Asset Management
and safe drinking water for Amsterdam

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Introduction

Figure 1: Amsterdam and the dune area

Traditionally, Amsterdam extracted its drinking water partly from the dunes. From 1853, the first drinking water companies pumped the water for Amsterdam directly from the deeper layers of the dunes. Due to the increasing demand, the sand bottom was found to dry out and salt water was coming up. From 1957 river water from the Rhine river was infiltrated into the dunes. In the seventies it was discovered that this technique polluted the dune bottom. So the water companies proceeded to infiltrate pre-purified river water into the dunes.

Methodology

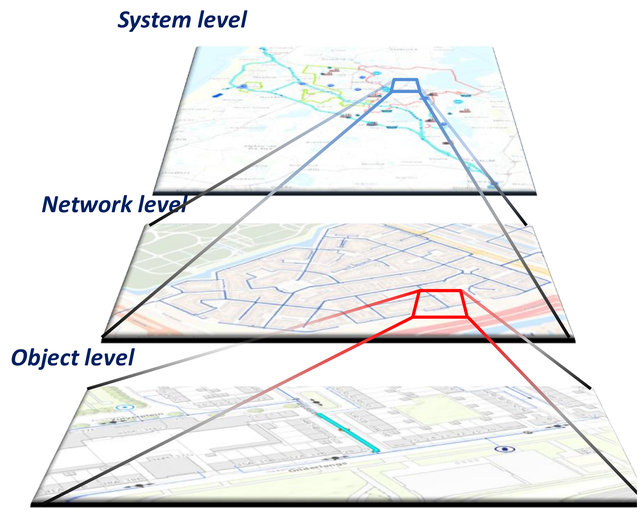


Figure 2: Three level approach: System-network-object

The three level approach shows the relationship between system, network and object. It illustrates a way of thinking.
An assessment at system level answers the question how we use our sources and produce and distribute drinking water, in general. What is needed, what is feasible and what is the effect for the whole system? At the network level, we look at smaller networks and their functioning as a part of the system. At object level we look at parts of the networks and their condition, such as a canal, a pipe, a well, a pumping station.
Measures relating to the condition of objects must fit within the framework of the functioning of the networks. The functioning of the networks must fit within the frameworks of the total system concept, according to chosen policy.

Results & Discussion

Decomposition	Basic questions for Asset Management	Asset Management	Instruments / Tools
System From source to tap Example: • Water chain • Watercycle	**System questions** 1.Future developments 2.Future demands including acceptable risks 3.System performance, now and in the future 4.System assessment (critical?) 5.Possible scenarios Life Cycle Cost (LCC) 6.Long term (financial) strategy ***Horizon long term : 30 - 50 year***	**System vision Water Chain** *Direction and strategy for the development of the water chain on the long term*	Stakeholder analyses • Policy and plans Scenario analyses • Long term prognosis for investments • Risk analysis • Visions of the future
Network Logical and coherent part of the system Examples: • Production plant • Dune area • Transport pipelines • Distribution	**Network questions** 1.Future developments 2.Future demands based on system demands 3.Network performance, now and in future 4.Network assessment (critical?) 5.Possible scenarios (LCC) 6.Prioritize ***Horizon: medium-term 5-30 years***	**Multi-year period action plan** • Investments • Maintenance & operations • Research *Integral multi-year period investment and exploitation planning; supported by business cases*	• Hydraulic modelling • Performance analysis • Monitoring • Risk analysis • LCC analysis • Life cycle analysis • Vision of the future
Object Part of a network Examples: • Pumping station • Pipe • Well • Infiltration canal	**Object questions** 1.Future demands including acceptable risks 2.Object performance, now and in future 3.Object assessment (critical?) 4.Possible scenarios Life Cycle Cost (LCC): Balance between maintaining and renewing 5.Short term finance and prioritize ***Horizon: short term 0-5 years***	**Control of the Information request** *Guidelines for design, operation and maintenance*	Results recorded in Business Cases Terms of reference • Risk analysis (FMECA*) • Monitoring • LCC/LC Analysis • CMMS (Maximo) • Scan maintenance

*FMECA : Failure mode, effects and criticality analysis

Source : waternet waterschap amstel gooi en vecht gemeente amsterdam

Figure 3: The implementation framework of the 3 levels / 5 questions

In the past, engineers have made choices how to realize the supply of safe drinking water. In the following years they are confronted with challenges, due to their choices. New choices and techniques implicate new problems. In the meantime, the number of assets has grown spectacularly, a transparent method is needed to manage these assets in a dynamic world. Waternet uses the so-called '3x5 format' to assess the assets within their position in the network and system. On 3 levels we ask ourselves 5 questions: what will the future bring us, what assets do we have, will they be critical, why do we want to change something and how can we prioritize and finance the measures?

