Sewer asset management:
Deciding about why to do what?

Wouter van Riel – 1 October 2013

What is it?

What is it?

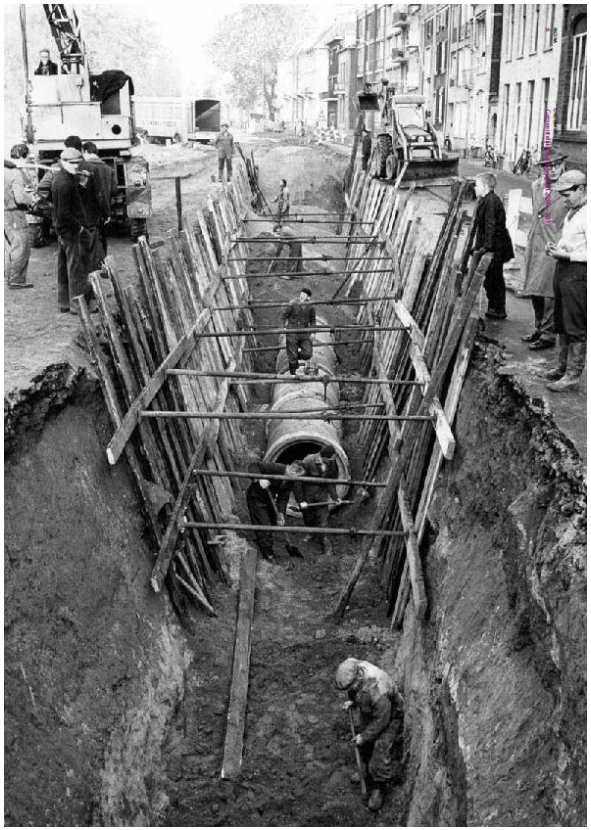
- Taking care of the functioning of the sewer system
  - Technical: maintenance, replacement
  - Financial: costs
  - Management and organization: responsibilities, decision process, argumentation

Why?

Bron: www.alwin-bathware.com

History of sam

- Since 1900 building sewer networks
- Attention since 1980s
  - Poor condition
  - A lot of buried money!
- Policies: sewer taxes & strategic plans

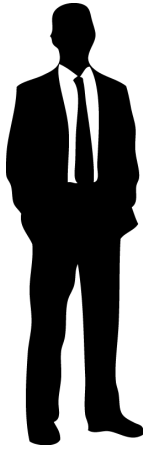


- Reactive → proactive
- Computers

History of sam

Reactive	Proactive	Predictive
Fix what is broken	Observe and act	Foresee and act

SAM: *Homo economicus*



1. Objective

2. Problem

Quality
&
Performance

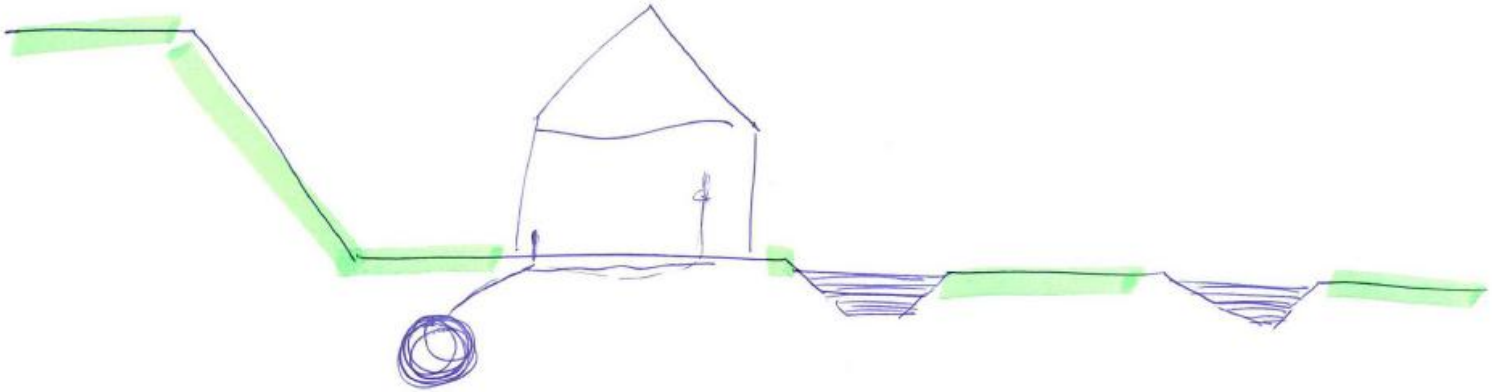
3. Alternatives

Repair
Replace

4. Choice

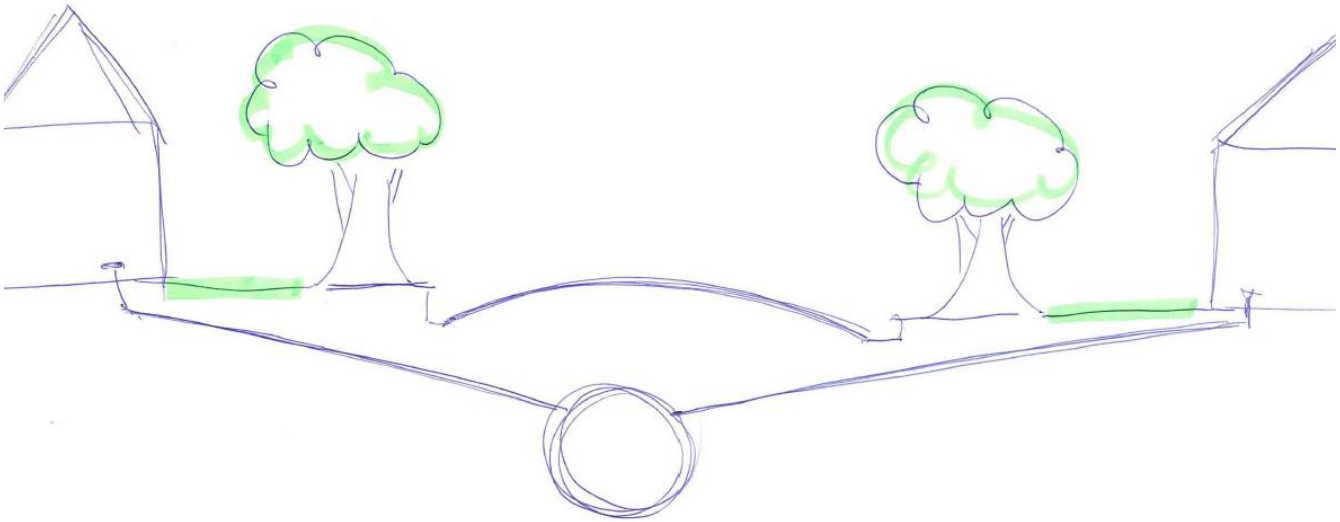
Example 1

- Problem?
- Alternatives?
- Choice?



