



Ministerie van Verkeer en Waterstaat

Joint Efforts in Watermanagement to Climate Change

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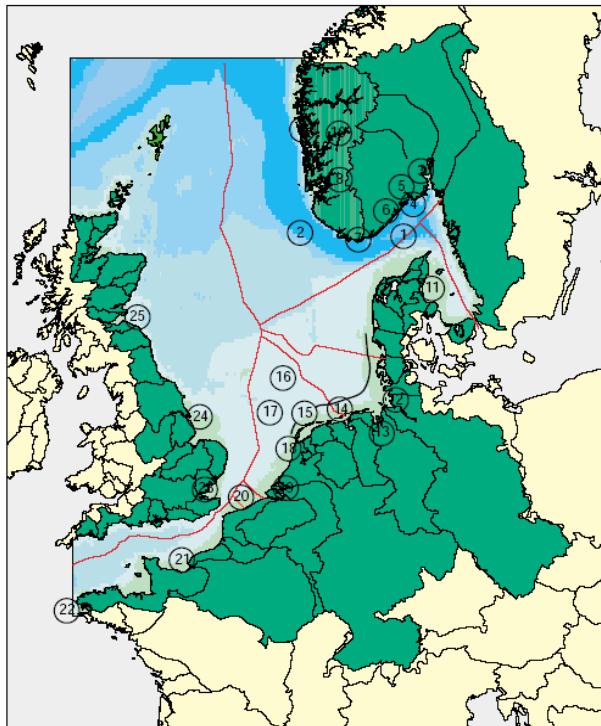
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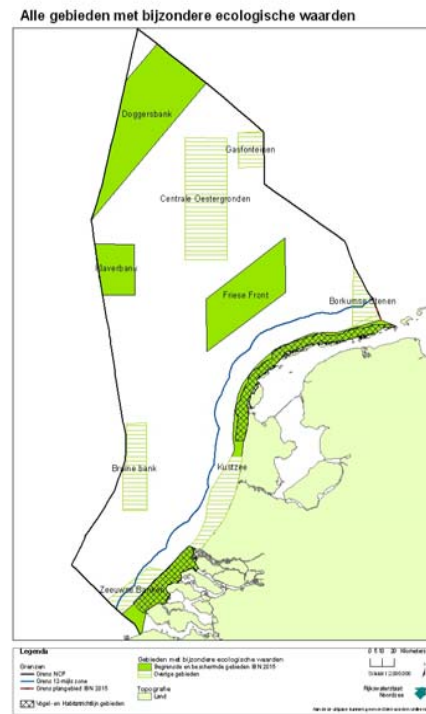
The North Sea



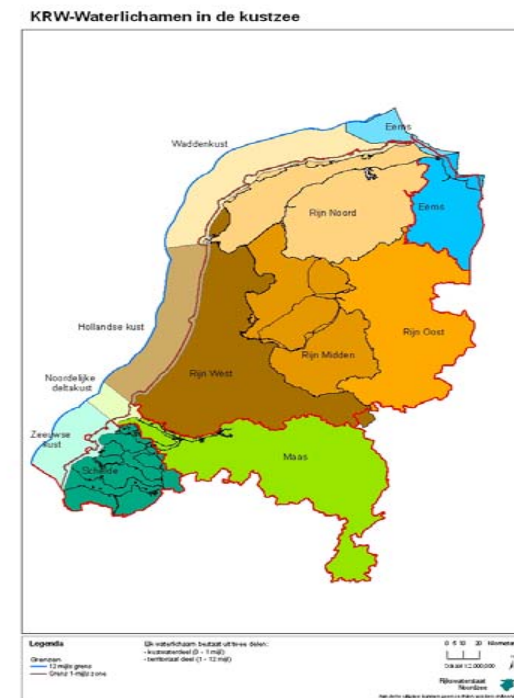
FORA: OSPAR, NSMC, EU (MSFD, WFD), EU-White book (users),
Natura 2000



'Greater North Sea'



Dutch part North Sea
(1.5 * NL)



WFD area
(12% of Dutch North Sea)

Climate Change (1)



