Ohne uns läuft nix.

Berliner Wasserbetriebe

Innovative Asset Management Processes

Regina Gnirß, Head of Research and Development

Outline

1. Berliner Wasserbetriebe - Key Figures
2. Motivation
3. Sewer Inspection
4. Methodology of Asset Management
5. AI for Asset Management
6. Conclusion

1. Berliner Wasserbetriebe - Key Figures

Largest puplic utility in Europe

Serving Berlin since
1856

4,511
employees

3.7
Million people served

1,174
Million EUR revenue

9
waterworks

6
WWTP

7,800
km drinking water pipelines

10,900
km sewers and pressure pipes

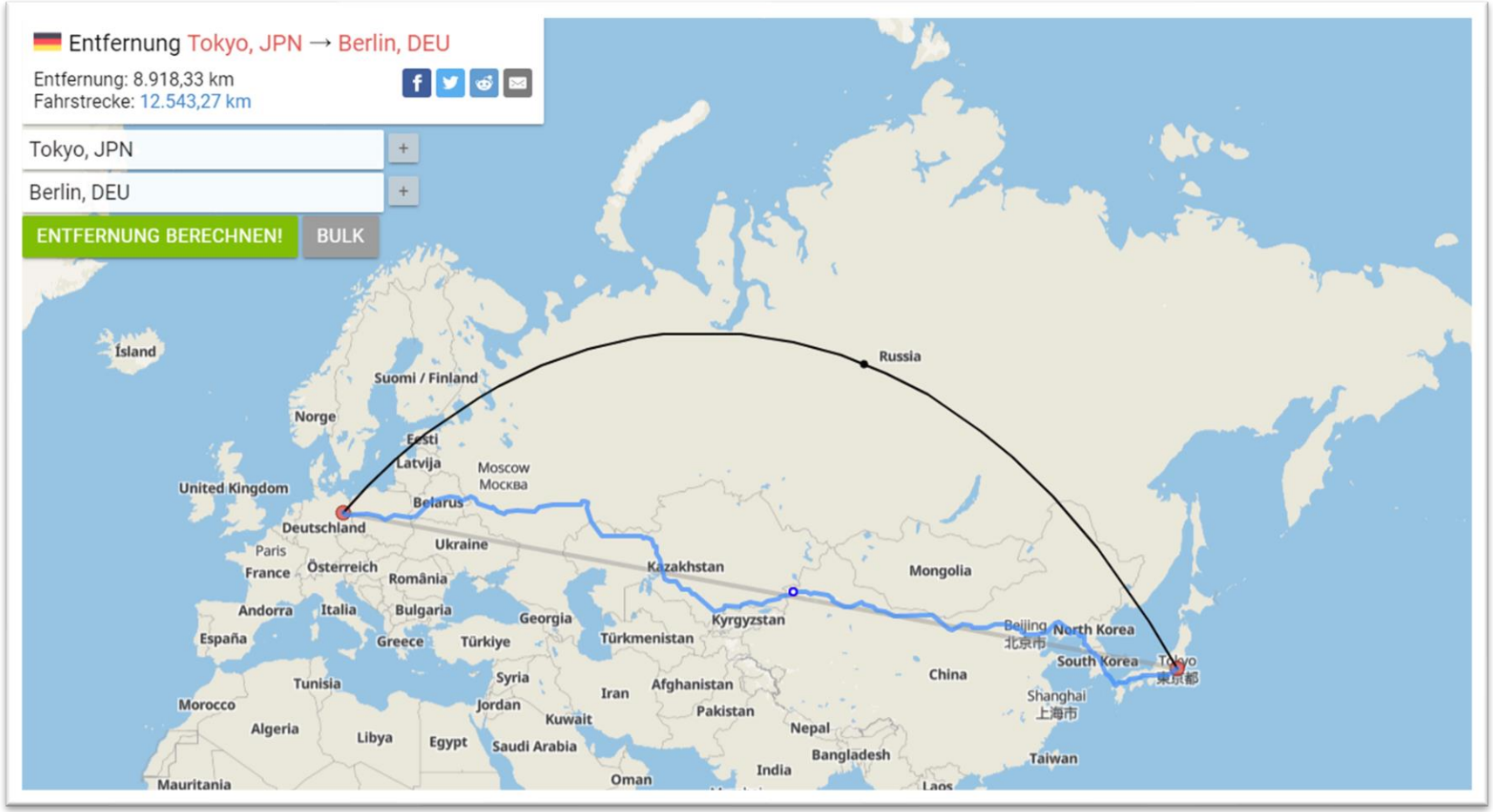
220
Million cbm drinking water sold

255
Million cbm wastewater treated

Numbers for 2019

1. Berliner Wasserbetriebe - Key Figures

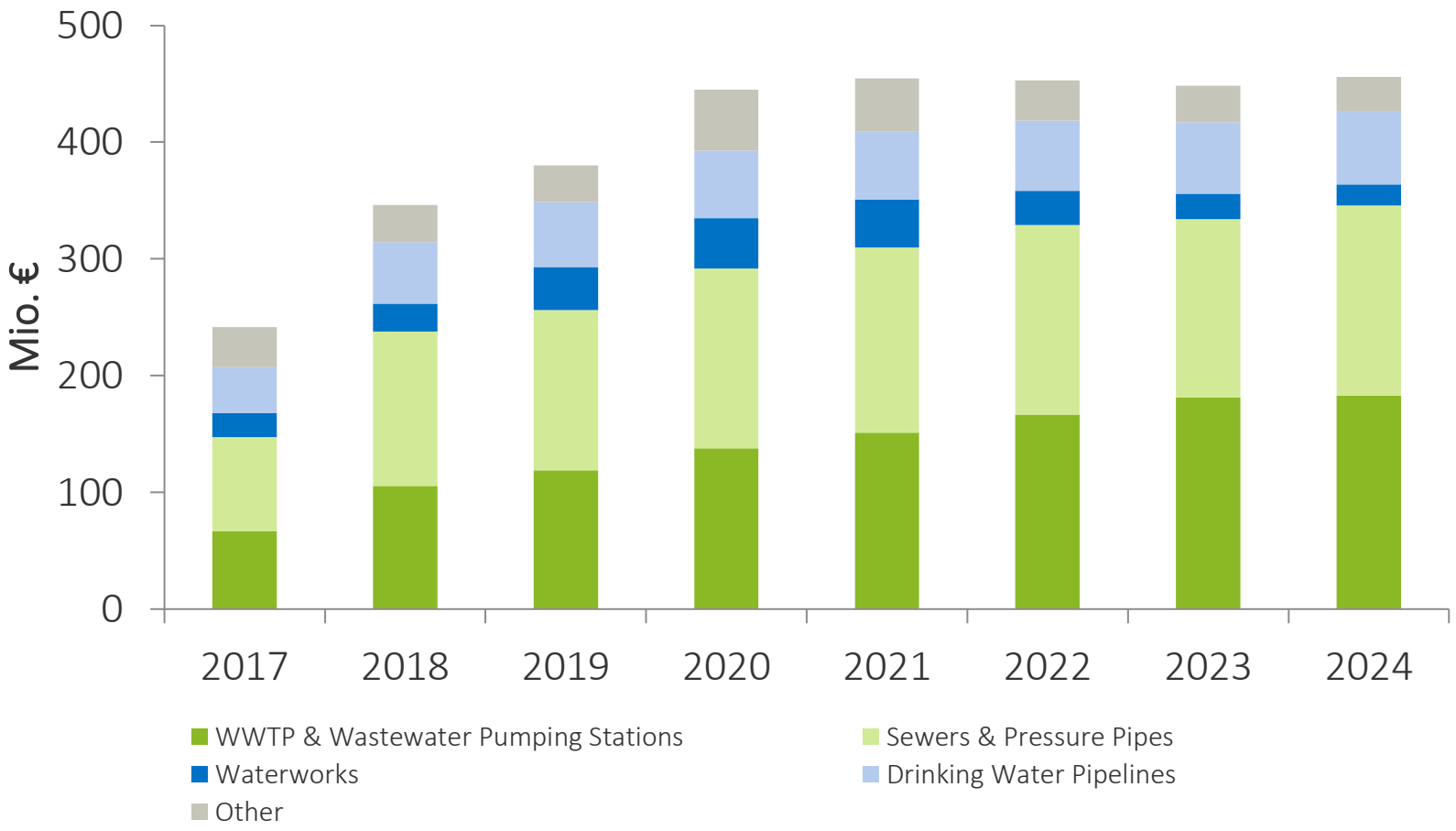
Sewer - Distance between Berlin - Tokyo



https://www.luftlinie.org/Tokyo,JPN/Berlin,DEU

