

Parallelsessie KPNK symposium:

Goud in Gegevens

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nattekunstwerkenvandetoekomst.nl

InfraScan: Locks

Semantic and rule-based
approach for VenR Object
Analysis

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Short History

2017 KennisProgramma NatteKunstwerken

- In 2017 'Renewal and replacement' was a relative new process separated from the 'regular maintenance'.
- It was unclear why some projects were brought into this 'VenR' programme
 - Insufficient budget, or functional/technical end of life, or political reasons
- To make a better prognosis we need to understand why projects 'become VenR'.
- How can we use 'data' in decisions regarding to VenR?
 - Is there information at all?
 - Yes a lot, but scattered, not-uniform, incomplete (for analyses purposes),
- Plan
 - Follow the money
 - Follow the decision
 - Case studies



Short History

- Case studies

- Brug Itteren



- Marijkesluizen



- Volkerak



- Sluizen Twentekanal



- 'Conclusions'

- We need a clear decision making model for VenR, supported by data sets we already have



Short History

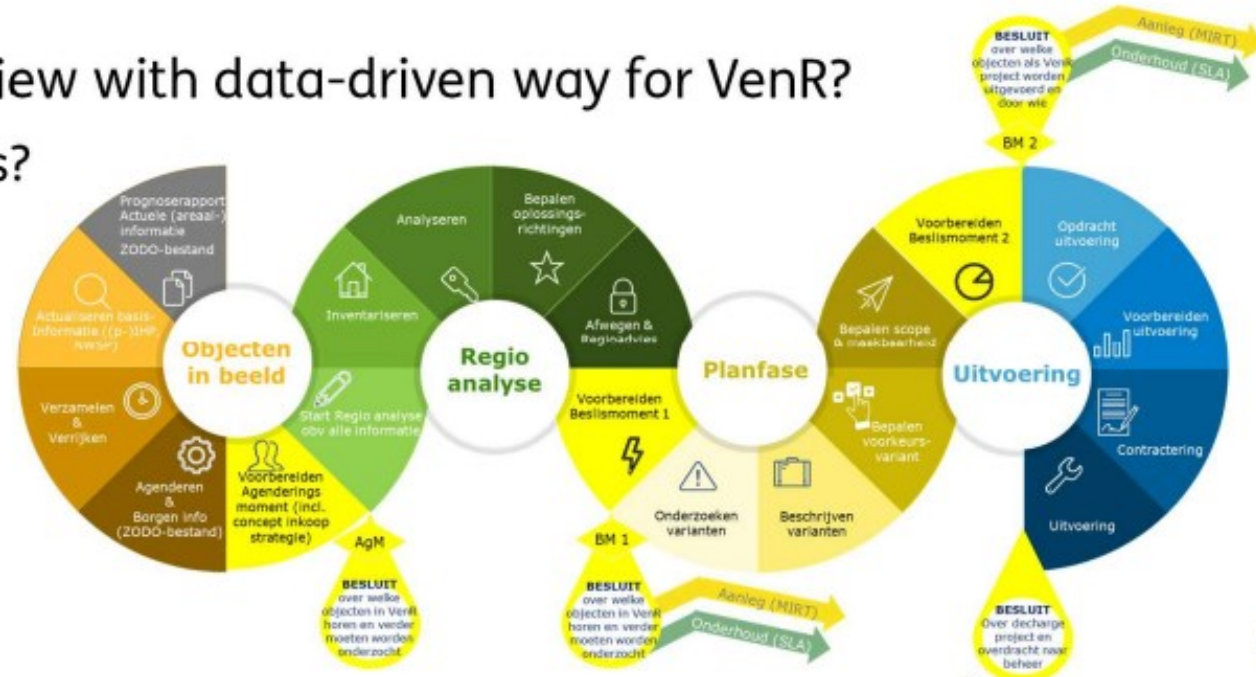
- Next step:
 - Develop a methodology for the Renewal Program based to help identify the renewal 'issues'
- What do you need to know?
- Given the existing data set(s), how would you use the data to make these analysis?



De Vernieuwingslang

- Rijkswaterstaat manages ~6600 assets, ~1700 of them built before 1960.
- For renewal, portfolio-level knowledge is needed to prioritize and optimize resource-use.
- How to provide this overview with data-driven way for VenR?
 - What should be the focus?