Causes

- **Natural causes**
 - internal fluctuations (El Niño)
 - variations in sun (ice periods)
 - eruptions volcano's
- **Human impacts**
 - changed land-use
 - erosian
- **Air-emissions, aerosols**



Impacts

Global and regional on water quantity and water quality

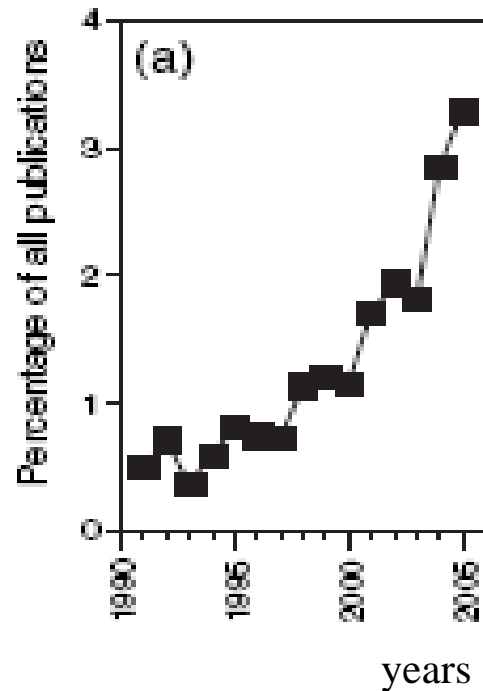
- **Sea level rise: human safety**
 - flooding
 - extreme conditions
 - storm surges
- **Riverine inputs: ecosystem health**
 - pulses, extremes, erosian
 - contamination, eutrophication
 - mismatch, acidification



Climate Change (2)

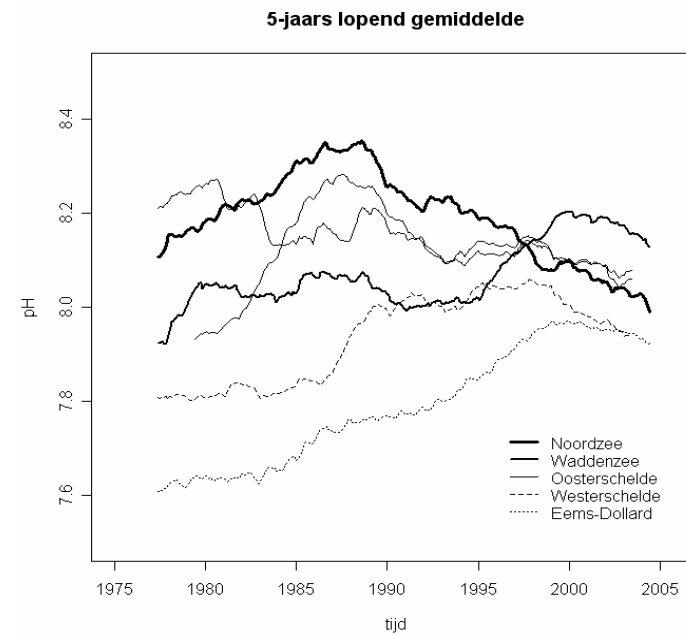


Effects of climate change: increased public awareness



Harley et al. 2006

Long term changes in pH (1990-2005)



