



# Water management in urban areas

## Planning, Structural approach

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# Introduction

- Civil engineering design is part of the urban planning and management process
- Water management policy development
- Integral planning
- Various approaches
- Always aimed at taking appropriate measures

# Appropriate measures

## Criteria

- are effective and efficient
- have wide support among stakeholders
- have an acceptable risk of failure
- are feasible within limited time and budget
- in line with natural processes
- are well able to be maintained and managed
- et cetera

**Appropriate is subjective!**

# Policy development

## Prerequisites

- Sense of urgency
- Vision vs current state
- Analyzing difficulties and setting priorities together
- Justify decisions
- Organize:
  - Inception phase (problem survey)
  - Creative phase (management vision)
  - Strategic phase (package of measures)
  - Implementation
- Each phase starts with stage of *diversion* before *converging*

# Creative phase

## ‘Rules of the game’

- Allow every idea (especially support unusual ones)
- Never dispute solutions
- Be aware of qwerty’s
- Involve as many stakeholders as possible
- Use different communication tools



# Creative phase

## What do we do?

- Lots of development
- A lot of (new) possibilities

Lets take a closer look at a few examples:

# Examples of measures

## Precipitation

- Wet and dry deposition
- Remove sources
  - non-diffusive loads
  - traffic
  - incineration plants and private fireplaces
  - etc...

# Examples of measures

## Drinking water supply

- Cut down water usage
- Secondary water system
- Using rainwater

Up to 50% less drinking water



# Examples of measures

## Roofs and paved surfaces

- Spatial planning
  - location of urban development
  - surface area
- Building materials
- Pesticides
- Precipitation losses

# Examples of measures

## Runoff infiltration

- At surface level / subsurface level
- Water quality
- Erosion control
- Groundwater nuisance
- Low permeability
- Use of infiltrated water

# Examples of measures

## Sewer system

- Investments
- Storage and settling tanks
- Operational
- Management and maintenance
- Custom made solutions

# Examples of measures

## Groundwater

- Nuisance
  - To high
  - To low
  - Consolidation
- Quality
  - Diffusive loads
  - Non-diffusive loads

# Examples of measures

## Surface water

- Sources
  - Waterbed
  - CSO's / toxic dumps
  - Calamities
- Robustness
  - Water preservation
  - Ecological purification capacity

# Examples of measures

## Sewer treatment

- Effluent quality
- Reed filters
- Decentralized treatment facilities

# Strategic phase

## How do we choose?

- With thorough consultation of all stakeholders
- Create trust among stakeholders
- Proclaim boundary conditions (time, money, etc.)
- Organized according to certain templates
  - No blueprint
  - Structure negotiations
  - Various templates available

# Templates

## DoFeMaMe

- **Doelen;** Objectives (What to achieve)
- **Functionele Eisen;** Functionality (How should the system behave)
- **Maatstaven;** Standards (Which values have to be met)
- **Meetmethoden;** Monitoring (Which methods are used)



# Templates

## New Technical Paradigm (NTP)

- Removing driving forces in favor of end-of-pipe measures
- Both constructive and non-constructive measures

| <i>Priority</i>                               | <i>Constructive measures</i> | <i>Non-constructive measures</i> |
|---|------------------------------|----------------------------------|
| 1) Remove sources or driving forces           |                              |                                  |
| 2) Local countermeasures, close to the source |                              |                                  |
| 3) End-of-pipe measures                       |                              |                                  |

# Templates

## BRUHO-chain

- **B**eleid; Policy
- **R**egelgeving; Legislation
- **U**itvoering; Implementation
- **H**andhaving; Enforcement, performance evaluation
- **O**rganisatie; Organisation

# Templates

## PRIMAVERA / MCA

Multi criteria analysis:

- Extent of the problem
- Reach of the problem
- Effectiveness of measures
- Costs of measures
- Time scale of effects to be revealed
- External conditions
- Administrative appreciation
- Social appreciation

Values of criteria are **subjective but organized** selection method

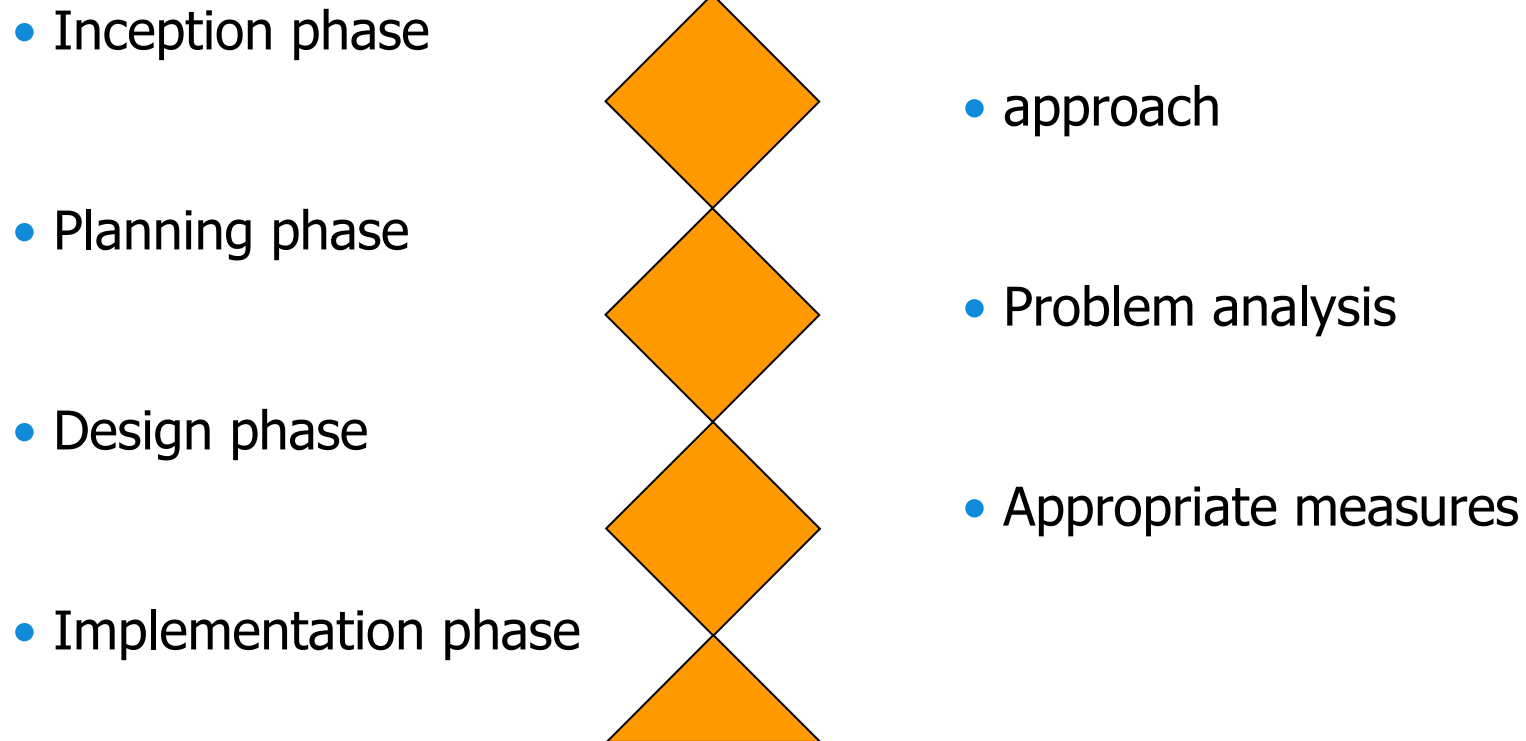
# Templates

## Concluding remarks

- Various templates to stimulate and organize selection processes
- Tendency for rational and transparent procedures
- Win-win situations / deals
- Non-quantitative selection methods with large freedom of choice
- Primary task is to **decide** what to do

# Policy development

## Creating an urban water management plan



Each phase concluded with a formal agreement and contract



# Collaborative planning

## Characteristics

- Multiple actors involved
- Process
  - Interactive
  - Iterative knowledge process

