EU Reference Document: Good Practices on Leakage Management

CASE STUDY SALZBURG: SUSTAINABLE NETWORK MANAGEMENT PRACTICES

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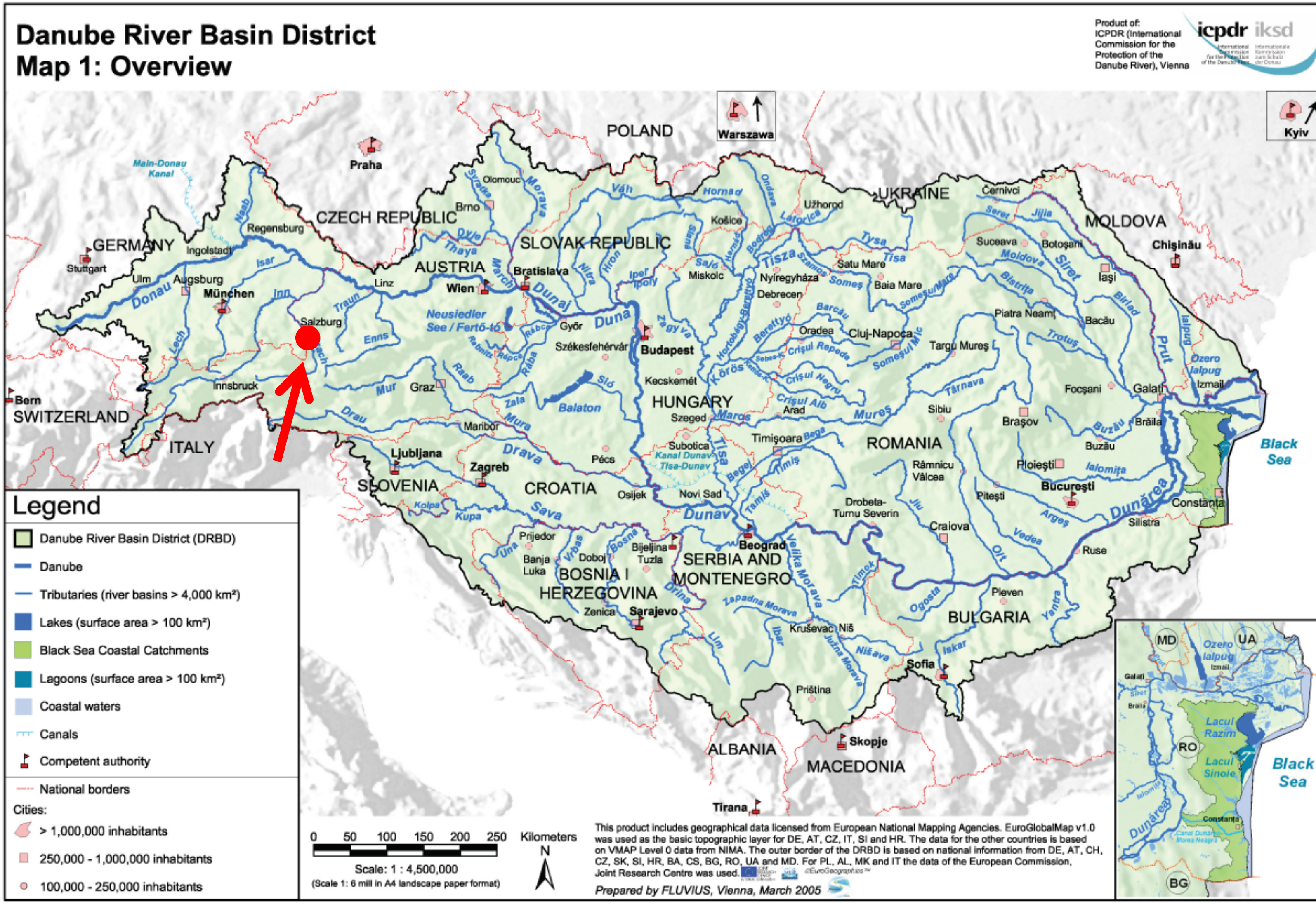
Consulting Engineers
for Water Management and
Environmental Engineering

OVERVIEW DANUBE RIVER BASIN



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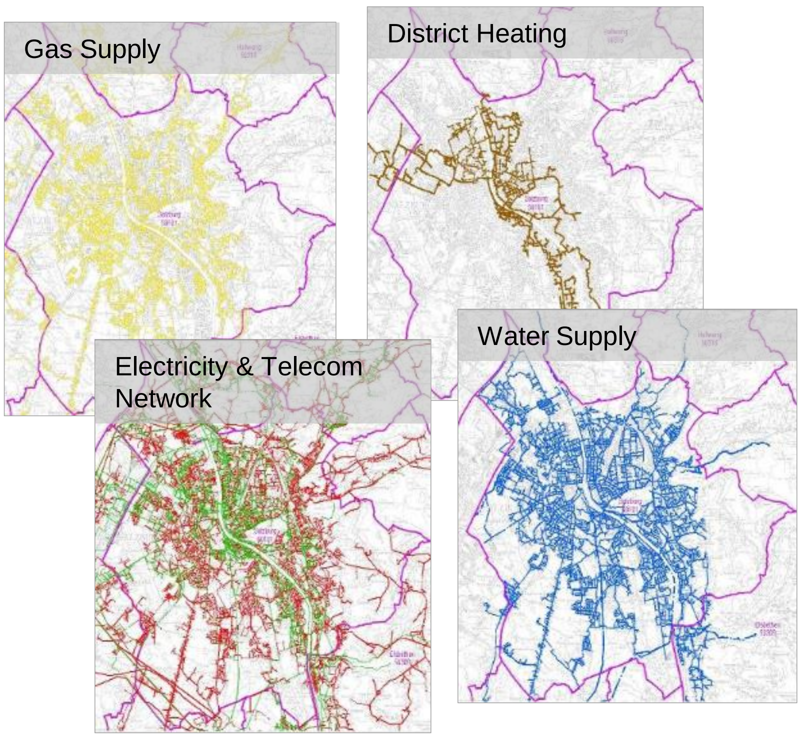
SALZBURG AG AND WATER SUPPLY SYSTEM

Salzburg AG is a regional multi-utility corporation serving 260.000 clients with 2000 employees



