# Integrated Asset Management as basis for sustainable Water Loss Reduction

## Water Loss 2012
## Manila, Philippines

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RBS wave GmbH

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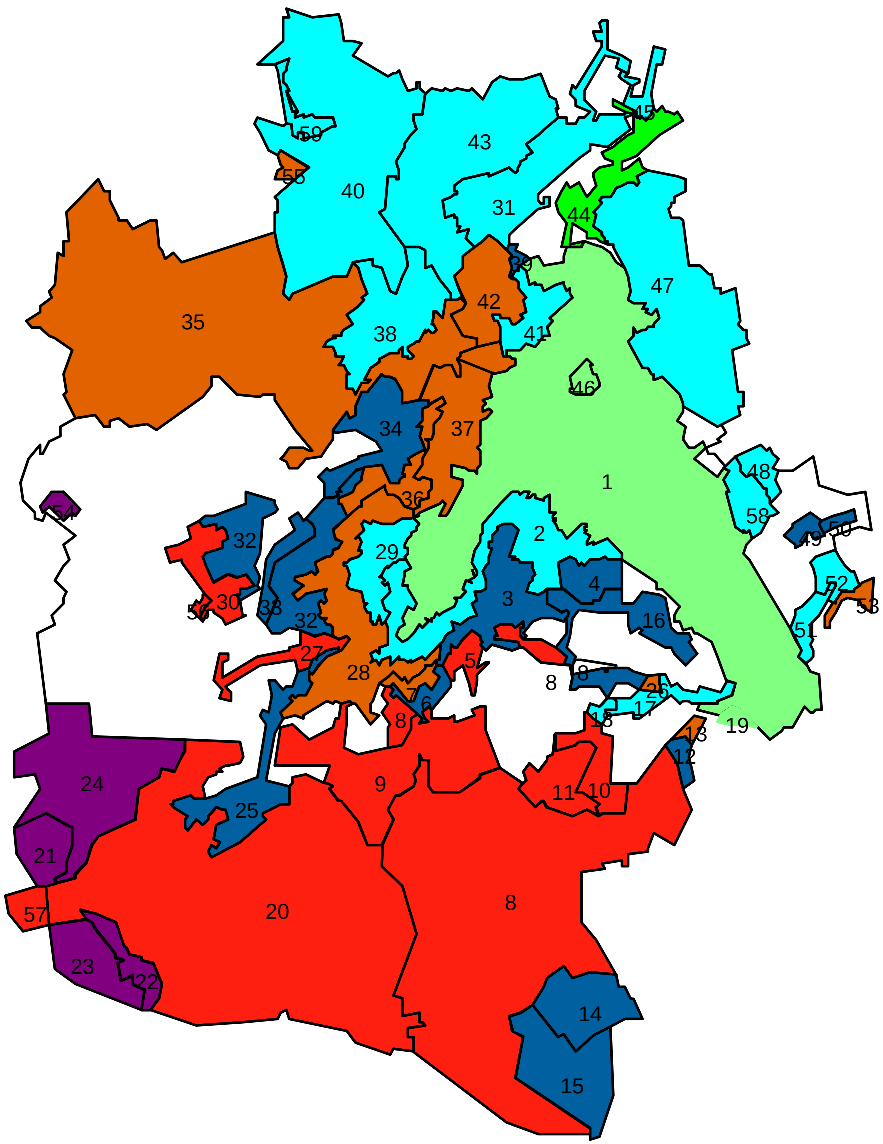
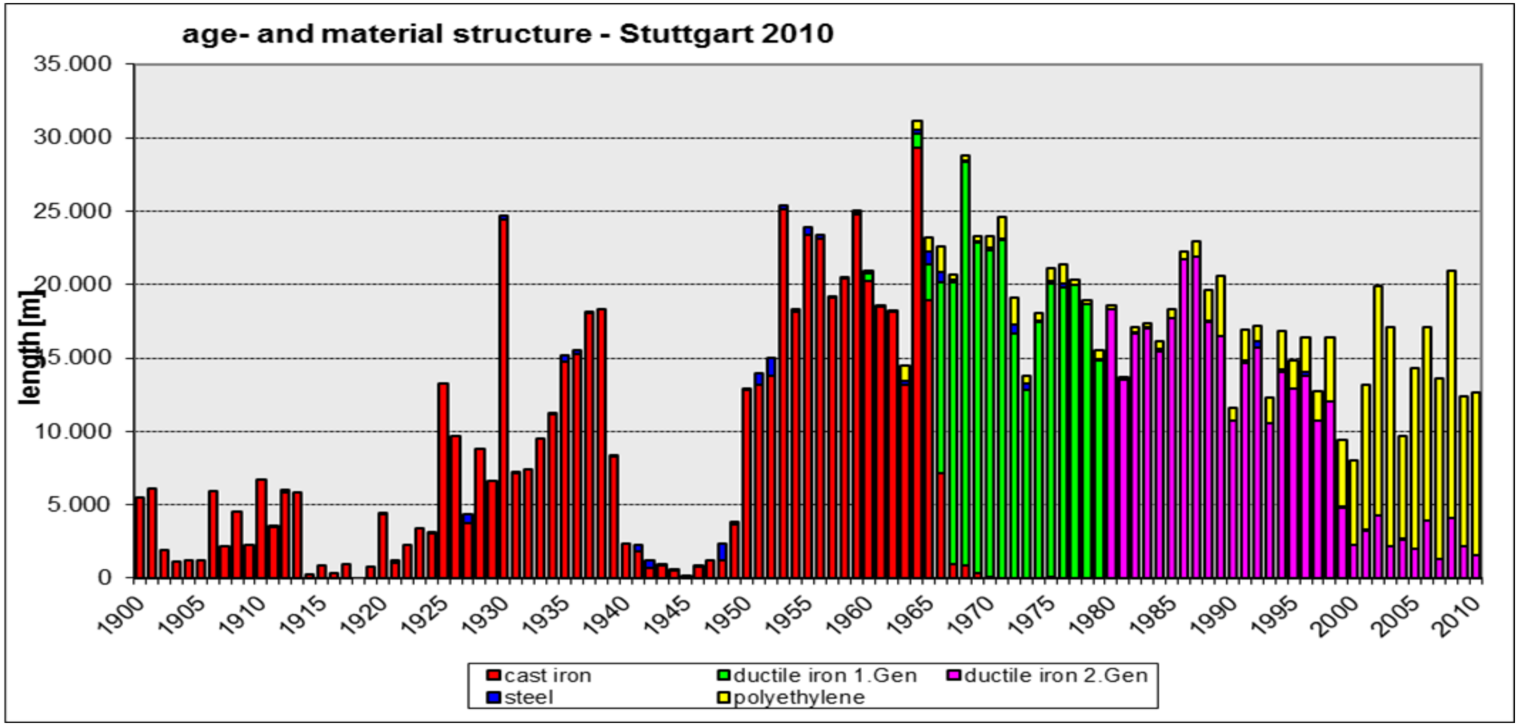
# Water supply of Stuttgart - Structure