North Sea
↓

Wadden Sea
↑

Delta
↓

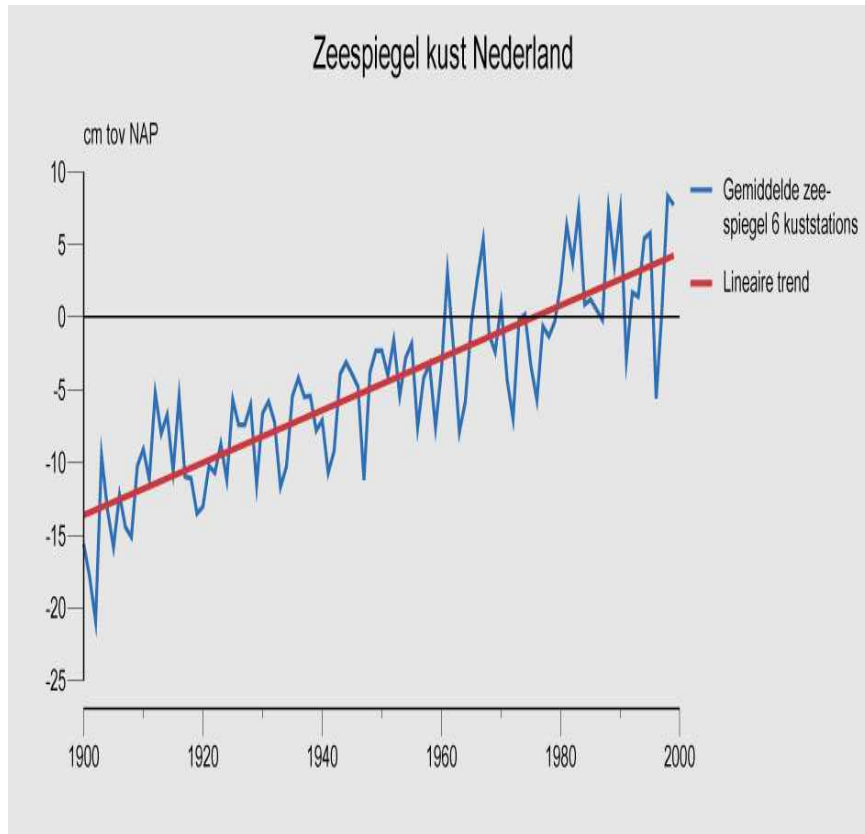
Ems
↑

(Provoost et al., 2008)

Climate Change (3)

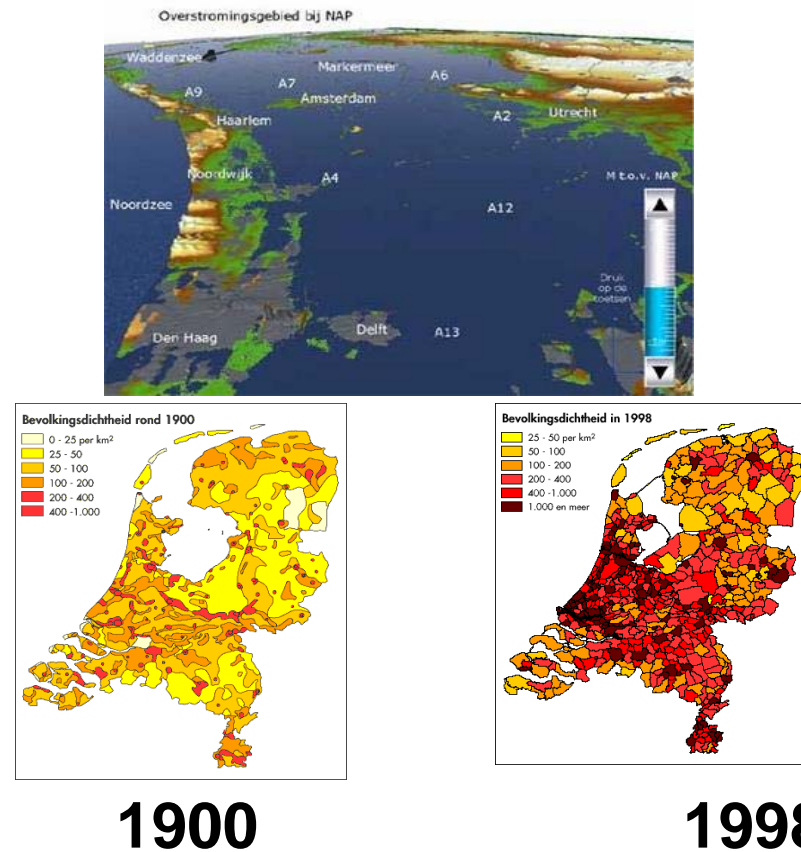


Sea level rise Dutch coast



Dutch Population density

80% of population within 60 km of coast (>1000/km²)



