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Network Rehabilitation Strategies as a Tool for Cost Recovery at Water Utilities – Best Practice Example of Leipzig, Germany

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1. KWL – KEY DATA

	2007	2008	2009
Supplied amounts, water (million m^3/a)	33,1	32,1	32,1
No. of water works in operation	5	5	5
Length of water supply network (km)	3.187	3.234	3.264
Treated wastewater discharge (million m3/a)	35,1	33,6	33
No. of sewage treatment plants	21	18	17
No. of wastewater and storm water pumping stations	162	162	166
Length of sewers (km)	2.561	2.597	2.616
Population served (thousand inhabit.)	615	618	621

2. KEY CONSIDERATIONS

Effective Network Infrastructure

- is the base for certainty of water supply and disposal
- is the base for the development of the region
- is the base for long-term assured service and quality

Replacement Water Supply Node, Probstheida

Investments in the Network Infrastructure

- keep the assets sustainable
- improve the condition of the network and the facilities
- have to be economical and long-term fundable

3. LONG-TERM INVESTMENT REQUIREMENTS

Thesis for Water Supply Network

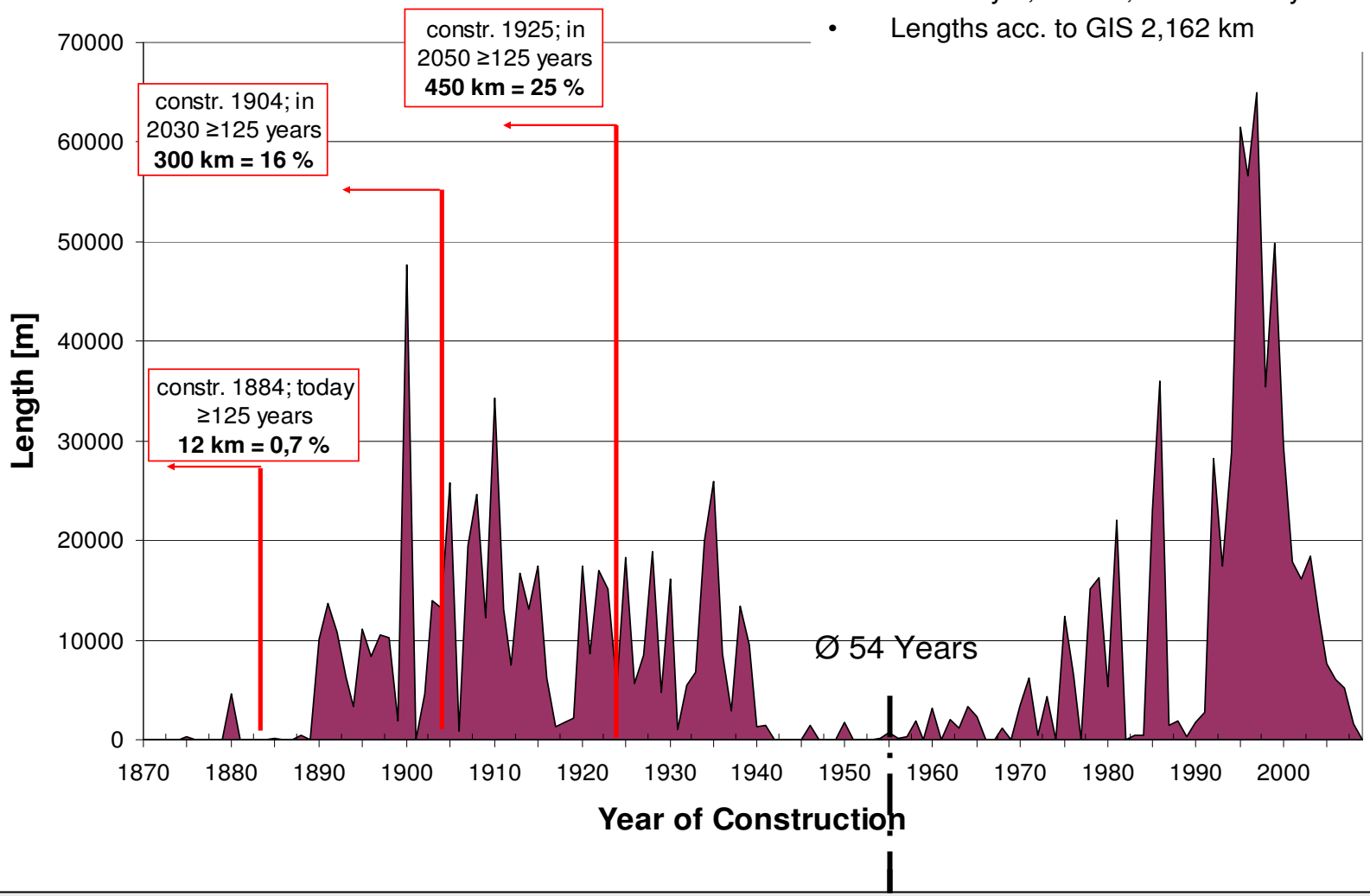
- Average age of water supply network is 48 years
- By the year 2030, 200 km of water supply network and 50 km of long-distance (trunk) lines would be more than 100 years of age (classical „static“ assumed life span) and would need repalcement
- This would correspond to an investment volume of roughly 100 million EUR and an annual renewal rate of 12 km until 2030

Thesis for Sewer Network

- Average age of sewer network is 54 years
- By the year 2030, 300 km of sewer network would be more than 125 years of age (classcial „static“ assumed life span) and would need replacement
- This would correspond to an investment volume of roughly 330 million EUR and an annual renewal rate of 15 km until 2030