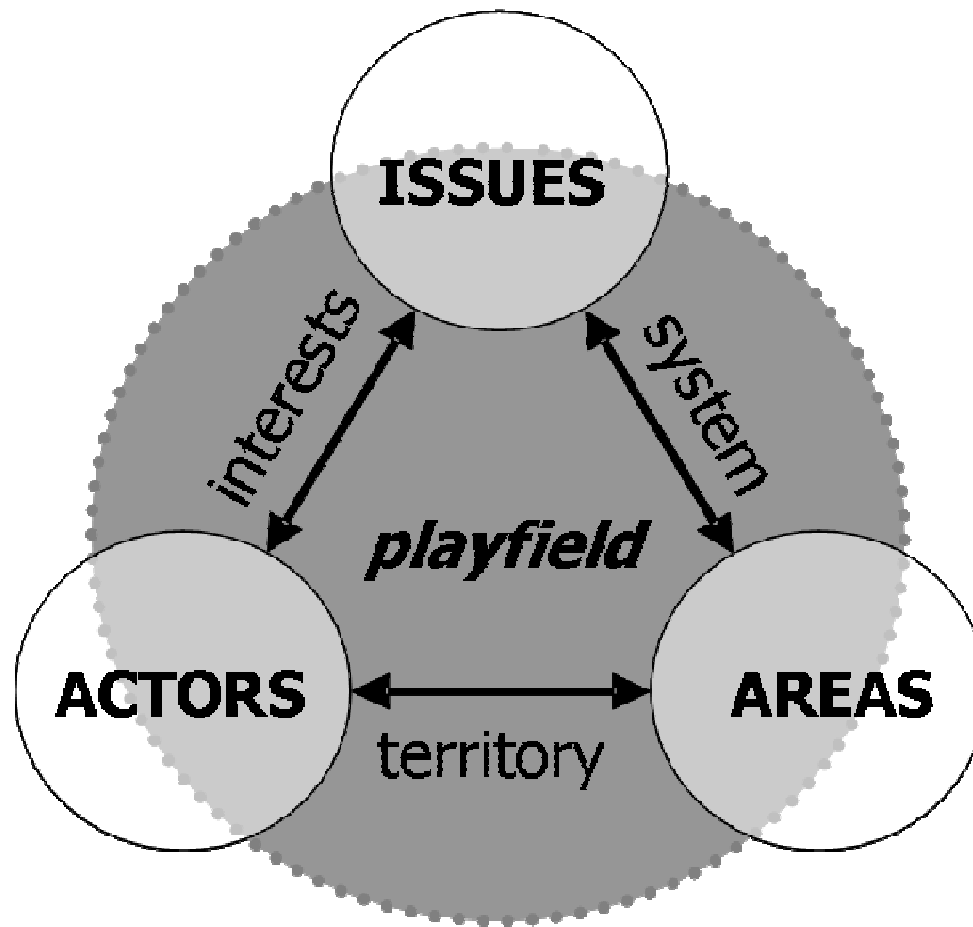
# Collaborative planning

## Pro's and con's

- Advantages:
  - Acceptation
  - Quality
  - Integrate knowledge
  - Image
  - Implementable
  - Etc.
- Disadvantages:
  - Control
  - Unpredictable
  - How to start?
  - Generates expectations
  - Etc.

# Inception phase

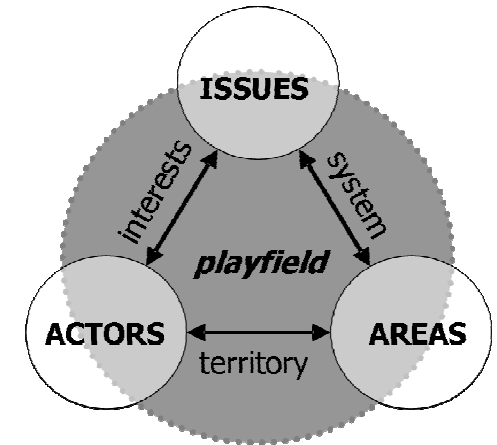
Source: Rijsberman, 2002. Speelveld van themas, actoren en gebieden (p.23)





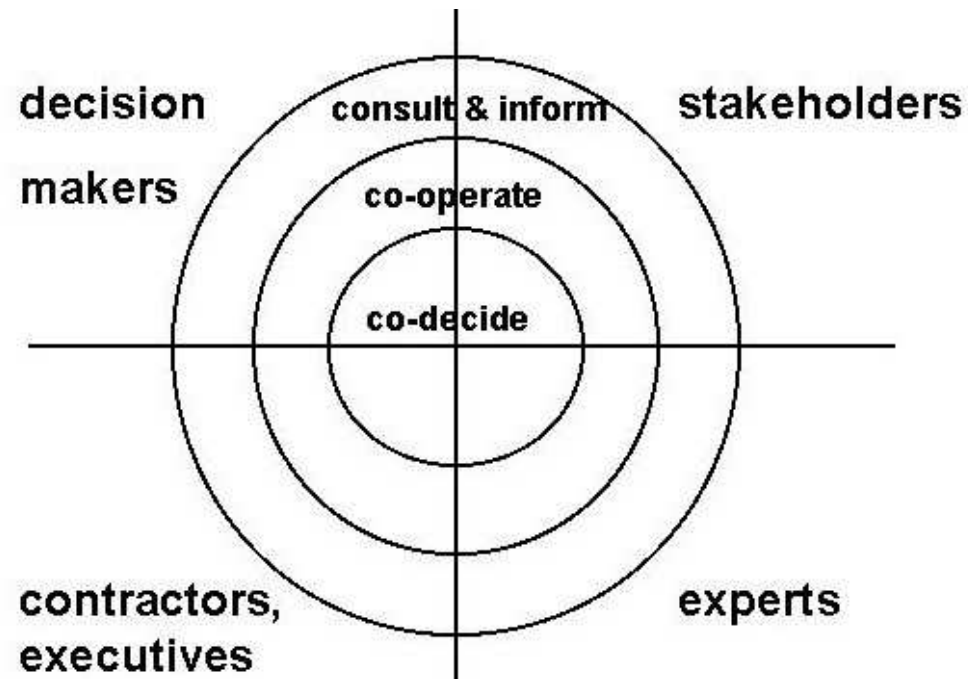
# Actors

- Taking part in the process due to:
  - Power
  - Money (investments)
  - Moral right
  - Knowledge
- Degree of participating depends on:
  - Phase of the process
  - Their stakes
  - Their preferences