RBS wave



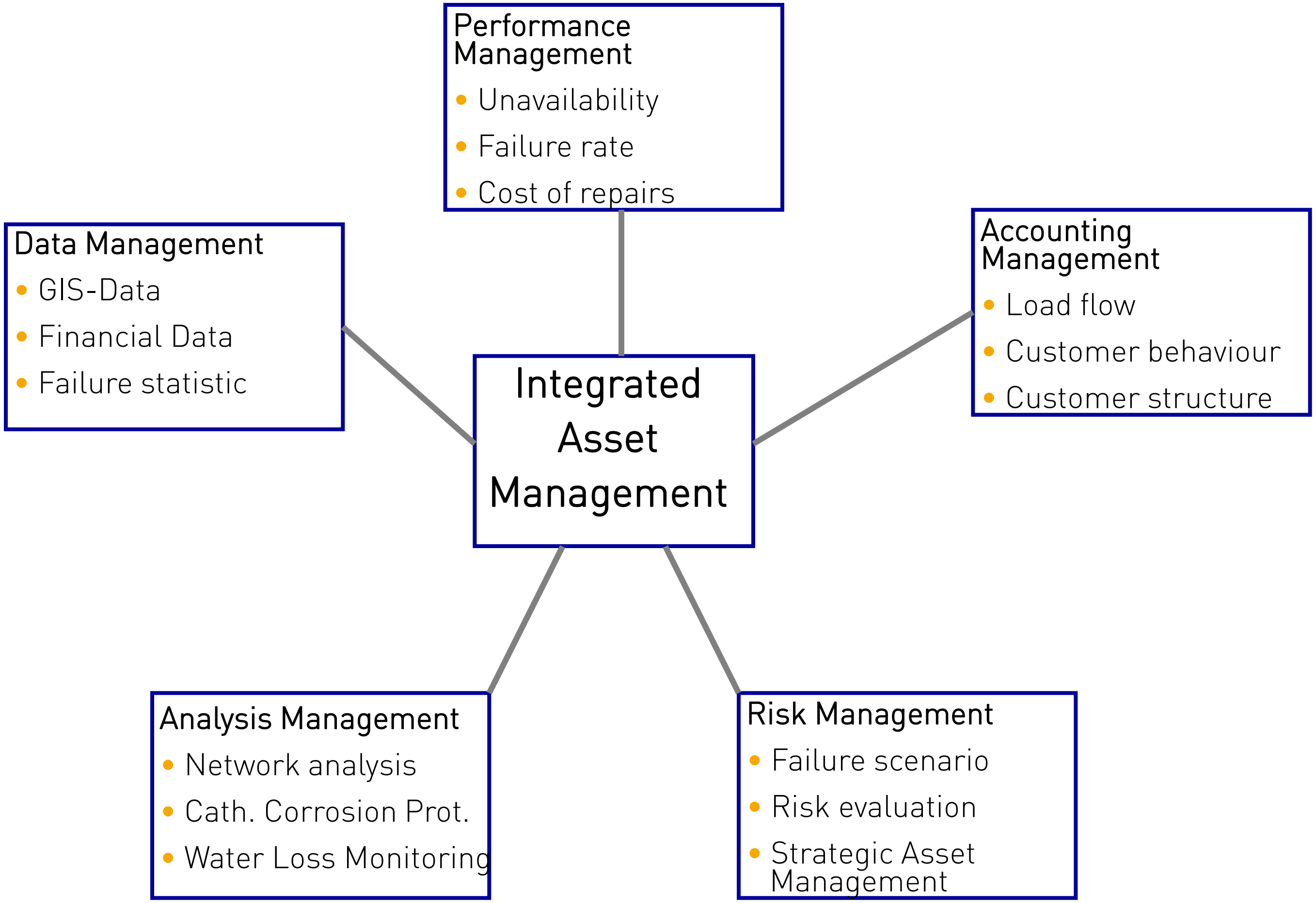

- 100,000 service pipes
- 600,000 inhabitants
- 58 pressure zones
- 310 m difference in altitude
- 142 km mains (primary system)
- 1,392 km pipes (distrib. system)
- 49 water reservoirs
- 163,000 m³ storage capacity
- 50 pumping stations

# Material- and Age Structure of Water Distribution System in Stuttgart

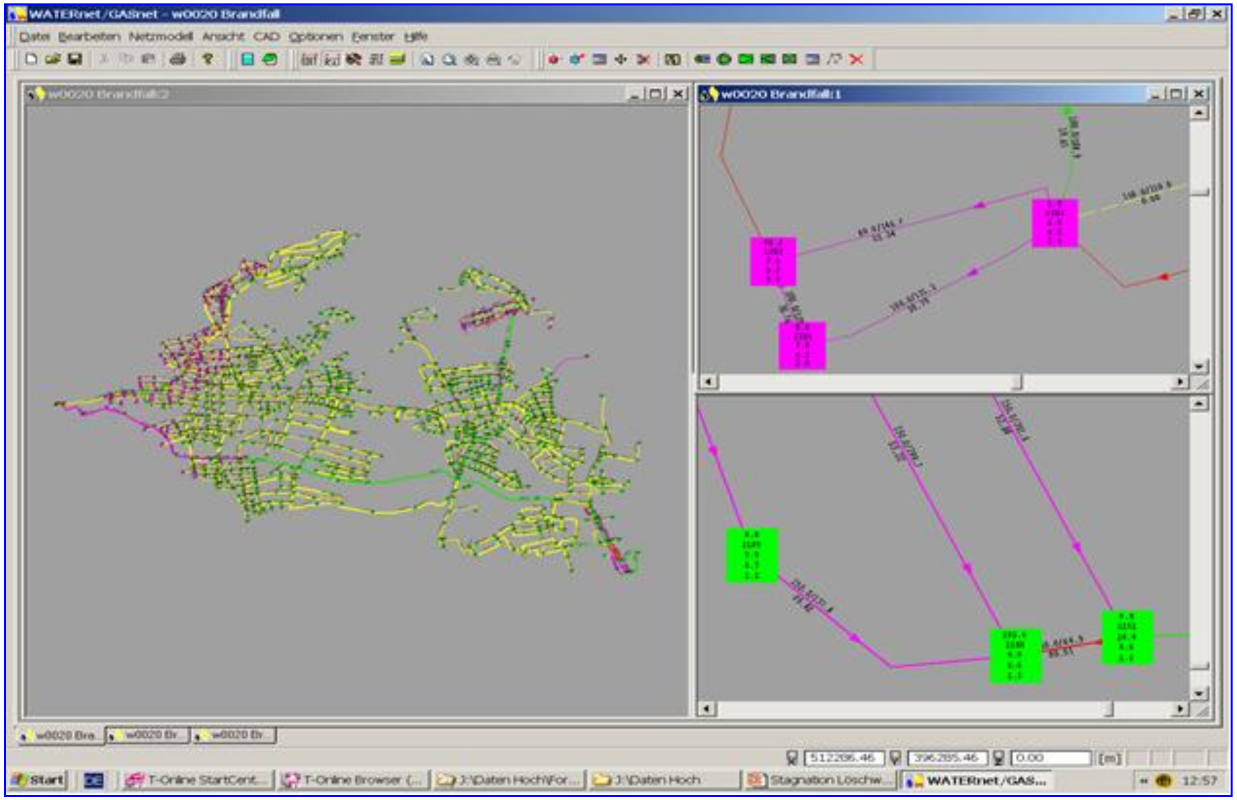



high percentage (47 %) of cast iron pipes (red) which are indicated by an increasing damage rate

# Integrated Asset Management



# Network Analysis – Hydraulic Performance



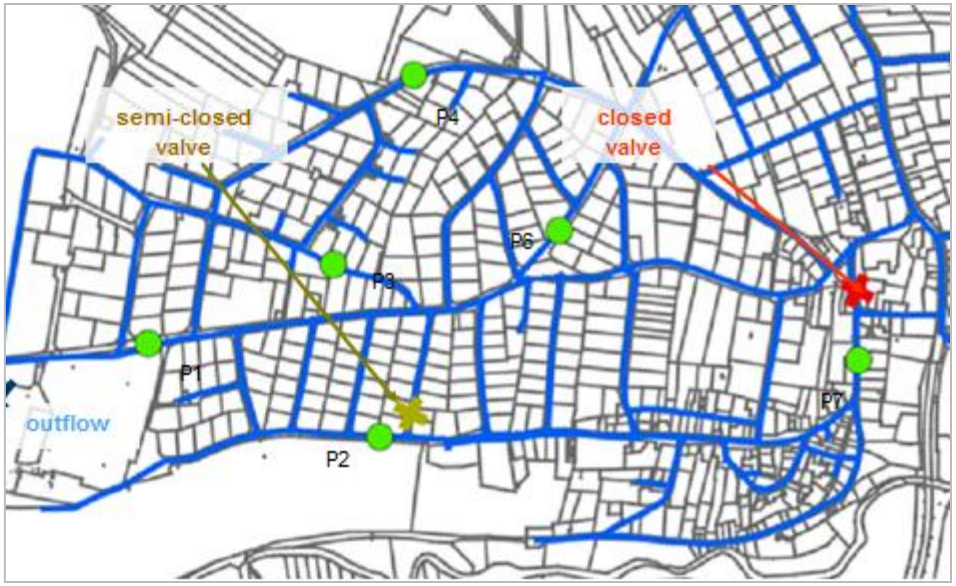

**Calculation of relevant scenarios:**

- maximum peak demand
- fire fighting situations
- network extensions
- design of DMA structures
- other design works

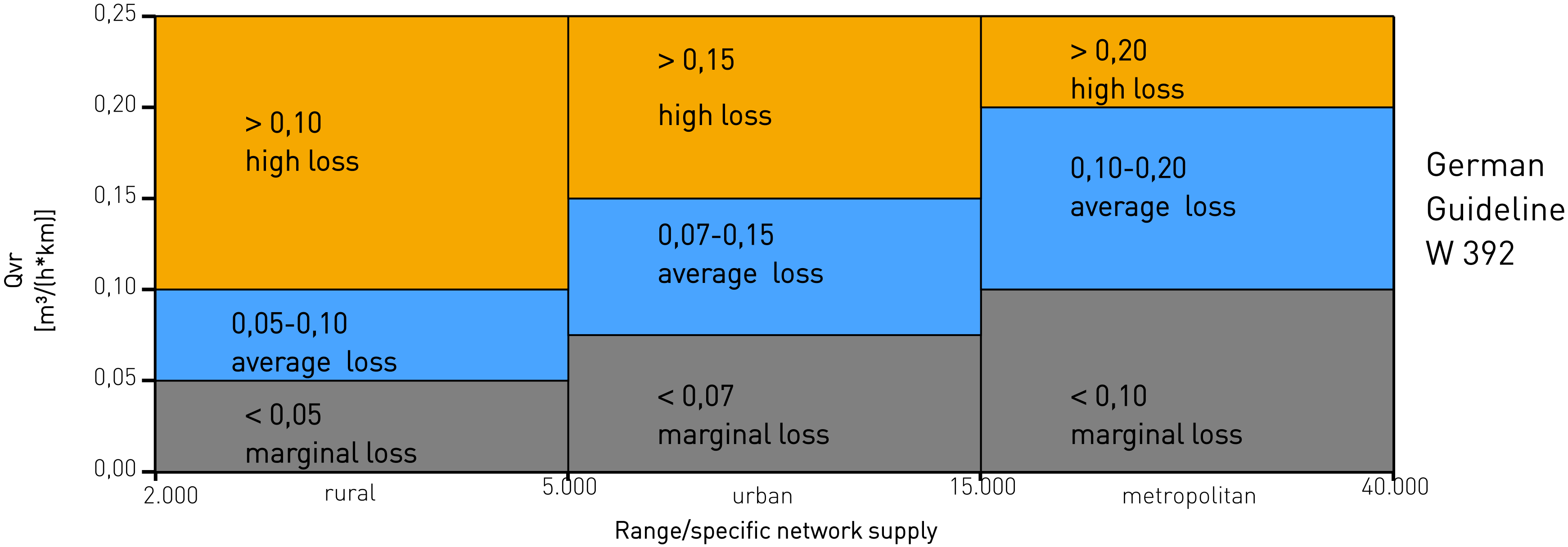
## Network Analysis – Calibration of Model