→ Display Age Structure Sewer Network

- In Tiffany:1,568 km, with constr. year 1240 km
- Lengths acc. to GIS 2,162 km



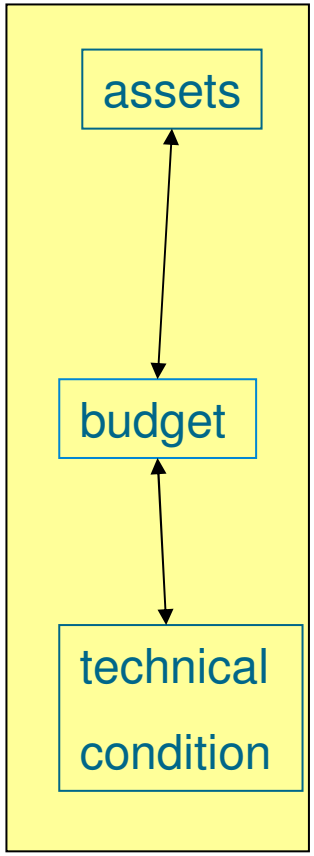
4. OBJECTIVES

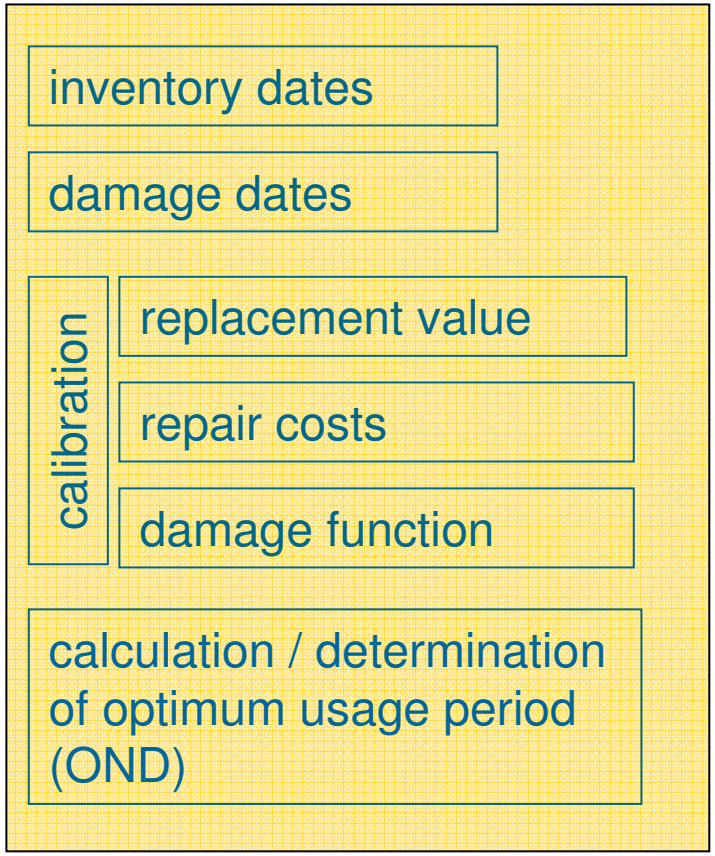
- For reasons of sustainability of the networks, the ratio of *net asset value / replacement value* shall be > 50% (for water supply this is already achieved)
- Investment backlog for water supply network and long-distance lines to be dissolved by 2030
- The project “Bleifrei 2012!” (“Leadfree 2012”) is planned to be completed by 2012 for all water supply house connections.
- Currently non-connected settlements shall be connected to the sewer network until 2015.
- Rehabilitation of the main sewer collectors shall be completed until 2025.
- Determination of needs and time frame to rehabilitate smaller scale sewer collectors (currently undertaken as part of elaboration of *Sewer Network Rehabilitation Concept*)

5. CHALLENGES

- Target Conflict between need (technical condition of network) and available budgets
- Need for an objective classification system to identify, classify, prioritise / rank and time investments in the networks
- Need for detailed conditions assessment of the networks, smallest units (pipe sections, segments)
- Strong need to justify investment costs and annual investment plans inside the company, and externally (stakeholders, the public)
- Need to link-up rehabilitation strategies with operational processes of the utility and to make it transparent (acceptance)