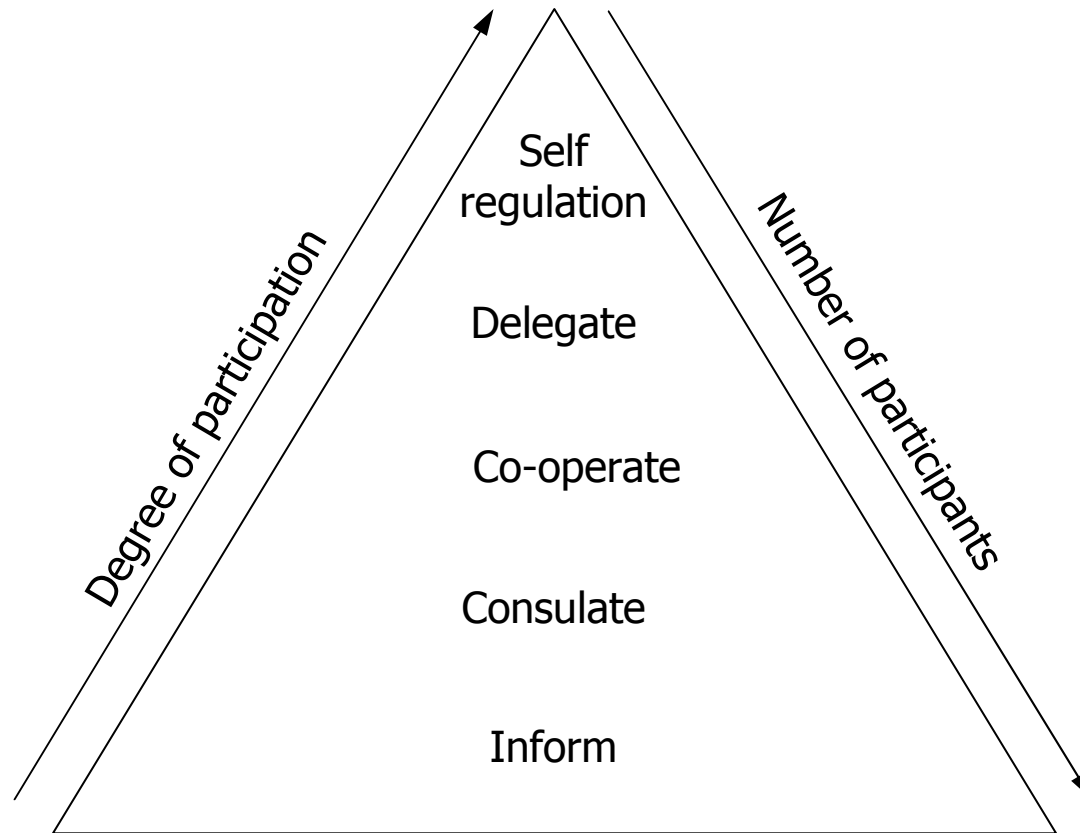
# Actors

## Involvement



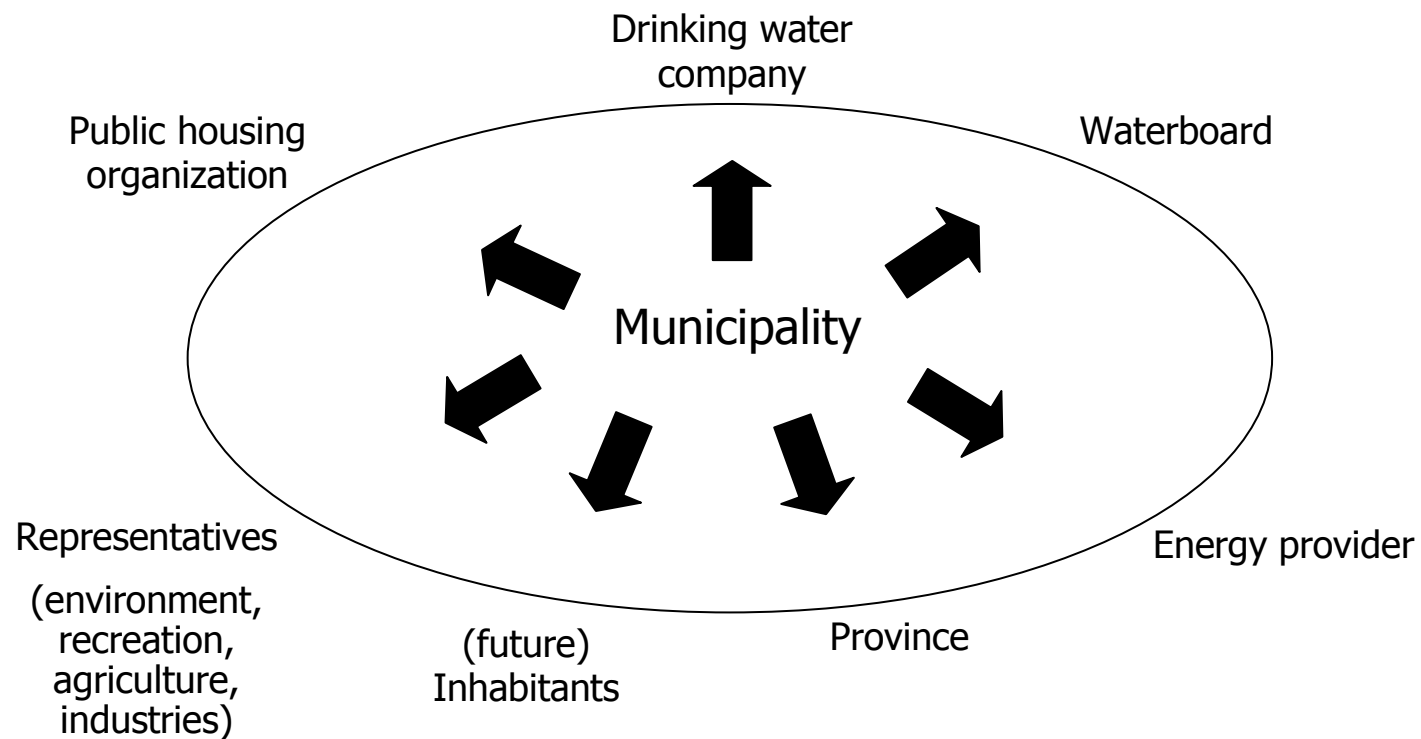
# Actors

## Involvement



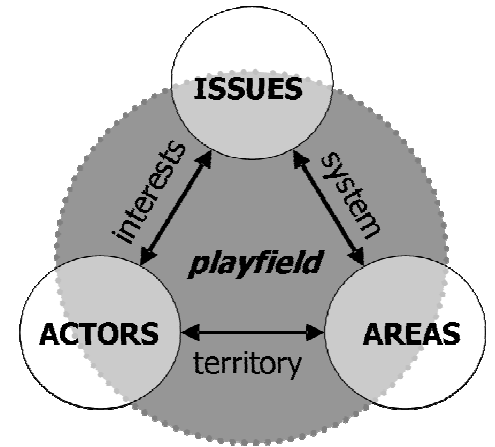
# Actors

## Example

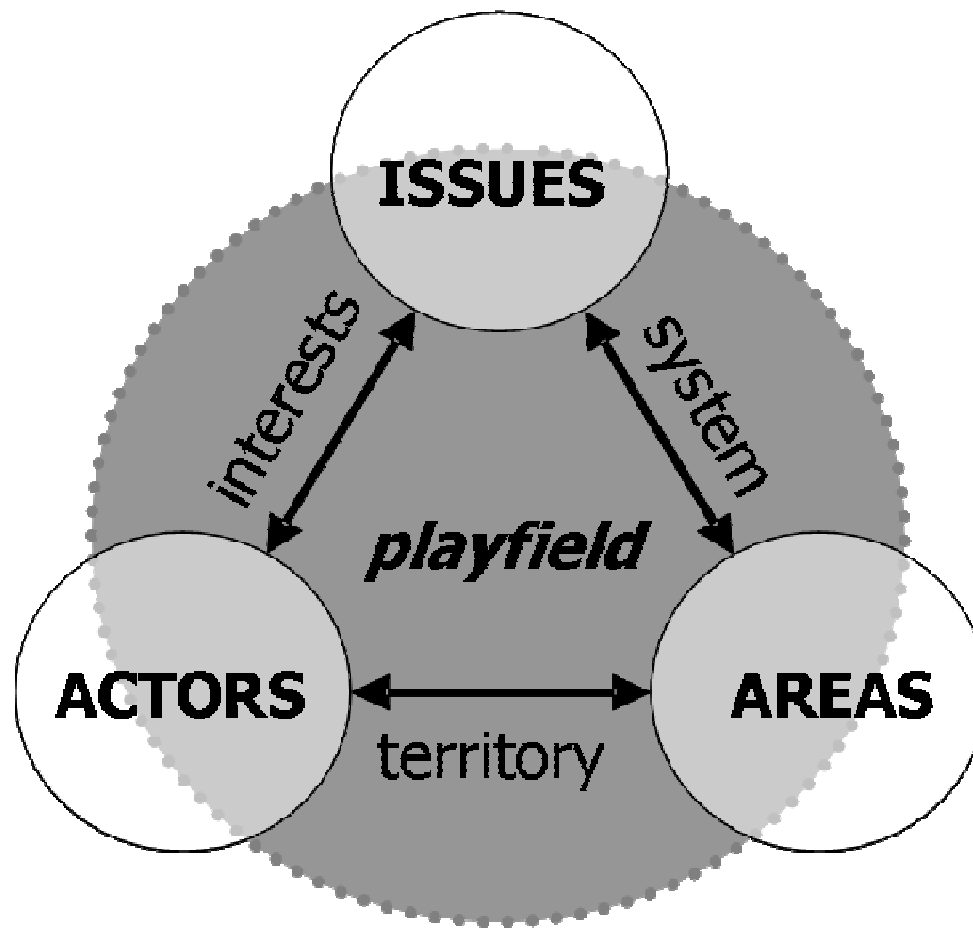


# Areas

- Planning area,  
local territory which will be subject of the development
- Study area  
Wider area which is under influence or influence the development



# Issues



# How to evolve?

- Integrated approach
- Developing receptivity
- Transition management

# Integrated approach

## Process management

- Three track approach

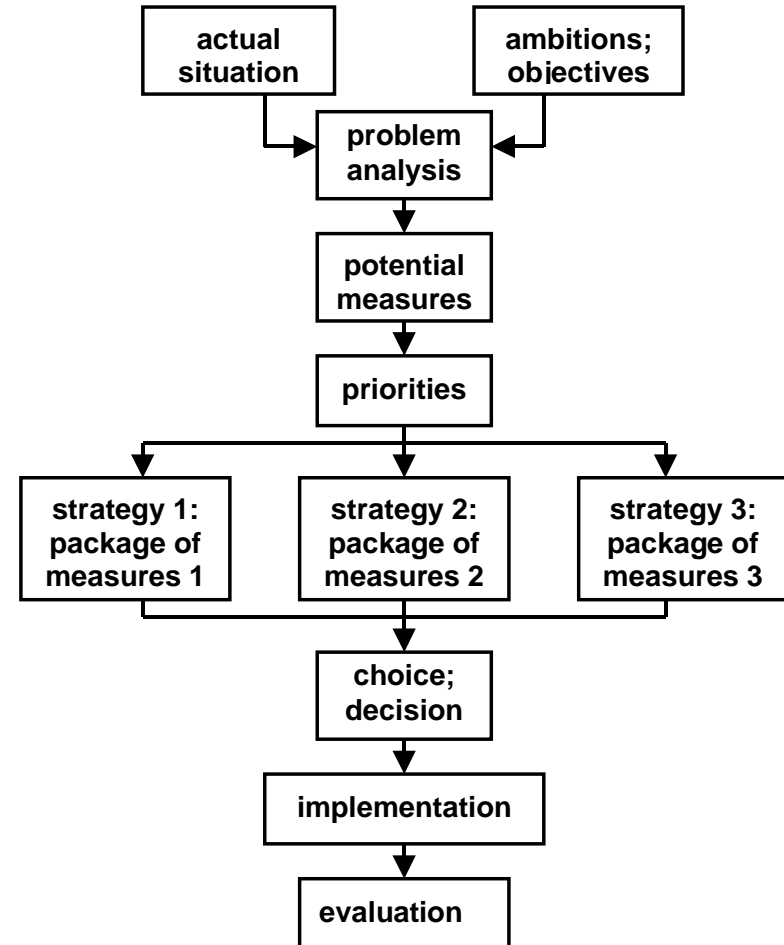
|                      |                | PROBLEMS & OBJECTIVES           |                                      |
|----------------------|----------------|---------------------------------|--------------------------------------|
|                      |                | <i>known or agreement about</i> | <i>unknown or no agreement about</i> |
| MEASURES to be taken | <i>known</i>   | Optimise                        | Negotiate                            |
|                      | <i>unknown</i> | Innovate                        | Design & Free research               |