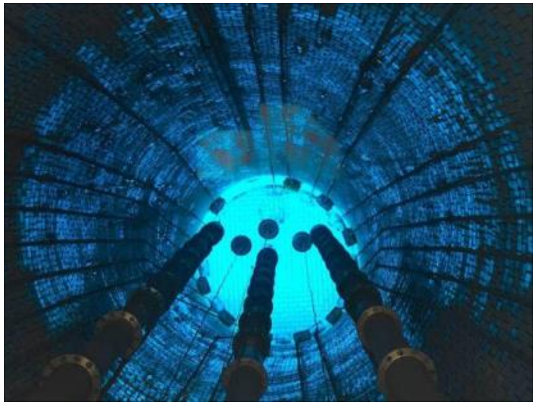
Salzburg AG is operating:

Electricity Network	15.300 km
Telecom Network	9.000 km
Gas Supply Network	1.900 km
Water Supply Network	**850 km**
District Heating Network	200 km

Salzburg AG Networks are managed in a **Multi-Utility Approach**

- one face to the clients
- one maintenance team for pipe networks

SALZBURG'S WATER SUPPLY SYSTEM



Courtesy of: Salzburg AG

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DETAILS WATER PRODUCTION SYSTEM AND DISTRIBUTION NETWORK OF SALZBURG AG

Total number of staff: 2001

Staff directly involved in water operations: 49

2 main groundwater resources, connection to trans-regional bulk supply system

9 reservoirs, 2 main reservoirs

5 water treatment plants

6 pumping stations

155,000 inhabitants served

20,130 service connections

Average consumer price (excl. VAT): 1.468 €/m³

Courtesy of: Salzburg AG

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DETAILS WATER PRODUCTION SYSTEM AND DISTRIBUTION NETWORK OF SALZBURG AG

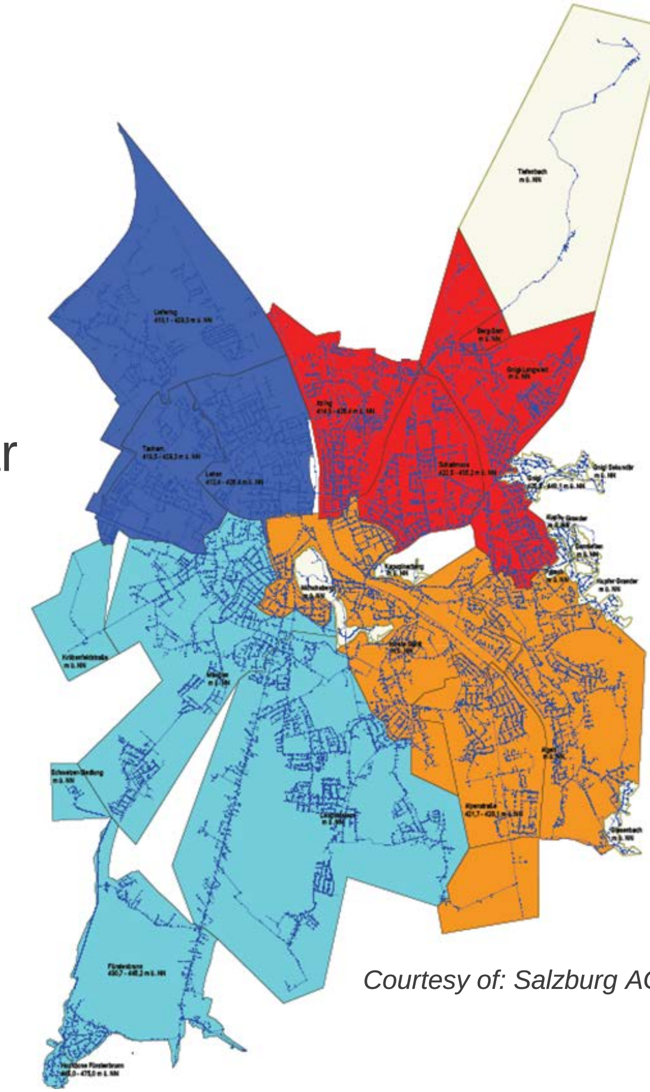
484 km distribution mains, 55 km trunk mains

4 main zones: 3,900 to 5,900 conn.

7 small zones, higher situated

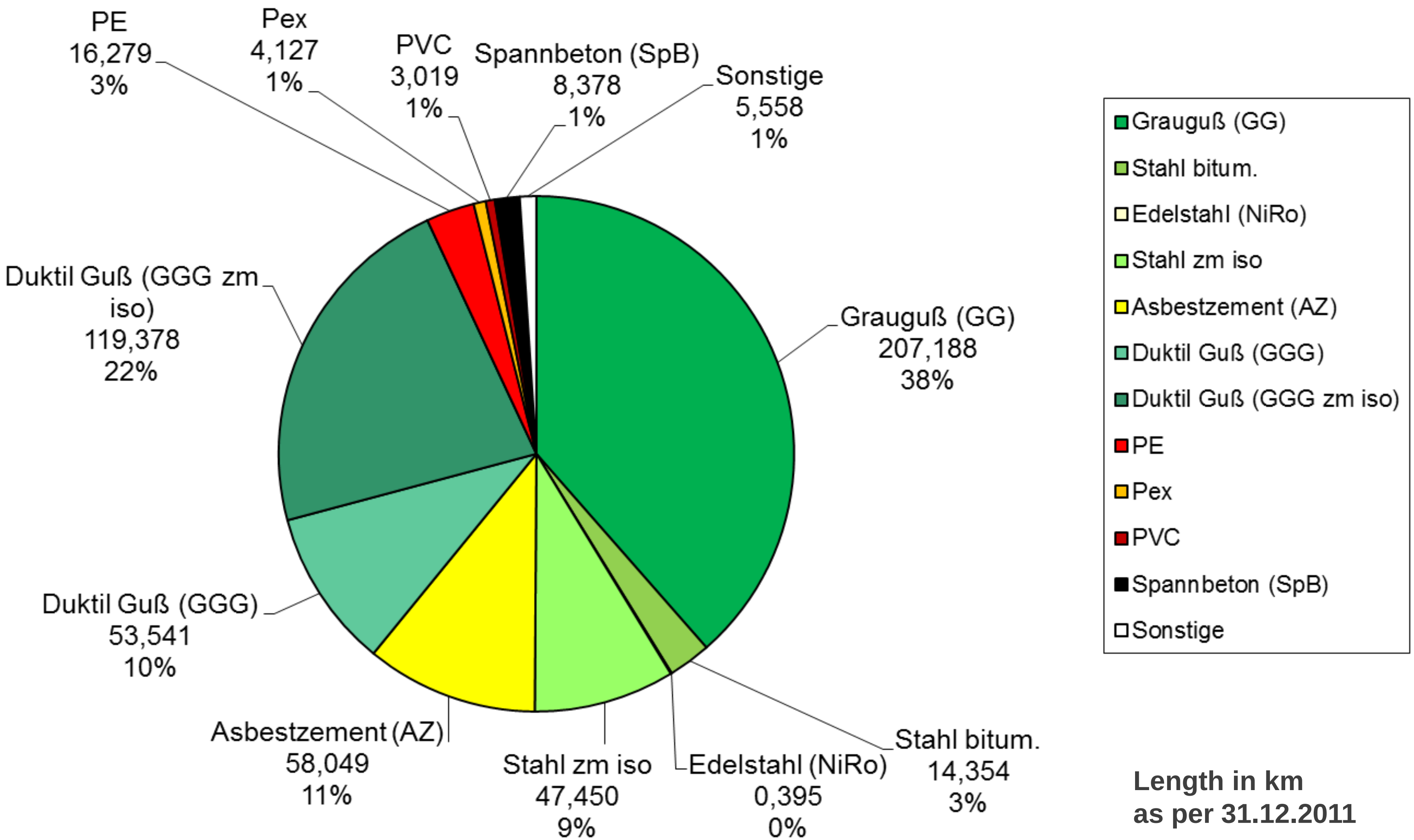
Supply pressure: average 4.6 bar, max 6.5 bar

