



Climate services for water and coastal management

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What do water / coastal managers do



Deal with too much, too little, too dirty water

- **Monitor** their water system' **inform people** what they can expect on all kind of water issues + warn them **for floods and droughts**
- **Develop and maintain an infrastructure** that meet all the requirements (*WFD, EU-FD, Marine Strategy Framework Directive, International agreements, design criteria of infrastructure*)
- **Discuss with policymakers** the (interpretation / meaning / consequences) of changes in these requirements
- **Discuss with sectors** dependent on the possible options to adapt the system (Long term)

*Generally very little mandate to influence the water using sectors;
Some times lots of influence on spatial planning via the water related infrastructure*

Climate services for the long term and short term planning



- Climate services for the long term planning: typically for serving the preparation of a water/coastal management plan for a country / water management system (frequency 5-10 yrs (?))
- Climate services for the short term: typically for serving flood/drought warning (frequency daily-weekly)
- How this planning is organized (to what extent alien parties are involved) varies a lot over countries; coastal management somewhat easier than inland

Long term: Typical questions of a water and coastal manager



1. Does the current management strategy for the water system I manage meets the standards
2. Is there a risk that policy targets will not be achieved
3. Is there a risk that additional measures will be needed soon (extra money needed)
4. Is there a risk that too much measures are taken (too much money is spend)

Strategic questions

4. How long will the strategy be efficient after the time horizon (robustness).
5. How easy is it to change in time to an alternative strategy (flexibility/no regret).

Typical questions in the water planning phase

- Are the **current standards** still **reasonable** or should they be **changed**
- What **adaptation strategies** do help to **meet the standards**
- Is implementation of the strategies **technically possible/feasible**?
- What are the **costs and benefits** of developing adaptation strategies?
- Can the strategies be implemented in the current **political and environmental conditions**?
- What are the **political consequences** and **institutional requirements** for implementation of the strategies?

Summarizing:

- Do measures do the job
- Is it technically possible to implement them,
- Can we pay them

Sometimes very large investments needed



And a very high detail



Zeeland Stroomrichting
Time passed: 0h:30m



3D_i Waterbeheer
Sneller. Beter. Doelmatiger.



Hoogheemraadschap van Delfland



Waterkader
Haaglanden



Deltares
Enabling Delta Life

Nelen & Schuurmans

TU Delft
Technische Universiteit Delft



Coastal / water management planning is changing, trend 2 bottom-up

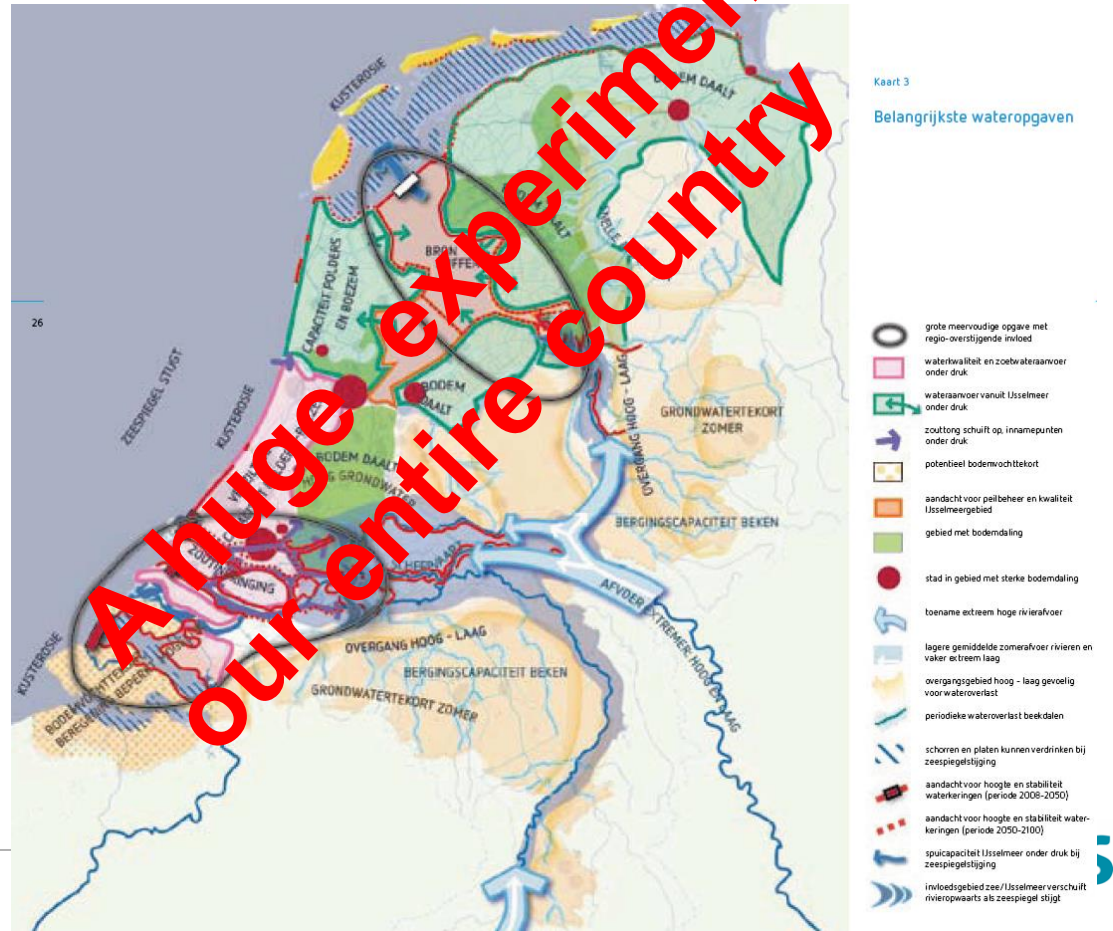
TOP->DOWN (no question: do we want them ?!)