6. STRATEGY DEVELOPMENT





"Monitoring" – worst case

Net Asset Value Strategy

Condition Strategy

Budget Strategy
•real
•optimal

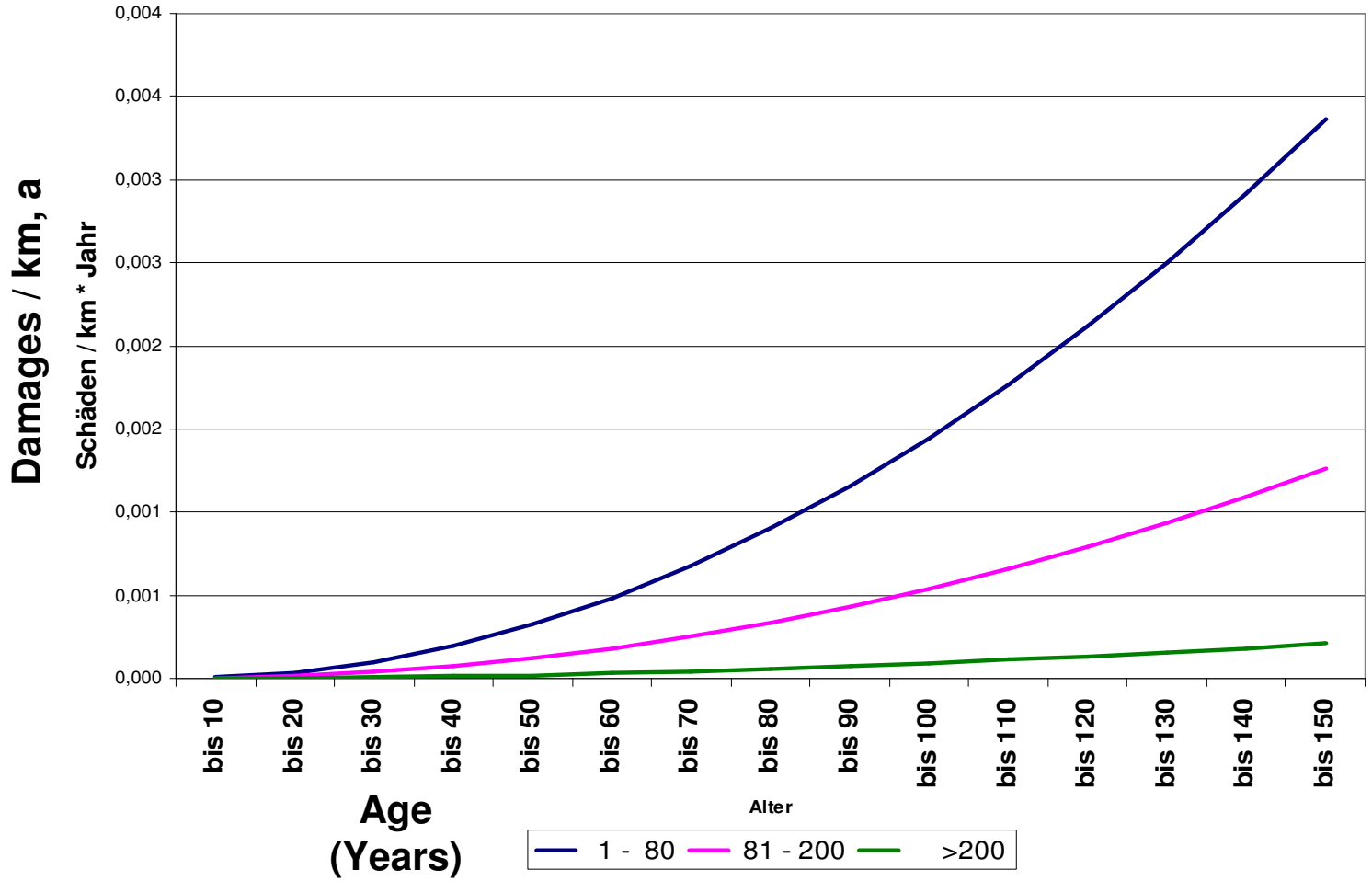
"Fire Fighting" Strategy

Target Conflict | ***Data Base and Functions*** | *Strategy*

→ Sample Damage Function Water Network

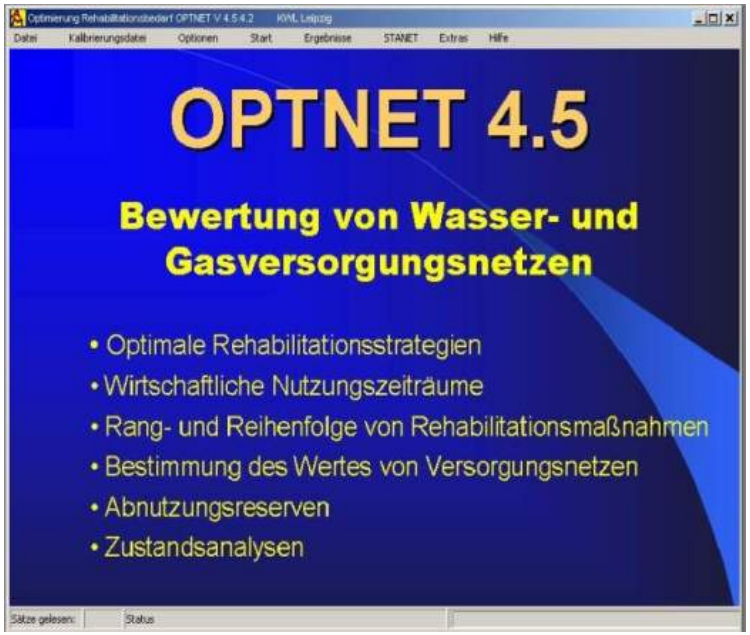
OptNet

15.09.201



Zurück

7. WATER NETWORK / OPTNET



regular updates of relevant inventory data

Number of costs of pipe failures

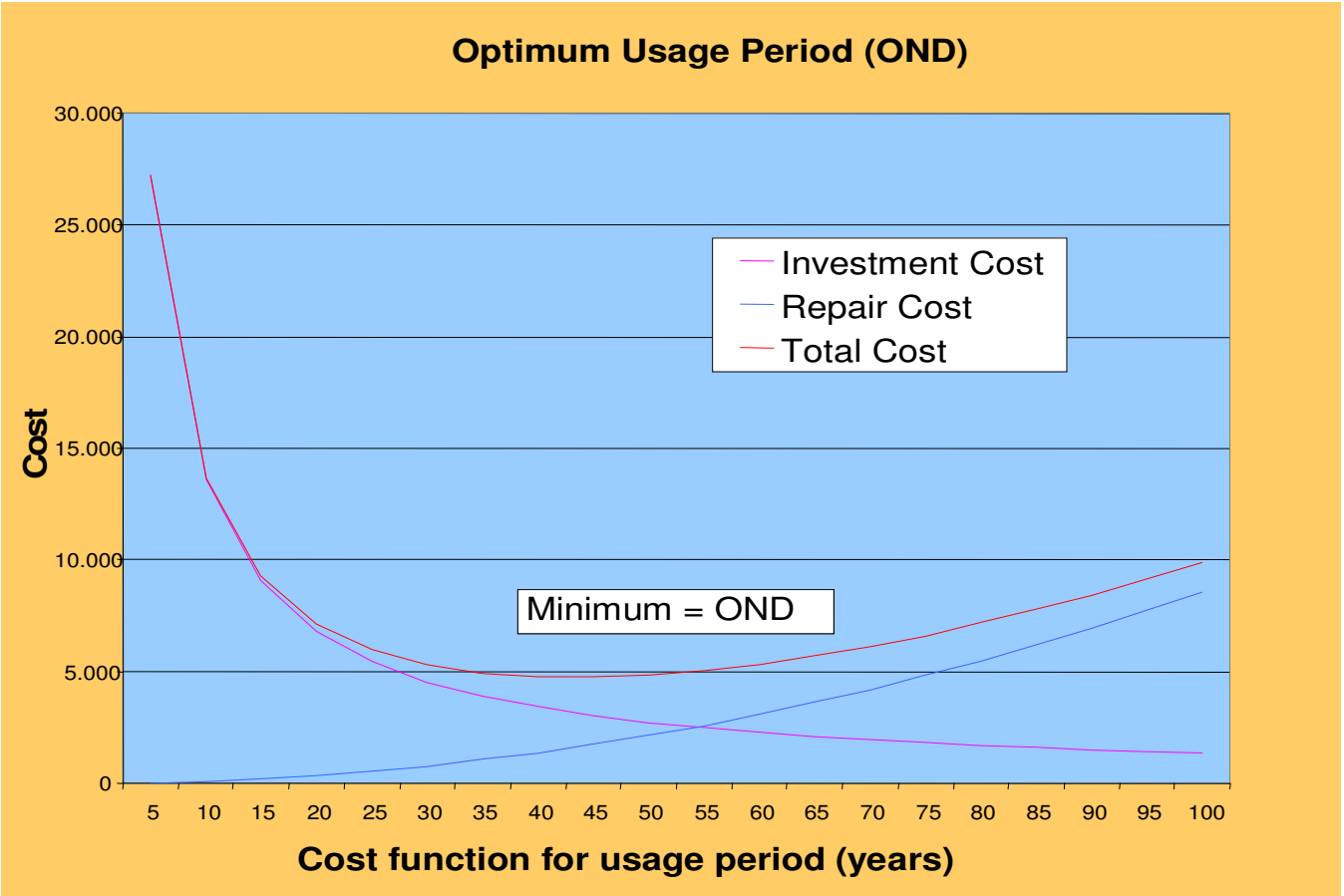
GIS

STANET

SAP-PM

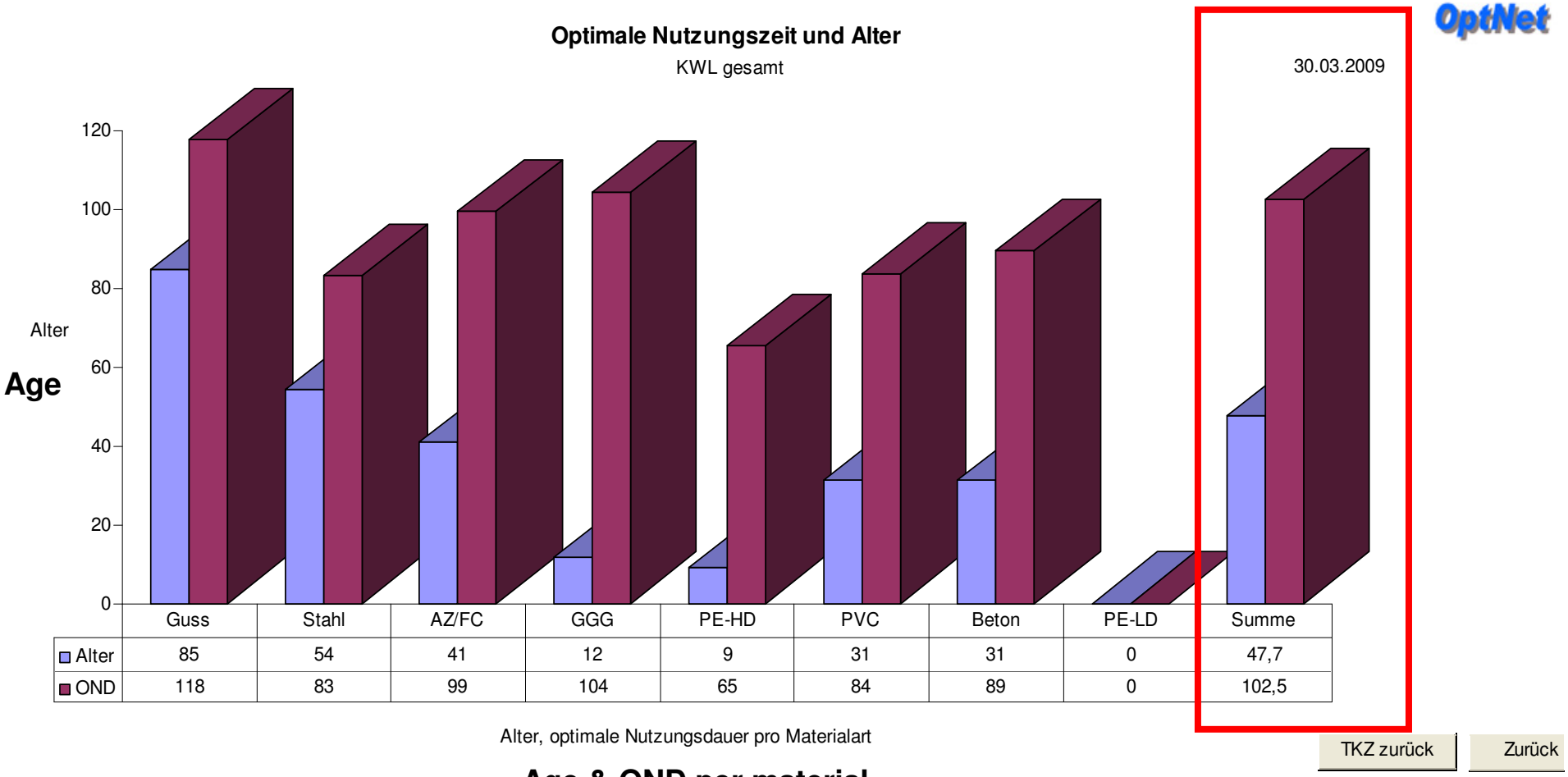
- Evaluates conditions for water supply networks, produces rehabilitation proposals for specified parts of the network