1. Berliner Wasserbetriebe - Key Figures

Investment

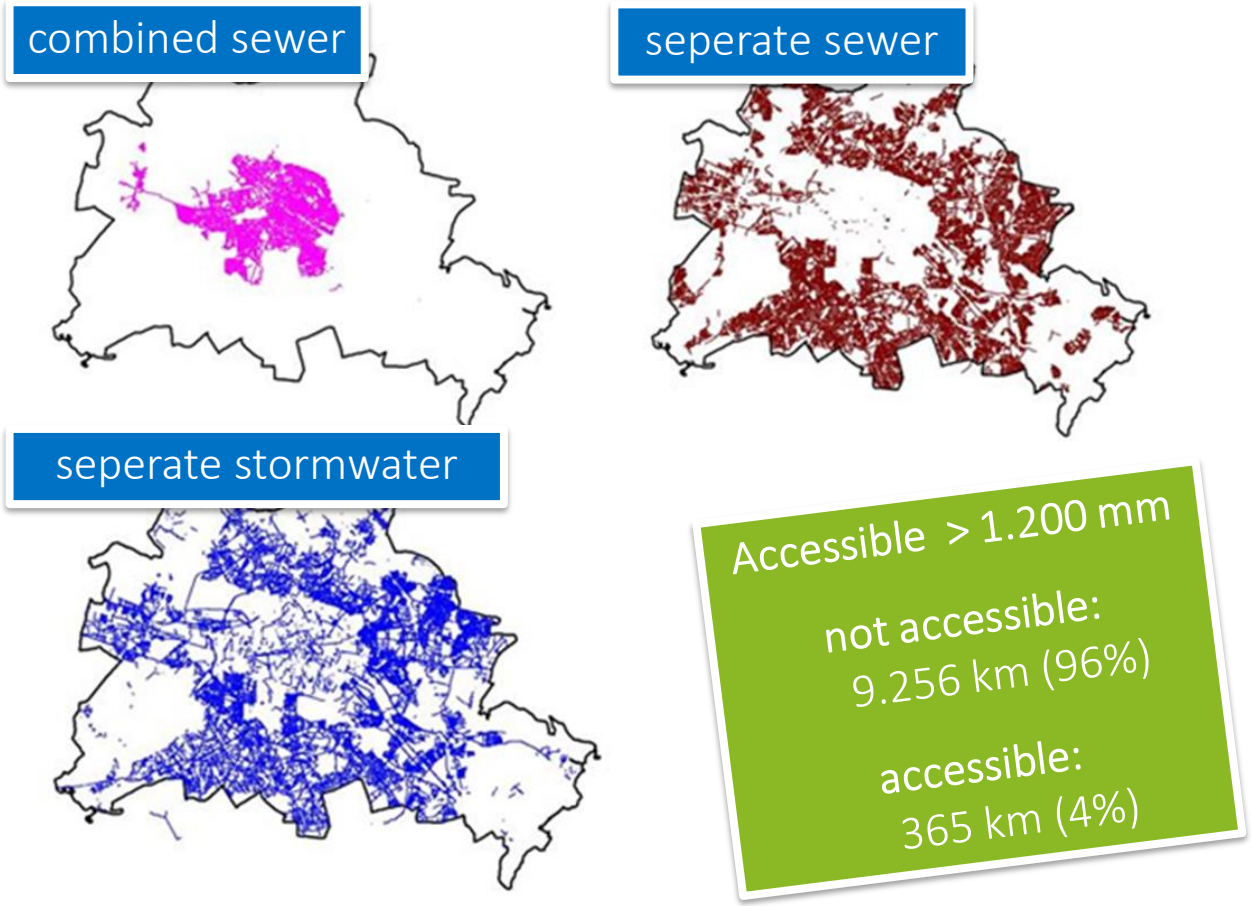


Investment Priorities:

- Water Framework Directive
- Trace Organic Removal
- Sewage Sludge Incineration
- Combined Sewer Overflow Storage
- Network Infrastructure
- Digitalisation

2. Motivation

Legal requirements in Asset management



- **Inspection**
  - Intervall of 15 years
    Berlin needs 641 km/a
  - DIN EN 13508-2
  - DWA M149-3

→ **high personnel & equipment costs**

  - manual process

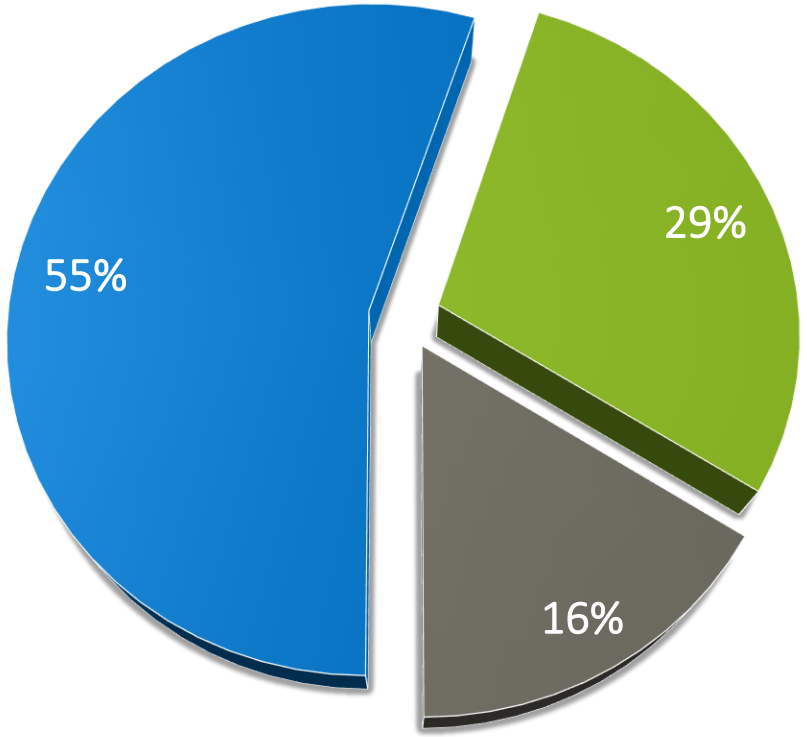
2. Motivation

Quality of Inspection

- **Status quo of Asset management with manual processes:**
  - pure quality of visual data, high variation in damage classes,
  - rough standardisation:
    - subjective, monotone and tiring process for operators
- **Evaluation Result:**
  - 307 revised inspected pipes
  - different inspection classes: 55%