### Calibration of mathematical network model

- side measurement of pressures and flows (evening / night)
- identification of system faults (Diameter, closed valves, incrustation)


# Guideline Values for Water Loss

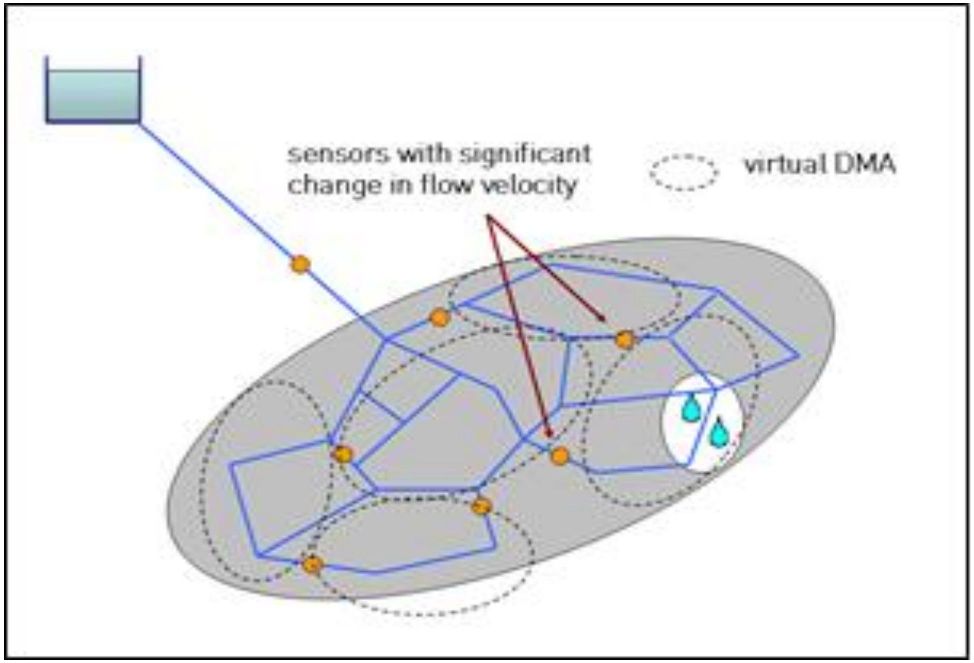



IWA – Infrastructure Leakage Index ILI (target value AWWA

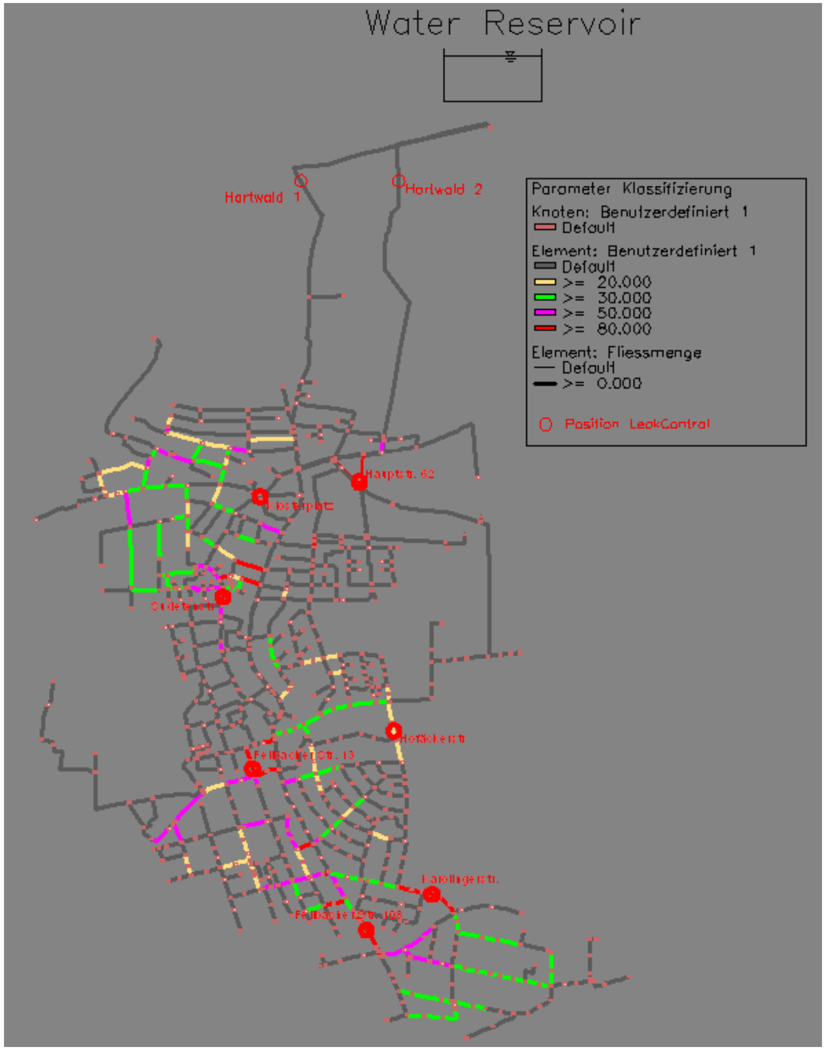
| ILI | Technical Performance Category | |
|---|---|---|
| 1 – 2 | A | Further loss reduction may be uneconomic unless there are shortages; careful analysis needed to identify cost effective improvement |
| 2 – 4 | B | Potential for marked improvements; consider pressure management; better active leakage control practices, and better network maintenance |
| 4 – 8 | C | Poor leakage record; tolerable only if water is plentiful and cheap; even then, analyze level and nature of leakage and intensify leakage reduction efforts |
| > 8 | D | Horrendously inefficient use of resources; leakage reduction programs imperative and high priority |

Realisation of physical or virtual DMA´s

- optimised positioning of flow meters (topology, hydraulics)
- permanent measurement of flow rates and their changes
- localisation of leakage area