- Calibrates water supply network damage functions
- Proposes optimum rehabilitation year for each line section
- Calculates the optimum usage period (OND) for different materials and diameters
- calculates the replacement value and the ratio between net asset value and replacement value (“amortisation reserve”)
- designs optimal rehabilitation strategies based on various scenarios and targets
- Ranks / prioritises investment measures
- Forecasts the state and values development for 30 years

→ Principle of Optimum Usage Period (OND)



Costs estimated with Discounted Cash Flow Method (DCF)

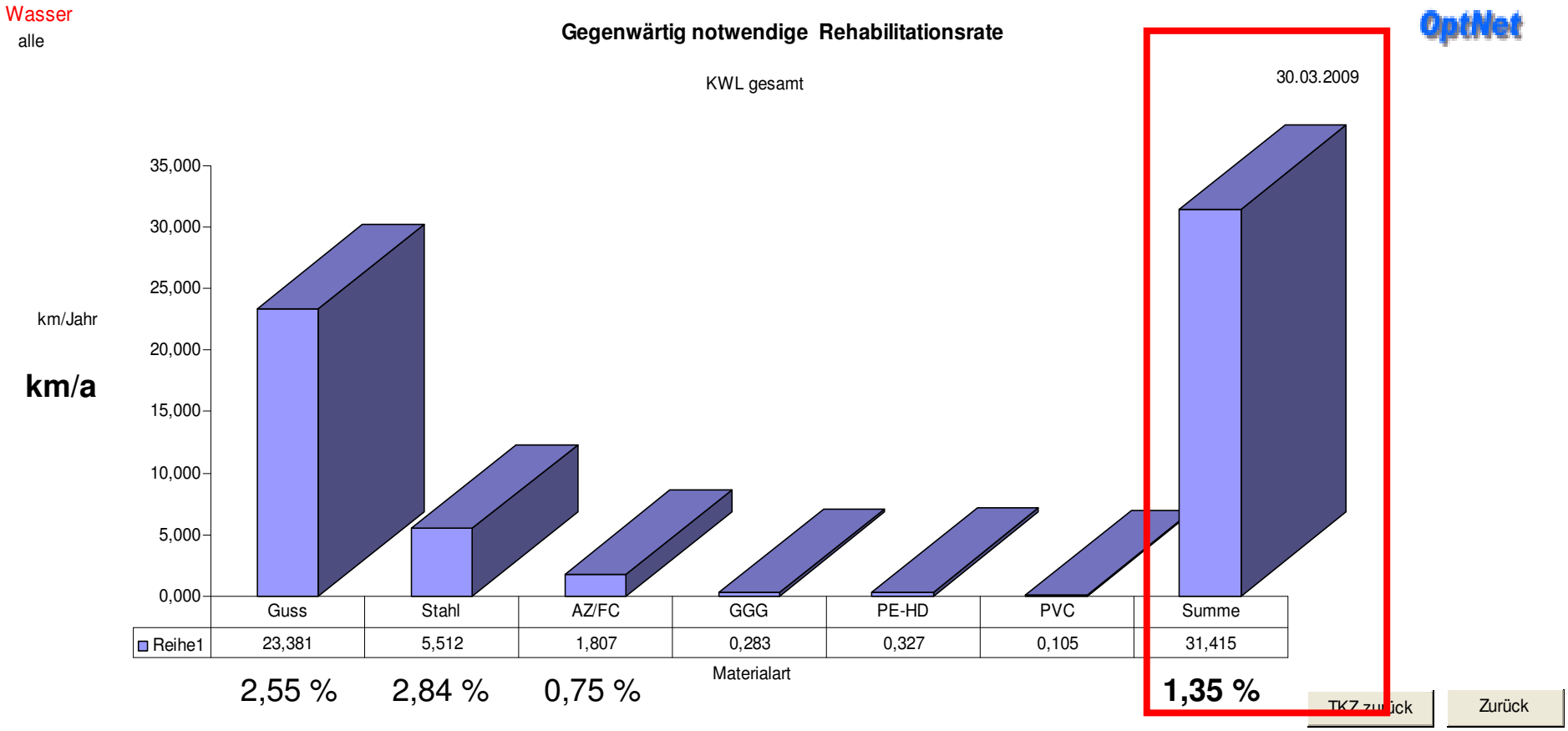
→ Age and Optimum Usage Period (OND) per material



