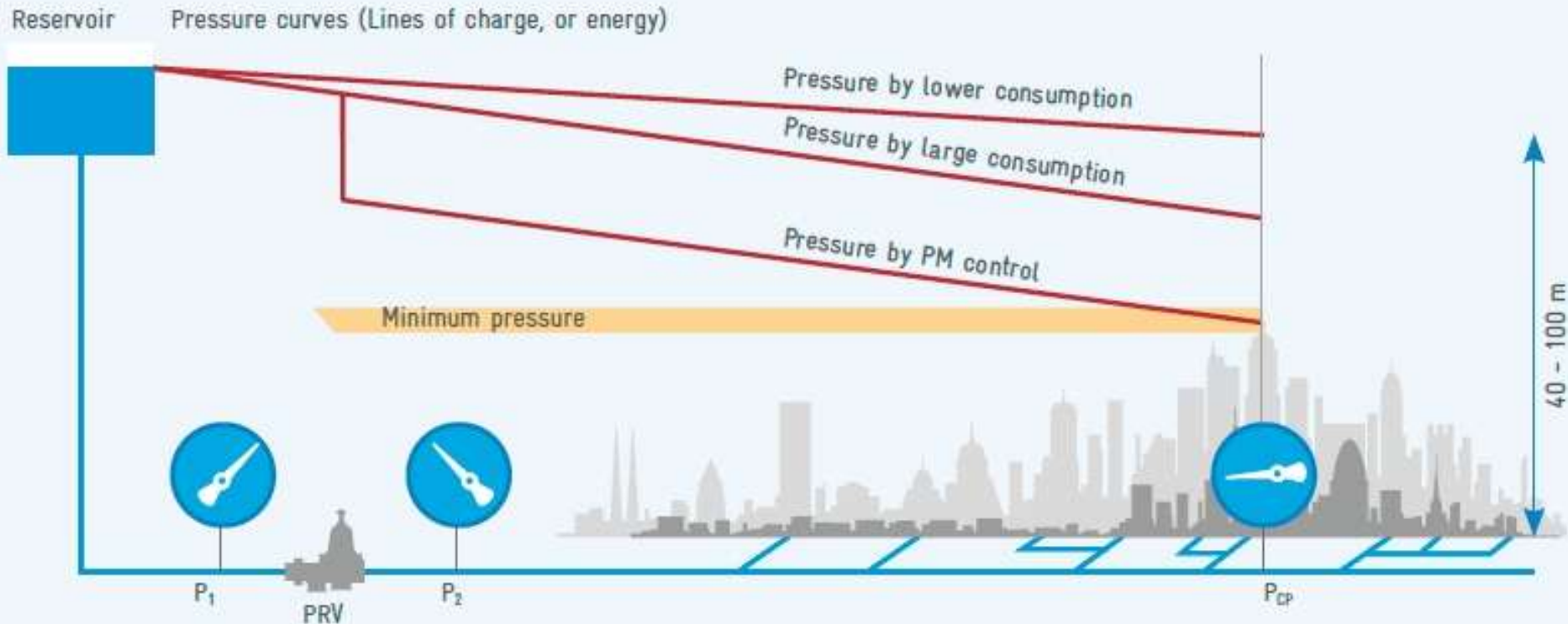
Methods and instruments for water loss reduction

- Taking action against real water losses
- District metered areas (DMAs)
- **Pressure management**
- Active leakage control (ALC)
- Leak repair
- Infrastructure management