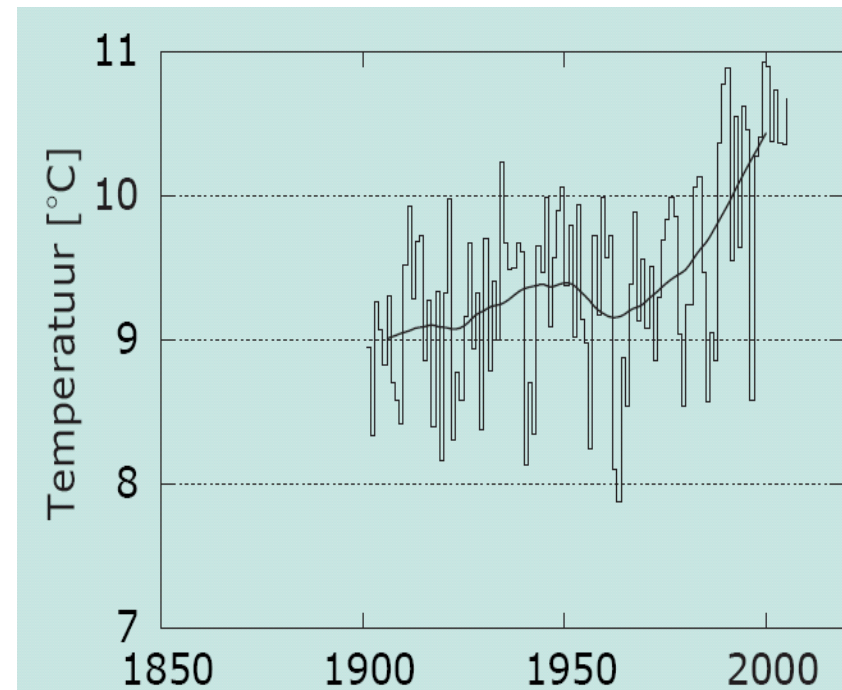
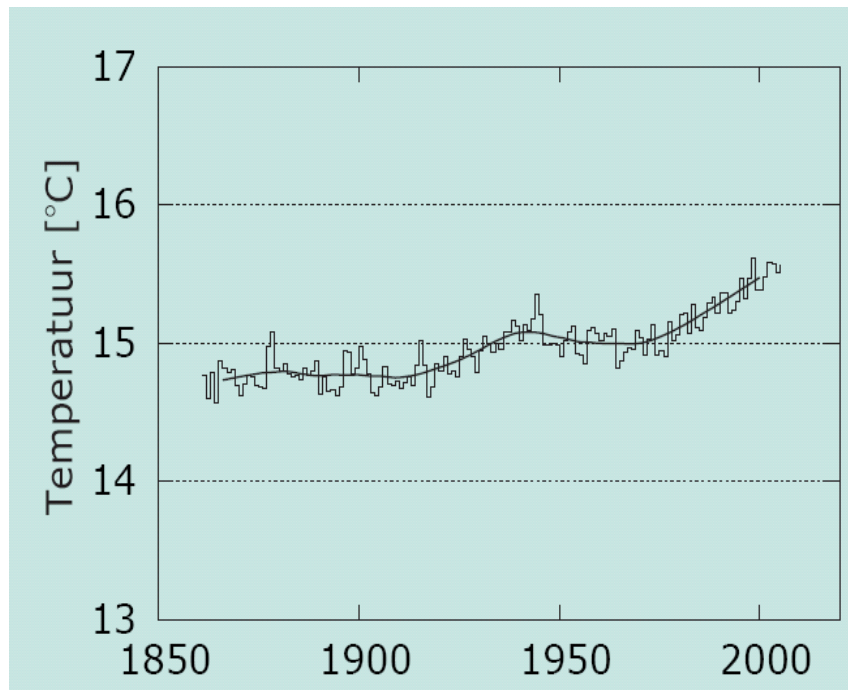
Climate Change (4)



Change in temperature over last 150 years

- Significant increase in averaged temp. for most European stations
- Larger year to year variation in regions compared to global