100 % of time pressurised (24/7)



Courtesy of: Salzburg AG

MAINS MATERIALS



Length in km
as per 31.12.2011

Courtesy of: Salzburg AG

> 80% metallic pipes

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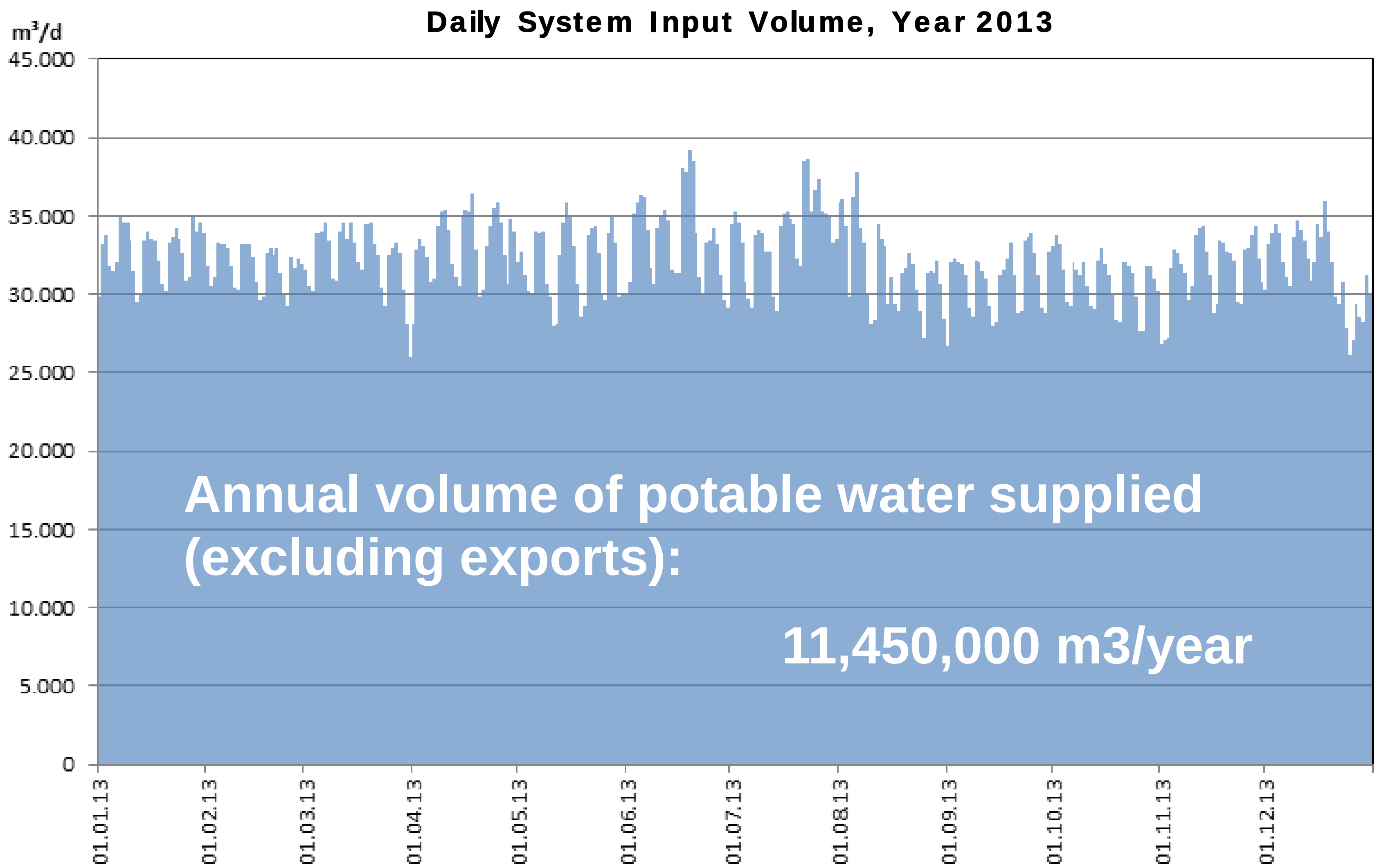
DAILY SYSTEM INPUT VOLUME, YEAR 2013