# Three track approach

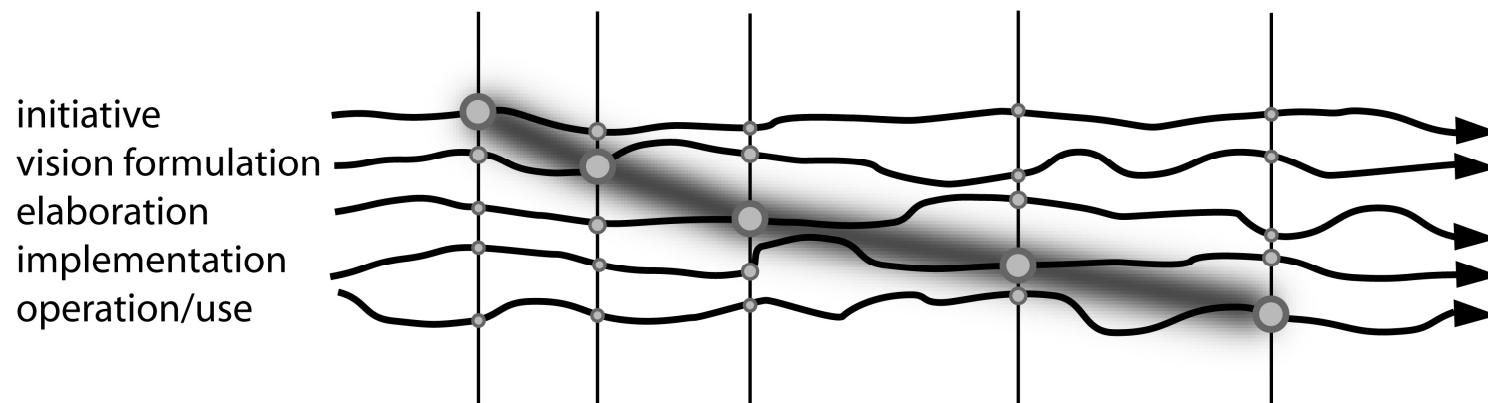
## Optimization problem

- Step-by-step method



# Three track approach

Negotiation problem: complex planning

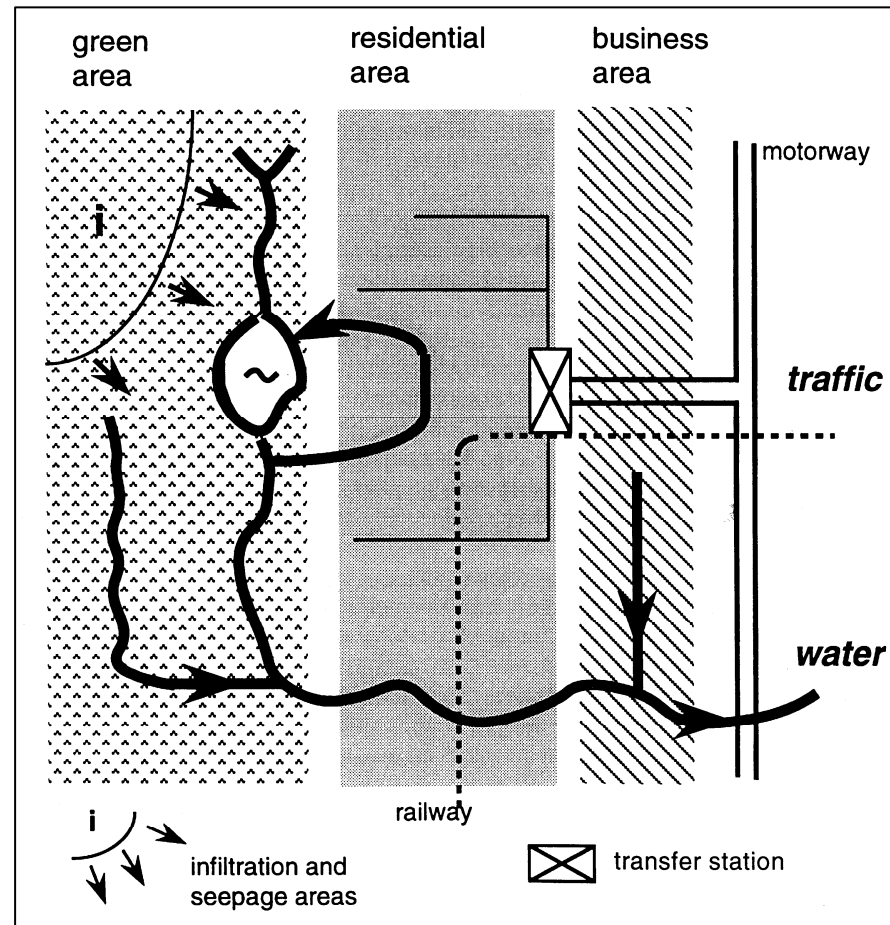


# Three track approach

## Design problem

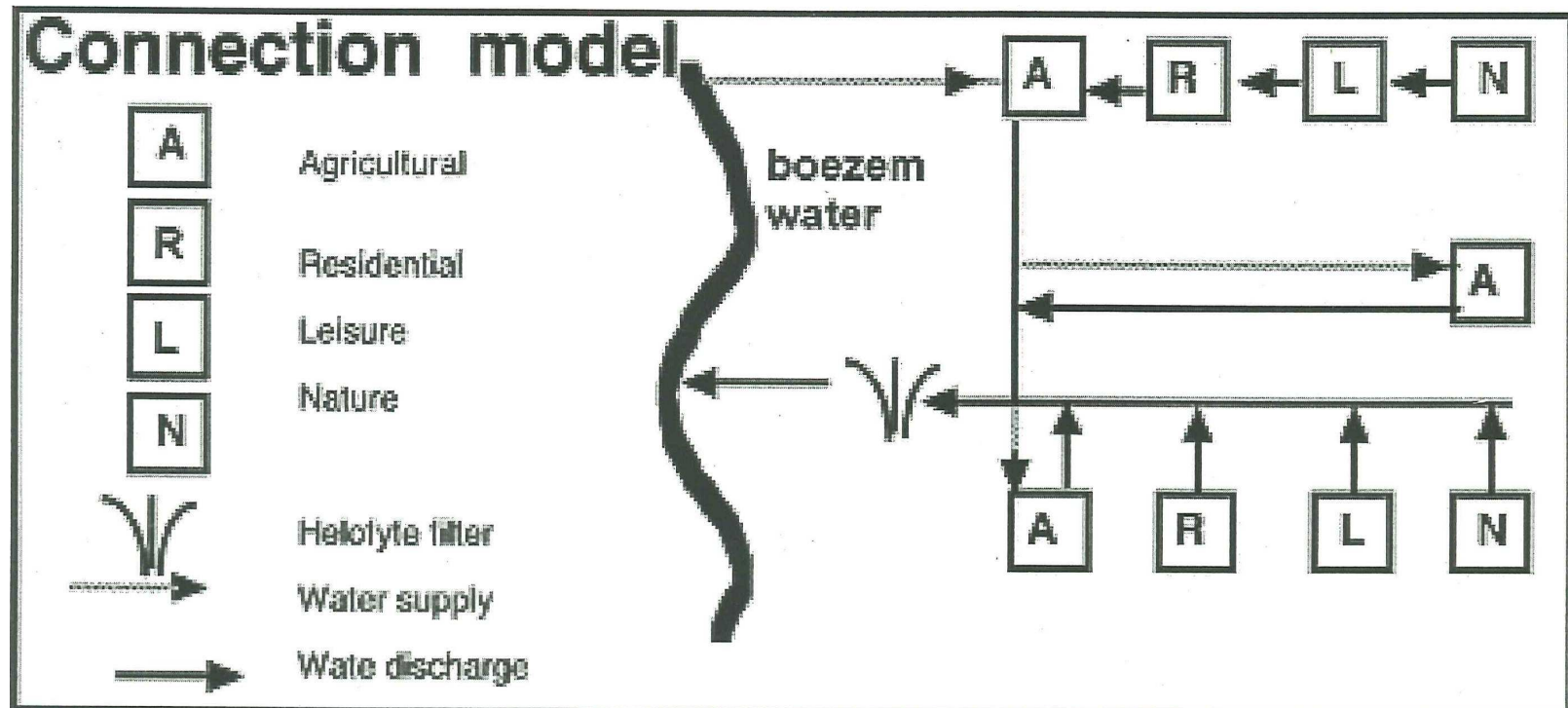
Guiding models for design

- Strategy of two networks



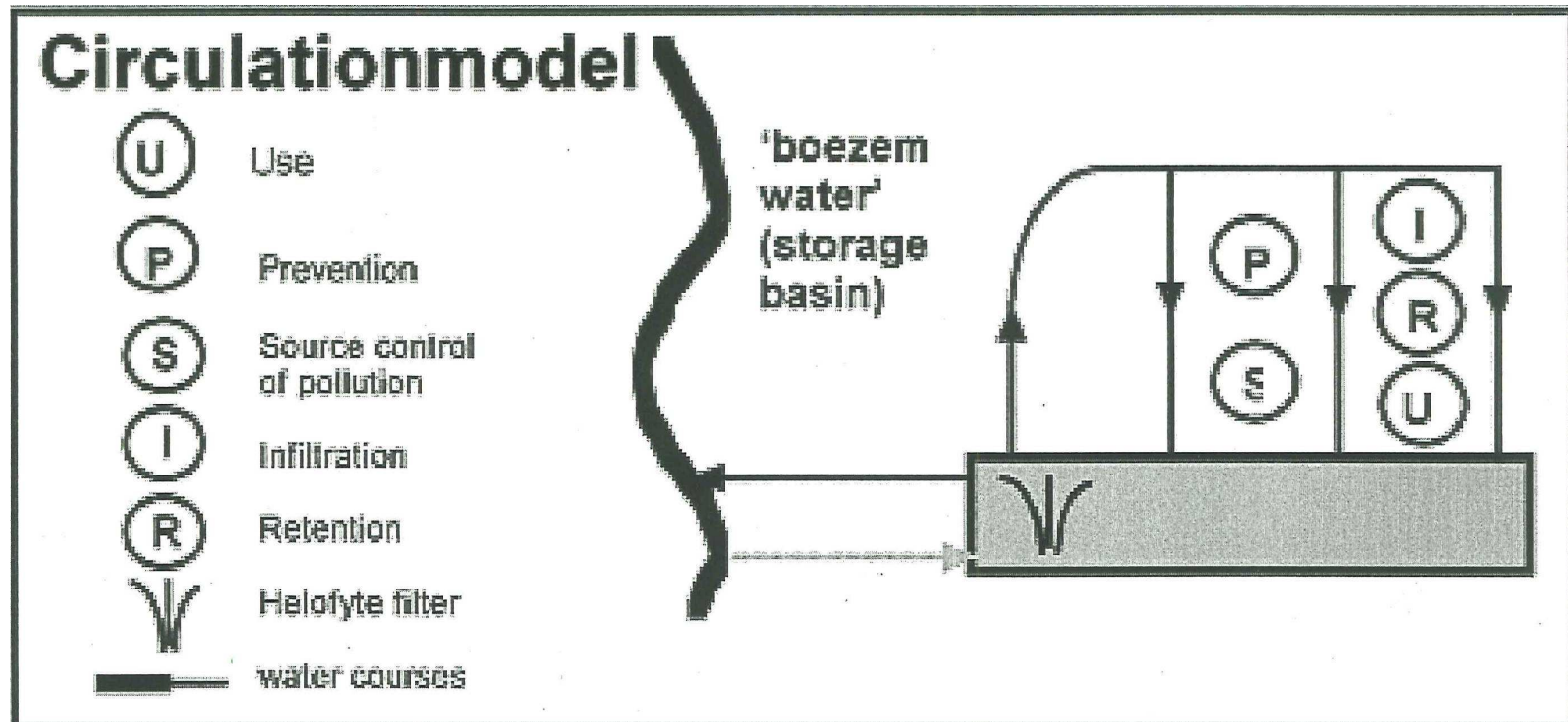
Source: Tjallingii, 1995. Strategy of two networks

# Design problem



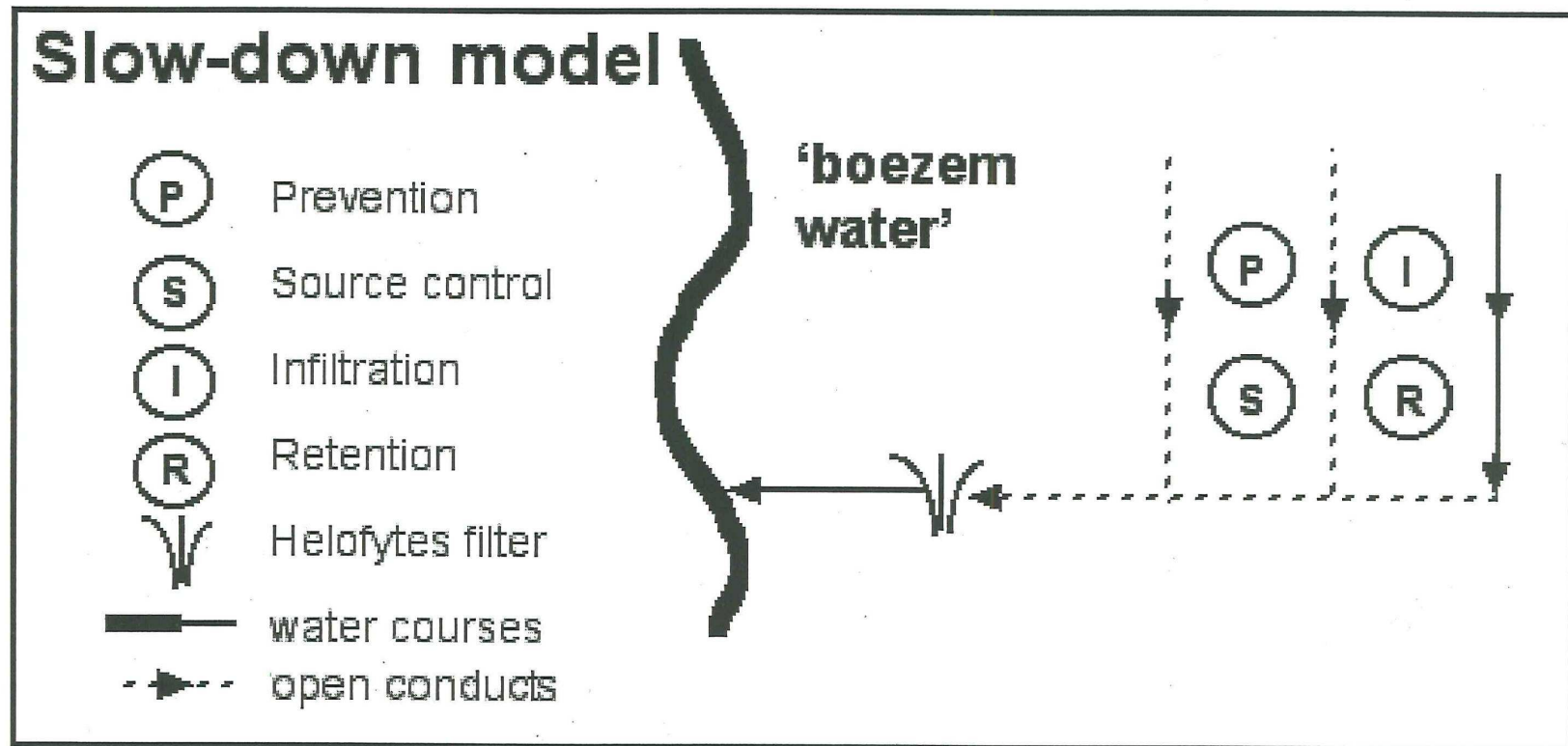
# Three track approach

## Design problem



# Three track approach

## Design problem



# Developing Receptivity

Source: Jeffrey P. & R.A.F. Seaton, 2004, A conceptual model of 'Reciprocity' applied to the design and the deployment of water policy mechanisms. Environmental Sciences, 1:3, pp 277-300

1. **Awareness creation** of problems, opportunities and of better solutions
2. **Associate** potential benefits with needs and capabilities of stakeholders
3. **Acquire** capacity to exploit new knowledge, technique, method, ...
4. **Apply** the new knowledge, techniques, creative design method, creating stimuli to act, ...;

# Transition management

## Key transition factors

Source: Brown, R.R., J. Clarke, 2007, Transitioning to Water Sensitive Urban Design; the story of Melbourne, Australia, Report no 07/1, FAWB, Monash University, ISBN 978-0-9803428-0-2



1. Vision for Waterway Health
2. Multi-sectoral Network
3. Environmental Values
4. Public Good Disposition
5. Best Practice ideology
6. Learning by doing
7. Opportunistic
8. Innovative & Adaptive

1. Socio-political Capital
2. Bridging Organisations
3. Trusted & Reliable Science
4. Binding Targets
5. Accountability
6. Strategic Funding Points
7. Demonstration Projects & Training
8. Market Receptivity