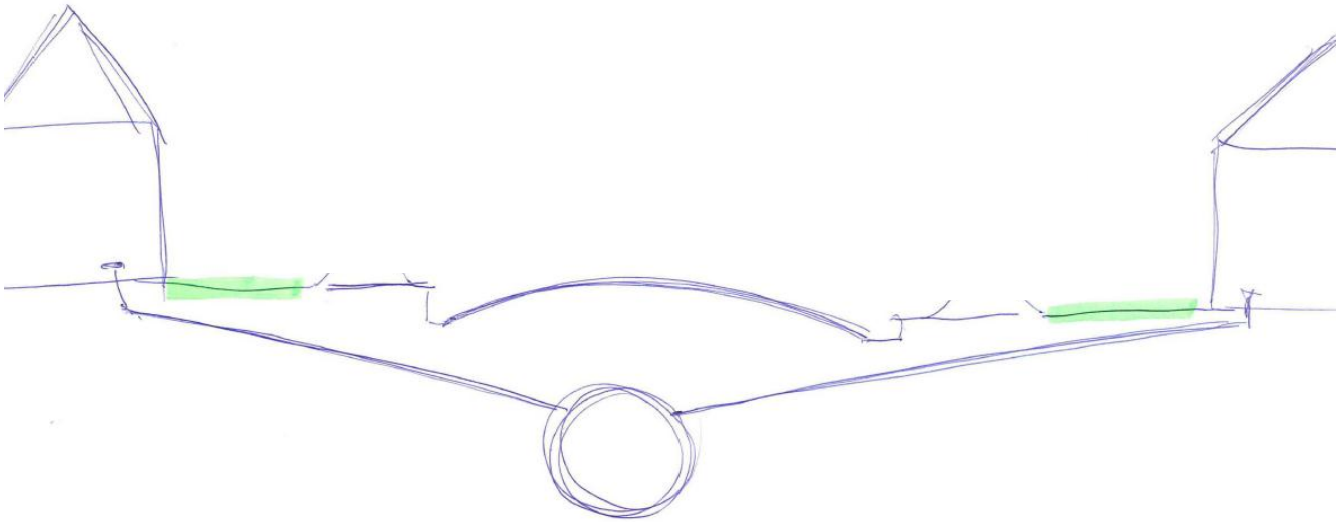
Example 2

- Problem?
- Alternatives?
- Choice?