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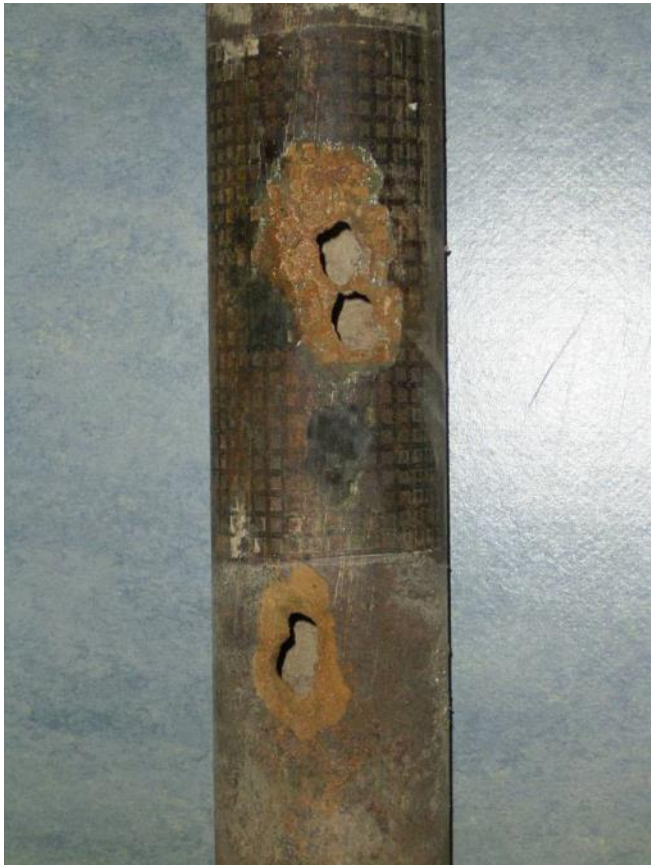
CONDITION OF PIPE NETWORK

Two criteria are mainly characterising the condition of a pipe network:

- **Real Water Losses**
- **Failure rates**

Failure dynamics is influenced by:

- Structure of the network (e.g. rural or urban → service connection density)
- Type of soil and soil movements
- Traffic load
- Excavations near pipes
- Pressure variations, water surges, operating pressure
- Age



Courtesy of: Salzburg AG

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REAL LOSSES AND FAILURE RATES (2013)

Leakage Indicators	Value
Infrastructure Leakage Index (ILI)	1.14
Losses per connection per day	84 l/conn/d
Losses per mains length	0.13 m^3/km/h
Non-Revenue Water as % of system input volume	6.3 %

Leaks on mains: 16.5 per 100 km/a
Leaks on service connections: 3.73 per 1000 conn/a

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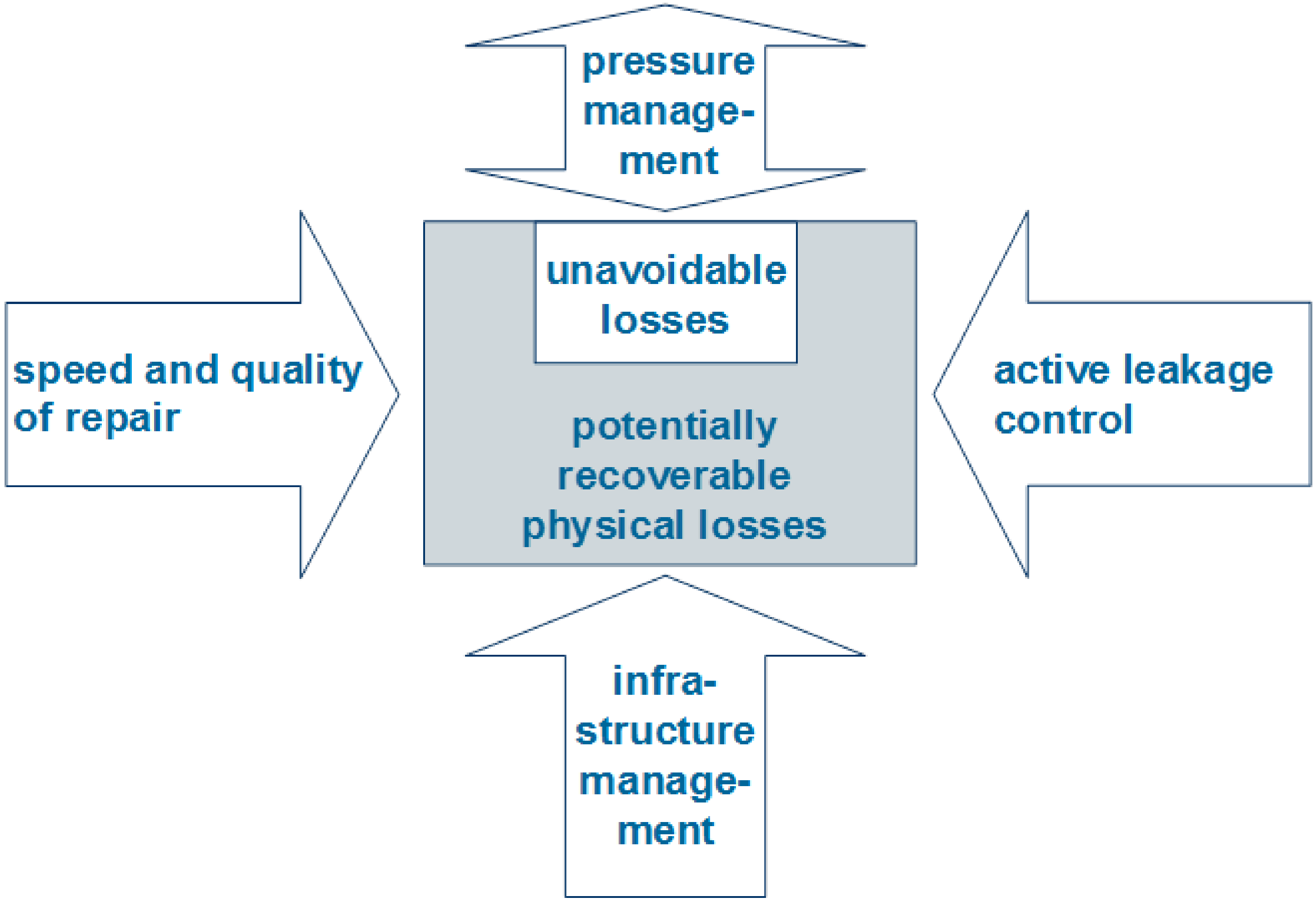
BASIC METHODS OF WATER LOSS MANAGEMENT