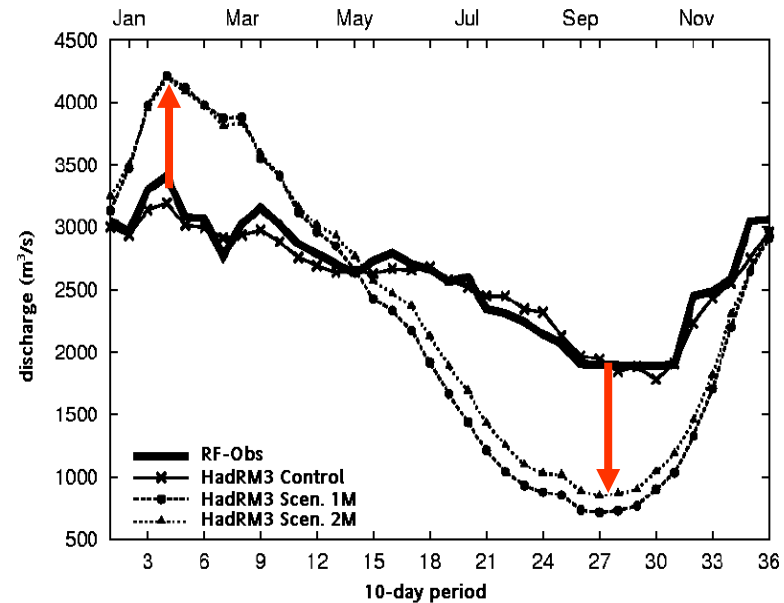
Global: increase of ca. 1°C Netherlands: increase of ca. 3°C



Climate Change (5)



Extreme discharges and conditions In Netherlands: wet winters - dry summers



- cooling water
- drinking water (contaminants)

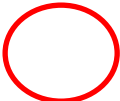
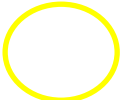
Contaminants (1)



catchment approach

downs stream areas
are at risk

emerging compounds

-  High risk areas
-  Under consideration

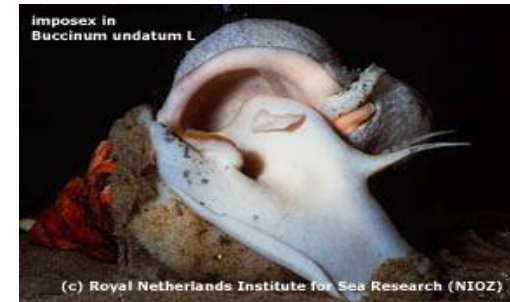


Contaminants (2)



Effects of contamination in North Sea: OSPAR and EU MSFD (GES 8,9)

- imposex (effect of TBT)
- fish diseases
- bioaccumulation
- oiled birds



Imposex in wulk

decreasing but still (sublethal-chronic) effects present



“oiled-Guillomets”



Bioaccumulation in sea mammals



Eutrophication



Effects excess N, P: OSPAR and EU MSFD (GES 5)