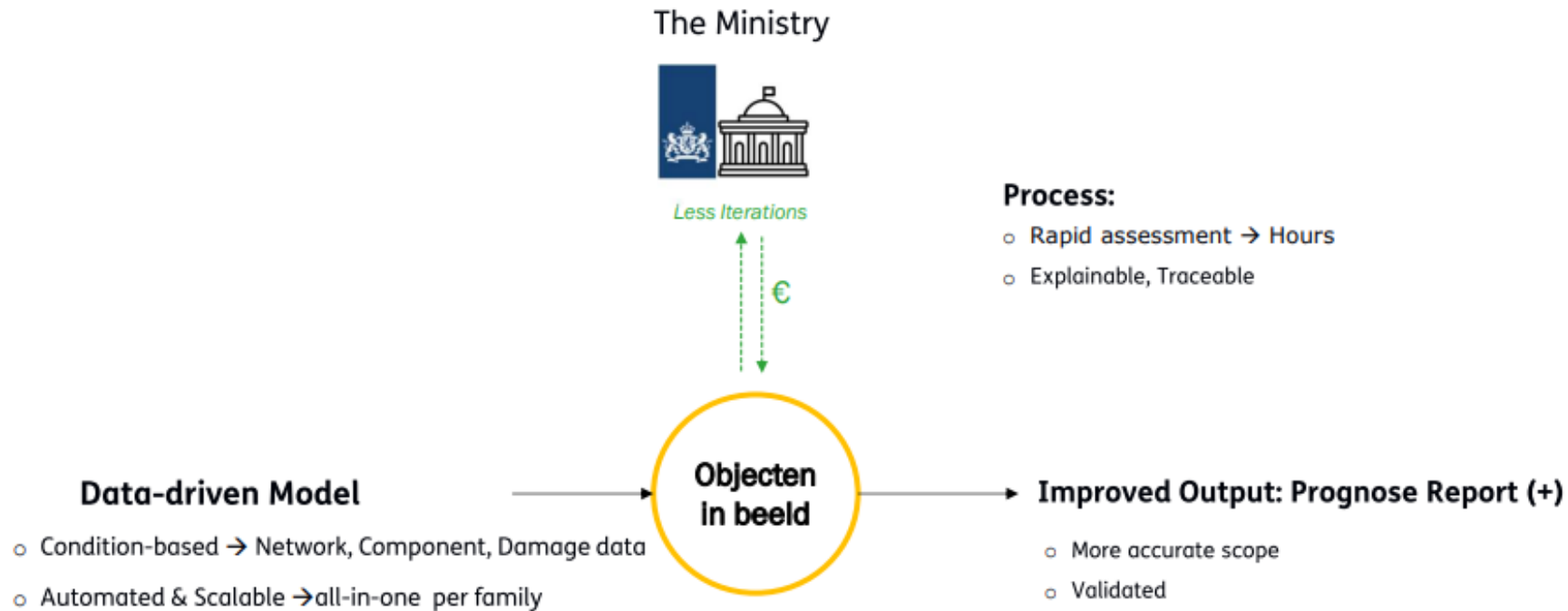
Intake Moment: Candidates for End of Life



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Focus/Goal: Data-driven Prioritisation on Portfolio Level



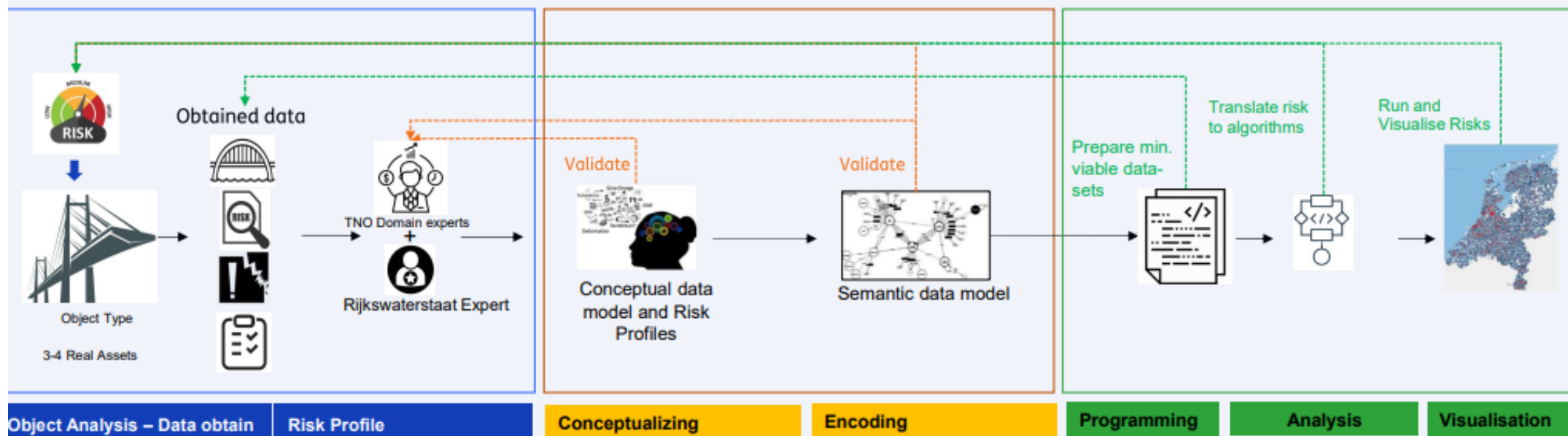
Data-Driven Methodology Design with Linked Data