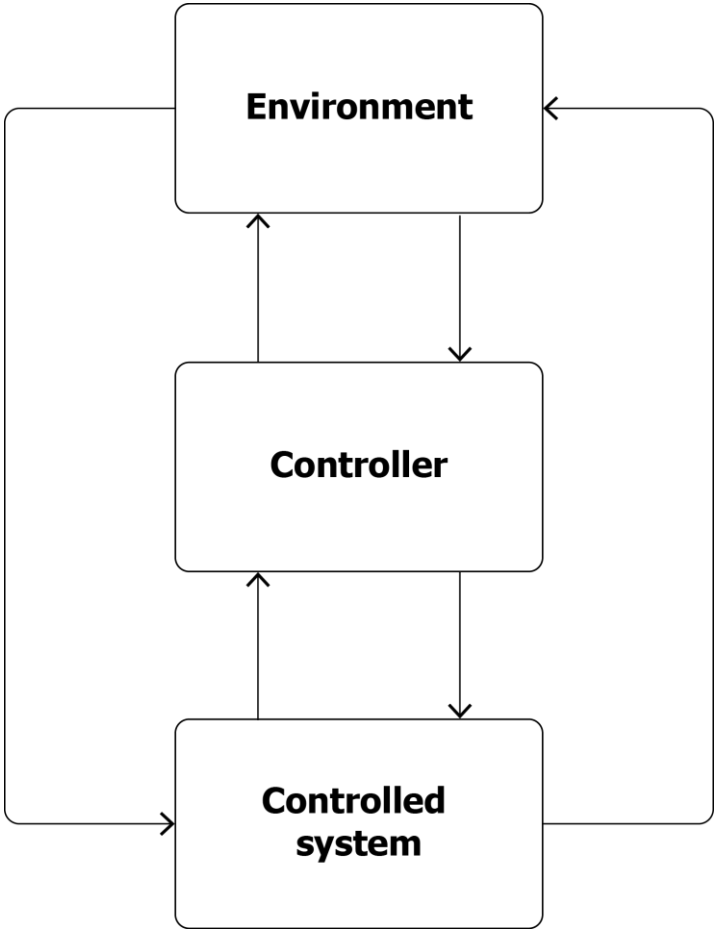
Example 3

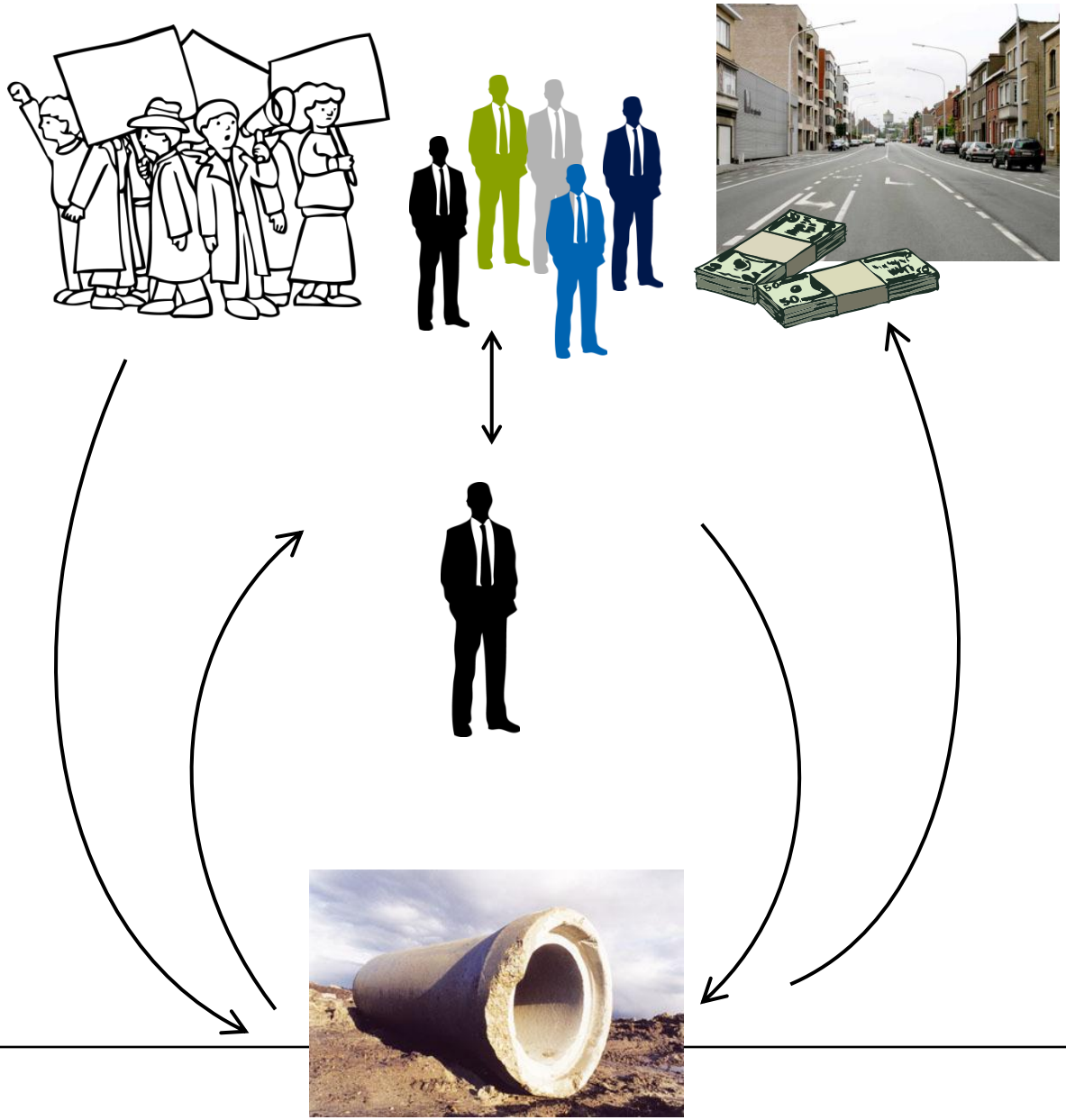
- Problem?
- Alternatives?
- Choice?



Theoretical framework

- Control paradigm (De Leeuw, 1974)
  1. Objective and evaluation
  2. Model of system
  3. Information system and environment
  4. Sufficient control actions
  5. Information processing capacity



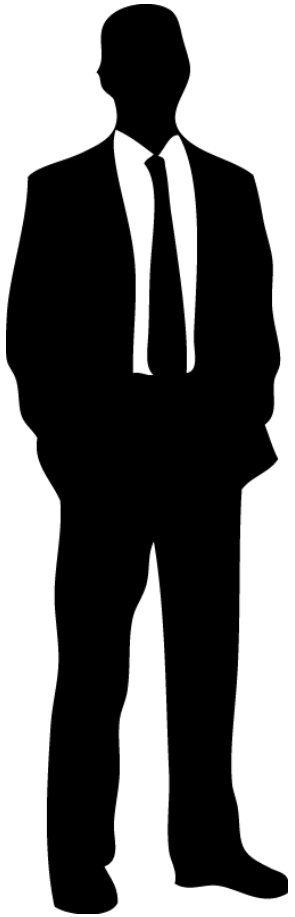


Strategic municipal sewerage plan

- Obligation!
- Meant to stimulate systematic asset management
- Policy objectives
  - Why, what and how?
- Costs
  - Measures and personnel
  - Taxes

In practice

1. Evaluate goals of previous period
   - Cost effective collection of water and transport to wwtp or surface water
   - Reduce pollution emission to surface water, soil and groundwater
   - Prevent and reduce nuisance to community
   - Cost effective management of the sewer system



In practice

2. What did you achieve?
   - Planned measures are realised
   - We cooperated with other works in public space as much as possible
   - We have knowledge about the performance of the sewer system
   - We have knowledge about costs on the short and long term

In practice

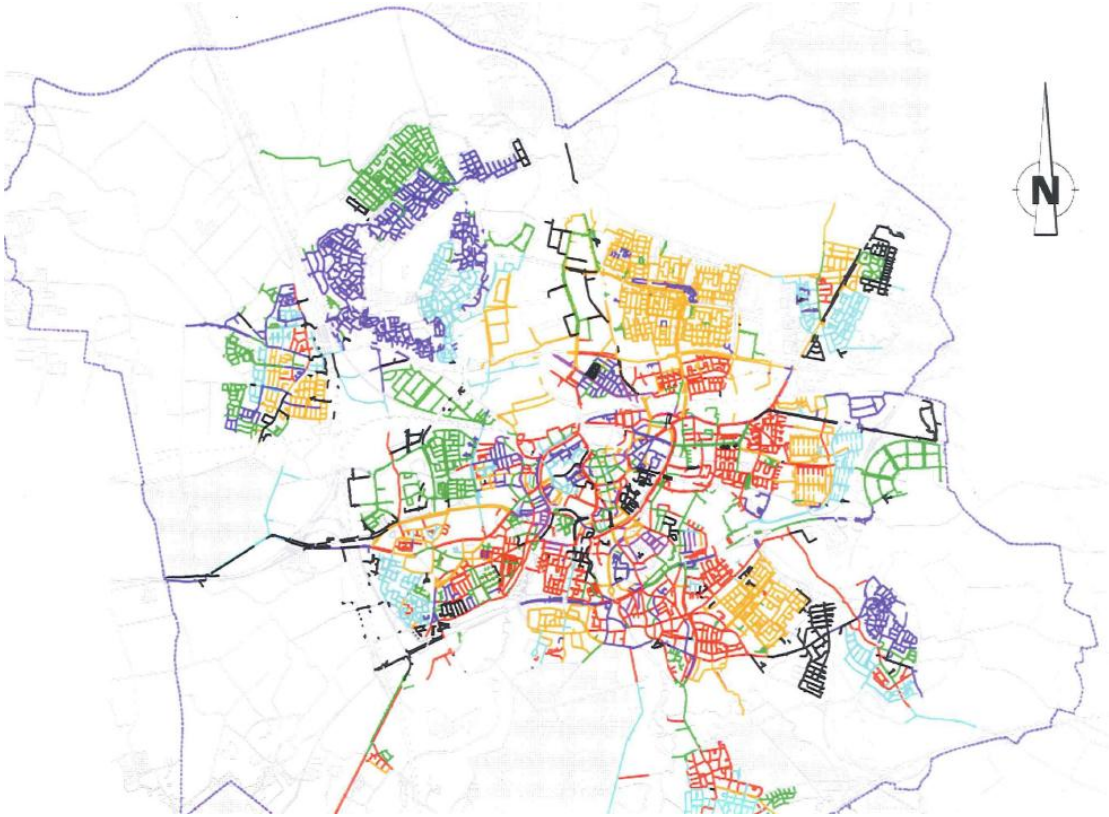
3. What did you learn?
   - We could not execute all measures
   - Knowledge about the sewer system is a prerequisite for sound management

In practice

4. What are our goals?
   - Cost effective collection of water and transport to wwtp or surface water
   - Reduce pollution emission to surface water, soil and groundwater
   - Prevent and reduce nuisance to community
   - Cost effective management of the sewer system

In practice

5. What are we going to do and where?
   - Data about system & environment



In practice

6. What does it cost?
   - Costs for projected measures, inspection, research, cleaning, etc.
   - Divide by number of connections ≈ sewer tax
   - Number of staff

Conclusion?