→ **Automatic Process**

  - reliable, identical inspection class,
  - less time and cost



different inspection classes

same inspection class / same protocol

same inspection class / different i protocol

Source: B_I umweltbau 5/06

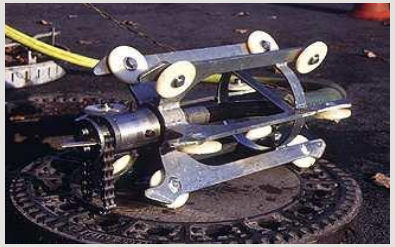
3. Sewer Inspection

Use of Robots

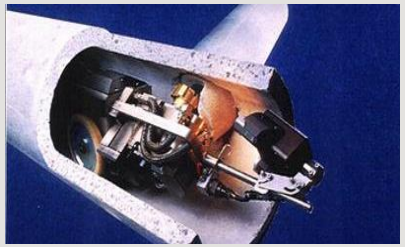
- Robots in service and trenchless technology 50 % No-Dig Pipes
- Data storage capacity increase dramatically (>> 120 Terrabyte)
- 250.000 data sets - inconsistent

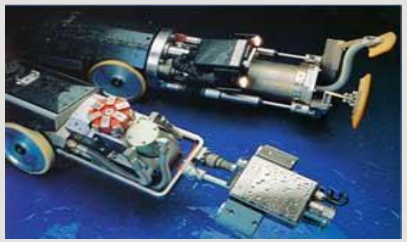
Inspection

highpressure rinsing



Cutting & milling



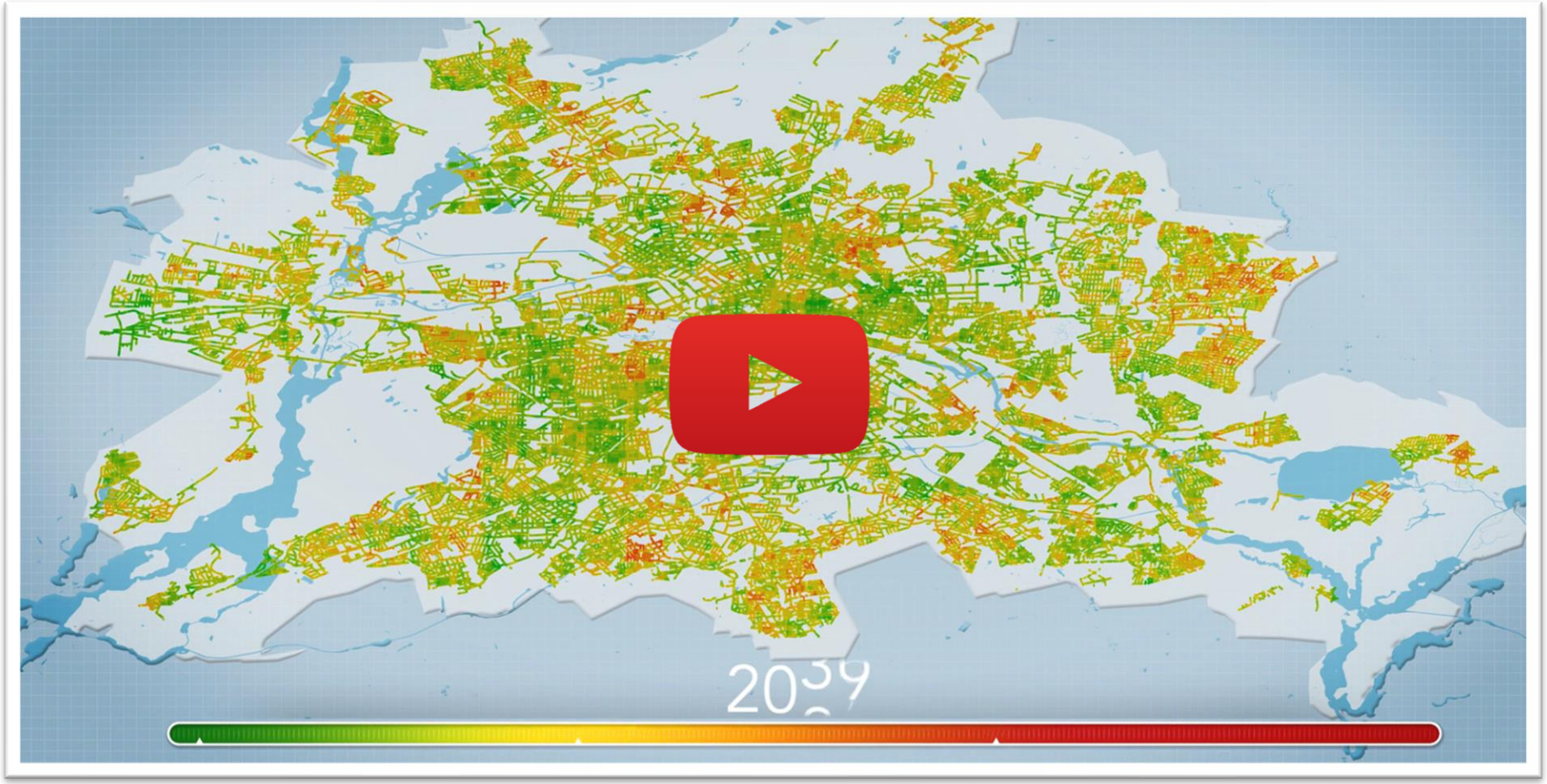


CCTV

Remote control

3. Sewer Inspection

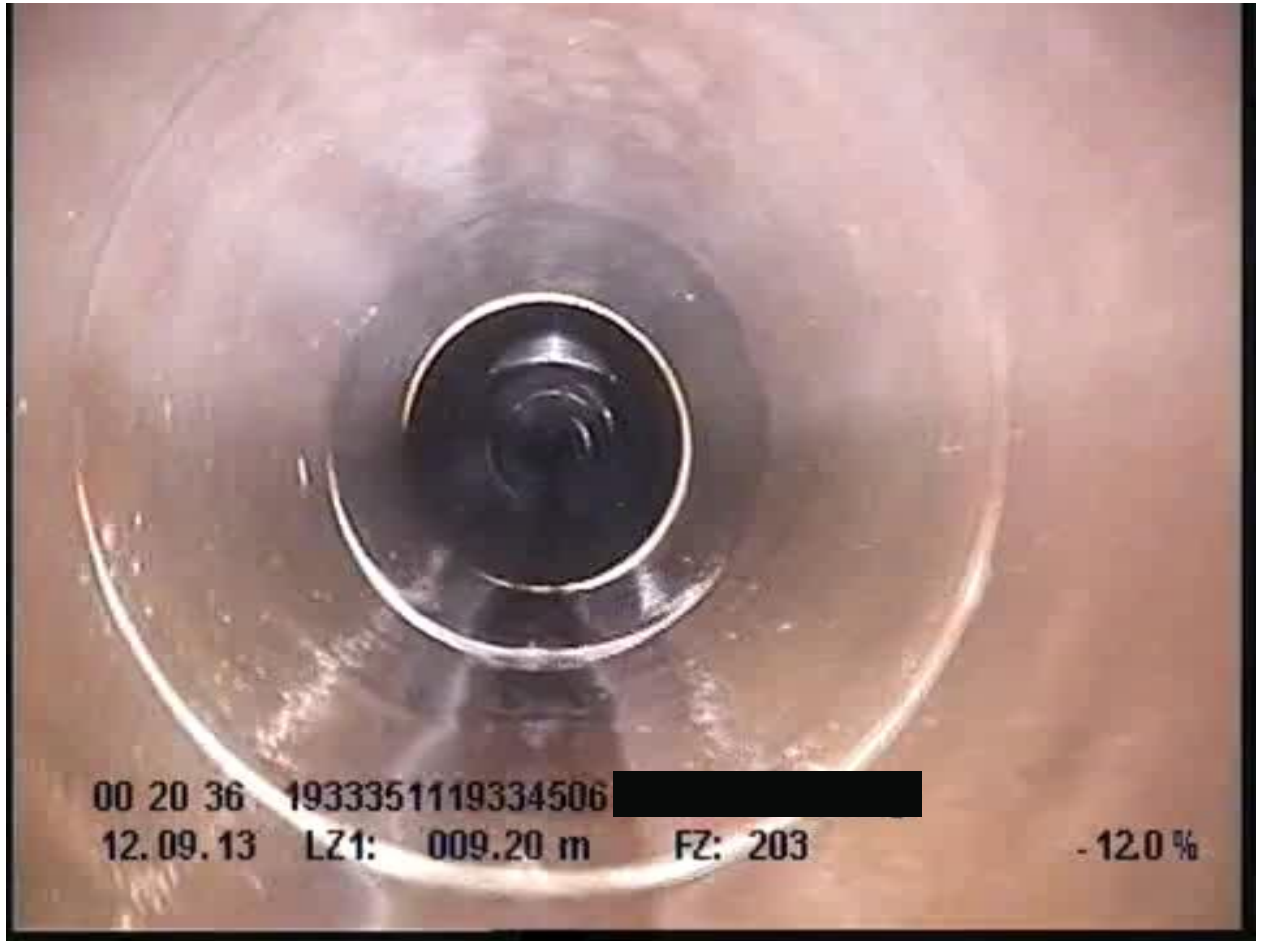
Prognosis of aging processes in sewer systems