# Software based Positioning of Flow-Measurement (Water Loss Monitoring)




## Infrastructure Data

- 60 km network length
- 20,300 inhabitants
- 26 m³/h minimum night consumption

## Mathematical Model

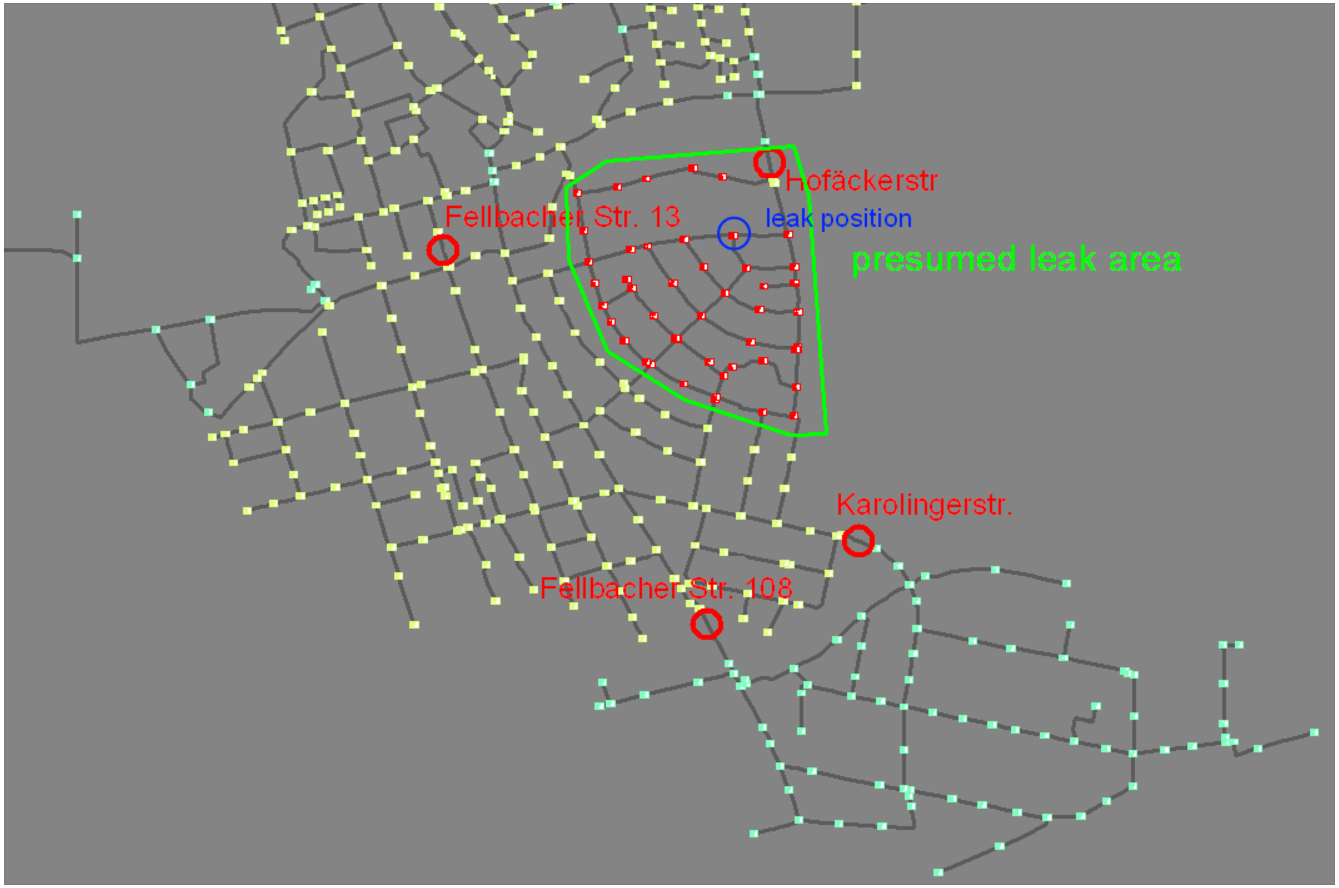
- 675 nodes, 813 pipe-elements

## Flow Measurement

- 7 LeakControl sensors
- 2 MID (outlet water reservoir)

Installed at relevant positions (hydraulic sensitive pipes)

# Software based Detection of Leakages




Mathematical analysis of measured and calculated flow rates will lead to a rough estimation of leak size and position (recognation of pattern)

detected leakage: 1 l/s

# Strategy for Rehabilitation Planning

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## Strategical Asset Management (SAM)

Definition of long term rehabilitation volume

- bottom-up
  rehabilitation volume (km) based on calibrated model with survival functions per material (material groups)

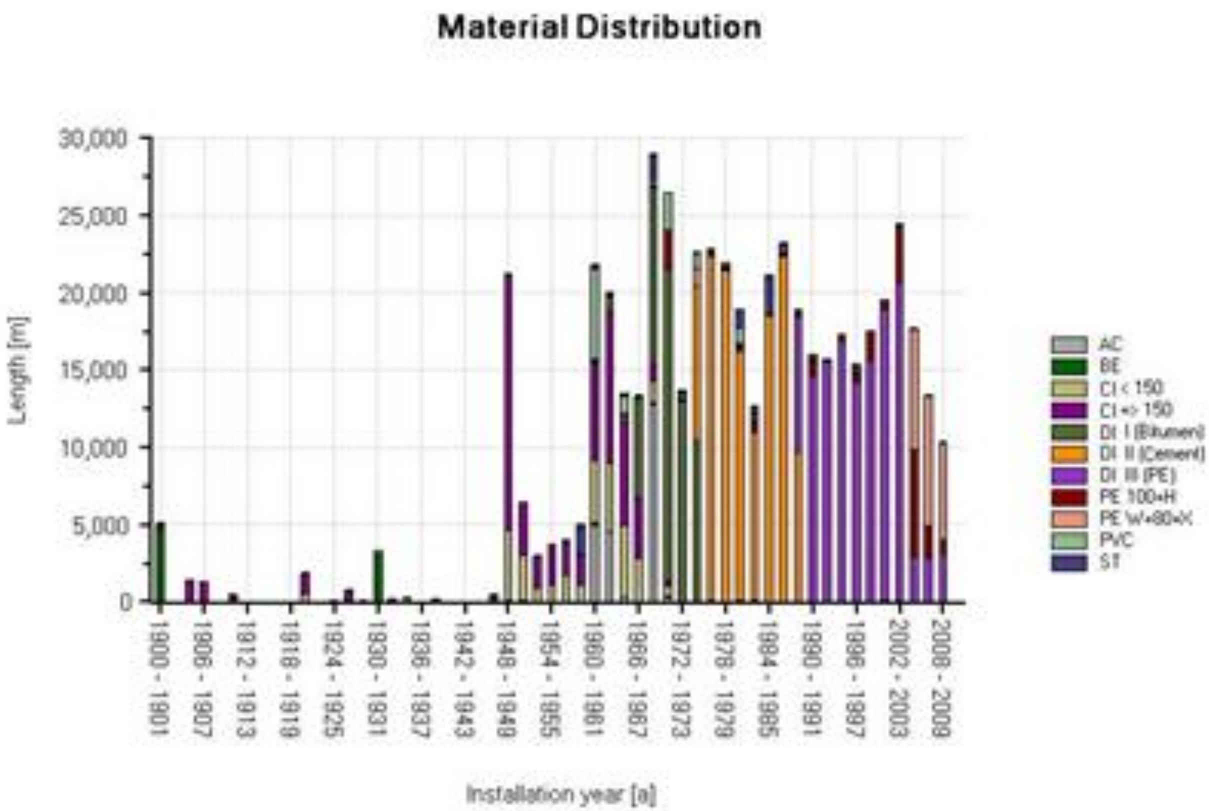
- top-down
  definition of budget by asset owner in respect to service level

## Operational Asset Management (OAM)

Definition of medium and short term rehabilitation measures

- calculation of pipe section related rehabilitation characteristics
- calculation of performance indicators
- definition of scenarios
- calculation of investments
- definition of priorities (technical / economical aspects)
- examination of external factors (e.g. sewer, gas) will lead in a change of priorities