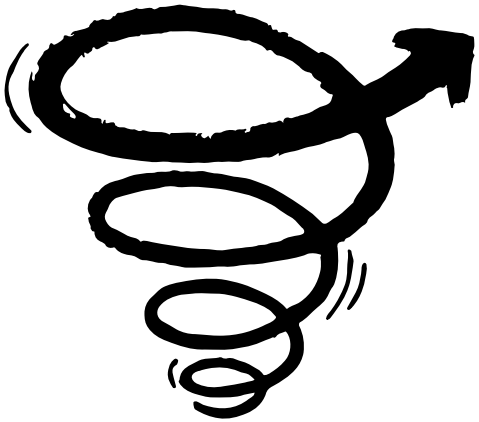
- Is it useful?
- Are we able to learn?

Preconditions met?

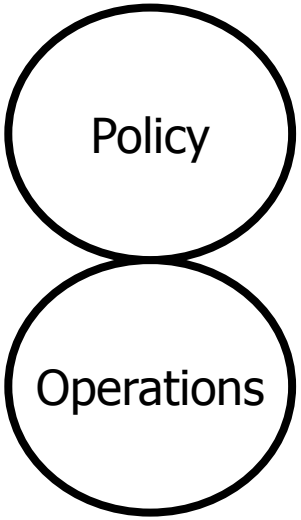
1. Objective and evaluation
2. Model of system
3. Information system and environment

Plan-Do

vs.



Plan-Do-Check-Act

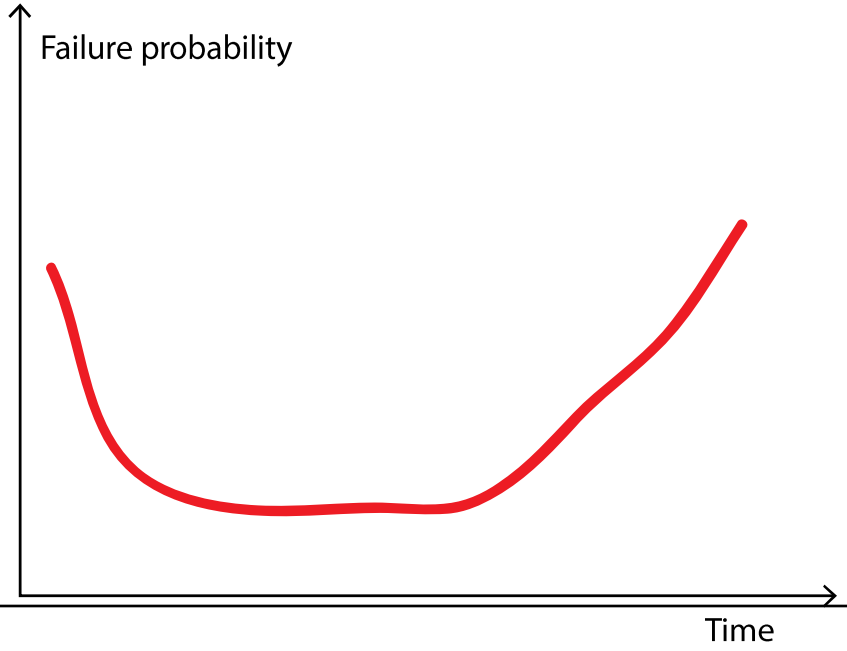


Preconditions: model en information

1. Objective and evaluation
2. Model of system
3. Information system and environment

System data: pipe quality

- Deterioration processes
  - Individual pipes
  - Cohort of pipes
- Highly complex (many interacting variables), not well understood
  Result: difficult to predict pipe failure



System data: pipe quality

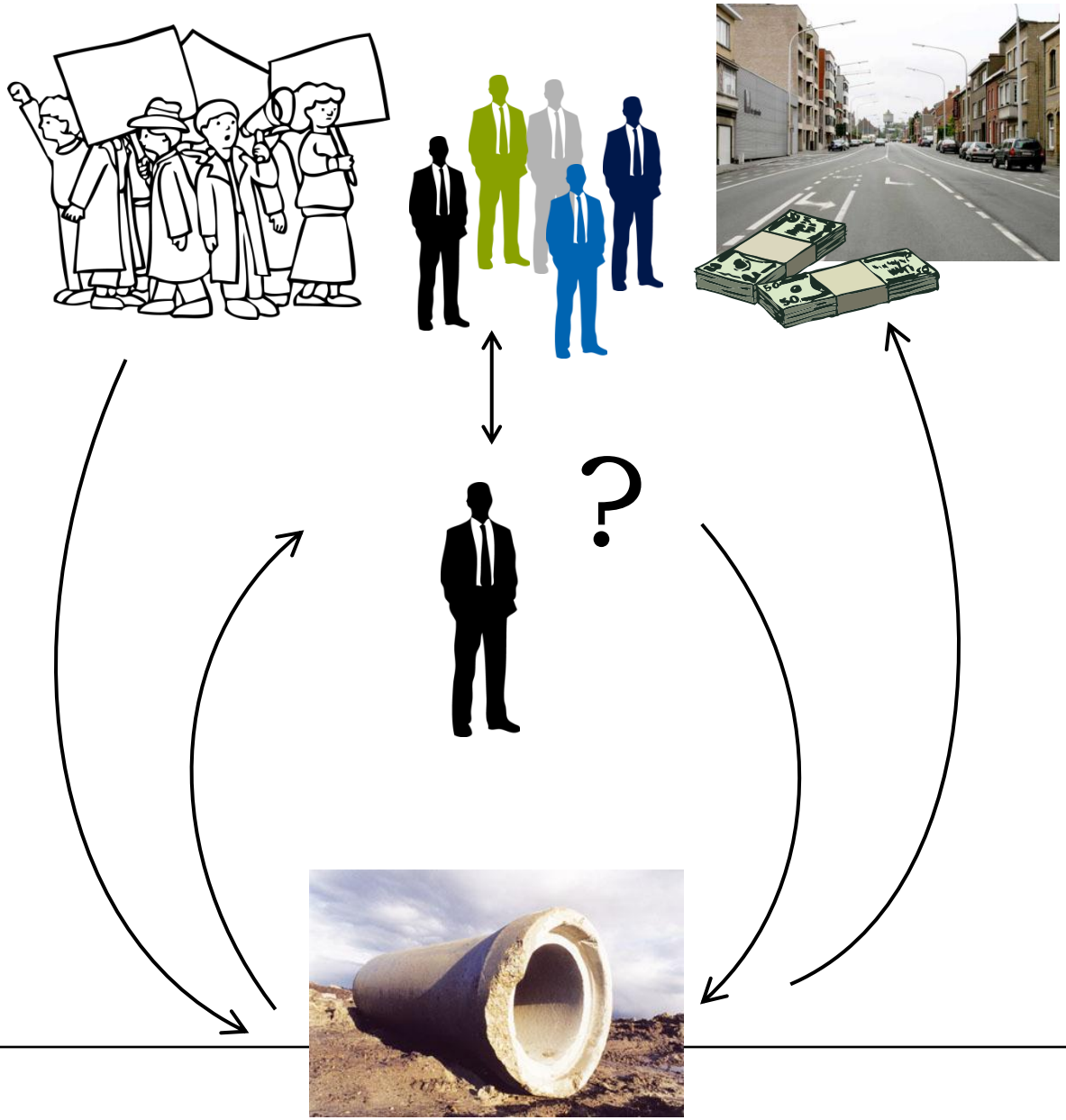
- Current use: pipe age & visual inspections (CCTV)
- Plus
  - Insight into current status and potential failures
- Issues:
  - Converting detailed, location specific data to larger scales
  - Weight/importance per defect
  - Interdependence of observations
  - Snapshots in time, no data series
- Conclusion: difficult to predict pipe failure