KOMPETENZZENTRUM Wasser Berlin

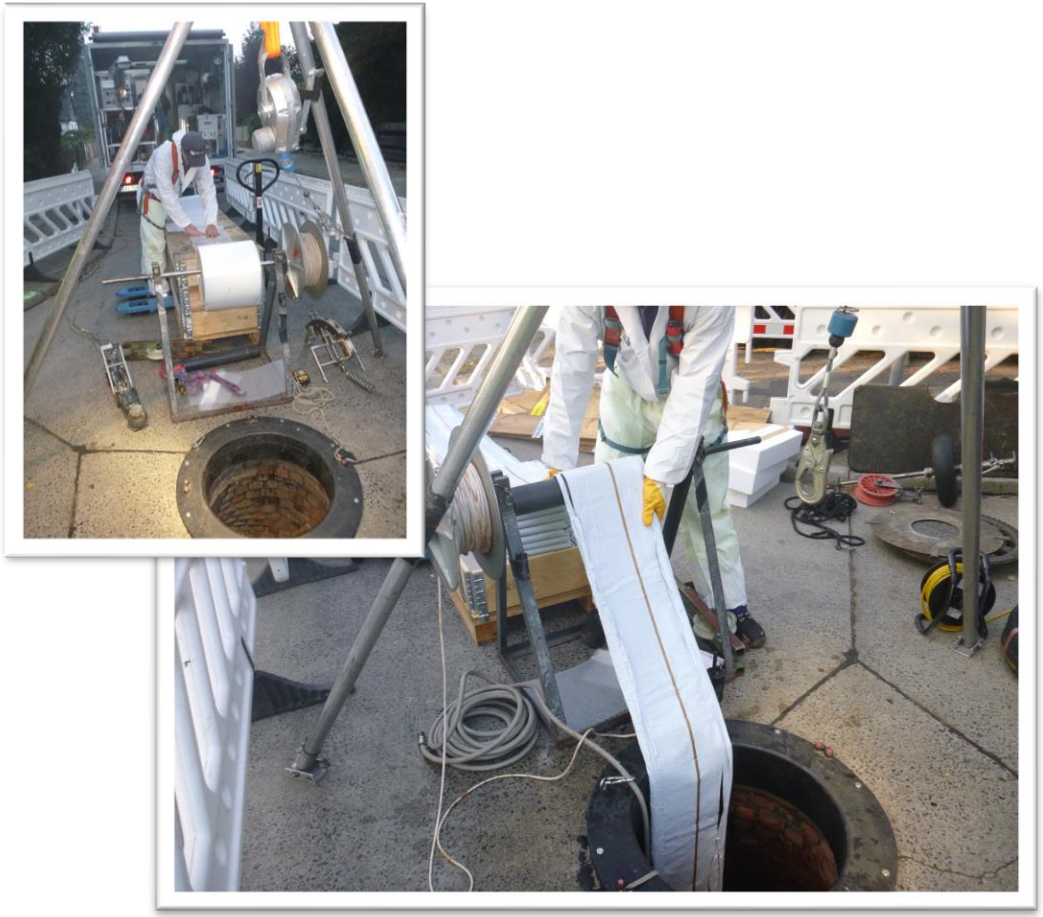
3. Sewer Inspection

Sewer without Damage



3. Sewer inspection

Innovative Rehabilitation: Cured -in-Place-Pipe



4. Methodology of Asset Management

Overall work flow

Data from TV-inspection

CCTV Inspection

Manual damage detection & Annotation

Inspection Software

Data base

RZ

DB

Rehabilitation measures DWA M149-3

Pipe assessment

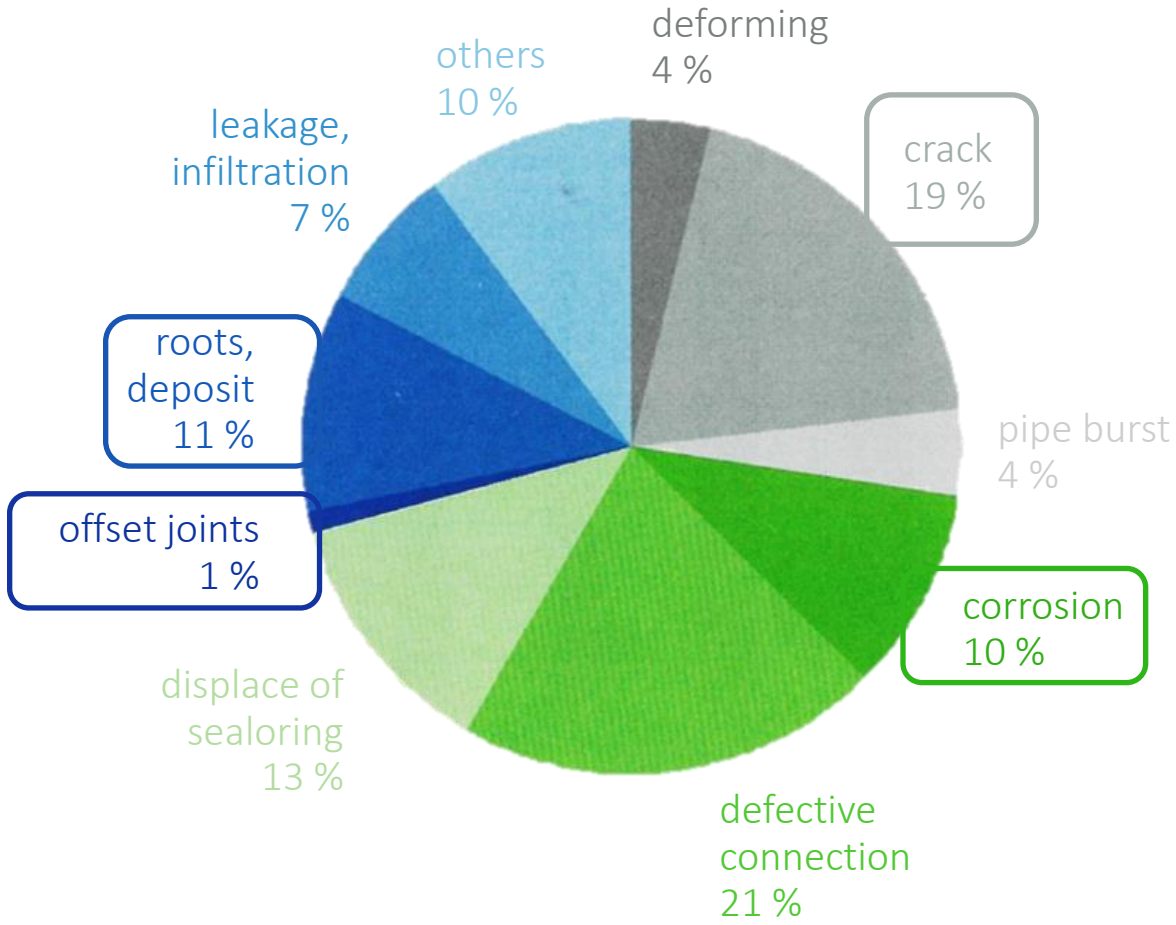
Condition	Need for action
Good	None / Long term
Fair	Mid term
Bad	Short term
Very Bad	Immediate