	Guss	Stahl	AZ/FC	GGG	PE-HD	PVC	Beton	PE-LD	Summe
Alter	85	54	41	12	9	31	31	0	47,7
OND	118	83	99	104	65	84	89	0	102,5

Age & OND per material

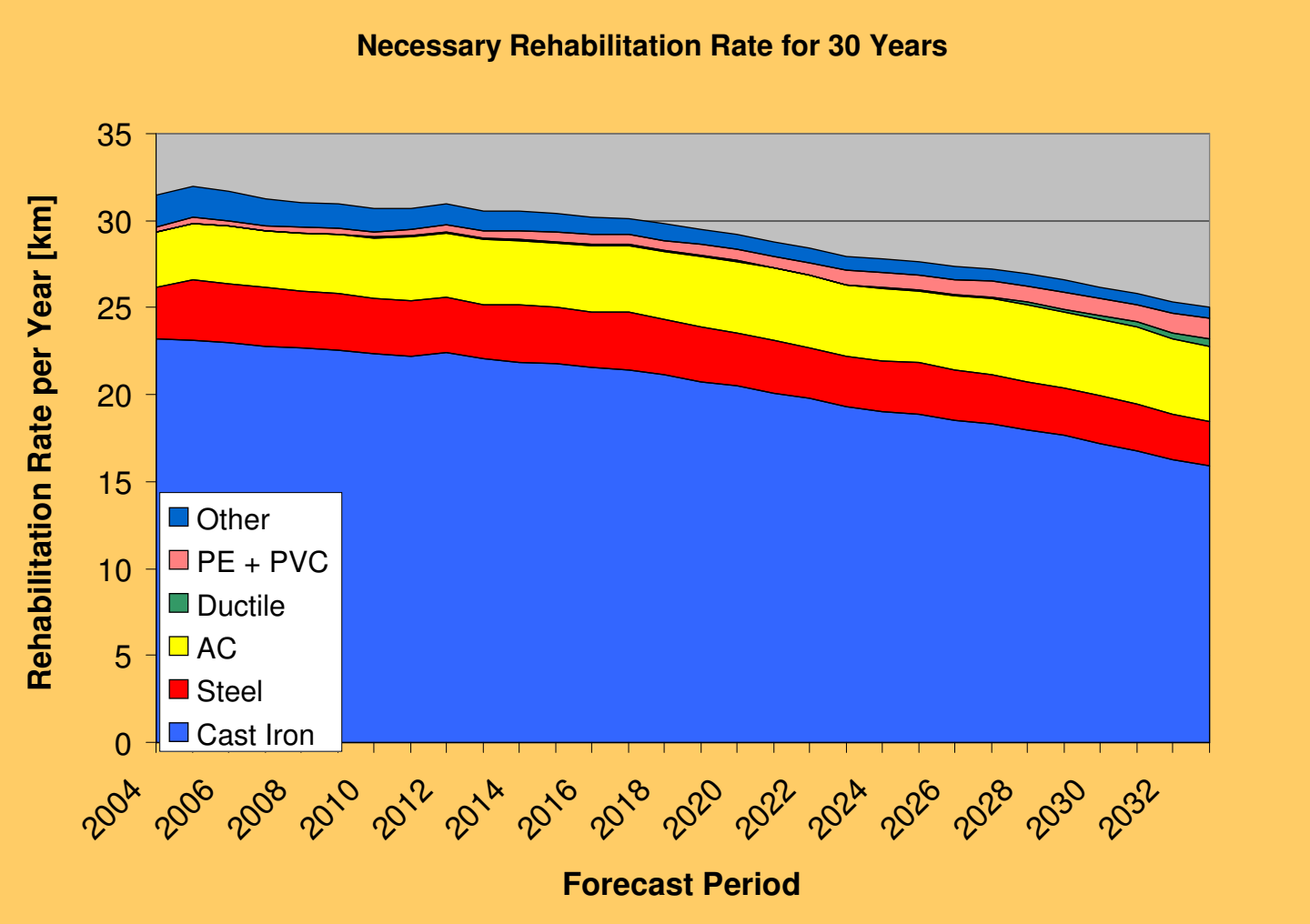
→ Necessary current rehabilitation rate per material



Forecasts over 30 years are possible

Target: Conservation of value, i.e. investments ~ abrasion

→ Rehabilitation Rate Prognosis for 30 years



→ Relation of Asset Value to Replacement Value (10 years)