The methodology was designed in 2022 within KpNK

Scientific Research: Risk Profiles by Case Studies

Design: Conceptual Modelling / Algorithm (rule) Development

Development: PoC



TNO innovation for life



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PoC: Ship Lock Portfolio Analysis

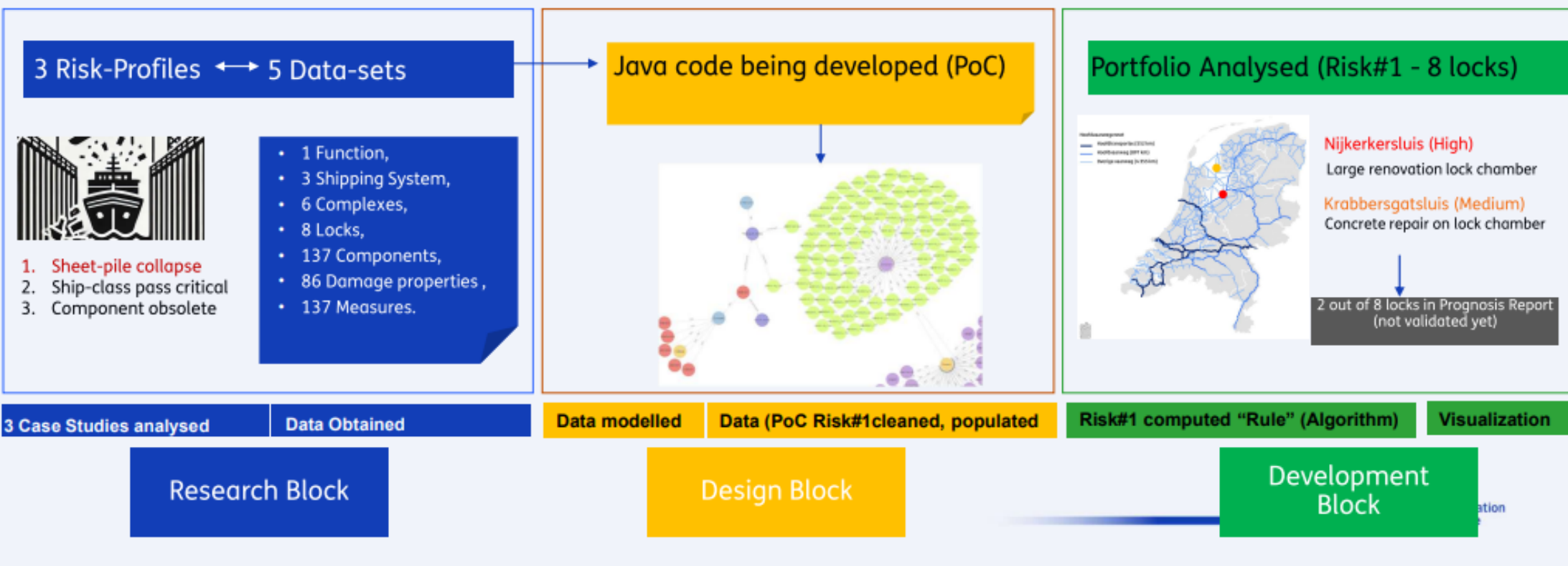
Implementing the methodology: research moved to OPV Research Line

5 different data-sets/sources (partially cleaned)

Data-set from 2017! (for illustration)

1-click to automatically create a Linked Data Model out of 5 different sets ("location") – In progress

Without UI – Preliminary stage



User Interaction Ideas (UI) – to interact with the Graph

InfraScan: Portfolio Analysis

Step 1: Select Sub-set

Asset type
Lock

Sub-Type
Schutsluis

Waterway/Corridor
Select

Step 2: Select pre-defined rules

Functional requirements

ShipClasses that can pass through lock

Waiting time
0 min. 30 min. 60 min.