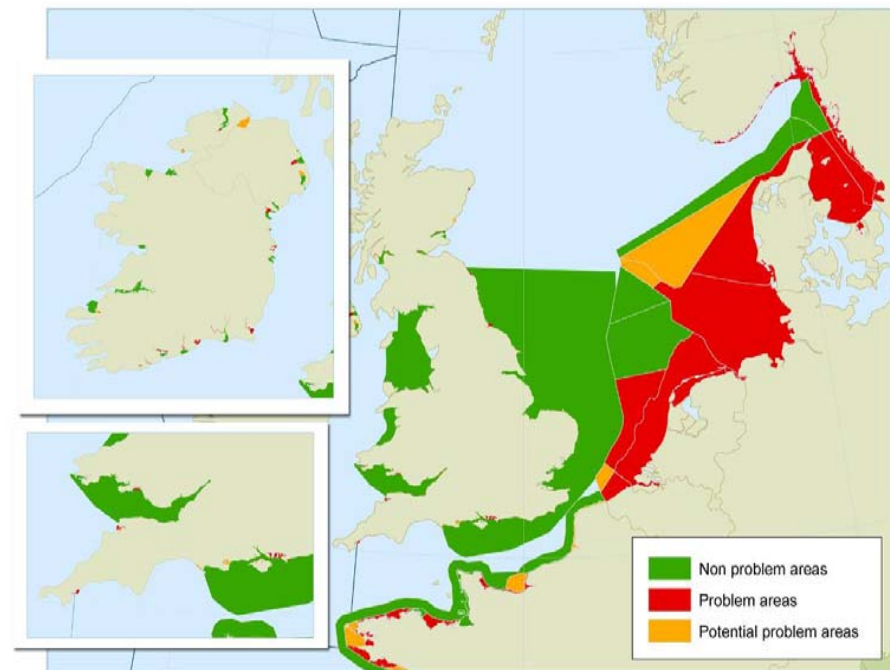
Excess of nuisance algal species,

- **effects on marine ecosystems:**
 - foam on beach, algalblooms, oxygen deficiency,
 - kills of benthos (mussels, cockles), fish kills
- **effects for users of the sea:**
 - recreation (skin aggitation, bad smell), human health,
 - and fisheries (clogging of nets, kills in shellfish)



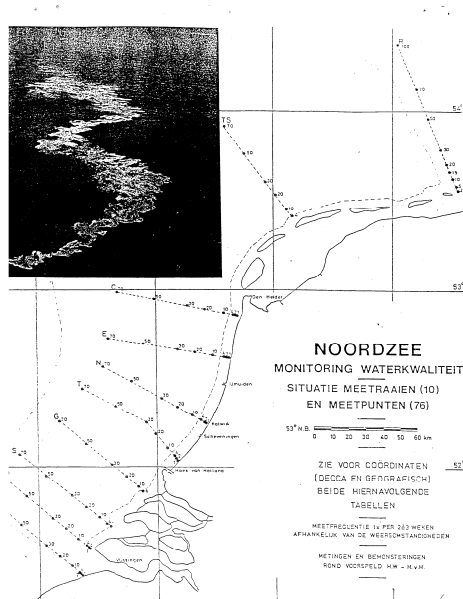
Foam on the beach

Enormous algal patches



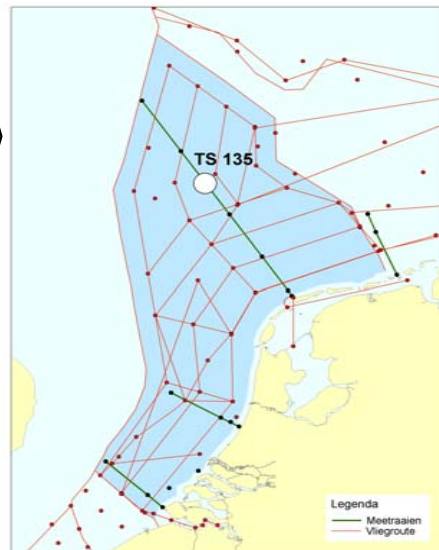
(OSPAR, QSR, 2010)

Monitoring (1)



1988

**10 transects (80)
ship
chemistry**



1996

**4 transects (40)
ship/airplane
chemistry/ecology**



Internationalisation

- COSYNA
- NOOS
- EUROGOOS
- EMODNET
- EMECO
- NWO –ZKO

2009-

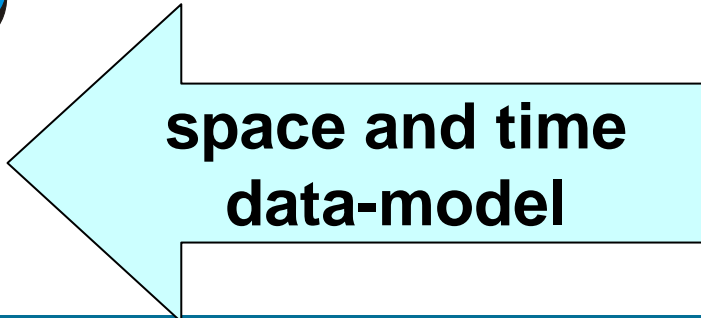
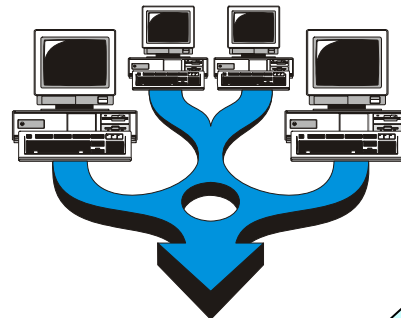
Monitoring (2)