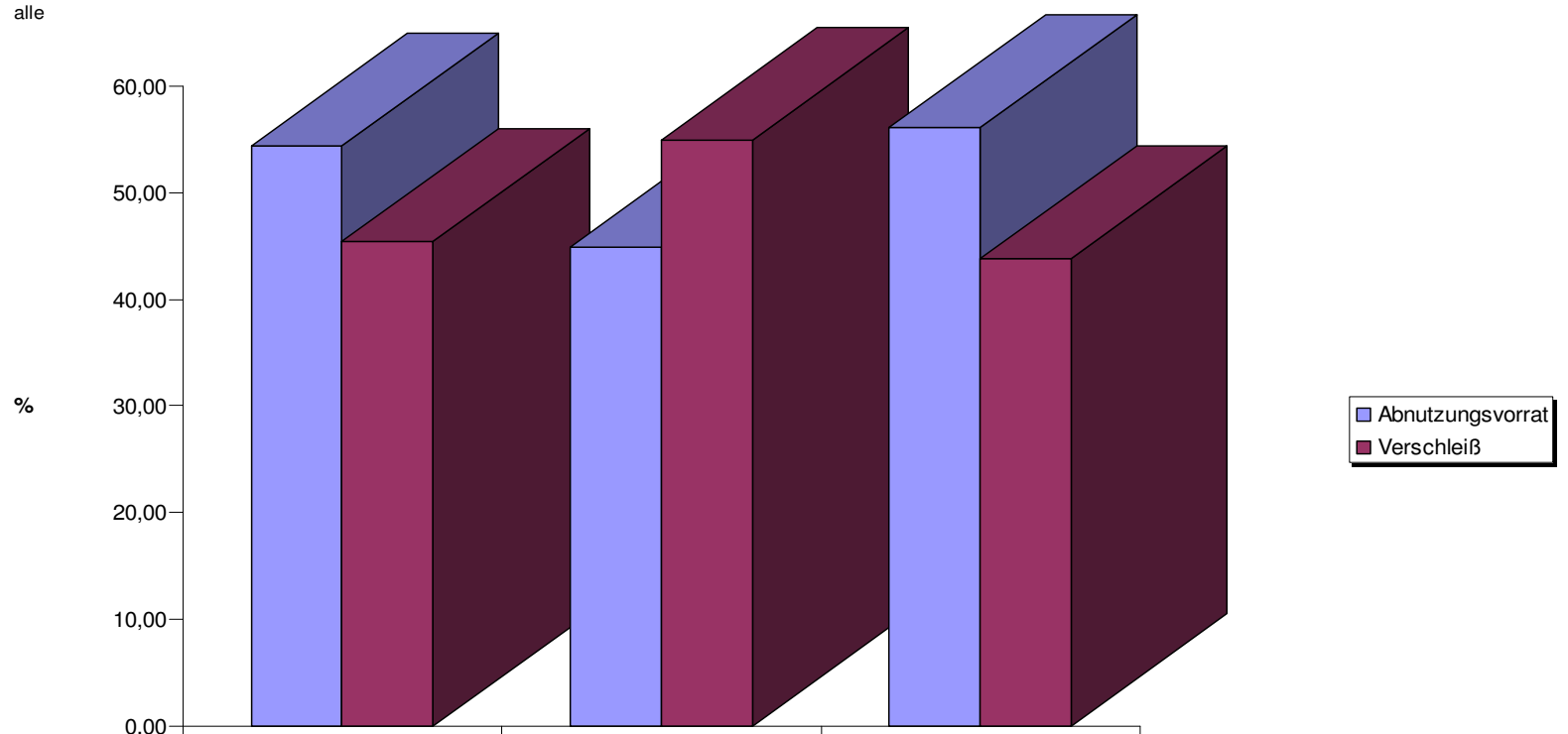
OptNet

Entwicklung des Abnutzungsvorrates für 10 Jahre

Wasser

KWL gesamt

30.03.2009

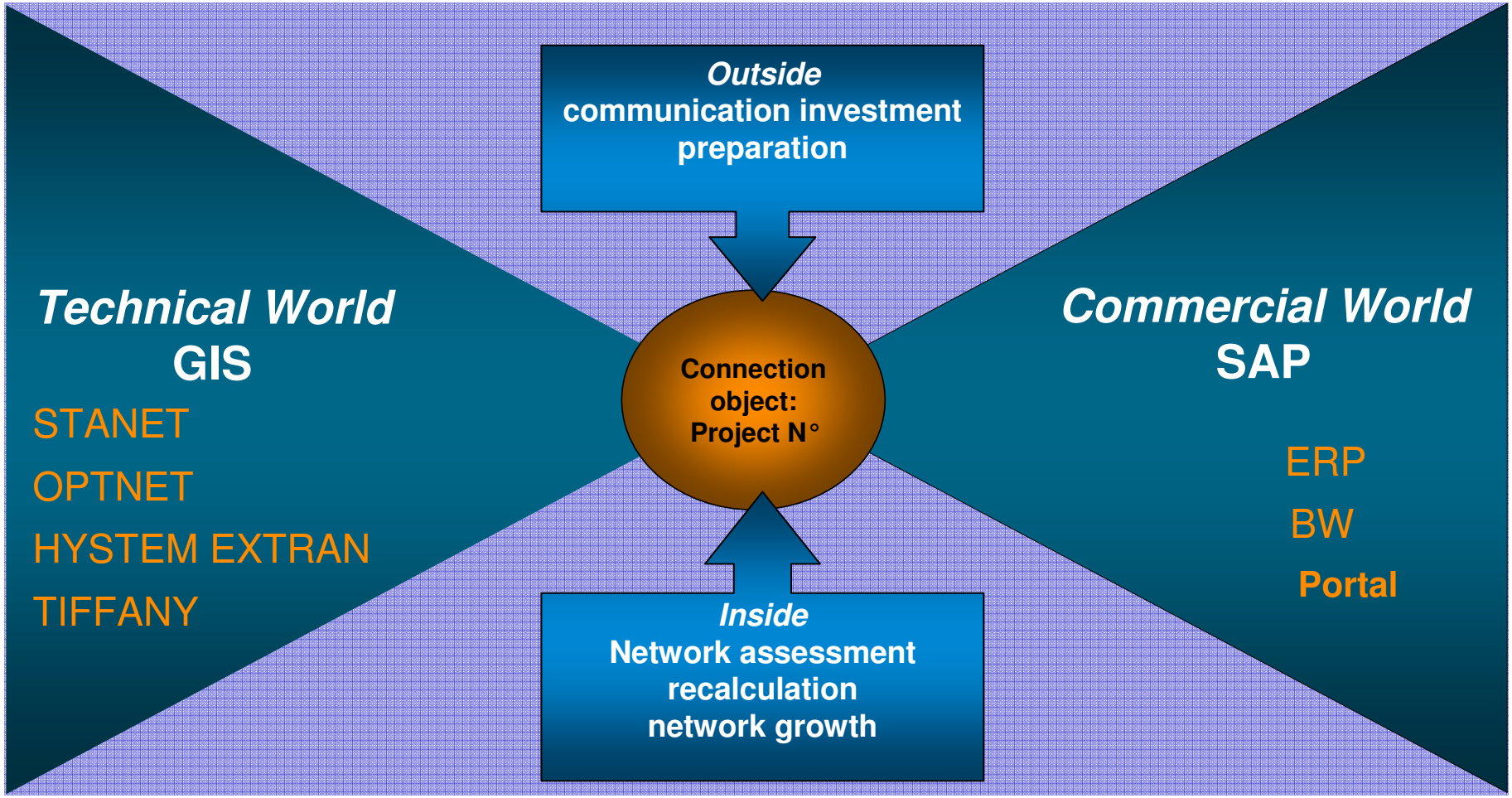


	heute	ohne Budget	mit Budget
Abnutzungsvorrat	54,48	44,99	56,15
Verschleiß	45,52	55,01	43,85