Max. discharge capacity
100 m3/s

Economical requirements

Minimum sum of costs to set time period
> 5000

REU indicator value
0 1000 2000 3000

Assigned in year
2000 2004 2008

Technical requirements

Condition based on number of elements with a high condition score

Only include these Elements

Only include these Interventions

Only include these Damages

Min. nr. of elements
1

Condition score
> 5

Element name
Door X Chamber X

Intervention
Replace X Repair X

Damage
Crack > 5mm X

Step 3: Make your search more specific

General

Time period
Present

Construction year
1900 1950 2000

Quality score
1 2 3 4 5 6

Add requirement for Element
Select Element Add

Gates

Conditional score
1 2 3 4 5 6

Contain condition
Select condition
Obsolete X Out of Stock X

Add requirement for building part
Select building part Add

Start analysis

Applied filter conditions

Show [Locks] constructed between the years [1940-1980] with a quality score [≥4] between the years [2030 - 2040].
This [lock] should have:
• [Gate] with a condition score [≥4] that is [Obsolete] and/or [Out of stock]

Economical requirement
The [lock] has a minimum sum of costs of [≥ 5.000] euros, and the REU indicator assigned in [2030 - 2040] is [0 - 0.5].

Technical requirement
The [lock] has a minimum of 10 [Door] and [Chamber] with condition score [≥5], and damage [Crack > 5mm], and measurement [Paint, Repair].

Functional requirement
Through the [lock] ships of shipclass [-] - Class V/E can pass.





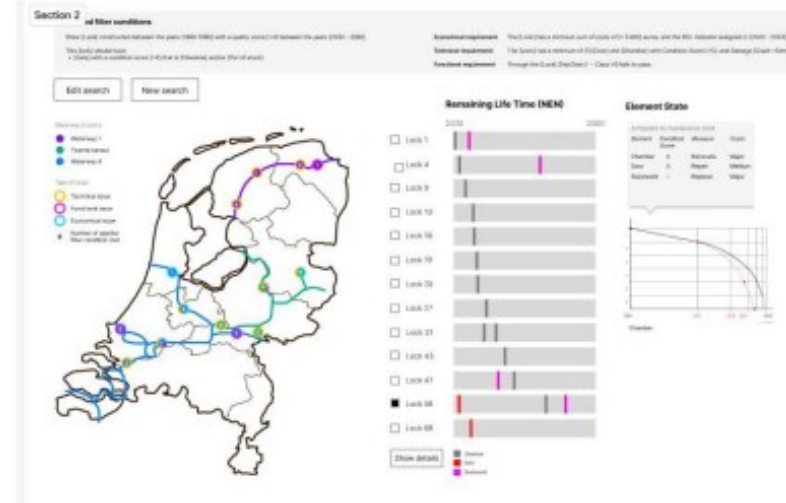
Next Steps

PoC:

- Visualisations and UI with linking available RWS Geo data
- Implementing NEN 2767-1 method for EoL per component

Future Investigations:

- How to make it modular and scalable (other NKW type)?
- How to enrich it with the output of detailed assessments?
- How to conform NEN 2660 and align RWS Linked Data systems?
- How do we align with other programs (AM 2.0, ...)?
- What are the potentials of Language Models with our model?



Concluding remarks

- It has been a **joint-knowledge development** project between RWS and TNO.
 - 2018-2022 KpNK: Ideation and Research Design, Explore the Framework
 - 2023-2025 OPV: PoC Development
- **Two innovative elements**: 1) Data-driven Integral End of Life Approach and 2) Linked Data solution:
 - Even in early stage, assets can be assessed based on technical, functional and economic aspects.
 - Emerging technology (LD): explainable, expandable and open-source.
- **Close-collaboration with the two Universities**: Tu/E, U Twente
 - 3 Master students supervised. 1 NWO Proposal submitted in Open Technology Program in 2024.
- This **methodology** and the model are **applicable and adjustable** for any type of assets.



Help to be aware of risks, reduce inefficiencies

Rapid Analysis



Accurate Prognosis



Efficient use of tax-payers money





Contact persons



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