4. Methodology of Asset Management

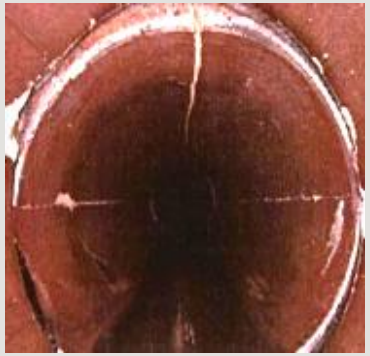
Damage

Roots

Offset Joints



Source: DWA (KA 6/16)

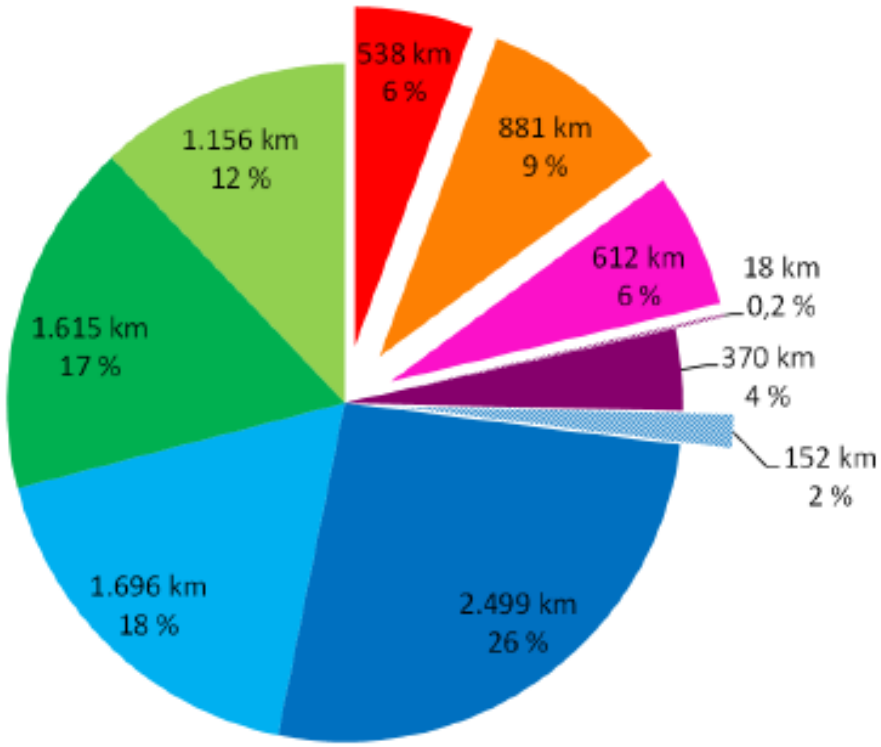


Crack

Concrete Corrosion

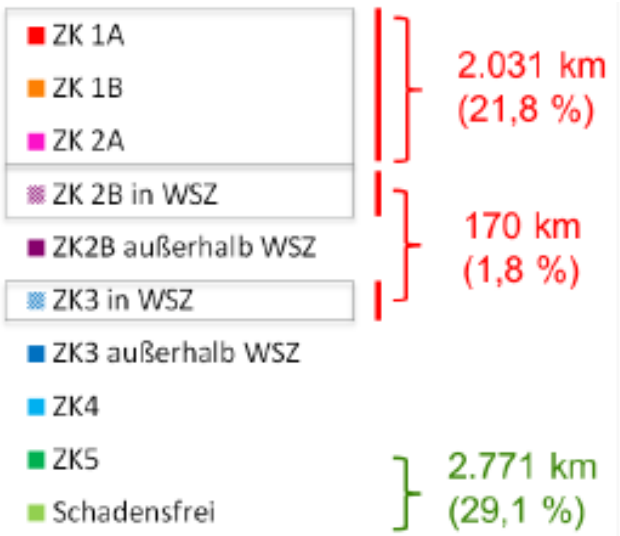
4. Methodology of Asset Management

Inspection Classes



Database:

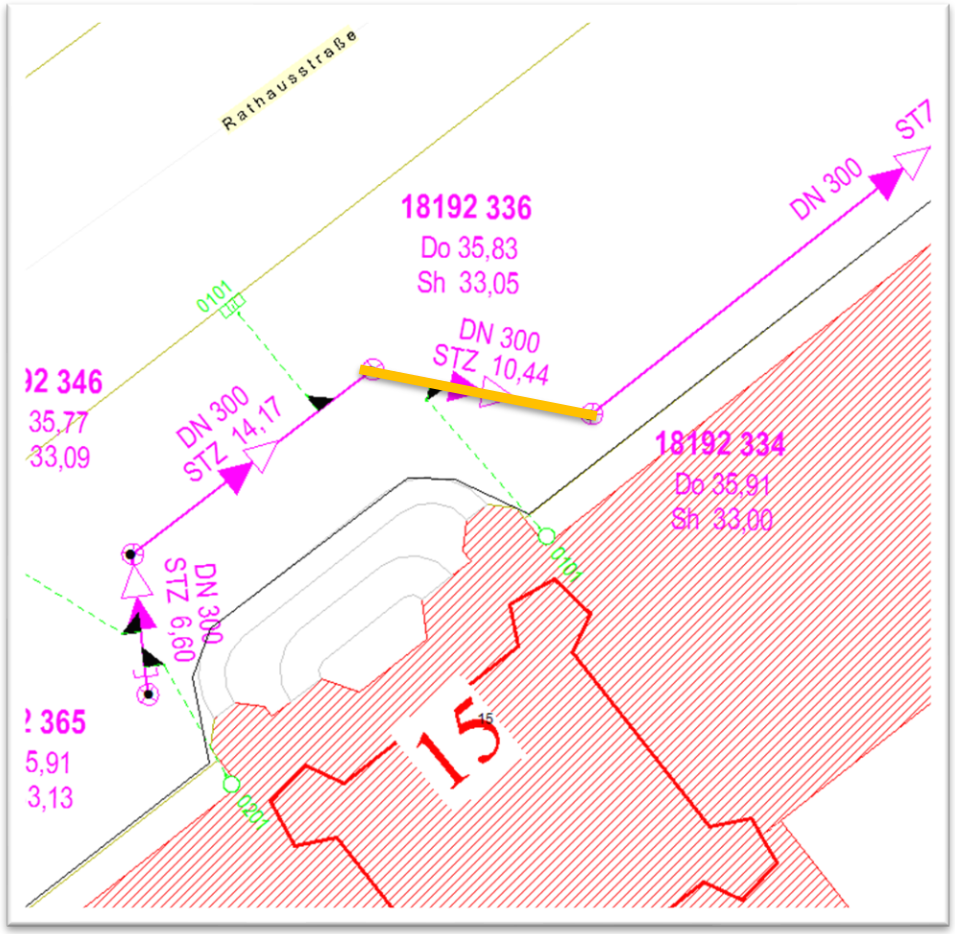
- total sewer length: 9,538 km
- Distribution length in inspection classes