System data: system performance

- Current use
  - Hydraulic model
  - Measurements (flow at pumping stations, overflows, wwtp, subsidence)
  - Complaints: call data
- Plus
  - Model: relatively cheap, fast and easy to do
- Issues
  - Large differences with reality
  - Measurement data is scarce
  - Point measurements in space and time
  - Converting measured data into knowledge
- Conclusion: difficult to predict performance

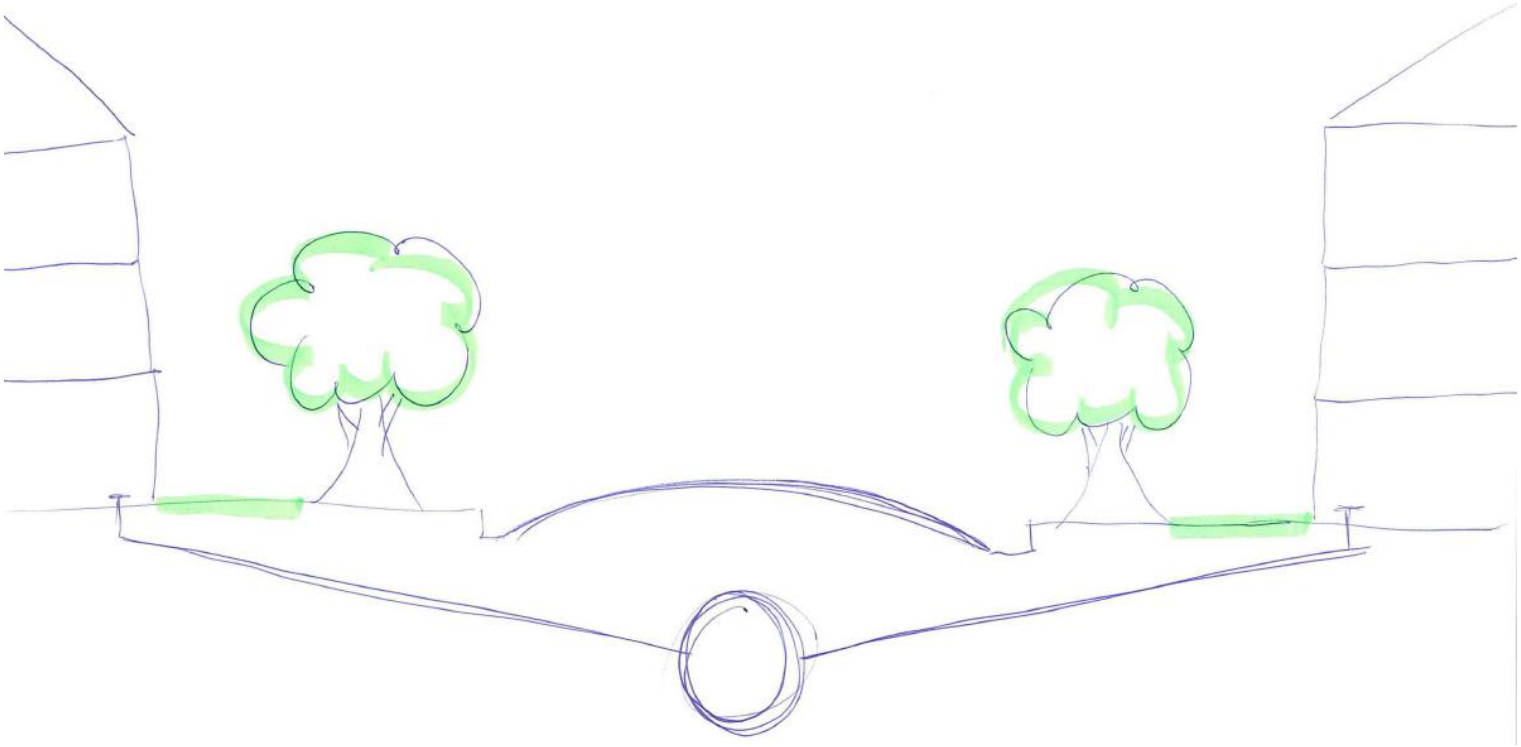
Data environment

- Why?
- Current use
  - Soil characteristics
  - Road manager
  - Green manager
  - Urban development projects
  - Traffic intensity
  - Citizens' complaints
- Plus
  - Reduce costs and nuisance by integration of works
- Issues
  - No guidelines or references: use of 'common sense'
  - Not reproducible
  - Preventing evaluation



Example

- What information do you need?



Influence on you as manager

Replace house connections?