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SALZBURG'S ASSET MANAGEMENT

Adequate supply pressure required for

sustainable infrastructure management;

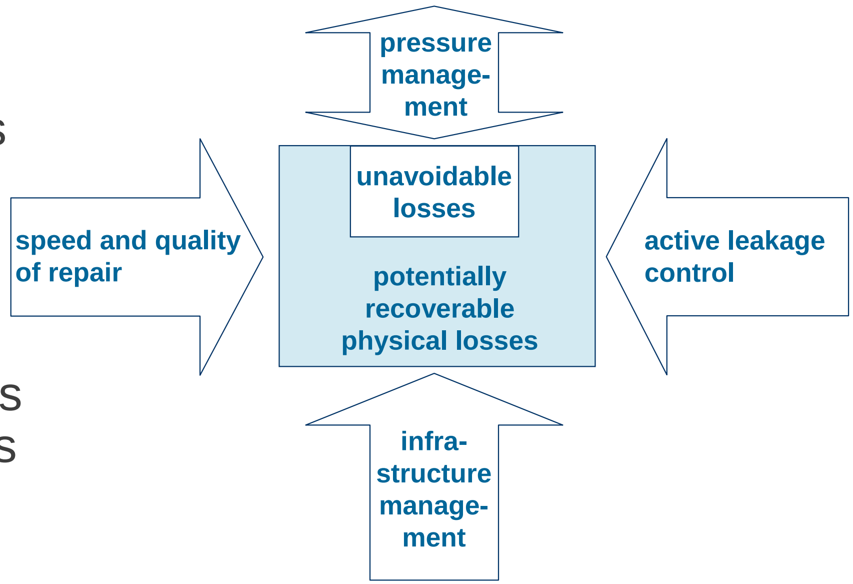
Basic pressure management
implemented in main zones

Multi-Utility approach

High quality materials

High construction standards

Average repair time:
mains: 1.5 days
services: 2.5 days



Zone measurements

Permanent noise loggers

Leak detection campaigns

Standard leak detection technologies

Conservation of good network asset condition

Regular network inspection (~20% per year)

Rehabilitation Planning

Long-term cost optimization

PERMANENT NOISE LOGGERS

More than 80% of network consists of metallic pipes

Stepwise implementation

- At the beginning only the main traffic routes
- Since 2013 whole network covered by 300 permanent noise loggers

Noise loggers read by cars of maintenance teams

- According to their daily routes and on demand
- At least every logger is read once a month

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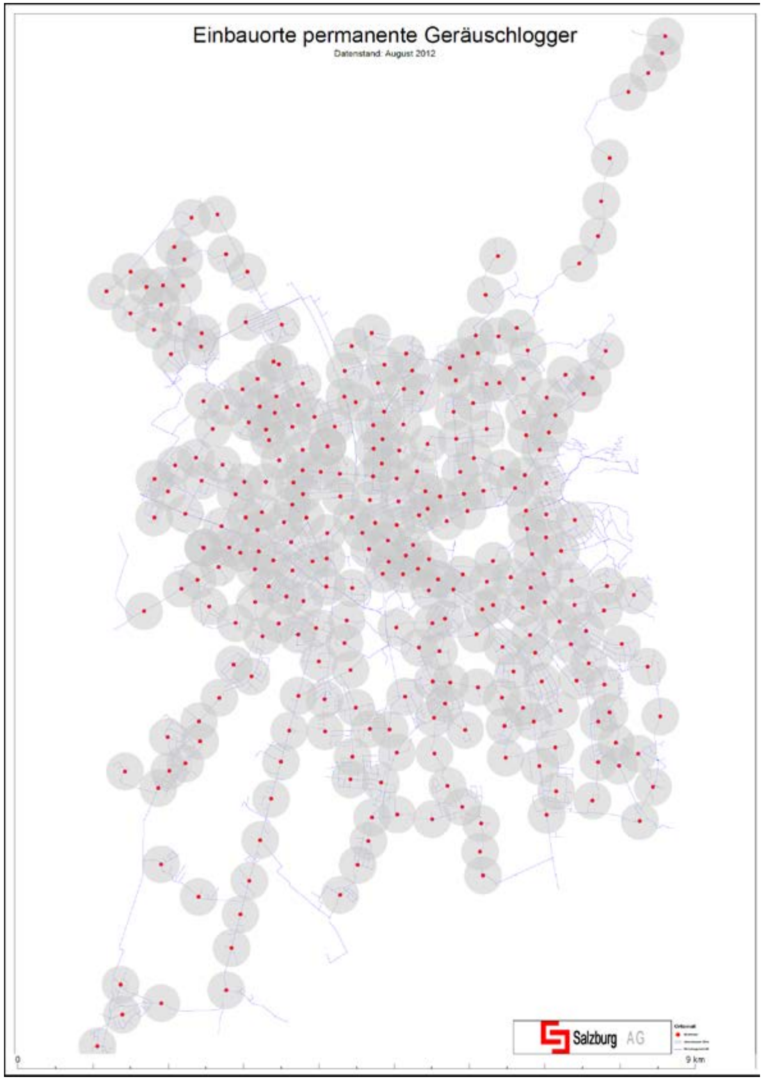
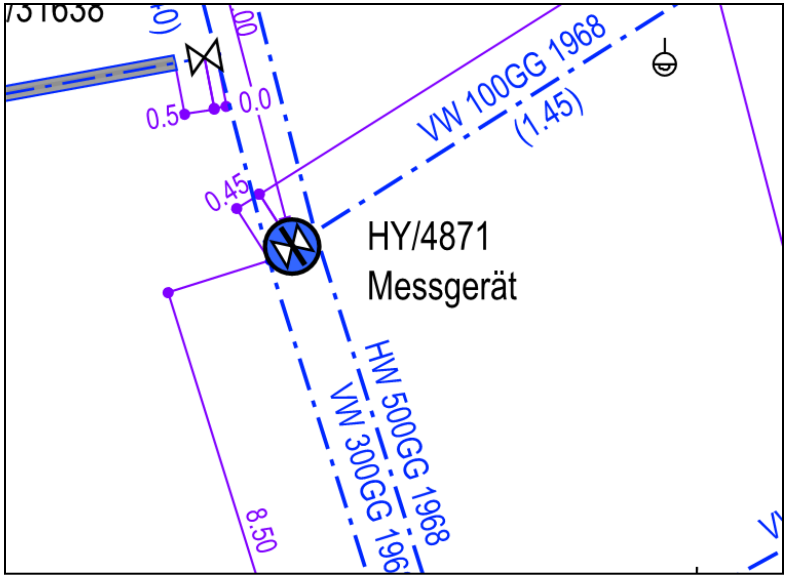
PERMANENT NOISE LOGGERS