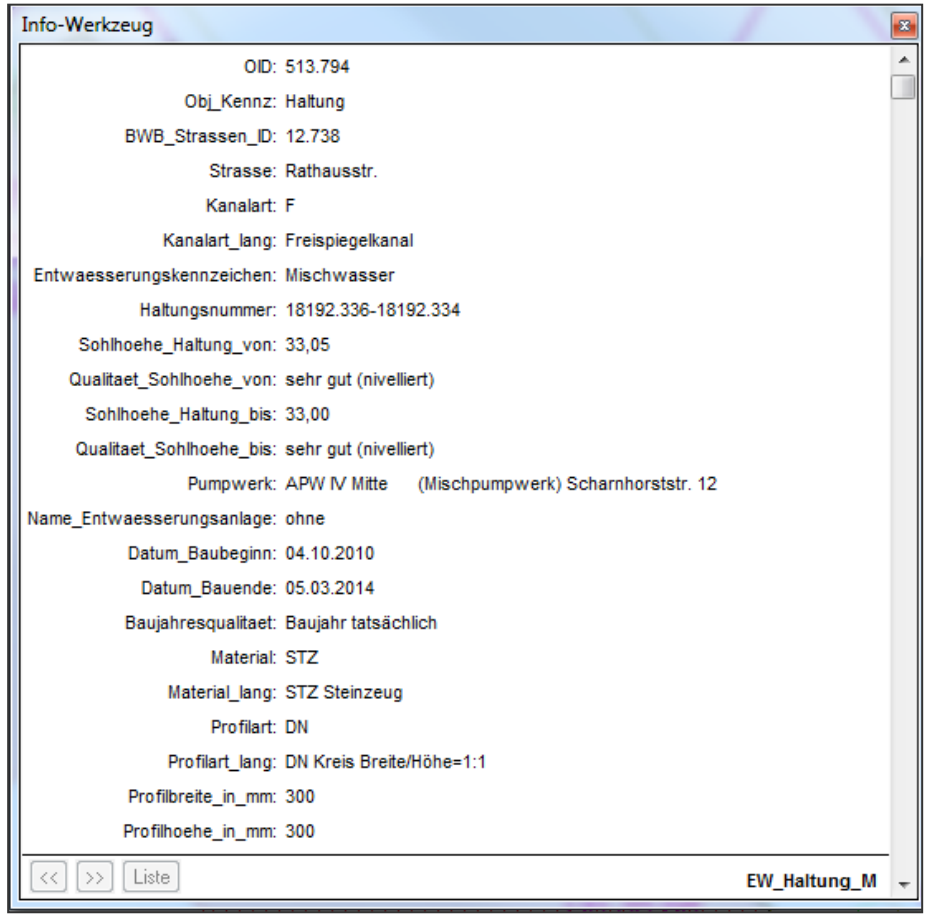


Source: BWB / No Dig - Symp. 2015

4. Methodology of Asset Management

GIS novaKandis - MapInfo





Info-Werkzeug

OID:	513.794
Obj_Kennz:	Haltung
BWB_Strassen_ID:	12.738
Strasse:	Rathausstr.
Kanalart:	F
Kanalart_lang:	Freispiegelkanal
Entwaesserungskennzeichen:	Mischwasser
Haltungsnummer:	18192.336-18192.334
Sohlhoehe_Haltung_von:	33,05
Qualitaet_Sohlhoehe_von:	sehr gut (nivelliert)
Sohlhoehe_Haltung_bis:	33,00
Qualitaet_Sohlhoehe_bis:	sehr gut (nivelliert)
Pumpwerk:	APW IV Mitte (Mischpumpwerk) Scharnhorststr. 12
Name_Entwaesserungsanlage:	ohne
Datum_Baubeginn:	04.10.2010
Datum_Bauende:	05.03.2014
Baujahresqualitaet:	Baujahr tatsächlich
Material:	STZ
Material_lang:	STZ Steinzeug
Profilart:	DN
Profilart_lang:	DN Kreis Breite/Höhe=1:1
Profilbreite_in_mm:	300
Profilhoehe_in_mm:	300