Roots in pipes

Citizens friends with mayor

Hard to predict pipe quality

Highly educated citizens: to court

Authentic street view

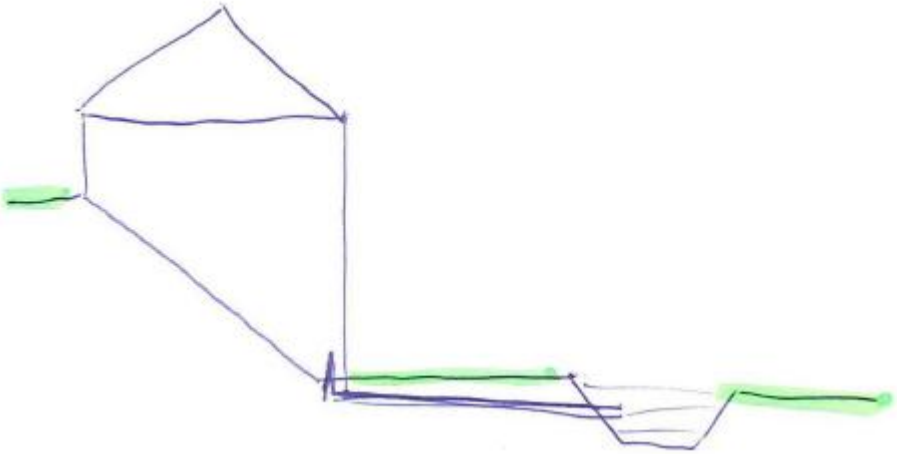
Repair hole, or replace pipes?

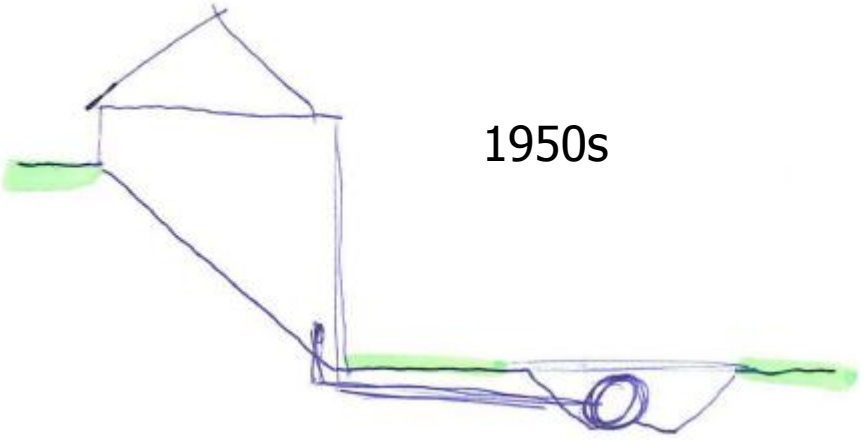
Old trees, risk of falling over?

Citizens can still flush toilets

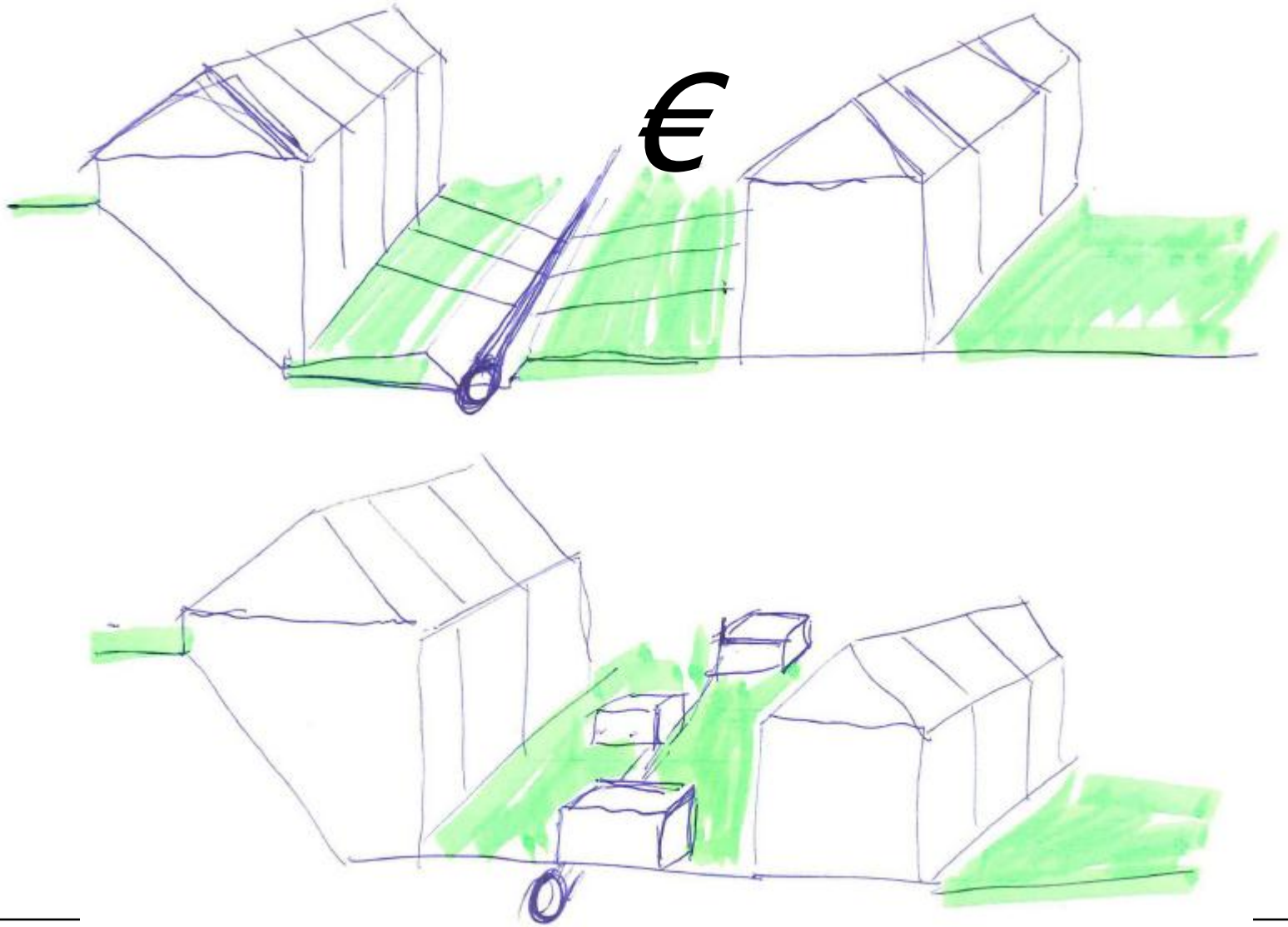
Street surface needs renewal

Example: Dijkhuizen





1950s



Example Dijkhuizen

- What would you do?