Various tools and relevant compartments



- ships of opportunity
- remote sensing
- airborne surveys
- satellites,
- smart moorings
- models

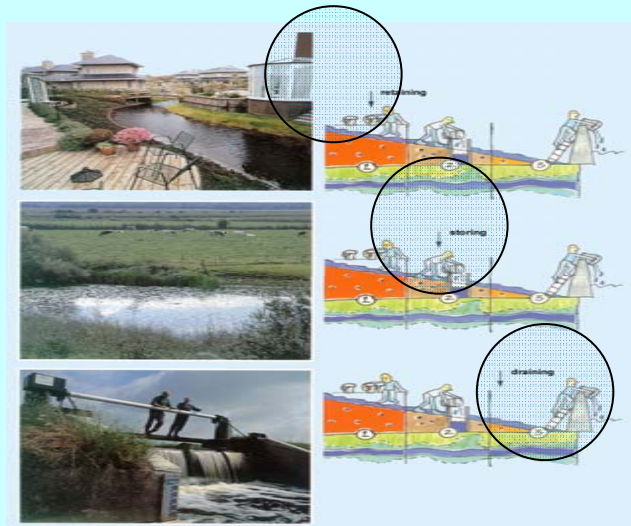


Management approach

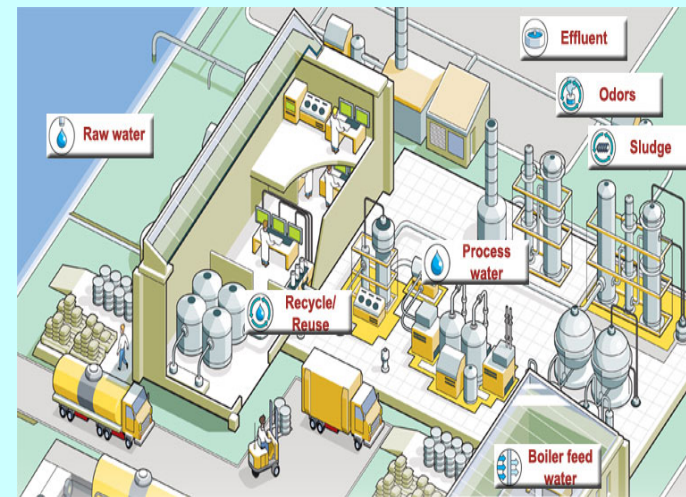


'living with water' (safety)

Retaining, Storing, Draining



Precautionary Principle reduction at source



do not shift the problems and responsibilities onto some one else

Joint forces



1. Impacts on safety (human) and health of the sea
 - extreme conditions; increased awareness
2. Netherlands: below sea level and downstream:
 - largest impact
3. Early Signals, Precaution, Reduction at source
 - smart cost-effective monitoring in space/time,
 - integration of tools
 - measuring in correct compartment
 - living with water
4. Joint Efforts



1. Without joint effort no solution for down-upstream problems for human health (safety) and for a healthy sea.
2. Joint integrated efforts on whole management cycle are necessary. How can we achieve that?
3. Fresh- and Marine waters: joint forces!



Mitigation measures: can they help?



"Dreaming of a White Christmas!"

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The North East Atlantic

- Region I Arctic Waters
- Region II Greater North Sea
- Region III Celtic Seas
- Region IV Bay of Biscay and Iberian Coast
- Region V Wider Atlantic

15 States, EC, IGO's, NGO's

**ecosystem approach
precautionary
principle**

6 Strategies: QSR2010

**hazardous Substances,
oil & gas,**

**eutrophication,
biodiversity,
radioactivity,**

joint Ass. Monitoring



Silty/sand coastal river

- loss of silt/sand along coastal transport into German Bight
- compensation by sand supply, restore coastal fundament, Wadden Sea / estuaria