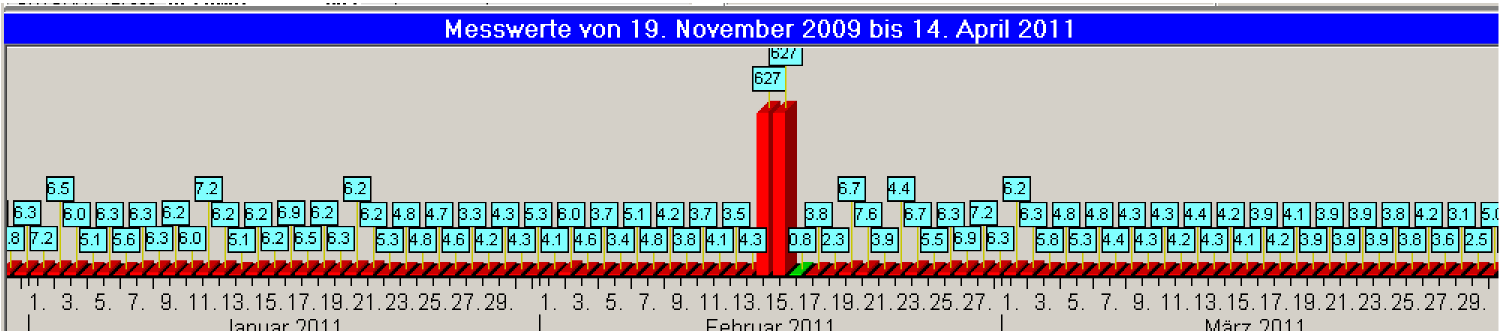
Location of Noise Loggers in GIS

- to avoid damages during construction work

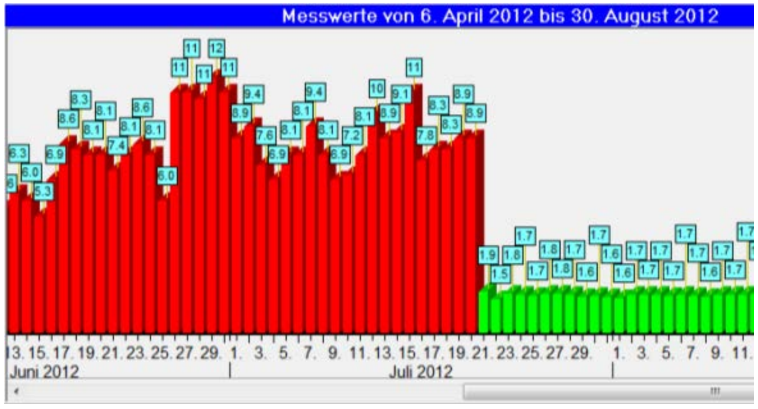
Courtesy of: Salzburg AG

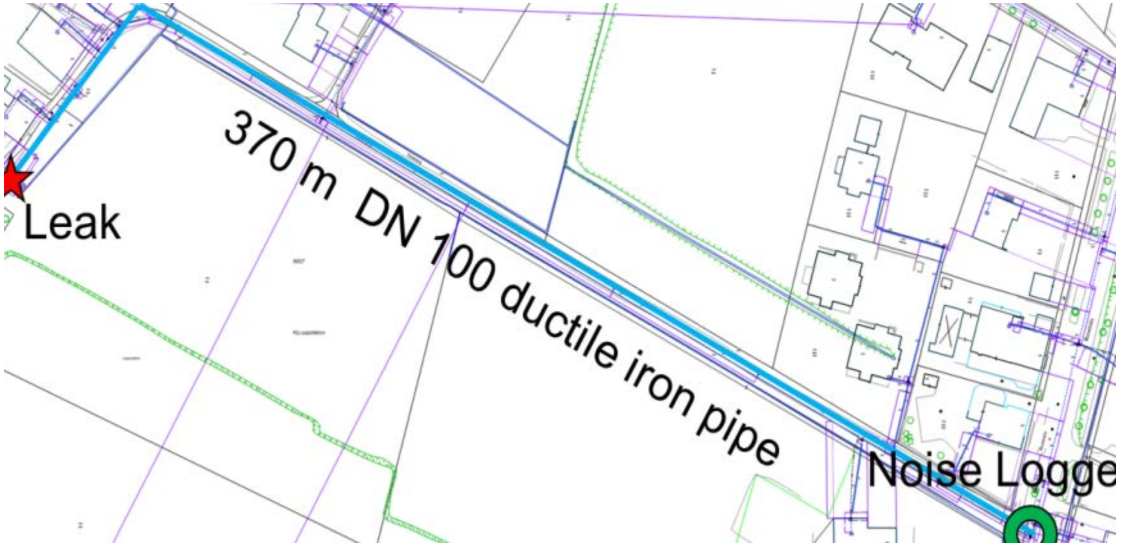
EXAMPLES OF NOISE LOGGINGS

Unreported burst DN 125 Cast Iron Pipe



Detection radius could be large:





Courtesy of: Salzburg AG

PERMANENT NOISE LOGGERS

Results after year 1 - detected by noise loggers only

- 16 out of 80 mains failures
- 8 out of 75 service connection failures, 26 not fully closed (leaking) hydrants
- In total about 50 leaks in one year, which **would not have been detected** before the next ALC campaign (every 5 years)