Delta works 1960-1980
Dikes and barriers



BOTTOM->UP (all is about commitment)

Delta programme 2010-> Re-design of the water management in the Netherlands



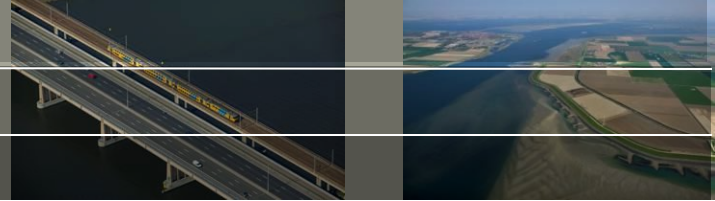
Do we want them: needs a lot of talking



Role of climate services in this



Three levels of services



1. Answering the questions: is the climate changing in my country and does it affect my water system (needed to monitor the effectiveness of strategies)
2. Answering the questions: What could be the changes in my water system (needed to decide if investments might be needed)
3. Answering the questions: is my management system up to date and (when/how) do I need to change my strategy (=> where/when2invest)

Level 1 Q: is the climate changing in my country and does it affect my water system



Needs: **Archives** for determining trends in atmospheric parameters and water related parameters: Focus on those parameters that are difficult to collect by water managers

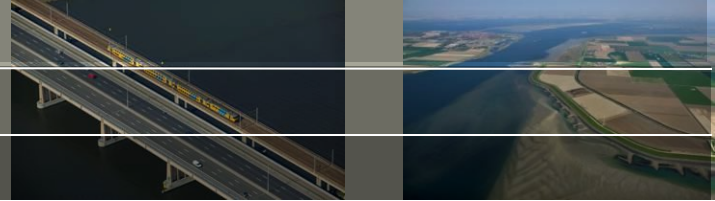
- Climate: *Precipitation, Temperature, Potential/Actual Evaporation, Wind*
- Hydrology: *soil moisture, groundwater, snow water equivalent, water temperature, may be extended with Nutrients, Dissolved Oxygen, area flooded)*
- Coastal: *Trends in local sea level rise, local subsidence, coastal erosion, wave amplitude and frequency; (extreme) surge heights, salt water intrusion in open estuaries, eventually extended with ecosystem info (shifts in algal species, more frequent (harmful) algal blooms, jellyfish ‘blooms’)*

Level 2 Q: What could be the changes in my water system (to decide if investments might be needed)

Needs: **Transient scenario's** for changes in atmospheric parameters and water related parameters

- Climate: *Precipitation, Temperature, Potential/Actual Evaporation, Wind*
- Hydrology: *soil moisture, groundwater, snow water equivalent, runoff, water temperature*
- Coastal: *Local sea level rise, wave amplitude and frequency; (extreme) surge heights, salt water intrusion in open estuaries, acidification, water temperature,*

Specific for the coastal zones



Extreme events due to :

- Inland runoff and precipitation-induced flooding, coincide with storm surges
- Dry spells (low flows) and local sea level rise meaning that salt water intrusion enters much deeper into the estuaries

Needs integration between events at sea and on land => data archives/scenario's should allow for that.