# Material and Age Structure

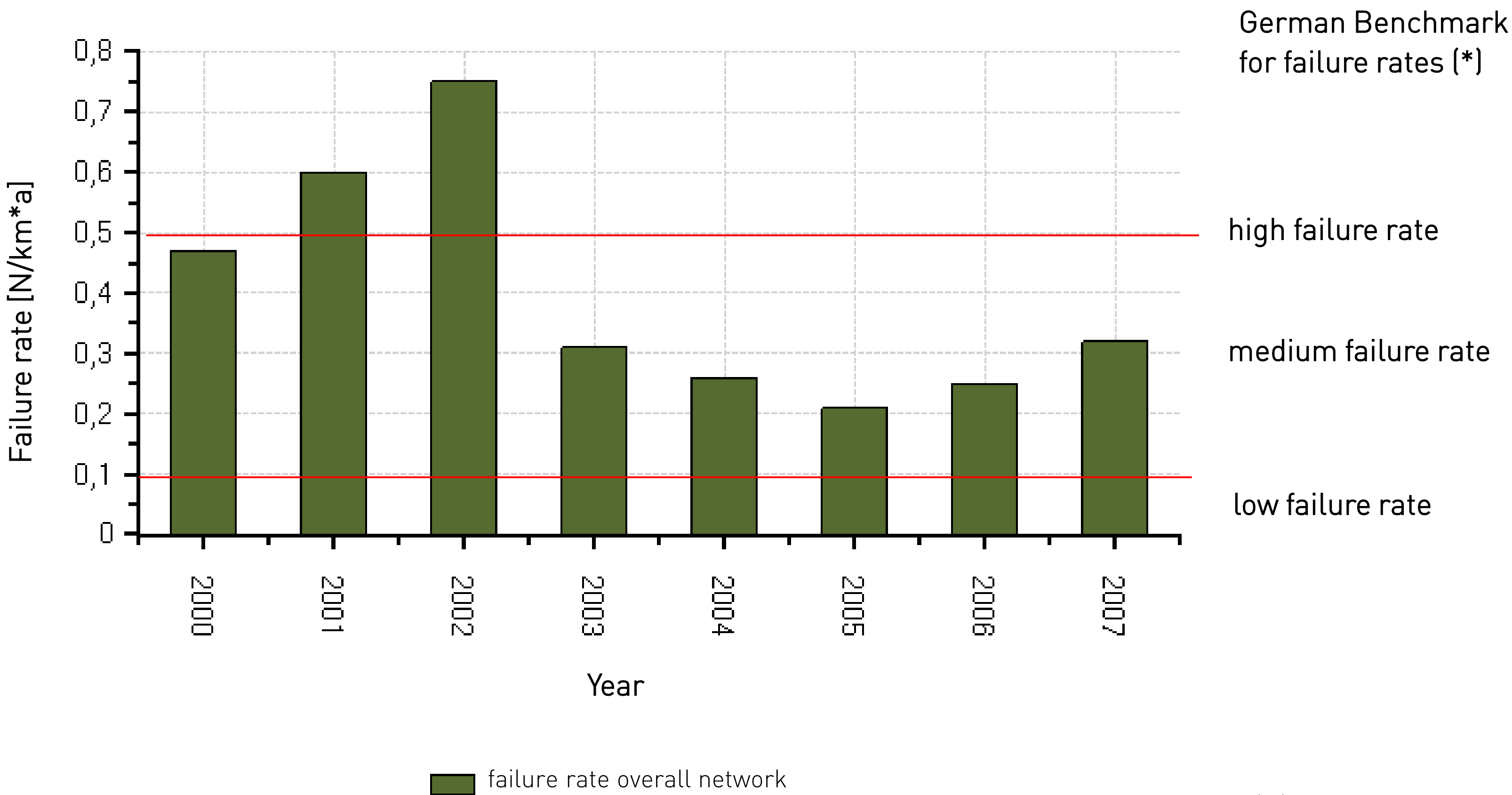



## Data Management

- GIS
- inspection data
- SCADA system
- CCP, water loss

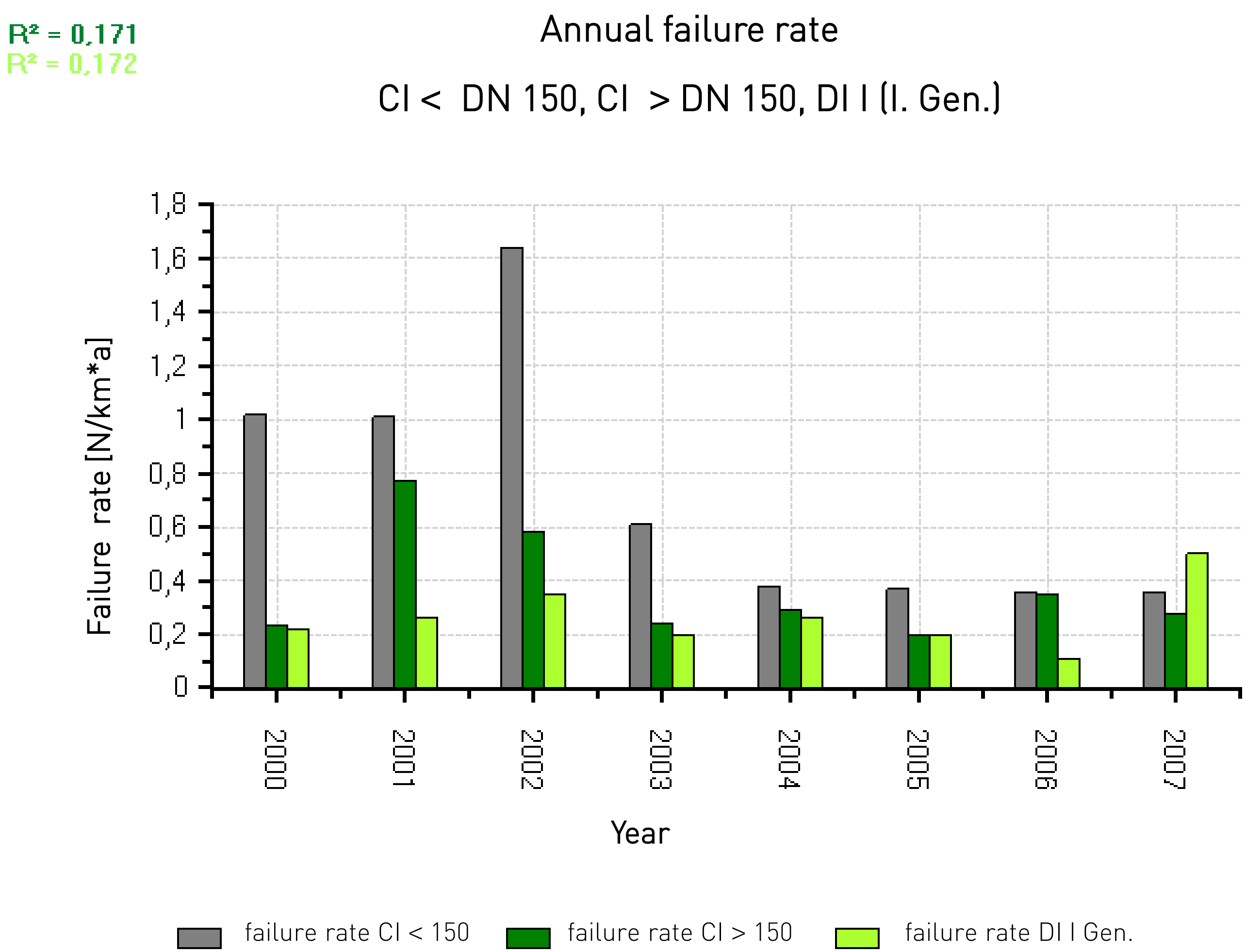
Analysis of combined data related to pipe-sections