The consideration with our asset management method has led us to decide that we want to continue the design of the current system. It helps us to consider the risks performance and costs of our drinking water system and makes clear that the river Rhine as a source, pre-treatment and transport with long pipelines is still the best way to supply safe drinking water to the inhabitant of Amsterdam, now and in the future.

Even if the system has his critical assets, as long as we define them, we are in control.

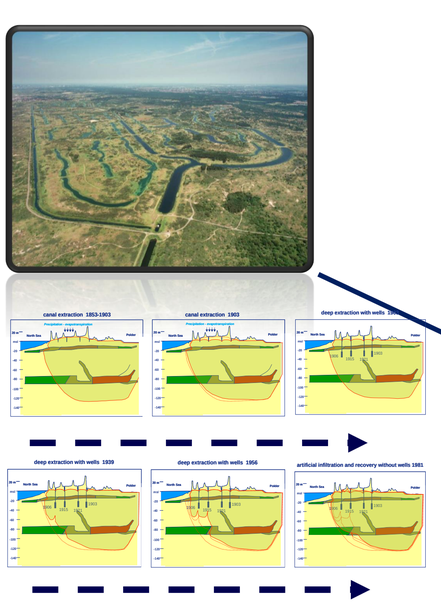
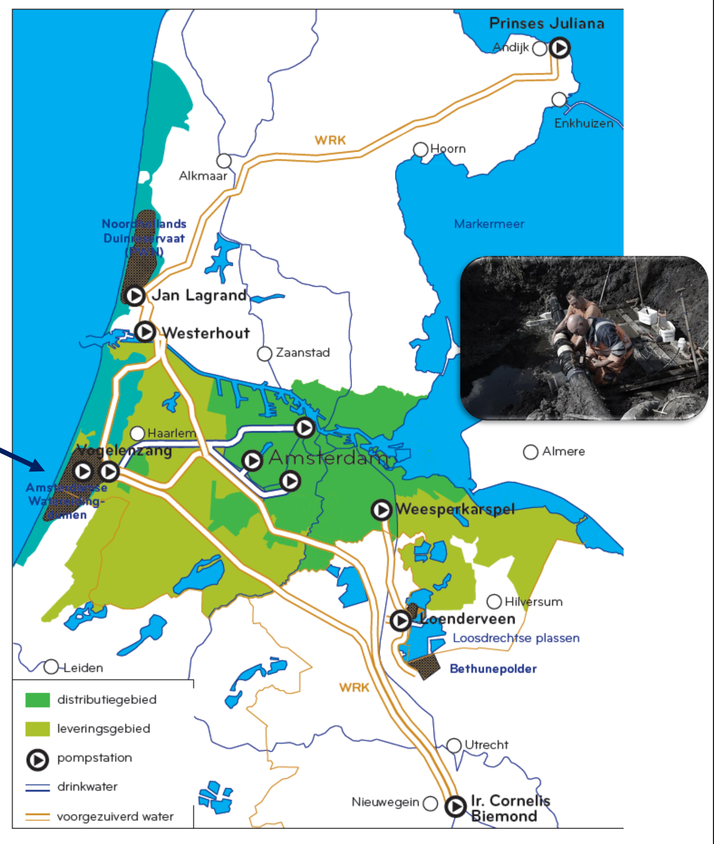


Figure 4: assets in a network and system

Waternet provides water services to 1.3 million people in an urban delta area, on behalf of the City of Amsterdam, about 95 million m3/year; 70-75% of this production has the water from the river Rhine as a source. Long pipelines, pre-treatment, the dune infiltration and post-treatment are needed to transform the water from the Rhine into drinking water. What does the future look like? Is this system, that exists decades, still the most efficient way to do the job? Or is it necessary to change it? And why?

As The Netherlands are located in the Rhine delta, we realize the risks and also the opportunities of the Rhine as our source and compare this with other possibilities. Our three level approach and the 5 basic questions helps us to make choices and substantiate them.



Conclusions

Asset management is necessary as a method to maintain, improve and adapt existing systems, networks and objects. In an approach of the three layers, system-network-object, and 5 questions we achieve to manage our assets in an effective and efficient way. This awareness helps us to see clearly the balance between risks, costs and performance. It results in transparent decision making for investments and maintenance of our assets.