Planungszeitraum

Zurück

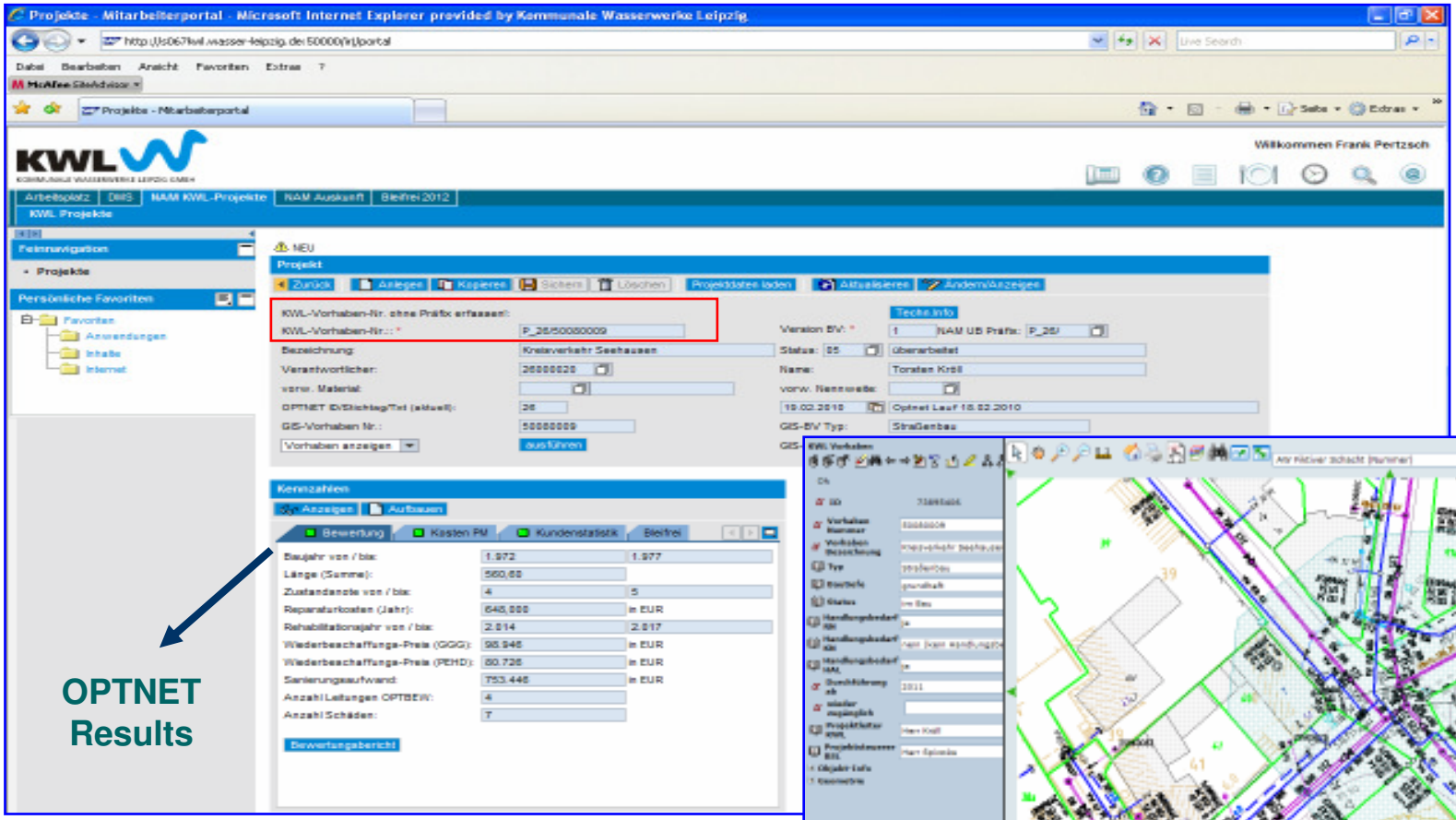
8. NAM PORTAL (Network Asset Management)



→ KWL Portal with existing NAM solutions

- NAM search of projects in GIS
- NAM inventory controlling GIS
- NAM Project ranking at the time only drinking water (wastewater in prep.)
- Reports of ongoing investment projects
- OPTNET reports
- NAM cost report
- Statistics of damages to fittings / valves and pipelines
- Selection, marking of selected GISLID

→ NAM Query for Sample Project



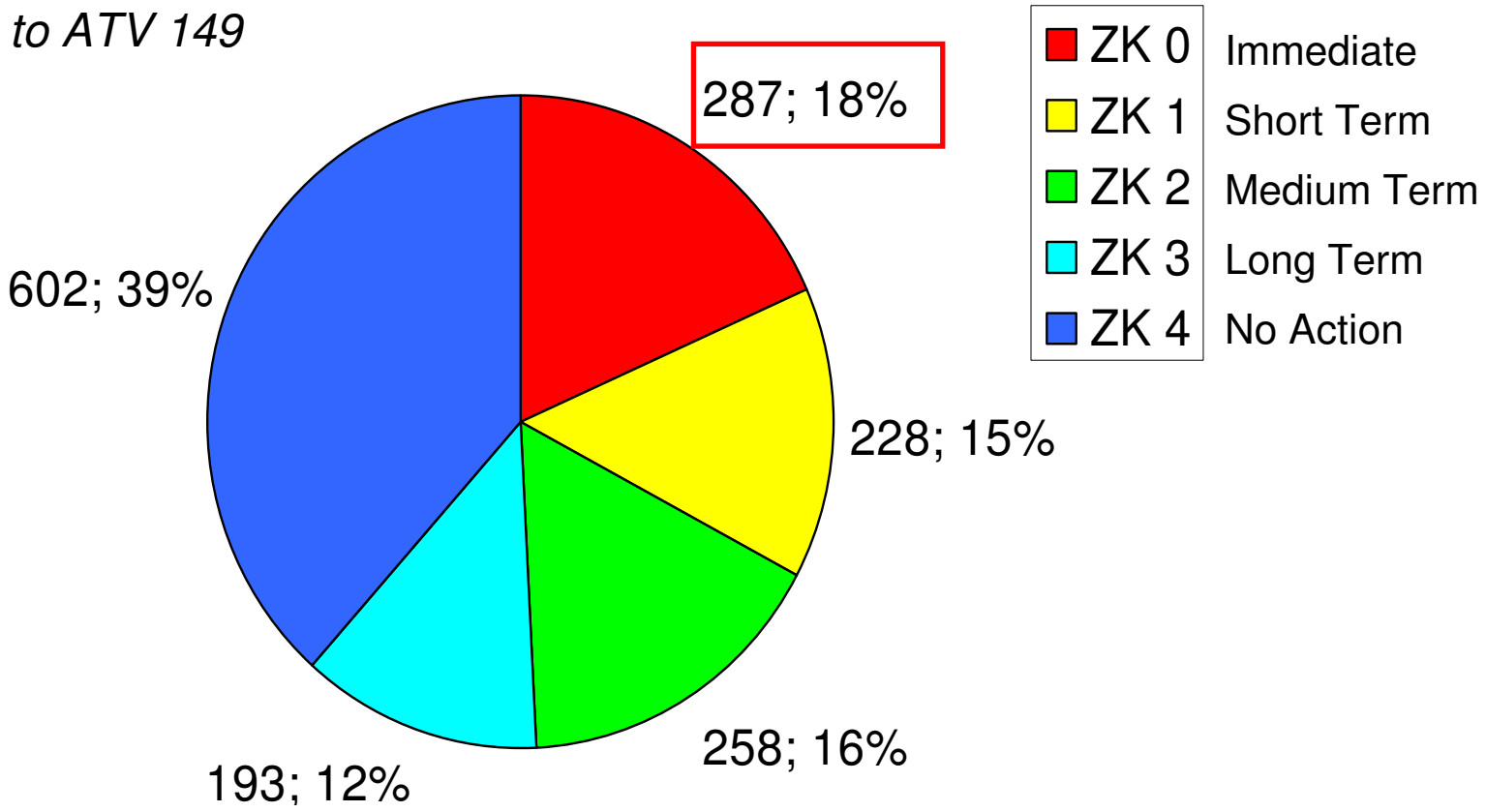
+ O&M Costs (from SAP-PM)