# Transition management

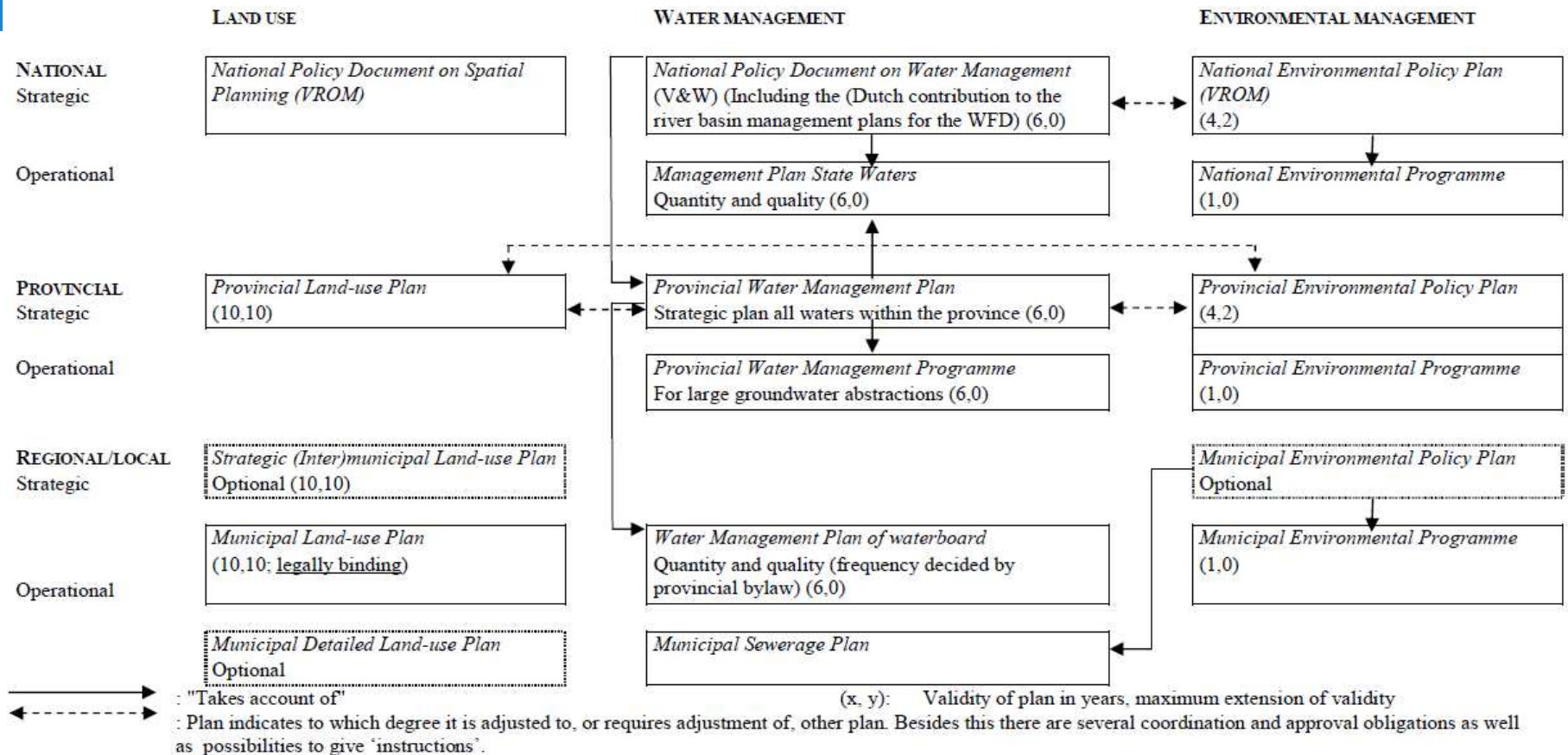
Source: De Graaf R., 2008. Urban water sustainability case studies; lessons from Australia and the Netherlands, P4086 Final report. Delft University, Delft, the Netherlands / Monash University, Melbourne, Australia

|   | <b>Conventional<br/>(water)<br/>management</b> | <b>Niche<br/>Management</b>                        | <b>Influencing praxis<br/>(niche/regime interaction)</b>                                      |
|---|--|--|---|
| <i>Actors &amp; resources</i>                           | Organization reform                            | Change agents,<br>front runners                    | Influencing value patterns of society   |
| <i>Physical artifacts</i>                               | Technology push                                | Technical experiments,<br>try-outs                 | Improvement and replication   |
| <i>Belief systems /<br/>Social infrastr.</i>            | Awareness campaigns                            | Demonstration projects,<br>pilots                  | Capacity building; education &<br>training  |
| <i>Institutional infrastr.<br/>Law governance syst.</i> | New laws and<br>regulations                    | Create space in legislation<br>for experiments     | New institutional mechanisms;<br>New types of alliances                                       |
| <i>Water system</i>                                     | Mono-functional<br>interventions               | Linking water objectives to<br>societal objectives | Water integrated in urban<br>development; charismatic<br>influencing; agents, opinion leaders |

# Planning structure

## Formal planning in the Netherlands

Source: Junier, S., 2008; based on Mostert, E., 2008. Water Law and Organization, Lecture notes CT5500.



# Water and spatial planning

## Safety first

- No building in flood-prone areas
- Space for dikes and facilities
- Retaining-buffering-draining water
- Retention areas and emergency flooding areas
- Retaining water in the ground
- Multiple land use
- Space for groundwater quality

# Water and spatial planning

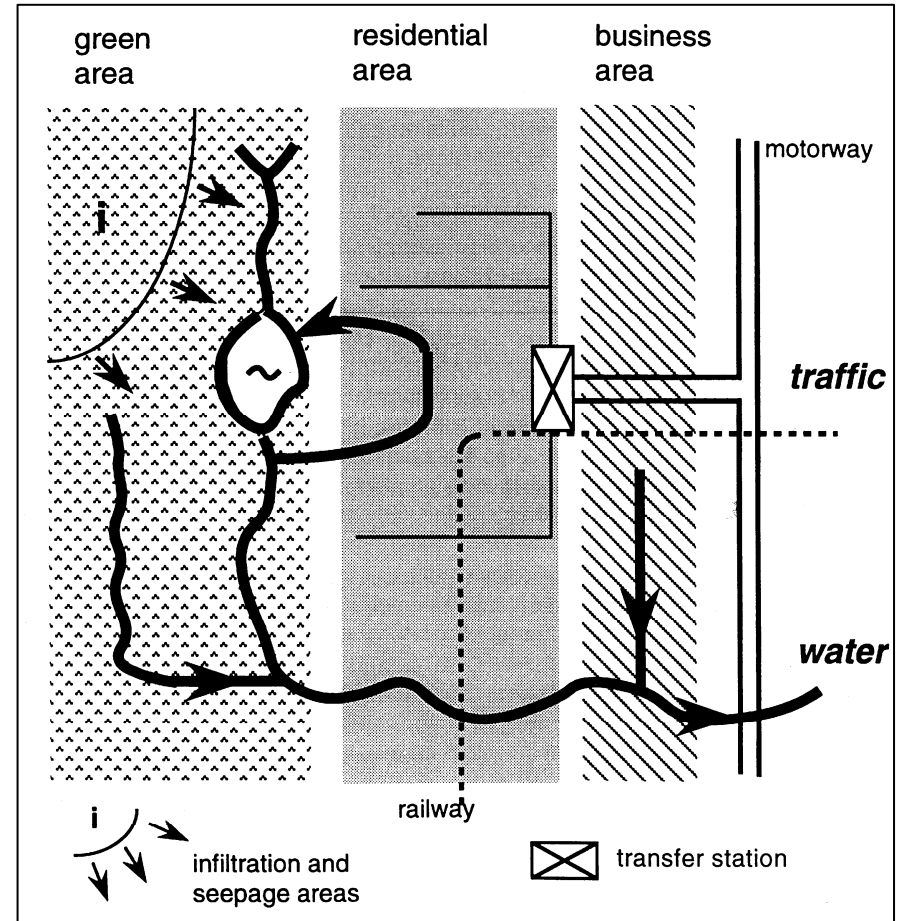
## Never shift problems

- Never shift problems to your neighbours/downstream
- Never shift problems to the future
- Blue junctions