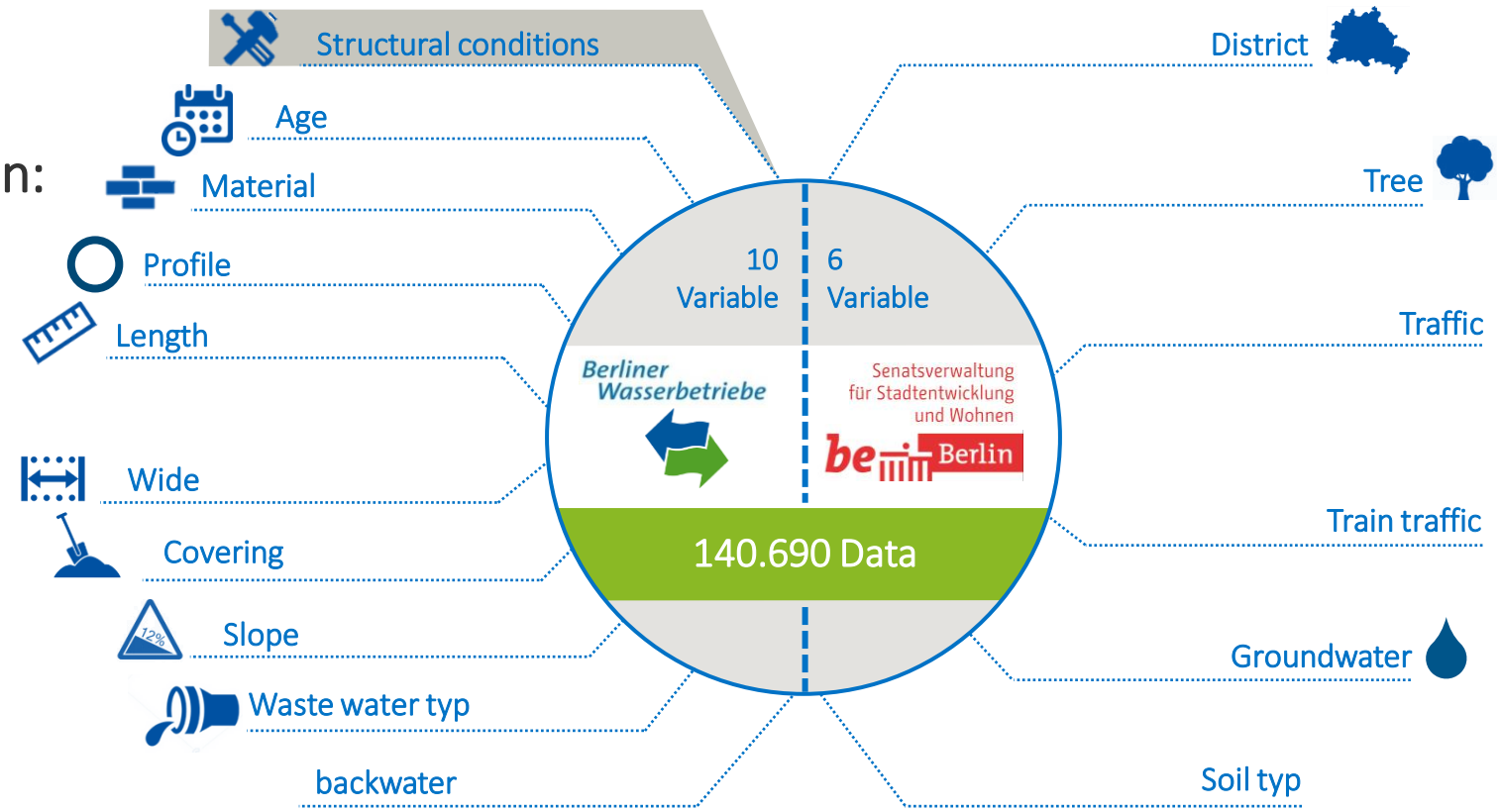
<< >> Liste EW_Haltung_M

5. AI for Asset prognosis

Deterioration factors

Highest Impact on deterioration:

- Profile
- Material
- Length
- Covering
  - trees
  - wastewater typ



5. AI for Asset prognosis

Differences between AUZUKA and SEMA-Berlin

AUZUKA

- inspection finalized on high quality
- comparable & consistent database
- AI for automatic damage detection
- Viewer suggest defect classes with animation

SEMA BERLIN

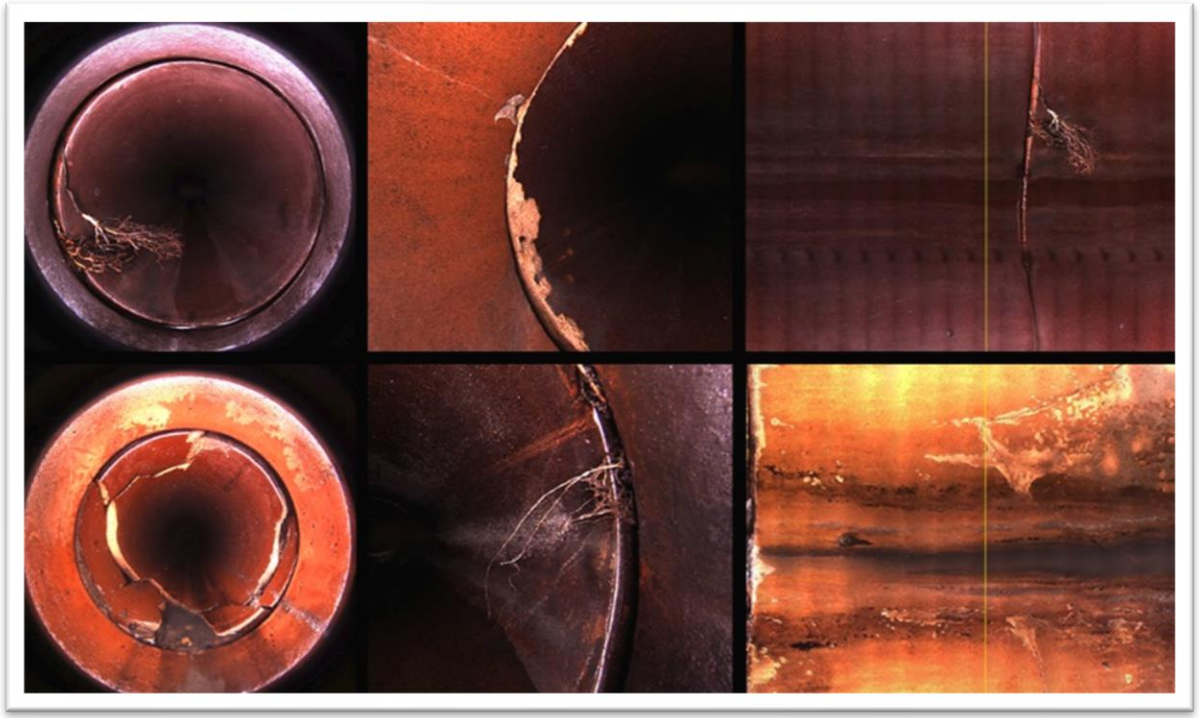
- AI for sensitivity analysis
- shortterm rehabilitation and construction on single sewer reach
- longterm investment strategy related to szenarios and aging prognosis (district, defect classes)

