Adaptation to Climate Change in The Netherlands

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- Situation of The Netherlands
- Impacts of CC in The Netherlands
- Priorities plans and costs to cope with CC in Dutch water management
  - Wetter conditions
  - Dryer conditions
- Climate change and water supply issues
The Netherlands

Below sealevel
55% Land / 60% Population
65% National Gross Product
Water management in the Netherlands is heavily dependent upon the Rhine River.
Our nightmare
Where would the Dutch be without dikes?
Climate change: scenarios for the Netherlands based on IPCC scenarios

Air circulation patterns

changed

+ 1°C

unchanged

+ 2°C

Global temperature in 2050 compared to 1990

G +

W +

G

W
Consequences for the Netherlands

- Rising sea level (35-85 cm)  >90%
- Increasing average temperature (1-2.5 °C)  >90%
- Increasing drought summer  >90%
- Increasing intensity rainfall summer  66-90%
- Increasing intensity rainfall winter  66-90%
- Increasing wind velocity, storm  33-66%
WE NEED MORE THAN JUST LOOKING AT THE PROBLEM!
Prime Minister perspective....

“The climate is changing and we should make our country climate proof. The national government together with science, policy and other stakeholders”

Jan-Peter Balkenende - Dutch Prime Minister, November 2005

Commentary

Climate proofing the Netherlands

Regional climate change should not be seen only as a threat; changes to weather patterns could generate opportunities for large-scale innovations, say Pavel Kabat, Pier Vellinga and their colleagues.
Climate change: opportunities for innovation

Kabat et al. (2005):

“Climate change should not only be considered as a threat, but could also create opportunities for large-scale innovations”
Dutch Climate proofing
“we will stay”

- Research for knowledge to
  - Inform the public
  - Build political support: first Chamber motion on climate proofing
  - Develop adaptation plans
Innovations: Hydrometropole
Possible impact of climate change on average discharge of the Rhine River (Lobith)

Priorities in Dutch water management

- Safety from flooding (sea, rivers)
  - Storm surge February 1953 (1800 dead)
  - River floods of December 1993, January 1995

- Maintenance of fixed water levels in polders
  - Ensure dike stability and infrastructure foundation
  - Facilitate agriculture

- Water allocation issues (droughts)

- Water quality improvement (WFD)
  - Chemical water quality
  - Ecological water quality
The National Adaptation Strategy
Choices made in the process...

1. **Open debate**
   Not: ‘for and by governments’ or a technocratic problem

2. **Ongoing, planned, future investments, plans, policies**
   Not: *just new* investments and programmes

3. **Innovation parallel to practice**
   Not: sequential; first research, than policy frames, laws, implementation

4. **Adaptation mainly by ‘combining work with work’**
   Not (yet): megaprojects *just* for adaptation

5. **Mainstream in 10 year**
   Not: blueprint or series of projects for the coming 50 years
Too much water
Restricted water capacity

In whole area:
- restricted discharge capacity
- increase wet damage crops

Increasing floods along IJssellake coast

Stronger salinisation by saline seepage

Increase salinization by saline seepage

Vulnerable sea-defence

Restricted water capacity

Bulbs in dune-area
Spatial consequences

- Reservation space for nature on a dynamical coast
- Bulb growth in the Wieringermeer polder
- Inner space area used as extensive grassland and as resting place for geese
- Extensivation peat grassland because of increasing water level from 60 up to 20 cm - surface
- Bulb growth not anymore possible in inner dune area
- New dynamic nature and more emphasis on recreation
Costs of adaptation Netherlands

- Cost of water safety now 0.1 to 0.2% of GDP
  - currently below norm

- Commission advise:
  - raise with 1 billion per year, that is 0.2% of GDP

- Over time costs are declining as % of GDP
  - productivity growth
Not enough water
Climate change and water scarcity

- Rising sea level
- Decreasing river discharge in summer
- Increasing temperature and transpiration in summer
- Salt water leakage
- Increasing salt water intrusion
- Decreasing fresh water availability
- Increasing fresh water demand

Fresh water problem
Climate change: Economic effects

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<thead>
<tr>
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<th>G</th>
<th>G+</th>
<th>W</th>
<th>W+</th>
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<tbody>
<tr>
<td>Increase of the Mean yearly damage*</td>
<td>16</td>
<td>232</td>
<td>48</td>
<td>534</td>
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<tr>
<td>Net value** in millions of euros</td>
<td>286</td>
<td>4222</td>
<td>868</td>
<td>9701</td>
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* Nowadays mean yearly damage = 250 million euros
** Interest rate = 5.5%; period = infinite
Climate change and Amsterdam utility/water board

- Climate change will affect the frequency and intensity of extreme events (floods, rainstorms, and droughts)

- This has strong consequences for all aspects of water supply (from source to tap)
  - Changes in demand, e.g. increasing peak factors
  - Changes in water resources availability (quantity and quality)
  - Risks to aquatic and terrestrial ecosystems (biodiversity issues)
  - Risks to infrastructure (floods, rainstorms, hurricanes)
  - Risks to drinking water quality (microbiology)
Watermanagement in Amsterdam and surroundings

City of Amsterdam:
- Sewerage
- Ground water
- Drinking water

Waterboard Amstel, Gooi en Vecht:
- Surface water management
- Waste water treatment

Waternet:
- Operational/administrative organisation
Waternet – Care for water

- Drinking water
- Waste water
- Surface water
- Safety behind the dykes
Some key figures

- Annual budget € 450 million
- Organization 1650 employees
- Serving 1.2 million inhabitants
- 90 million m³/year drinking water
- 130 million m³/year waste water
Strategy Waternet

- Adaptation
  - adapting to a changed climate
  - short term effect
  - local effect

- Mitigation
  - reducing greenhouse gas emissions
  - long term effect
  - global effect
Strategy Waternet - Adaptation

- Safety
- Discharge of rainwater
- Ecological healthy water
- Drinking water
- Waste water treatment
Strategy Waternet - Adaptation

- Safety (resistance)
  - Dikes (primary) content to the current standards (1:10,000)
  - Discussion on future standards around Amsterdam in relation to climate change and economical development
  - Protection level in relation to the economical value

→ Main measure: more capacity/space for rivers (overflow areas) and dikes (compartments)
Strategy Waternet - Adaptation

- Discharge rainwater (resistance and resilience)
  - Climate change causes more intense rainfall (50% in 2100)
  - Solving the problems according the principle: 1) retaining, 2) storing and 3) discharging
  - Water in development plans (multiple land use and groundwater care)
  - Surface water and sewer system meet the current national standard

→ Main measure: alternative water storage (i.e. vegetation roofs, infiltration)
Strategy Waternet - Adaptation

- Ecological healthy water (resistance and resilience)
  - European Water Framework Directive with realistic aims as an outcome
  - Improving quality, structural measures to improve the ecological flexibility and connecting waters
  - Report to Europe (Brussels) in 2009 about the ecological situation

→ Main measure: ecological banks to improve the ecological flexibility
Strategy WaterNet - Adaptation

- Drinking water
  - Planning new resource development to meet changing quantity and quantity (salt water intrusion, temperature)

→ Main measures: new technologies and new resources
Strategy Waternet - Adaptation

- Waste water treatment
  - European Water Framework Directive with strict aims for N and P
  - Separation of ‘grey’ and ‘black’ waste water flows

→ Main measure: better technologies (membrane) and better spatial planning
Strategy WaterNet - Mitigation

Increase of the CO2-concentration
Amsterdam today and in 2050!!!
Adaptation to Climate change

Prevent mitigate... .. and adapt!
Thank you!
www.waterandclimate.org