+ Customer Statistics (from SAP-ISU)

GIS Inventory

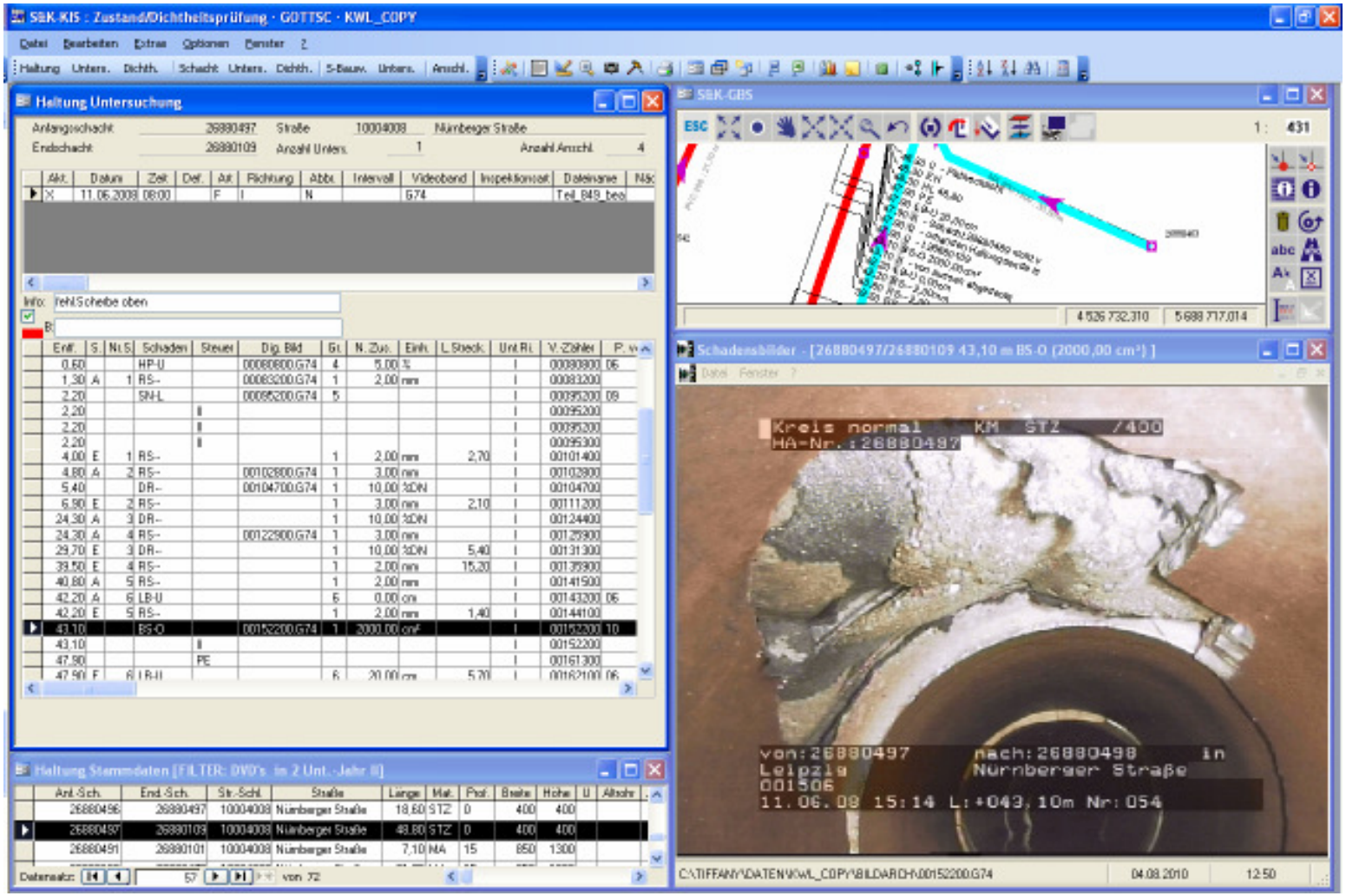
9. SEWER NETWORK CONDITIONS EVALUATION

According to ATV 149



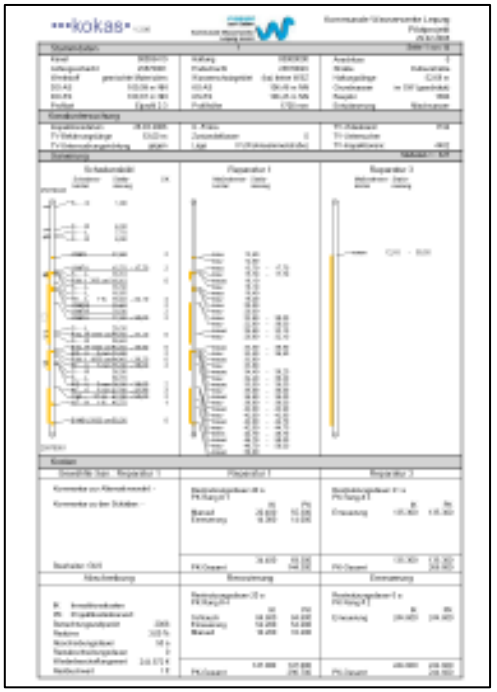
Not possible to delineate strategy from here.

→ SEWER NETWORK EVALUATION / TIFFANY



→ SEWER NETWORK CONSIDERATIONS

- 2 Pilot Projects for establishment of integrated conditions forecast and ageing modelling currently underway
- The conditions evaluation of network parts needs to be based on a classification of individual damage / malfunctions (per segment), this will be finalised / updated using TIFFANY
- Pilot Projects expected to achieve:
  - Summary of the rehabilitation demand over time and delineation of aggregated key parameters (cost / length)
  - Variation and comparative analysis of the proportion and costs relating to Repair, Renovation, Replacement (i.e. the "3-columns-model")
  - Existing and optimum ratio between net asset value and replacement value



10. CONCLUSIONS & OUTLOOK

- Exact conditions evaluation and application of conditions forecasts and ageing models (as in OPTNET) lead to more *effective rehabilitation strategies*
- *Reduction in investment costs* achieved, while operational costs are also optimised (e.g. by decreasing the water losses)
- Information stored and the link-up of the systems lead to a higher professionality and greater flexibility, e.g. systems adapt to changed parameters (e.g. demographic factors, cost developments etc)
- Water network: KWL aims to establish complete computing ability of the system (with cyclical inventory update and „Master OPTNET network“)
- Sewer network: Planned implementation of an integrated conditions forecast and ageing model (for accessible and non-accessible sewers), comprehensive *Sewer Network Rehabilitation Concept*

Thank you!