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

Let's 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

<table>
<thead>
<tr>
<th>Priority</th>
<th>Constructive measures</th>
<th>Non-constructive measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Remove sources or driving forces</td>
<td></td>
<td></td>
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<tr>
<td>2) Local countermeasures, close to the source</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) End-of-pipe measures</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Templates

**BRUHOD-chain**

- **Beleid;** Policy
- **Regelgeving;** Legislation
- **Uitvoering;** Implementation
- **Handhaving;** Enforcement, performance evaluation
- **Organisatie;** 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

- Inception phase
- Planning phase
- Design phase
- Implementation phase

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

- Self regulation
- Delegate
- Co-operate
- Consulate
- Inform
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

- **ISSUES**
  - interests
  - system

- **playfield**

- **ACTORS**
  - territory

- **AREAS**
How to evolve?

- Integrated approach
- Developing receptivity
- Transition management
## Integrated approach

### Process management

- Three track approach

<table>
<thead>
<tr>
<th>MEASURES to be taken</th>
<th>PROBLEMS &amp; OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>known</td>
<td>known or agreement about</td>
</tr>
<tr>
<td>unknown</td>
<td>Optimise</td>
</tr>
<tr>
<td>unknown</td>
<td>Innovate</td>
</tr>
</tbody>
</table>
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

Three track approach

Design problem
Three track approach

Design problem
Three track approach

Design problem

Slow-down model

- Prevention
- Source control
- Infiltration
- Retention
- Helophytes filter
- Water courses
- Open conduits

‘boezem water’
Developing Receptivity

1. **Awareness creation** of problems, opportunities and of better solutions
2. **Associate** potential benefits with needs an 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


Group of Champions

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

The Enabling Context

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

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

Formal planning in the Netherlands

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
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


<table>
<thead>
<tr>
<th>Land Use</th>
<th>Water Management</th>
<th>Environmental Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Strategic</td>
<td>National Policy Document on Spatial Planning (VROM)</td>
<td>National Environmental Policy Plan (VROM) (4.2)</td>
</tr>
<tr>
<td>Operational</td>
<td>National Policy Document on Water Management (V&amp;W) (Including the (Dutch contribution to the river basin management plans for the WFD) (6.0)</td>
<td>National Environmental Programme (1.0)</td>
</tr>
<tr>
<td>Provincial Strategic</td>
<td>Provincial Land-use Plan (10.10)</td>
<td>Provincial Environmental Policy Plan (4.2)</td>
</tr>
<tr>
<td>Operational</td>
<td>Provincial Water Management Plan</td>
<td>Provincial Environmental Programme (1.0)</td>
</tr>
<tr>
<td></td>
<td>Strategic plan all waters within the province (6.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provincial Water Management Programme</td>
<td>Provincial Environmental Programme (1.0)</td>
</tr>
<tr>
<td></td>
<td>For large groundwater abstractions (6.0)</td>
<td></td>
</tr>
<tr>
<td>Regional/Local Strategic</td>
<td>Strategic (Inter)Municipal Land-use Plan (Optional, 10.10)</td>
<td>Municipal Environmental Policy Plan (Optional)</td>
</tr>
<tr>
<td>Operational</td>
<td>Municipal Land-use Plan (10.10; legally binding)</td>
<td>Municipal Environmental Programme (1.0)</td>
</tr>
<tr>
<td></td>
<td>Water Management Plan of waterboard</td>
<td>Municipal Environmental Programme (1.0)</td>
</tr>
<tr>
<td></td>
<td>Quantity and quality (frequency decided by provincial bylaw) (6.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Municipal Detailed Land-use Plan (Optional)</td>
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<tr>
<td></td>
<td>Municipal Sewerage Plan</td>
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"Takes account of": Plan indicates to which degree it is adjusted to, or requires adjustment of, other plan. Besides this there are several coordination and approval obligations as well as possibilities to give "instructions".

(x, y): Validity of plan in years, maximum extension of validity.
Water assessment

Transitions between spatial planning and water

- National policy document on spatial planning
- Provincial land-use plan
- Municipal land-use plan

- Criteria
- Policy consultation
- Operational consultation

- National policy document on water management & WB21
- Provincial policy document on water management
- Catchment policy plans & water opportunities map
- Regional water management plan
- GGOR drainage level policy

Water management in urban areas – Planning, Structural approach
Water assessment

Scope

- All spatial plans and 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

Inceptor
Informing and consulting water manager

Water manager
Information on water aspects, Compensation in/outside planning area

Province
Indicative spatial design and compensation criteria

Inceptor
Design with indicative spatial design criteria

Water manager
Design assessment of water aspects and compensation

Inceptor
Consideration of water aspects and recommendations of “waterparagraaf”

Municipality Province National gov.
Assessment of procedure and effective results

initiative consultation design recommendation consideration assessment