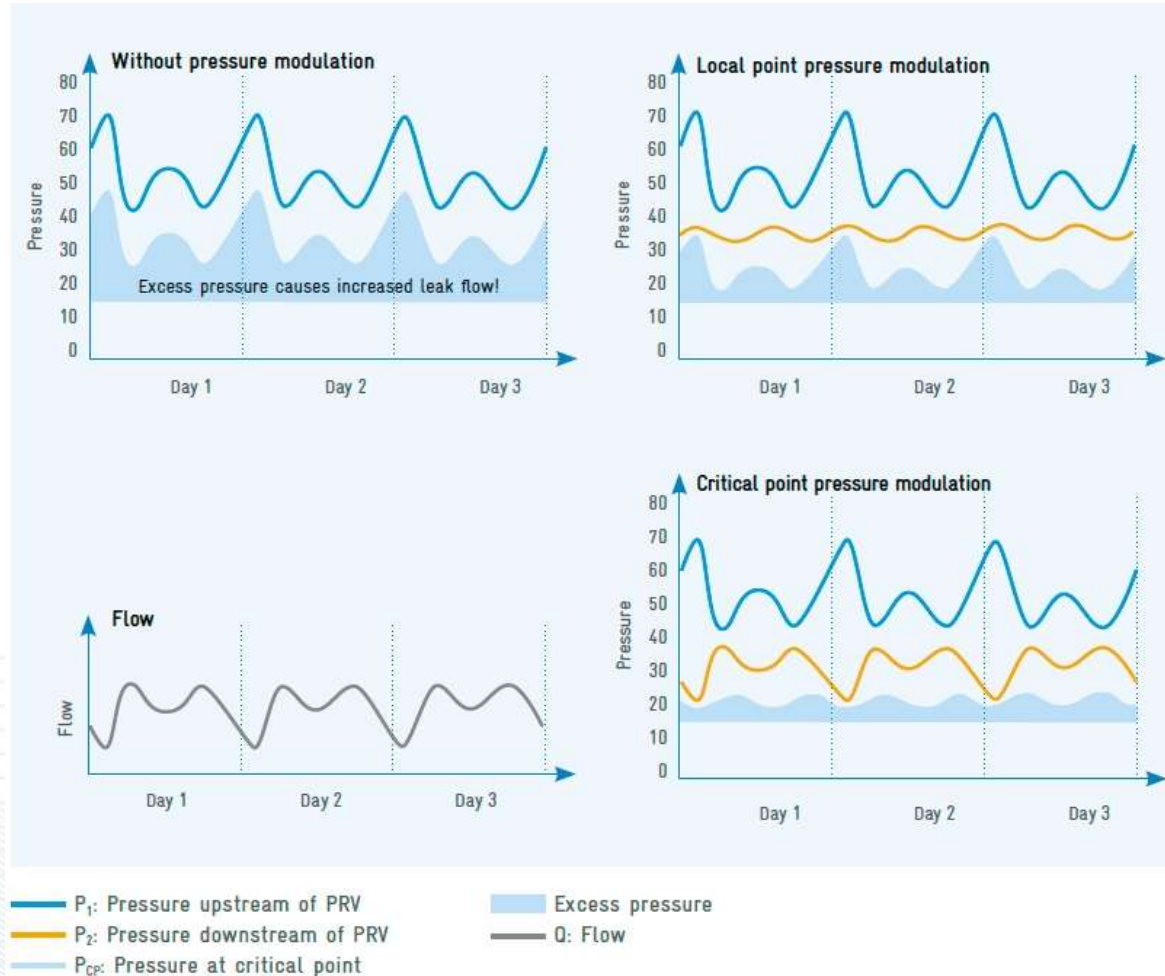
Content of the guidelines – Pressure Management

Simplified view of pressures within a distribution network



Content of the guidelines – Pressure Management

The different types of pressure modulation (simplified)



Content of the guidelines – Pressure Management

Classification of the different components for Pressure Reduction

Modulation location

- Local point modulation
- Critical point modulation
- Section 6.4.2

Modulation type

- Fixed outlet pressure
- Time-based pressure
- Flow-based pressure
- Section 6.4.2