Influence on you as manager

What is the system we want?

Who pays what?

Is renewal needed?

Wait for failure to get approval from citizens?

Forbidden to build on that area

Not manageable now

Damage each garden

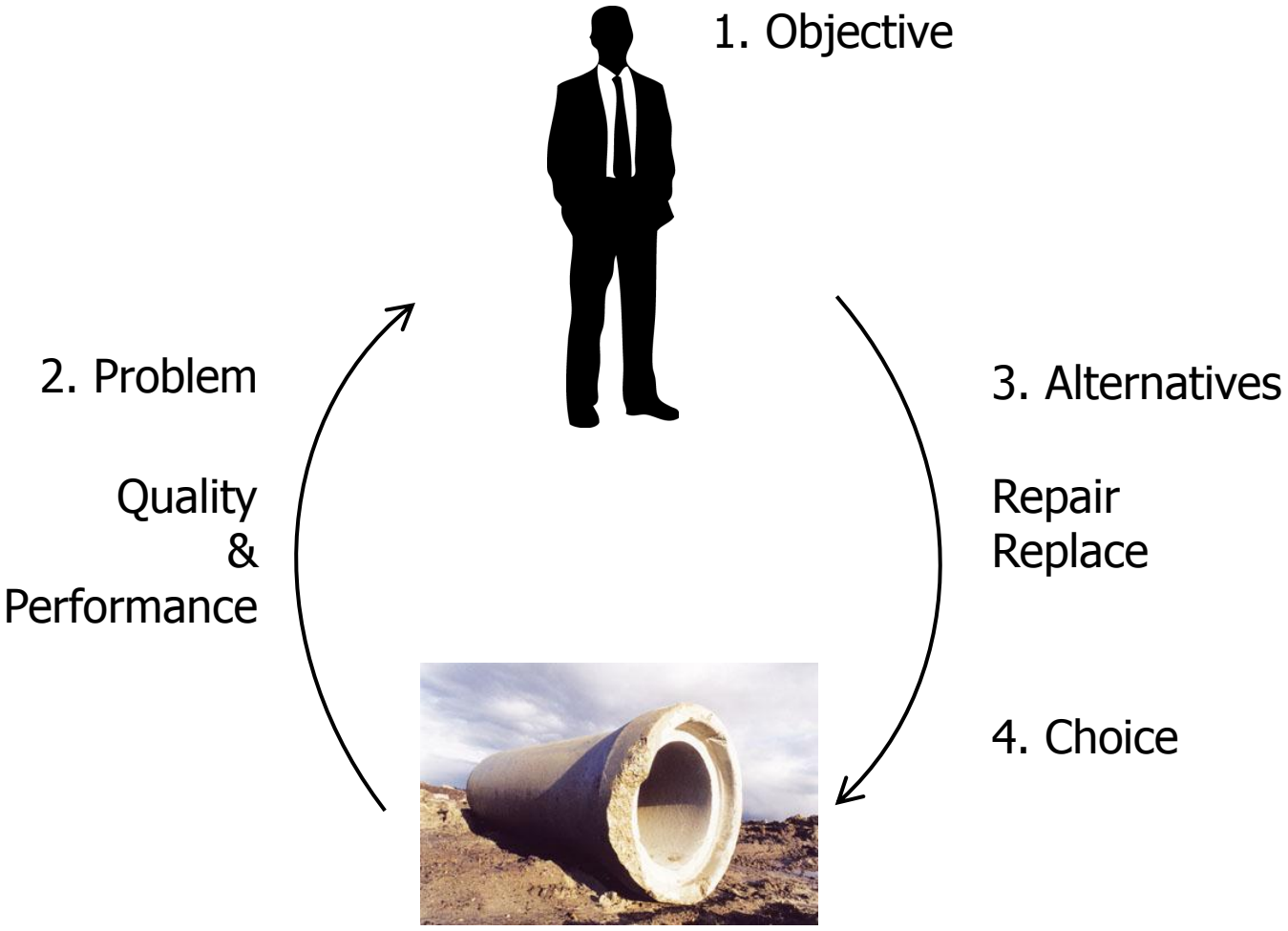
Situation like this for 20 years

Compensate inhabitants?

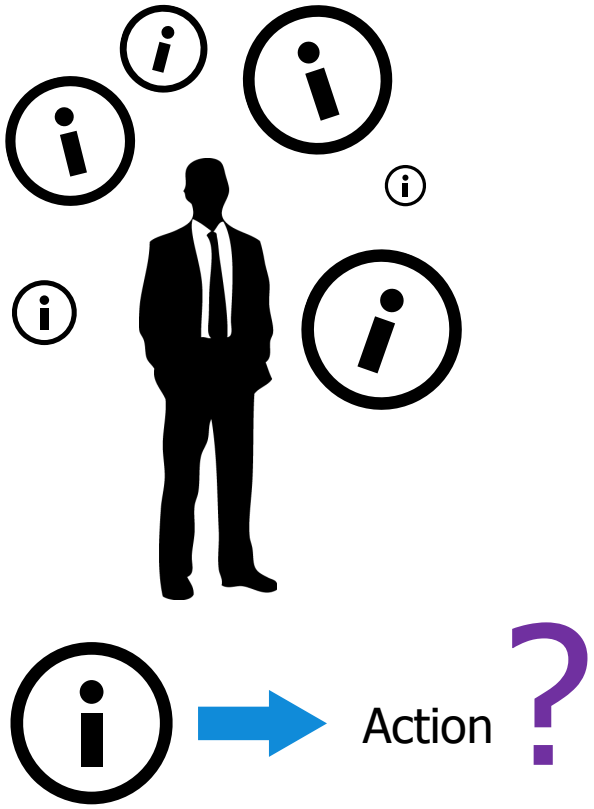
Preconditions met?