# Water and spatial planning

## Land use from clean to more dirty

- Two network strategy

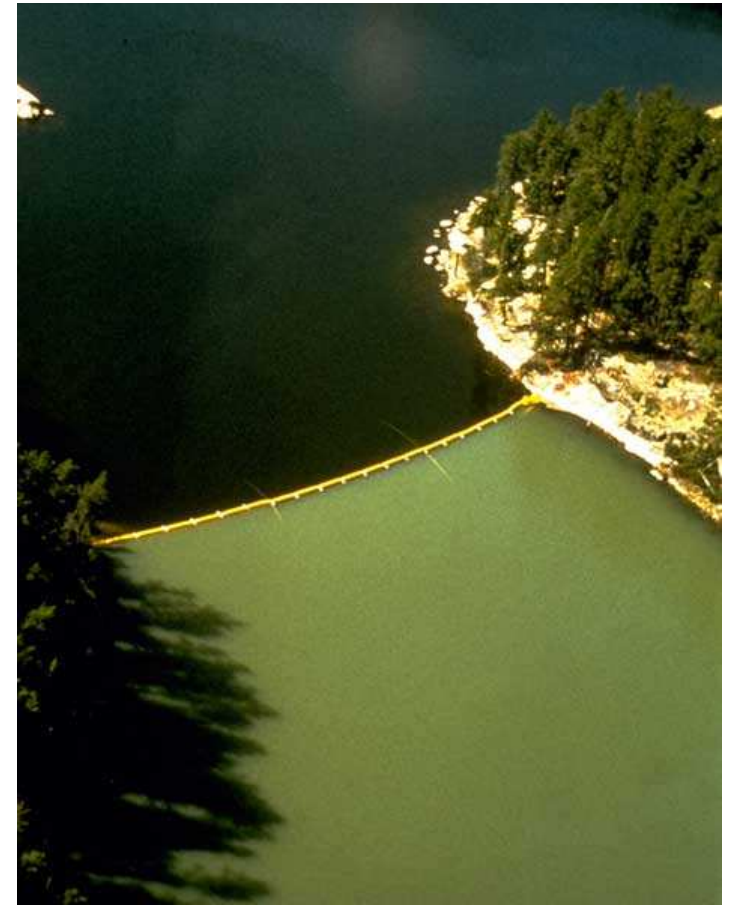


Source: Tjallingii, 1995. Strategy of two networks

# Water and spatial planning

## Keep clean water clean

- Clean versus polluted watercourses





# Water and spatial planning

## Make water fun

- Keep water visible



# Water and spatial planning

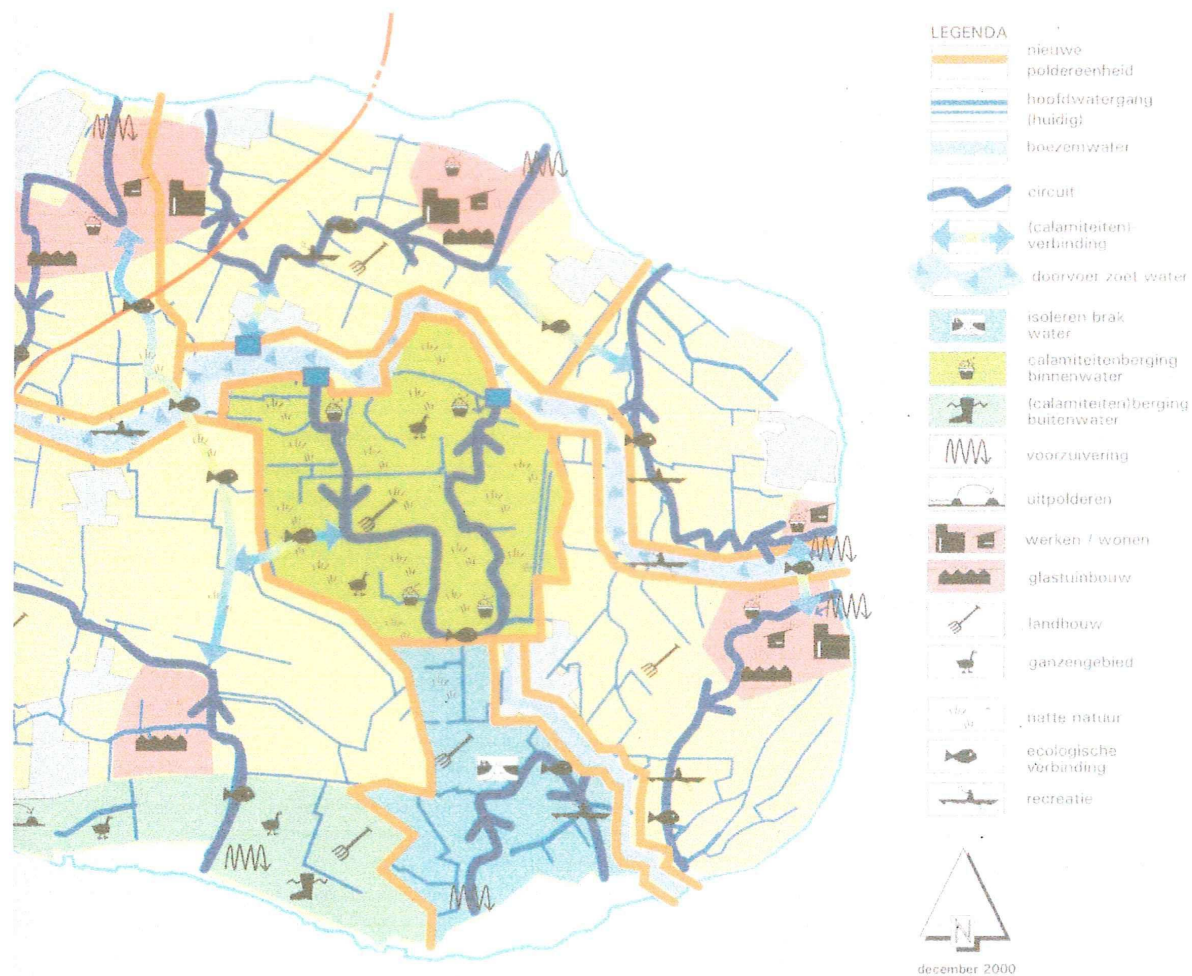
## Build water positive

- Prevent sealing surfaces





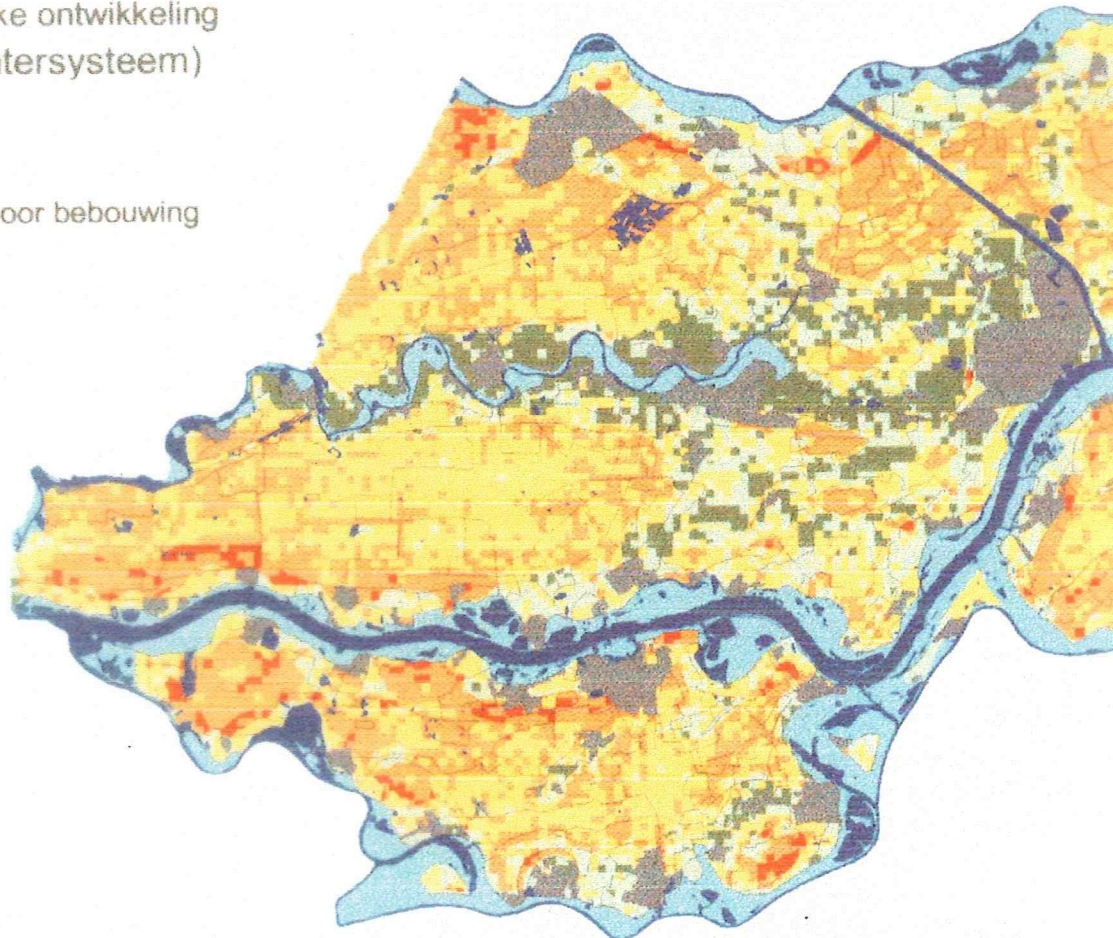
# Water opportunities map



# Water opportunities map

Geschiktheid voor stedelijke ontwikkeling  
(bekeken vanuit het watersysteem)