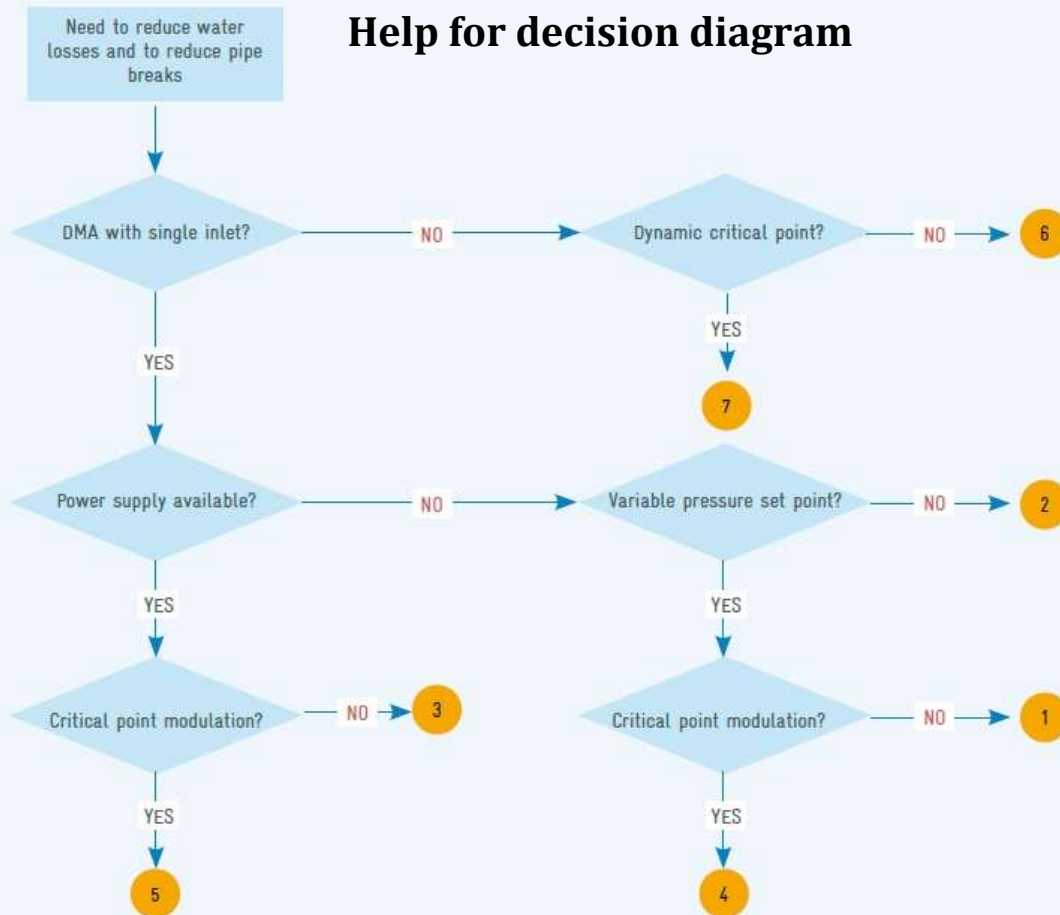
Valvetype

- Diaphragm (membrane) valve
- Plunger (needle) valve
- Section 6.4.3

Inlet & PMA type

- Single inlet PMA
- Multiple inlet PMA
- Dynamic PMAs
- Micro & macro PMAs
- Section 6.4.4

Content of the guidelines – Pressure Management

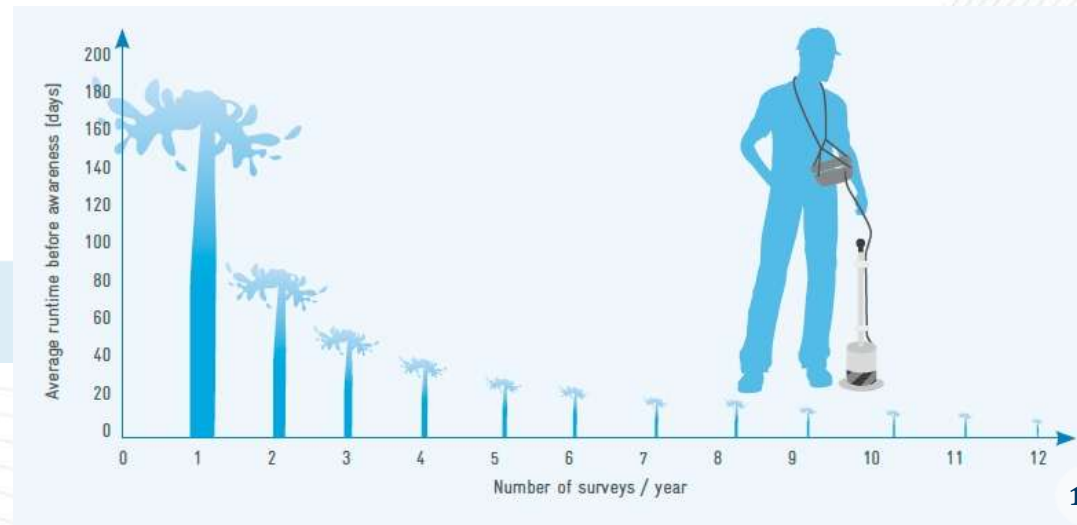


- 1 Local point modulation, diaphragm valve with fixed outlet pressure
- 2 Local point modulation, diaphragm valve with time or flow modulation
- 3 Local point modulation, plunger valve with time-based or flow-based modulation
- 4 Critical point modulation, diaphragm valve with time-based or flow-based modulation
- 5 Critical point modulation, plunger valve with time or flow modulation
- 6 Multiple Inlet
- 7 Multiple Inlet, Dynamic DMA

Content of the guidelines – Chapter 6

Methods and instruments for water loss reduction

- Taking action against real water losses
- District metered areas (DMAs)
- Pressure management
- **Active leakage control (ALC)**
- Leak repair
- Infrastructure management