# Annual Failure Rate

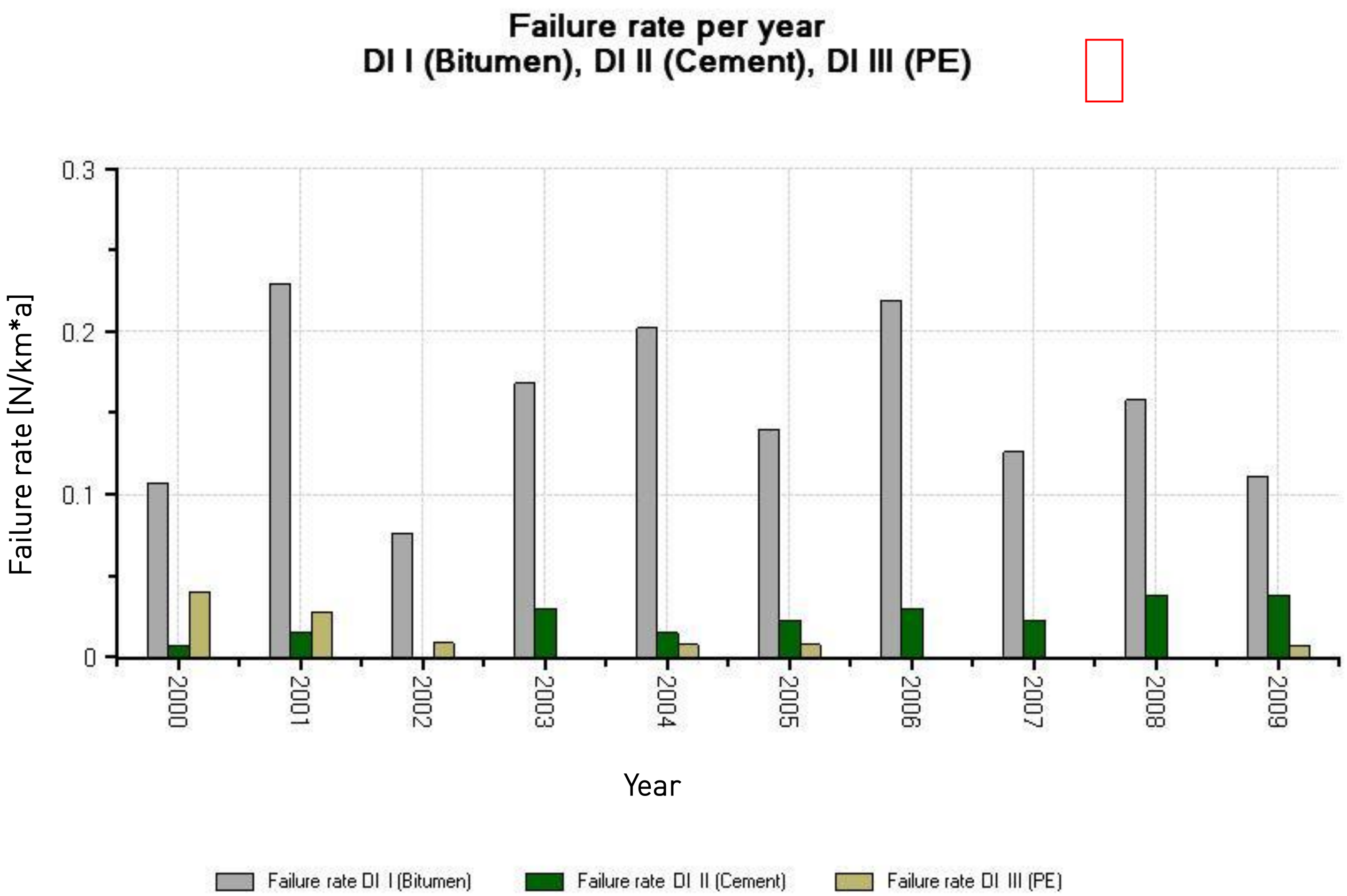



(*) DVGW

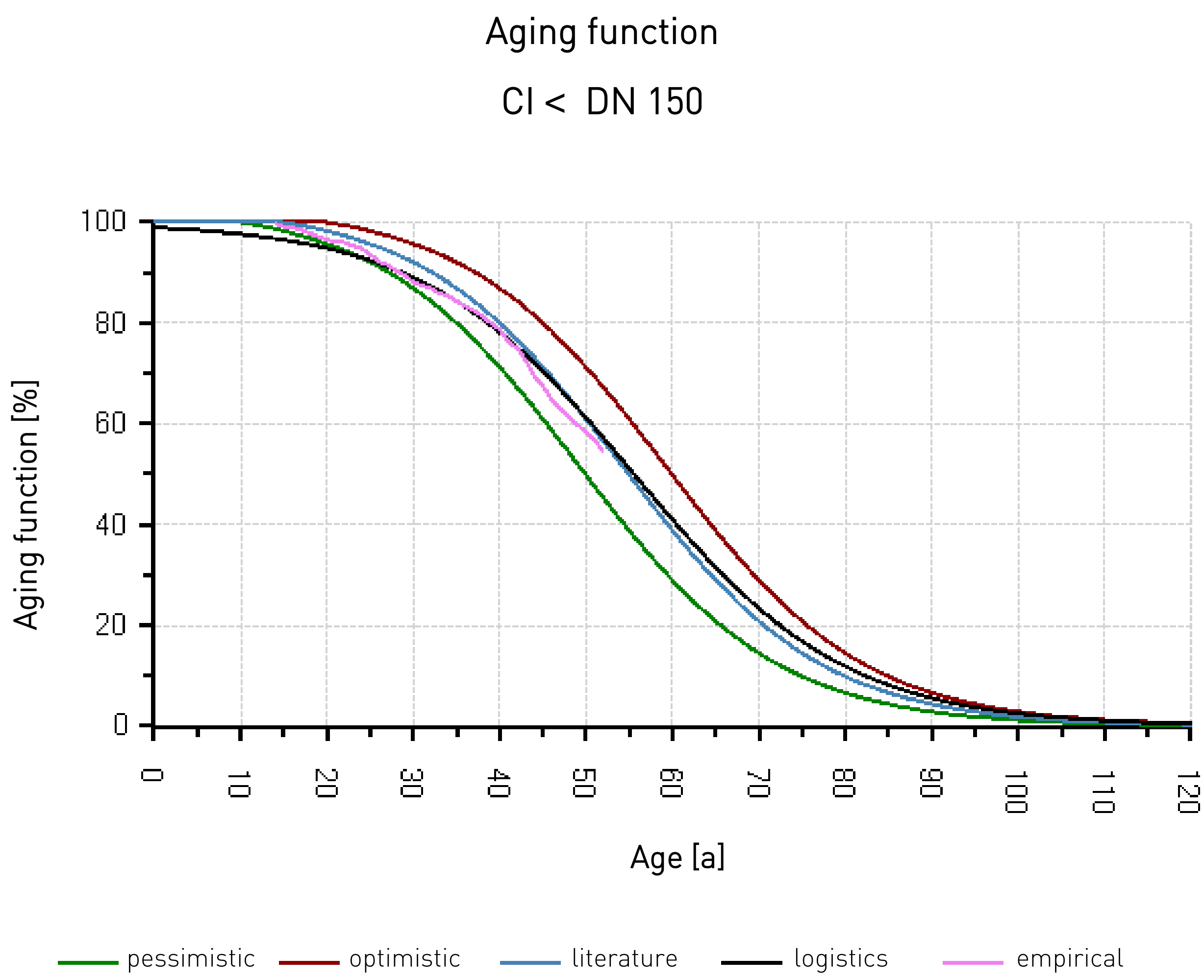
# Annual Failure Rate of different Pipe Groups



# Failure Rate for Ductile Iron Pipes

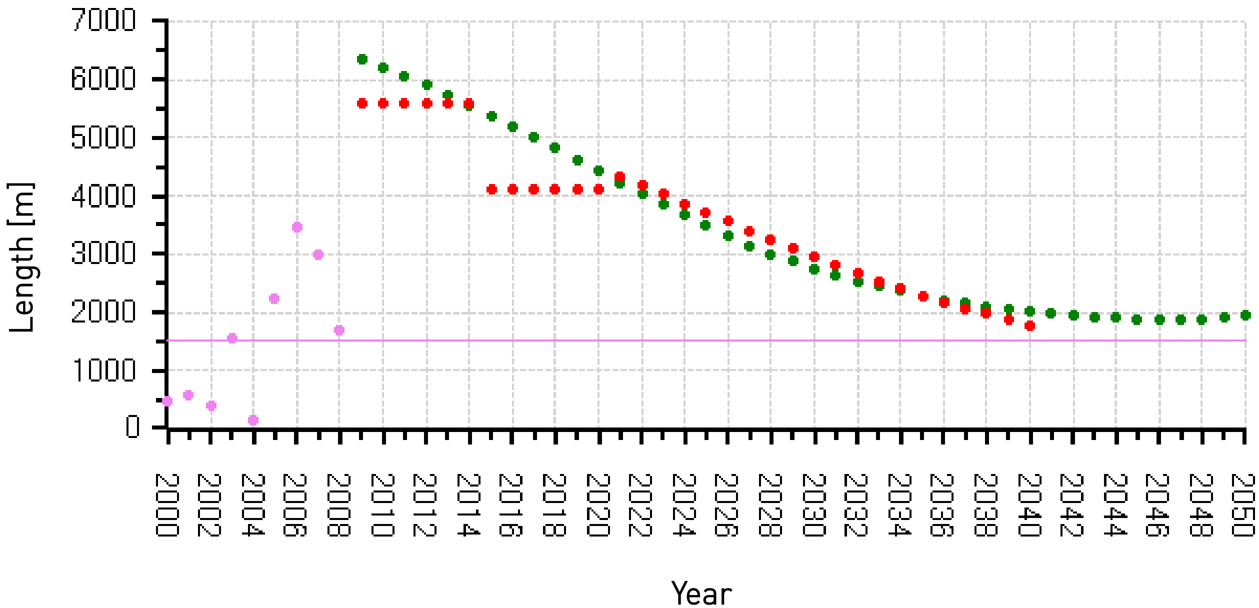


# Fit of Aging Functions



# Definition of Scenarios

Rehabilitation demand in scenario




realized renewal [m]

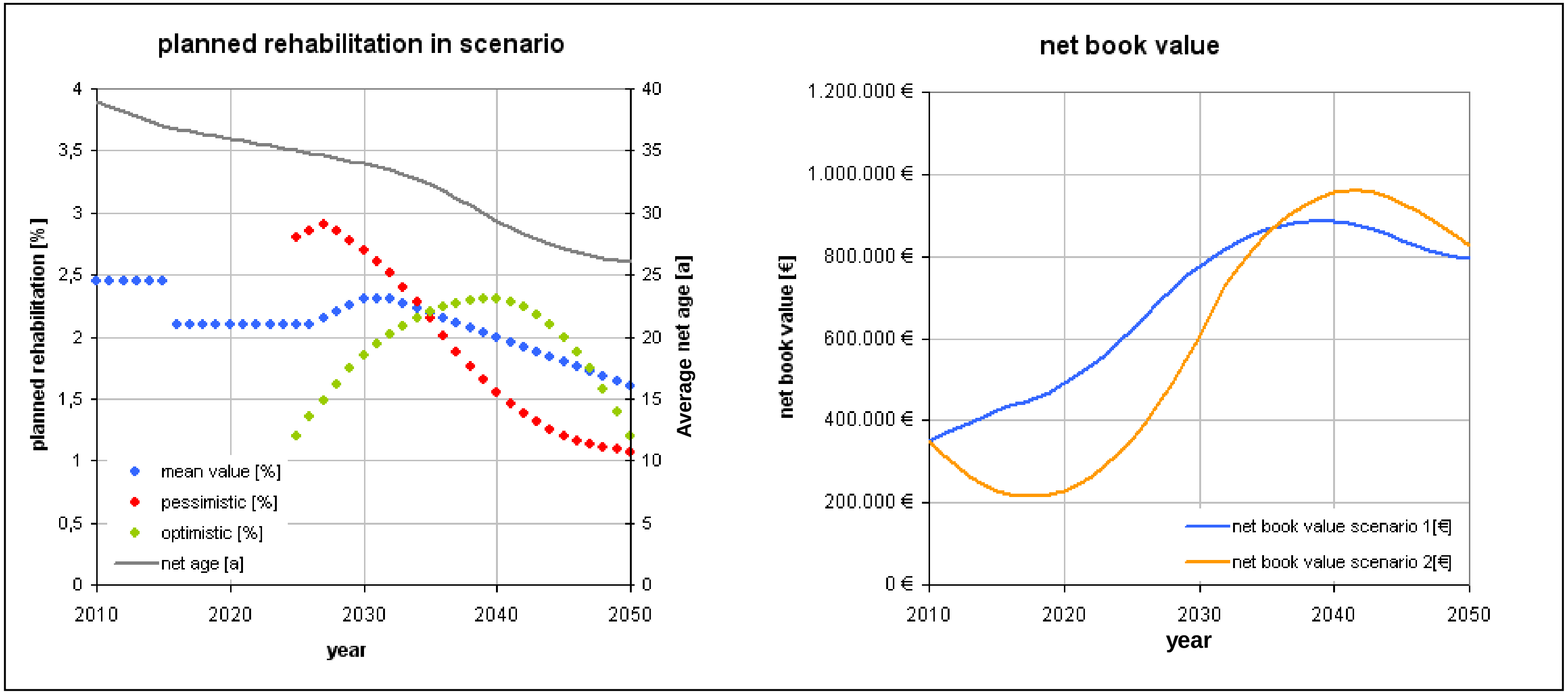
average (realized renewal [m])

Demand of renewal: average [m]