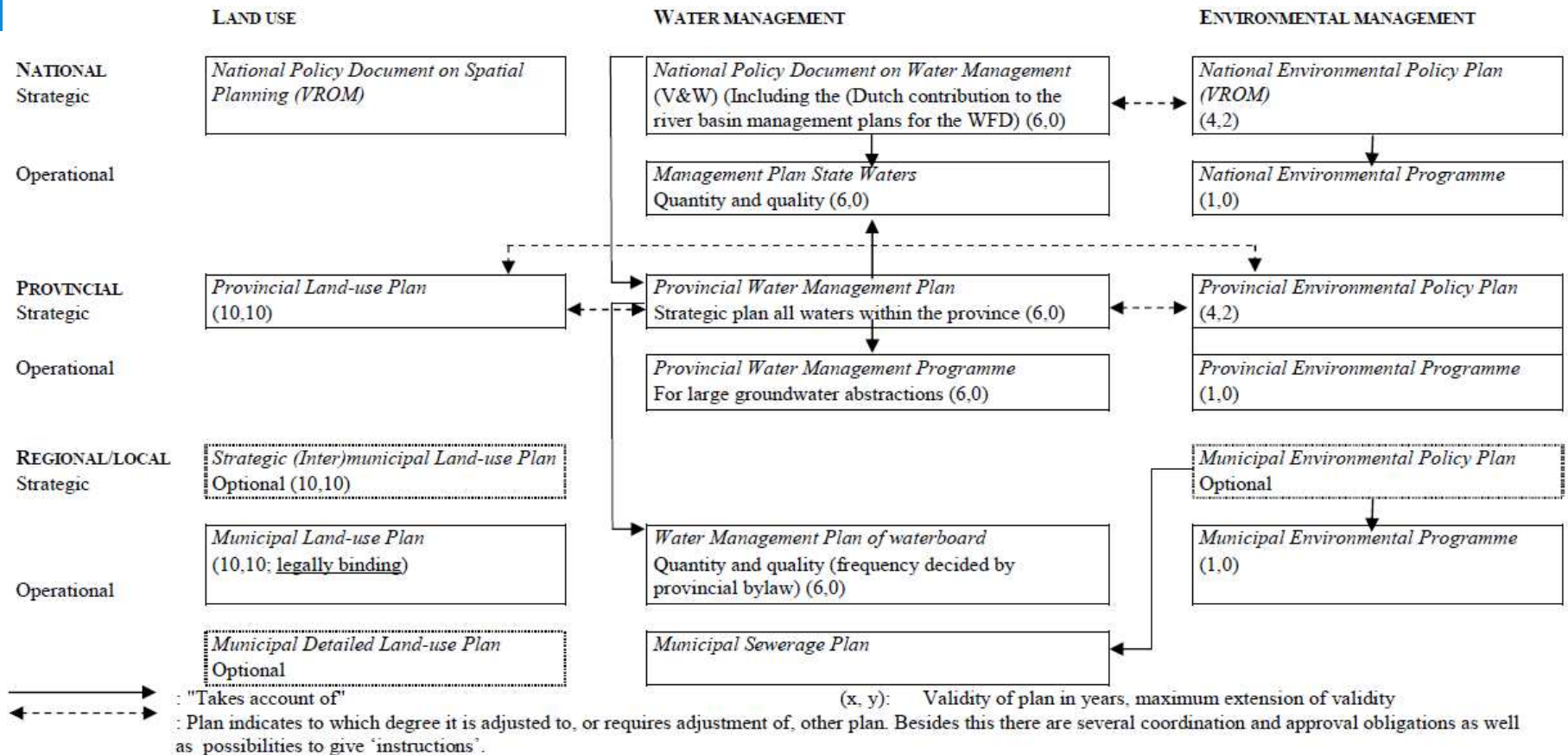
- Peilgebieden
- Water
- Gebieden uitgesloten voor bebouwing
- Zeer ongeschikt
- Ongeschikt
- Neutraal
- Geschikt
- Zeer geschikt
- Bebouwd



# Planning structure

## Formal planning in the Netherlands

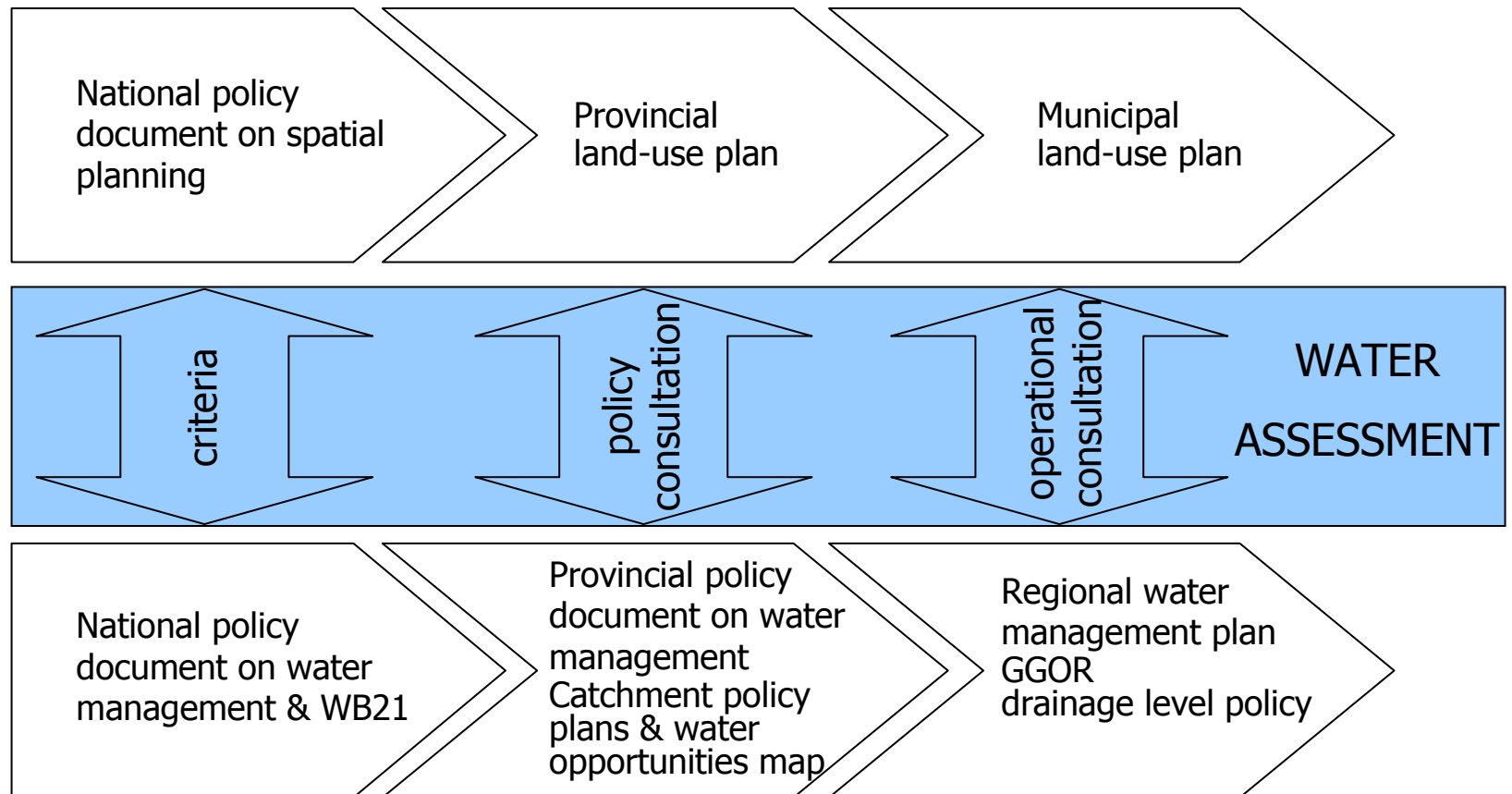
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# Water assessment

## Transitions between spatial planning and water



# Water assessment

## Scope

- All spatial plans en decisions
- All water courses
- All relevant water management effects

# Water assessment

## Approach

- Safety / water nuisance
  - Prevent shifting problems
  - Quantitative approach; delay, storage, discharge
- Water quality
  - Qualitative approach; prevention, separation, purification
- Groundwater depletion
- Wider approach is “allowed”

# Water assessment

## Characteristics

- Impulse for consultation
- Effective procedures
- Design and test criteria
- Active involvement of water opportunities maps, catchment policy's and water storage assignments
- In consultation with long term policy objectives
- Transparent considerations

# Water assessment

## New approach

- No other policy but renewed attitude
- Water manager involved in early state
- Co-responsibility of the water manager
- Explicit consideration of water aspects
- Recommendations on water are taken into account as “waterparagraaf”



# Water assessment

## Step by step