Content of the guidelines – Chapter 6

Methods and instruments for water loss reduction

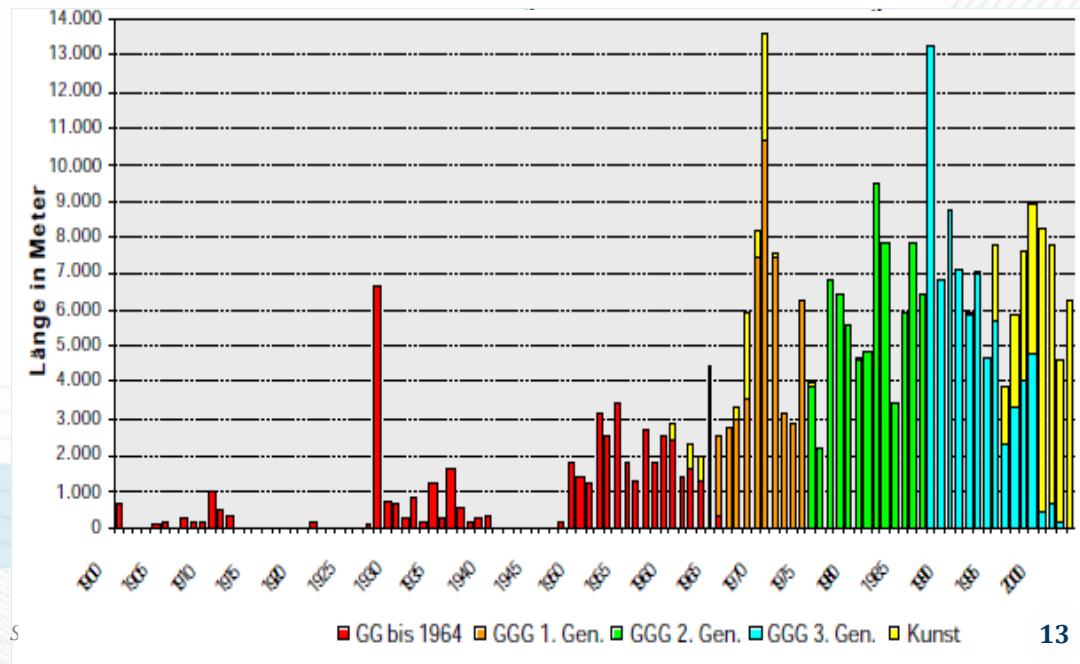
- Taking action against real water losses
- District metered areas (DMAs)
- Pressure management
- Active leakage control (ALC)
- **Leak repair**
- Infrastructure management



Content of the guidelines – Chapter 6

Methods and instruments for water loss reduction

- Taking action against real water losses
- District metered areas (DMAs)
- Pressure management
- Active leakage control (ALC)
- Leak repair
- **Infrastructure management**



Content of the guidelines – Chapter 7

Case studies

- **Pressure Management training modules**
The example of Lima, Peru
- **Reducing water losses by pressure management**
The example of Santo Amaro, Brazil
- **Hydraulic modelling**
The example of Ouagadougou, Burkina Faso
- **Water losses reduced by up to 40%**
The example of Ain Al Basha, Jordan
- **Reduction of apparent water losses**
The example of Huaraz, Peru



Thank you for your attention!

www.waterloss-reduction.com

info@waterlossreduction.com



01

Bibliography

- 1 A. Knobloch and P. Klingel, KIT, 2010.
- 2 VAG-Armaturen GmbH, 2010.
- 3 T. Diettrich, Gelsenwasser AG, 2010.
- 4 M. Brenner, KIT, 2010.
- 5 www.hessenwasser.de website, 2010.
- 6 www.zewe-gmbh.de website, 2010.
- 7 www2.tntech.edu website, 2010.
- 8 www.werner-schmid.de website, 2010.
- 9 www.diy-guides.com website, 2010.
- 10 www.propertylovenia.si website, 2010.
- 11 webhelp.esri.com website, 2010.
- 12 www.stadtwerke-karlsruhe.de website, 2010.
- 13 RBS Wave, 2010.
- 14 Farley, M. and Trow, S., Losses in Water Distribution Networks. IWA Publishing, 2003.
- 15 Kingdom, B., Liemberger, R. and Marin, P., The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries. World Bank, Washington, USA, 2006.
- 16 Guibentif et al., Acceptable Level of Water Losses in Geneva. Proceedings of the IWA International Specialised Conference 'Water Loss 2007', Bucharest, Romania, 2007.
- 17 DVGW. GAWANIS - Datenmodell für die Dokumentation von Gas- und Wasserrohrnetzen. Deutsche Vereinigung des Gas- und Wasserfaches (DVGW), Bonn, Germany, 2000.
- 18 May, J., Project Manager for Pressure and Leakage Management, Gold Coast Water, Australia. Personal communication, June 2010.
- 19 Morrison, J., Tooms, S. and Rogers, D., District Metered Areas Guidance Notes. IWA Publishing, London, United Kingdom, 2007.