Significant reduction of leak run times and losses

Risk reduction regarding consequential damage and disturbance of road traffic

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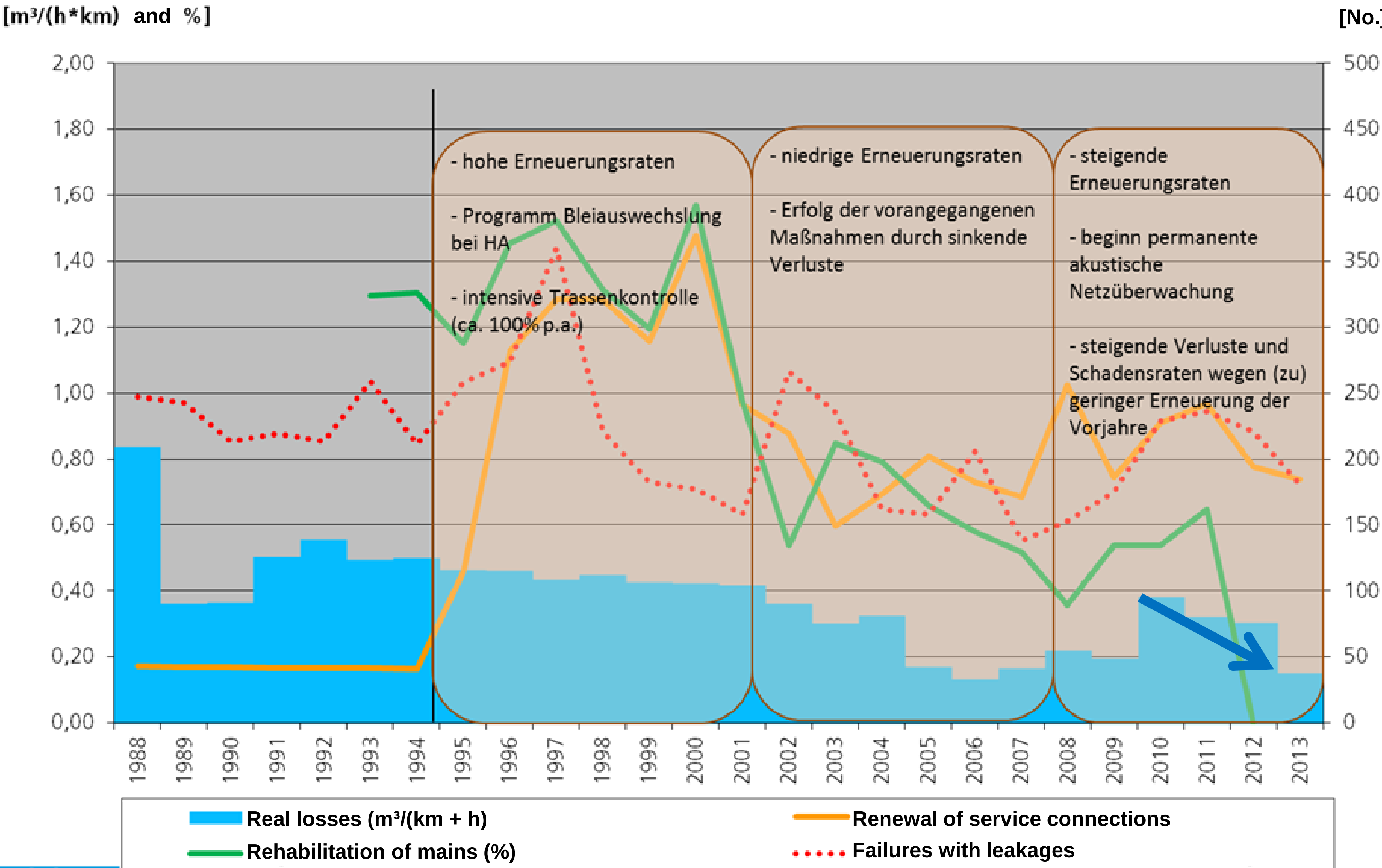
LOSSES, FAILURES, AND RENEWAL RATES



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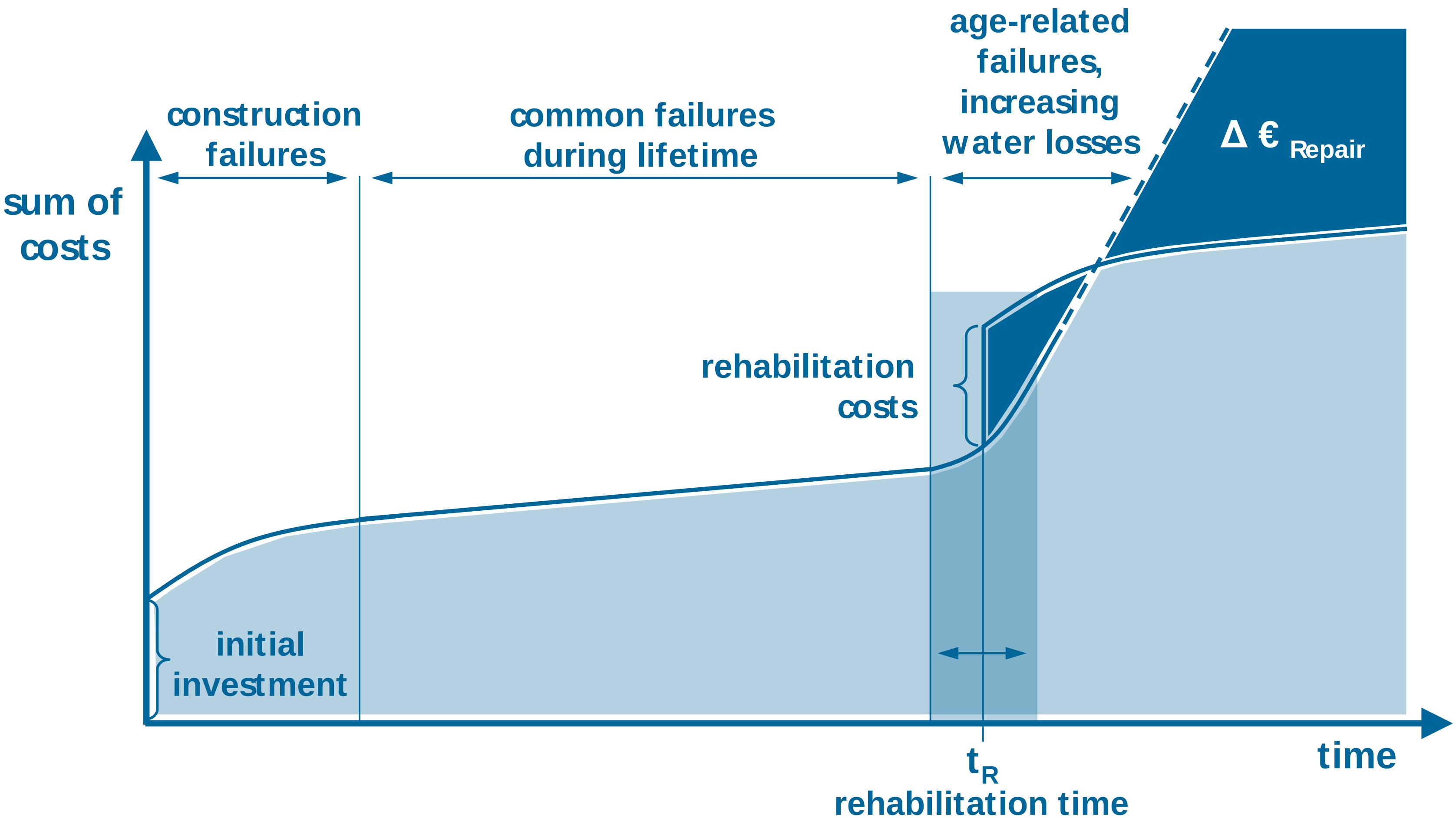
WHEN TO REPLACE ASSETS