Level 3 Q: is my management system up to date and do I need to change my strategy

Needs: Level 1+ 2 + **Tools that allow for evaluation** of different measures, strategies under changed conditions. Needed input and required output strongly tailor made. Differs from country to country and often even within countries

Making available the data in Levels 1 and 2 would be of great support for making informed evaluations

But: decisions will be simply based upon the climatic / hydro information that is available

During a 2008 panel for the IPCC's launch of a report on water and climate, a hydrologist and an engineer called for additional monitoring and research to understand the effects of climate change. The third member of the panel, a frustrated World Bank infrastructure lender, declared in response,

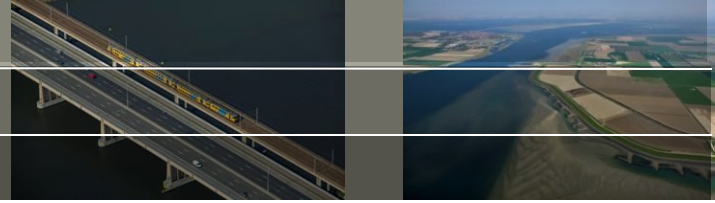
**“I can't wait thirty years for precise science to tell me how much global warming contributed to a particular drought or flood...
I need to make investment decisions now.”**

Climate services for the short term



Focus on 10d - Seasonal forecasts for the slowly responding stores:

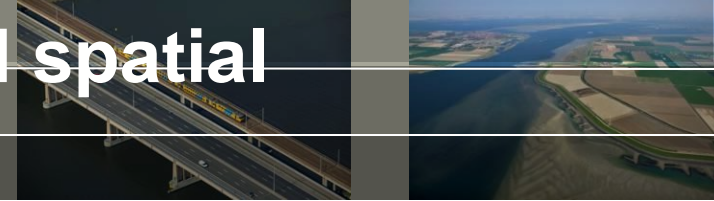
- Groundwater, reservoirs, snow water equivalent, soil water
- A game changer would be water levels in near real time for all open water bodies.



Parameters and resolutions

A proposal

Proposal for the temporal and spatial resolutions, climate

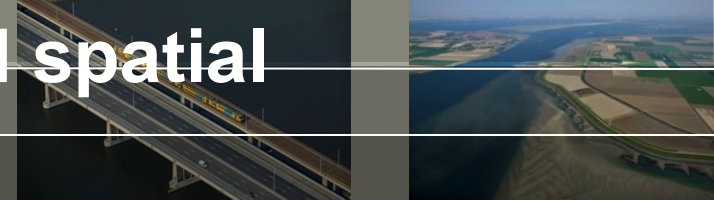


Parameter	spatial (m)	temporal	maxima
P	10 ³	hr	1-100yr
T	10 ³	6-hrly	
PE/AE	10 ³	daily	
Wind (speed, direction)	10 ³	hourly	1-100yr

These should be considered as an estimate

Guide lines to downscale to these values could be an alternative

Proposal for the temporal and spatial resolutions, Hydrology

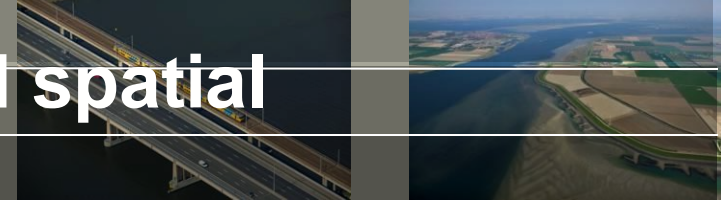


Parameter	spatial	temporal
soil moisture	km	daily
ground water	km	decadal
Runoff	km	daily
Snow (SWE)	km	daily
Water temp	Open water	daily

These should be considered as an estimate

Guide lines to downscale to these values could be an alternative

Proposal for the temporal and spatial resolutions, Coastal

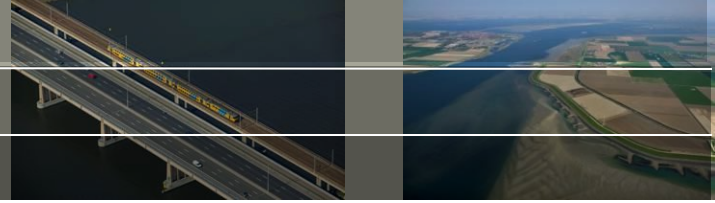


Parameter	spatial	temporal	maxima
SLR	local	annual rate	
Subsidence	km	annual rate	
coastal erosion	km	annual rate	
surge heights	local		1-1000
wave amplitude/ frequencies		during storm events	
Salt concentrations		daily	

These should be considered as an estimate

Guide lines to downscale to these values could be an alternative

The Key



- Less the number of parameters and the resolution
- **Accessibility + ease to combine different data sets**
- **=> community that can provide tailor made level 3 services will be much bigger**
- A structure such as Google X Earth Engine would be great