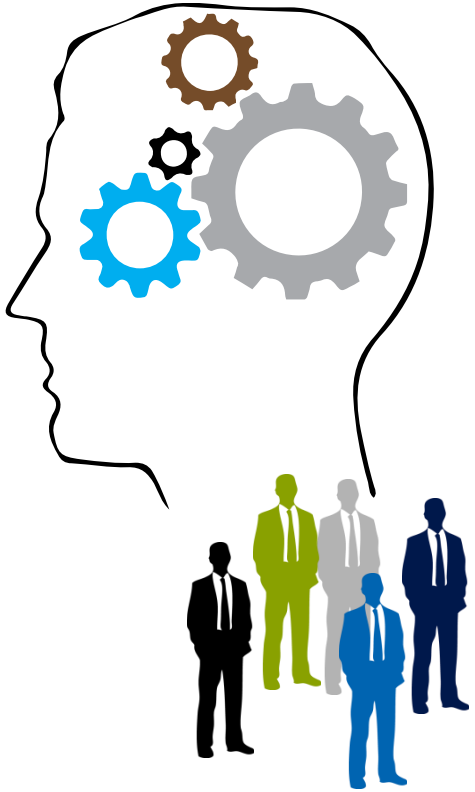
1. Objective and evaluation
2. Model of system
3. Information system and environment

Homo economicus valid?

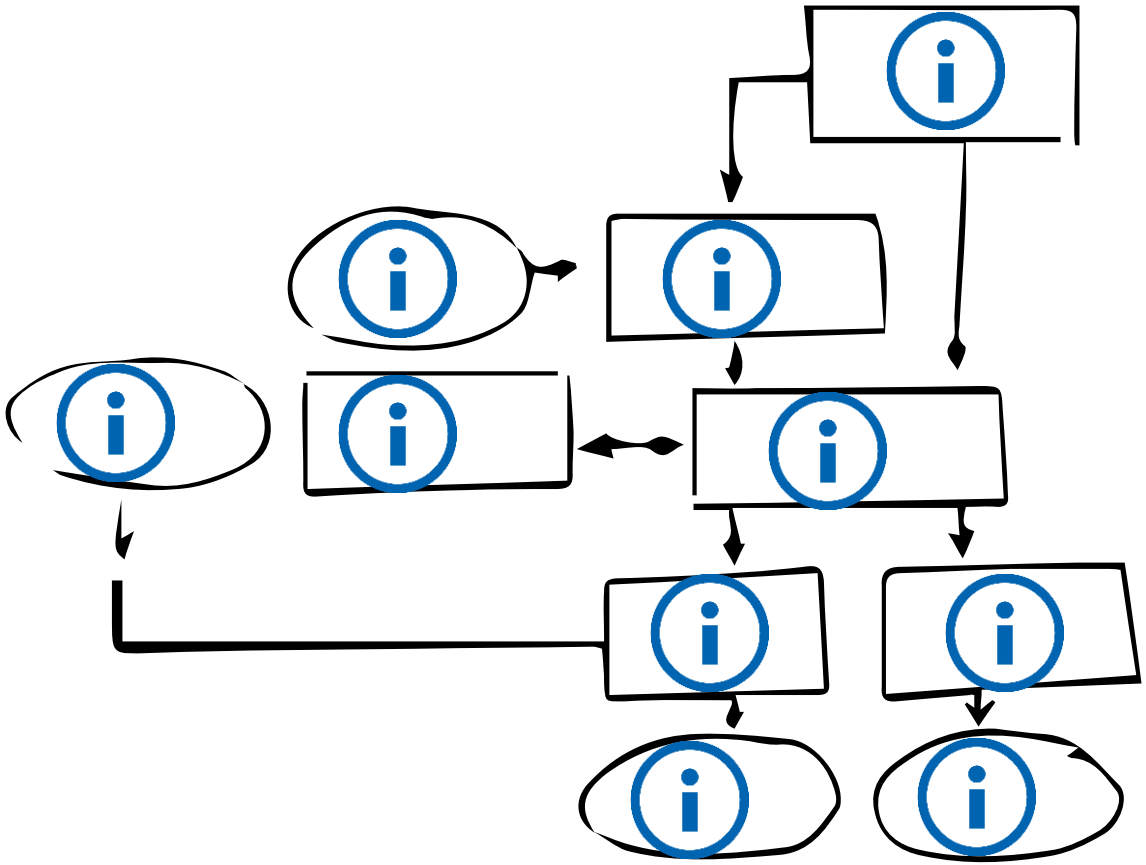


Research: decision-making

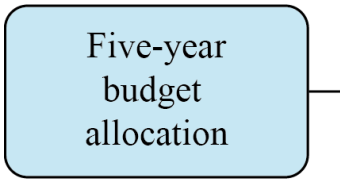




Two aspects



Decision process for sewer replacement



Information use five-year budget

- Analysis municipal sewerage plan
  - Age (7/7)
  - Camera inspection (6/7)
  - Soil subsidence (1/7)
  - Public works (1/7)
  - Other…?

Information use

- Camera inspection
- Age
- Hydraulic model
- Soil subsidence
- Public works
- Urban development
- Traffic density
- Water management strategies
- National policies

Information use

- Camera inspection
- Age
- Hydraulic model
- Soil subsidence
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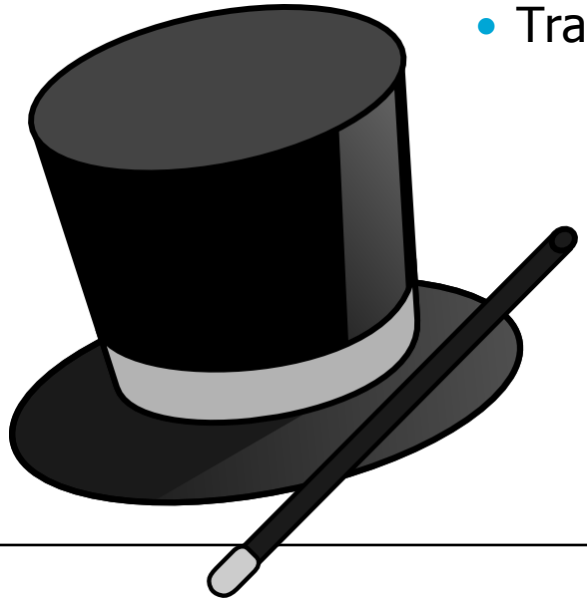
Gut feeling!

Information use

Implicit risk analysis (feeling x consequence)

Technical renewal need

- Pipe collapse
- Insufficient hydr. performance



Synergy with other works

- Nuisance to citizens
- Higher costs
- Traffic disruption

Summary

Theory

- Rational
- System quality and performance
- Compare with requirements
- Develop plan

Practice

- Complex
- Limited learning experience
- Data of limited quality
- Interactions and influences
- Difficult to be a manager: weigh system data and interactions/influences

Still…

- Sewer system managers use their best available knowledge
- Are multidisciplinary people
- Hardly any problems
- Why?

Because…

- Use of intuitive judgments
- Better to be safe than sorry
  - Is the current system performance too good?
  - We don’t know

What do we need?

- Research:
  - the decision processes
  - Use of information vs intuition
  - Influence information vs intuition

Questions?

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