source: Koelbl (2011)

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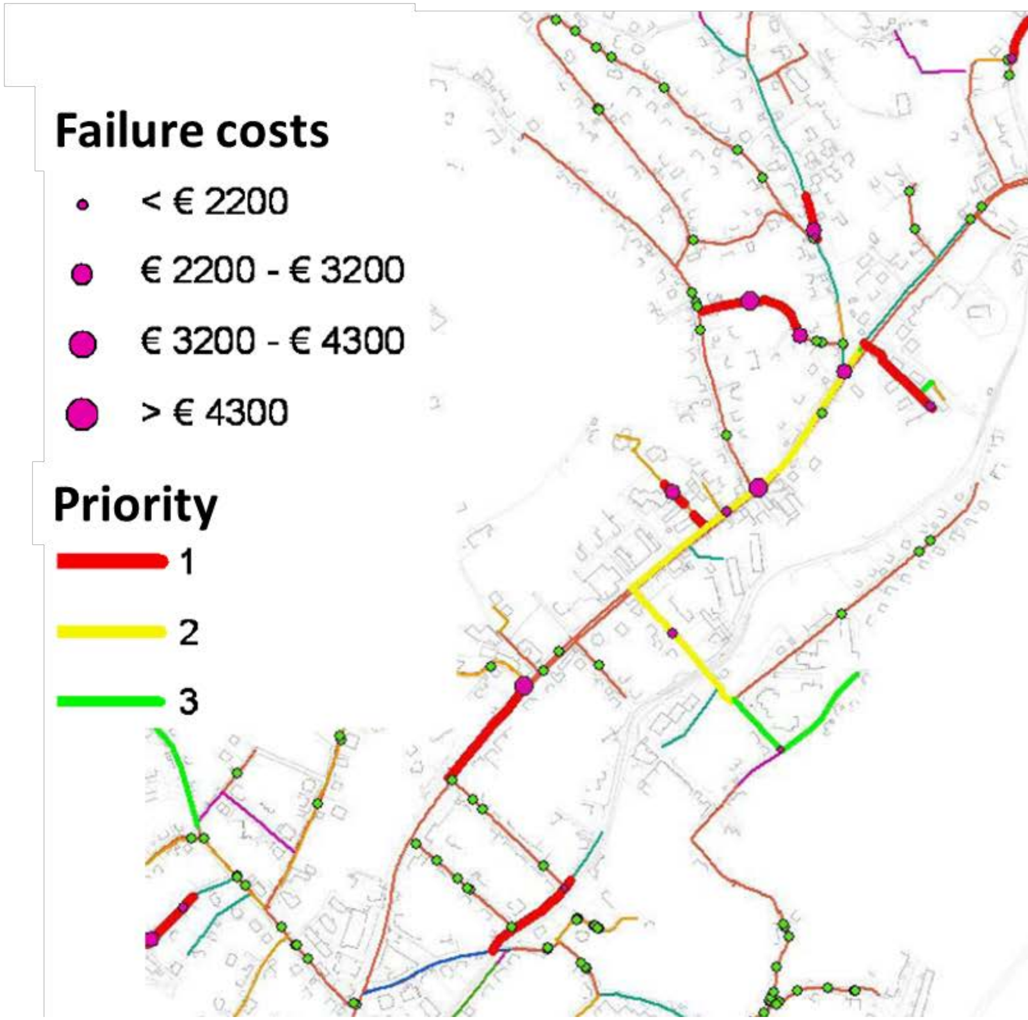
SOFTWARE BASED REHABILITATION MANAGEMENT

PiReM | Systems

- Software based Decision Support System
  - Rehabilitation planning of pipe networks
- Developed at Graz University of Technology
  - with leading Austrian water utilities including Salzburg AG
- Mathematic Model
  - “Herz” function describes aging behaviour
- Standard Pipe Groups
  - Pipes with similar aging and failure behaviour
- Mid- and Long-term rehabilitation planning
  - Economical ideal time for rehabilitation

EXAMPLE – MID-TERM REHABILITATION PLANNING



- **Class 1**

  Ideal rehabilitation time within next 3 years

- **Class 2**

  To prepone when coordination with other infrastructure measures possible

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CONCLUSIONS

High quality materials and highest construction standards

- Guidelines and standards for quality assurance
- Supervision of construction works and quality checks

Network monitoring and Water Loss Management

Comprehensive asset and failure data base

- Precondition for reliable analyses of network aging behaviour and rehabilitation planning

Long-term service contracts

- To achieve long-term cost optimisation and minimised lifecycle costs

Long-term cost recovery to ensure sufficient financial capabilities

- Cost recovering tariffs and minimum of non-revenue water

Continuous improvement process

- Permanent performance analyses and orientation at national and international benchmarks