5. AI for Asset Prognosis

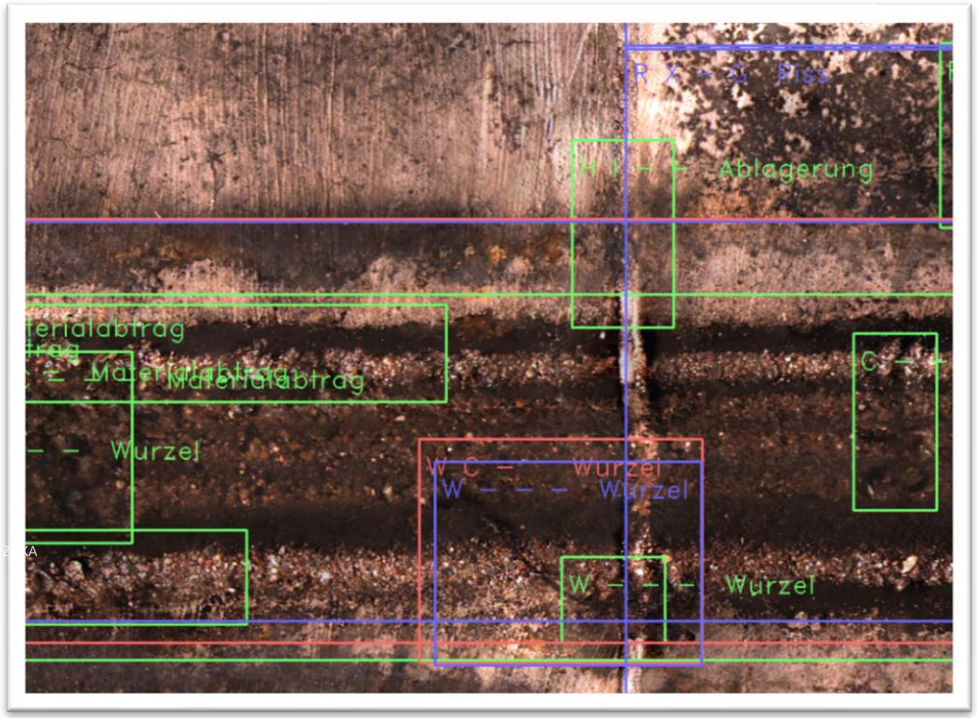
AI approaches

Approaches in the R&D-Project AUZUKA

- Reengineering

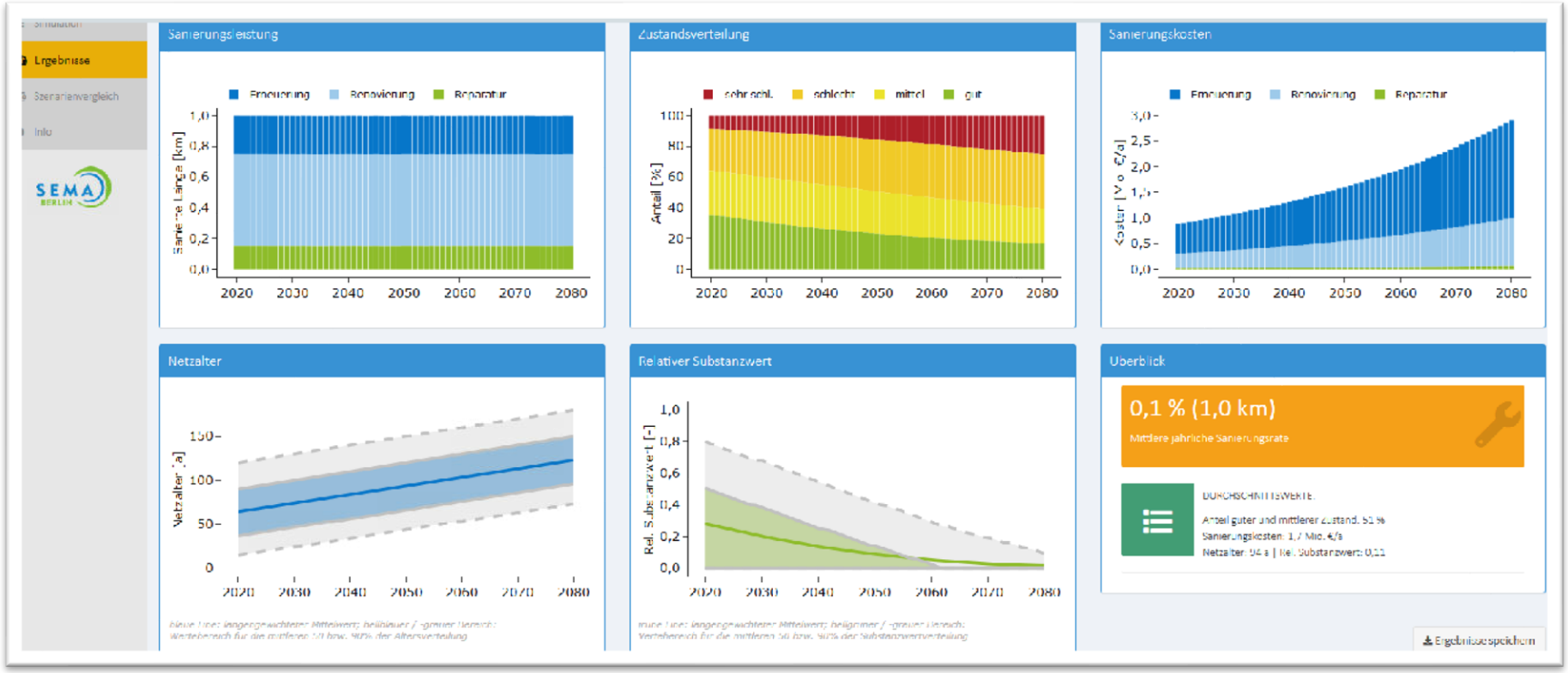


- Bounding Box Labeling for AI



5. AI for Asset Prognosis

Action taking place during project time



6. Conclusion

- Asset management high investment costs: ‚Generation contract‘
- High Potential for digitalisation: Assistance System
- Long tradition for R&D at Berliner Wasserbetriebe
- Funding enables Innovation and Collaboration with scientist & SME
- Test implementation at Berliner Wasserbetriebe in 2021

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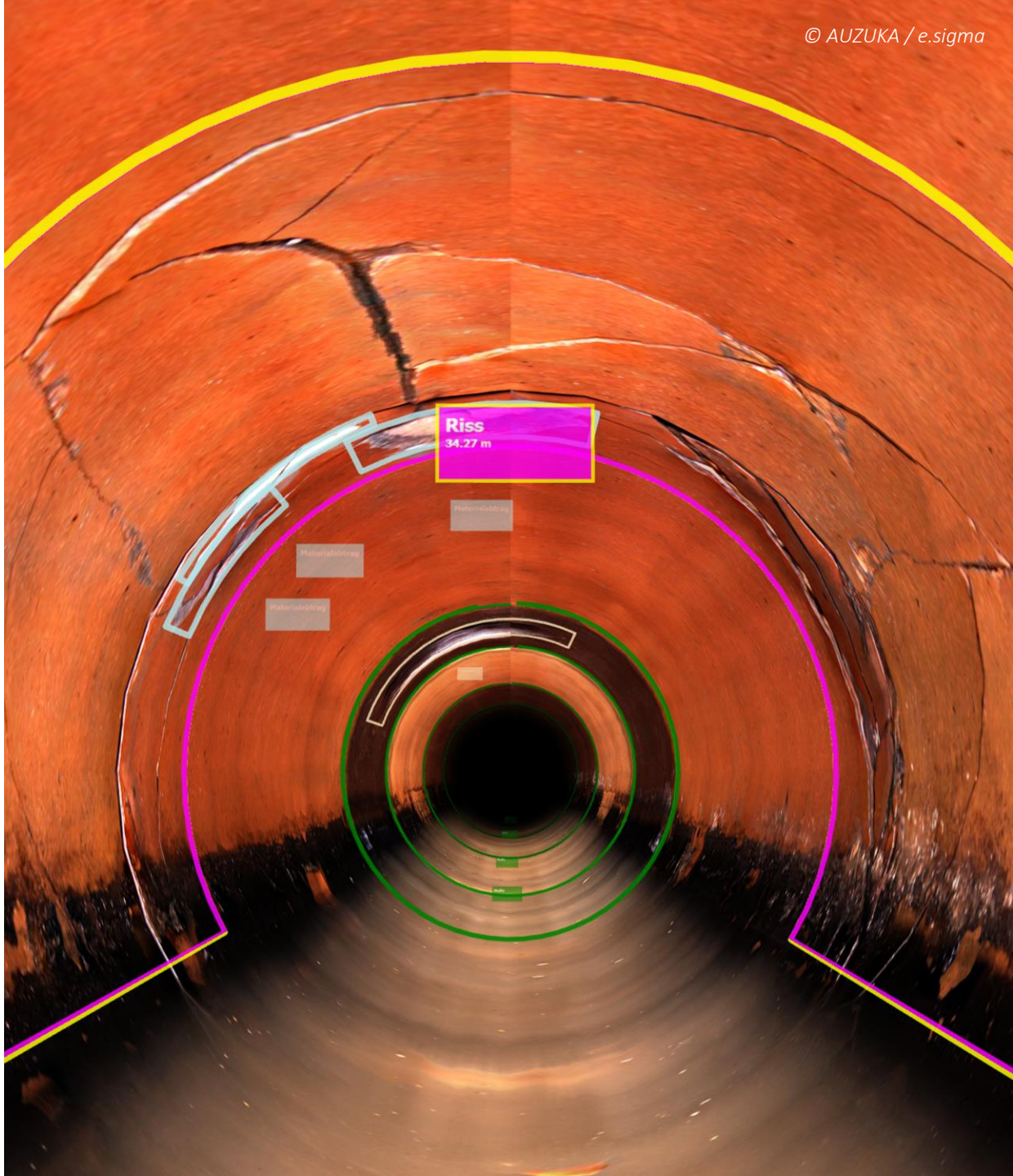

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Thank you for your attention

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