Example for realisation

# Planned Scenario with related Net Book Value

## Rehabilitation Scenario of pipe group ductile iron (I gen.)



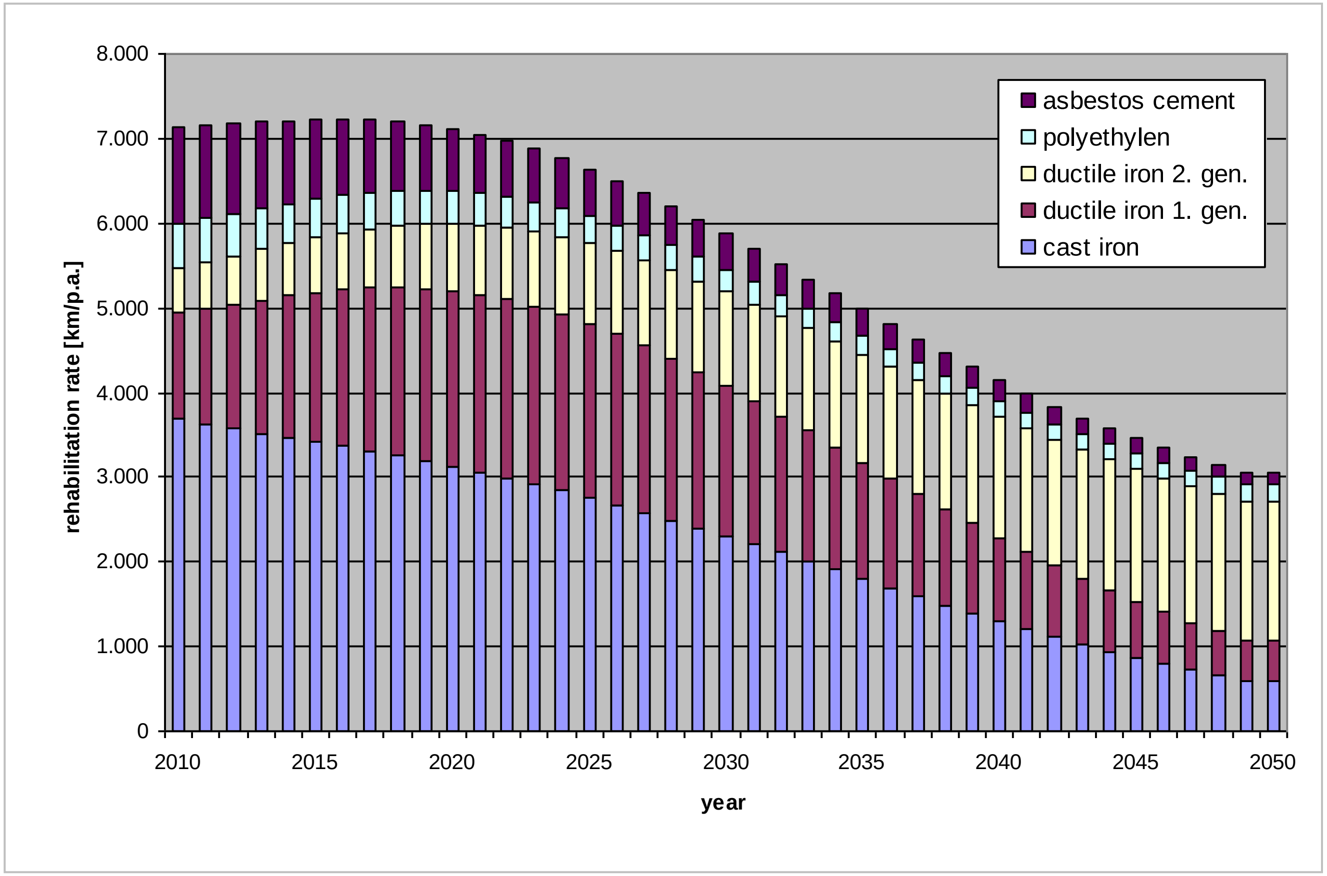
# Medium and Short Term Rehabilitation Planning

**Criteria catalogue with performance indicators**

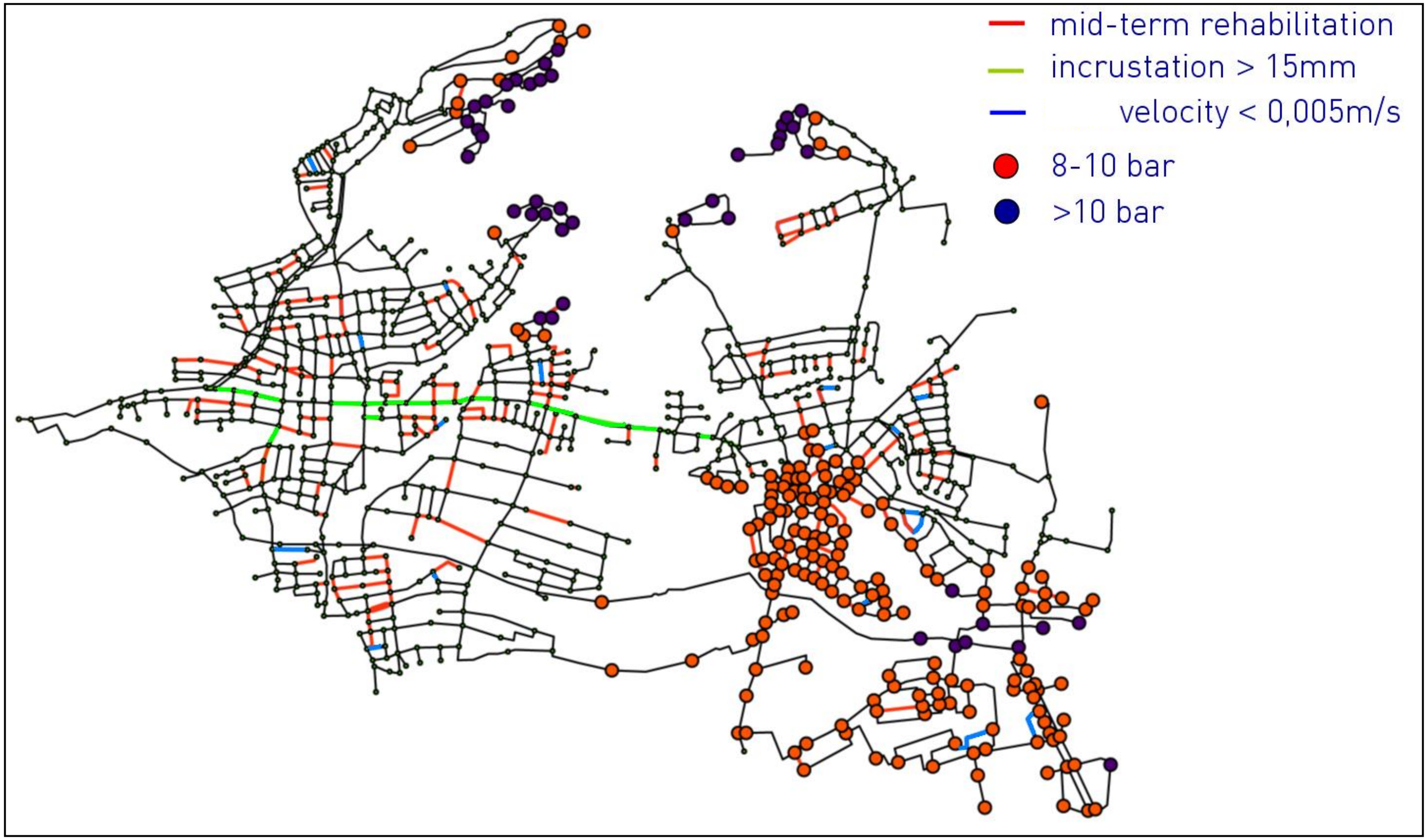
- technical indicators (incrustation, failure risk, water loss, pressure …)
- failure rate of specific pipe groups
- economical indicators (economic optimal time for rehab., public traffic, flushing,…)
- combined excavation projects (street, sewer, gas,…)

Result: Ranking of pipe sections for rehabilitation

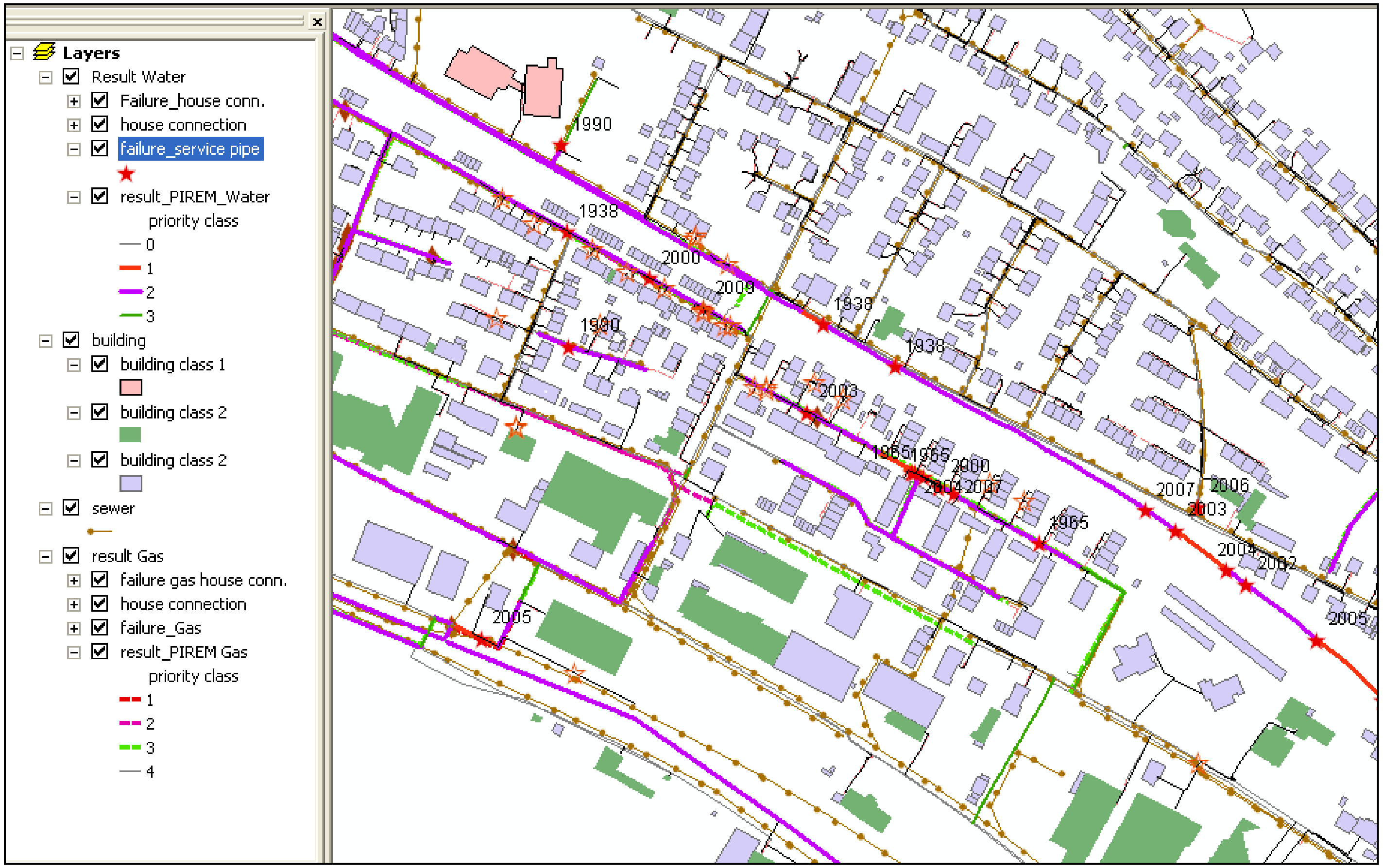
# Resulting Rehabilitation Programme



# Analysis of different Aspects for a Rehabilitation Strategy (Hydraulics)

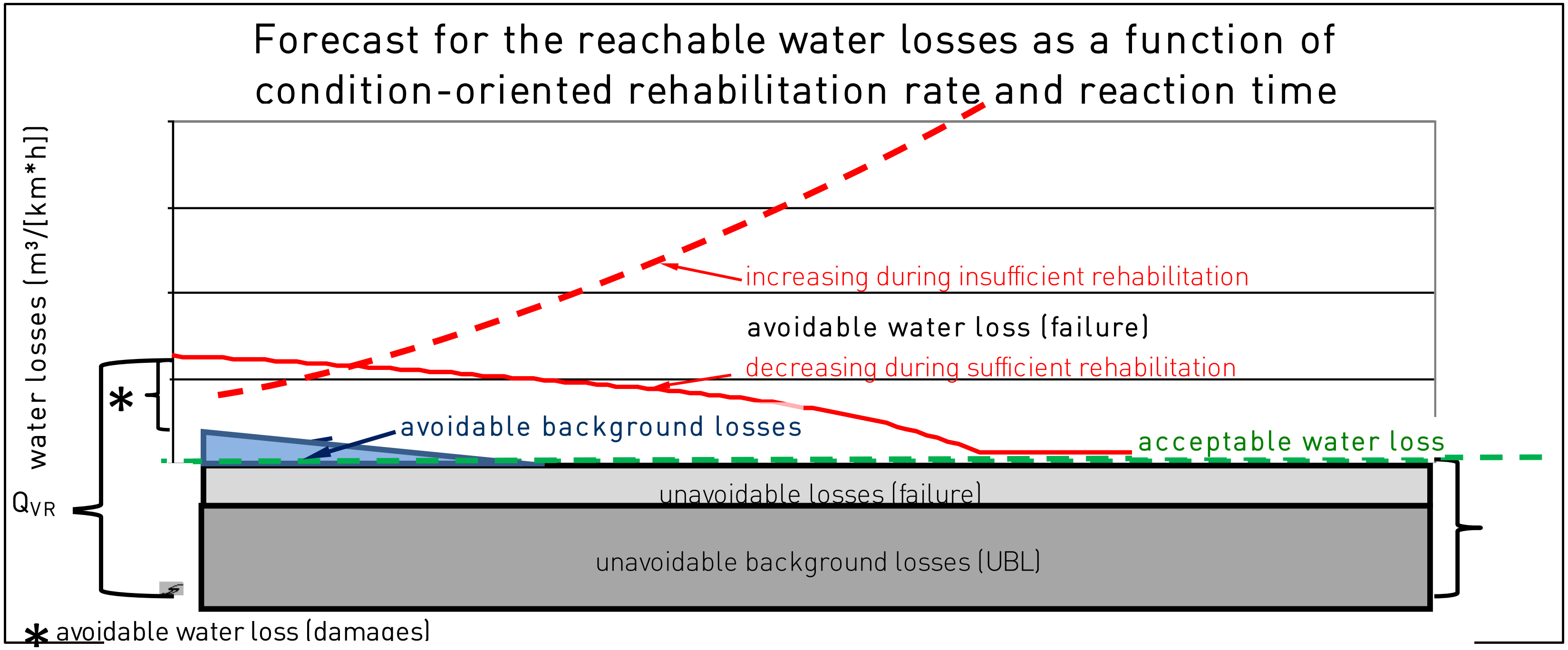


# Analysis of Failure Rates of different Supplies



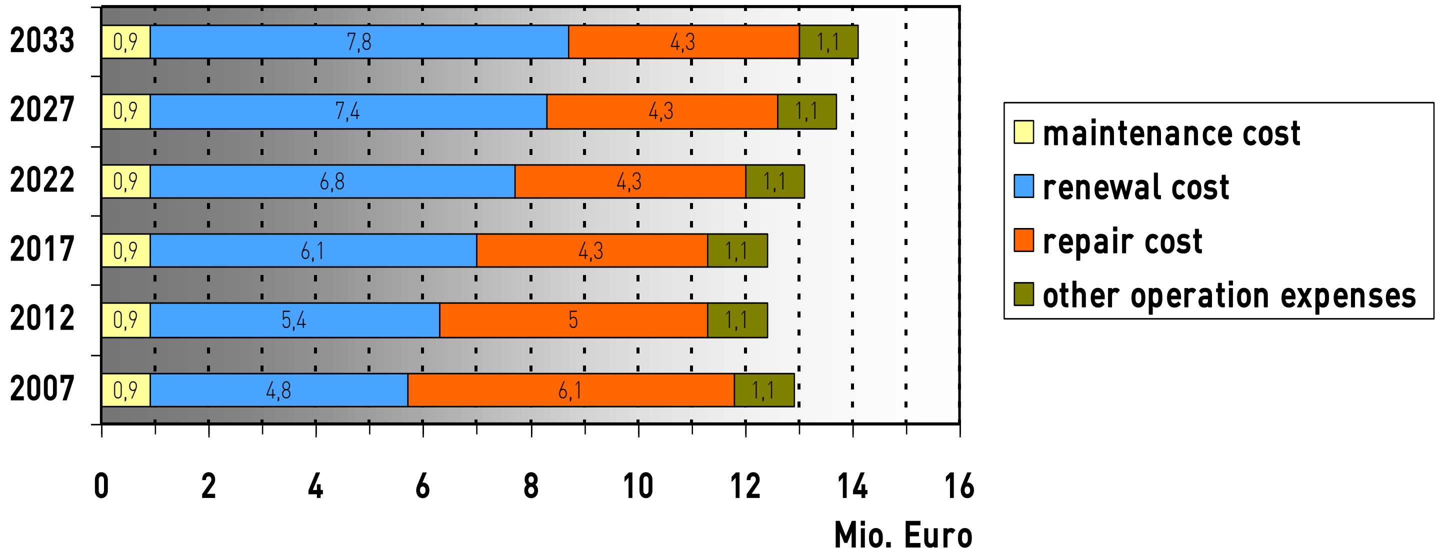
# Representation of Rehabilitation Programme

## Context Rehabilitation Rate and Water Loss



# Expected Effect of Rehabilitation Programme

- Through concerted replacement of defective pipes or pipe sections a decrease of expensive damages and disturbances is to be expected.
- Medium period of 5-7 years are expected with a decrease of repair cost (orange) of approximately 30 %.



# Conclusion

## Asset Management, Rehabilitation and Water Loss

- Modern asset management is based on analysing lots of information and data in a data-base evaluation by using an applicable asset management software
- On this basis water suppliers can efficiently utilize company's know-how for the strategic planning and rehabilitation of the system
- The introduced Integrated Asset Management understands the strategic and operative asset management as a cluster of five categories
- This approach has been well approved in the water supply industry and in multi utility companies
- The application of such an asset management is essential for a safe and largely faultless operation of a pipe network with tolerable failure and water loss rates and leads to improved economic efficiency

## Contact Details

Do you have any questions ?
I am looking forward hearing from you !

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