



Climate proofing in the Netherlands: Dutch climate research in practice

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Kennis voor Klimaat Knowledge for Climate



Climate proofing concept....

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



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nature

COMMENTARY

Science - Policy interaction

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.



Increased political support for climate adaptation research in the Netherlands

At both regional and national levels

Adaptation meeting, november 2005



 climate changes spatial planning

Lemstra motion in the Senate 2005

“Is Climate Change sufficiently taken into account in our planning of investments in infrastructure and land use?”

 climate changes spatial planning

Climate *changes* Spatial Planning

- The climate becomes *one of the guiding principles* for sectoral development and spatial planning of The Netherlands and Europe
- A high degree of *synergy and integration* is needed to implement the *climate dimension* of different policy lines and societal sectors
- *The climate - knowledge infrastructure in The Netherlands:* good at parts, but mainly with a sectoral focus, not integrated and therefore sub-optimal

 climate *changes* spatial planning

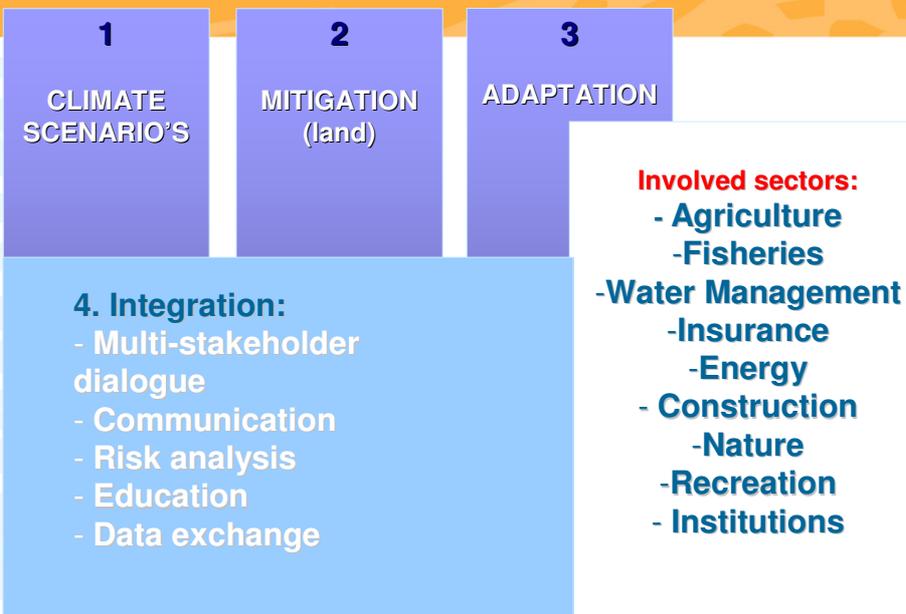
Climate *changes* Spatial Planning

***Dutch National
Research Programme
on Climate and Climate
Related Knowledge
Infrastructure***

***100 MEuro
2004-2011***



The framework:



National Programme: Knowledge for Climate

Goal:

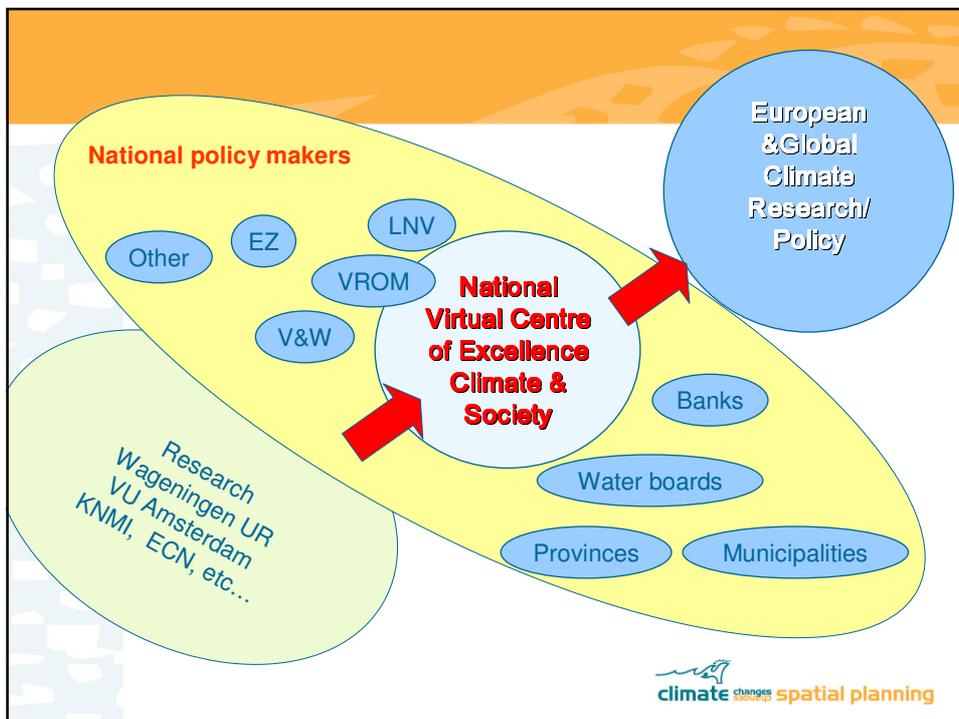
“How can we adjust/modify our planning of investments in infrastructure and land use, in order to make them more robust in view of a changing climate”

Knowledge for Climate: Hotspot Areas

Climate proofing the Netherlands, hotspots



-  Lakes, meadows and peat
-  Great rivers
-  Waddenzee
-  Southern delta
-  Dry rural areas
-  Deep polders / Haaglanden
-  Mainport Schiphol and Haarlemmermeer
-  Rotterdam port and region



Example: Climate proofing agricultural development

- Climate friendly development
 - development that leads to low GHG emissions (nitrate/energy)
- Climate safe development
 - development that leads to low vulnerability to direct (temperature and water) and indirect (flooding, saline intrusion) effects of climate change

Climate proofing the agricultural sector



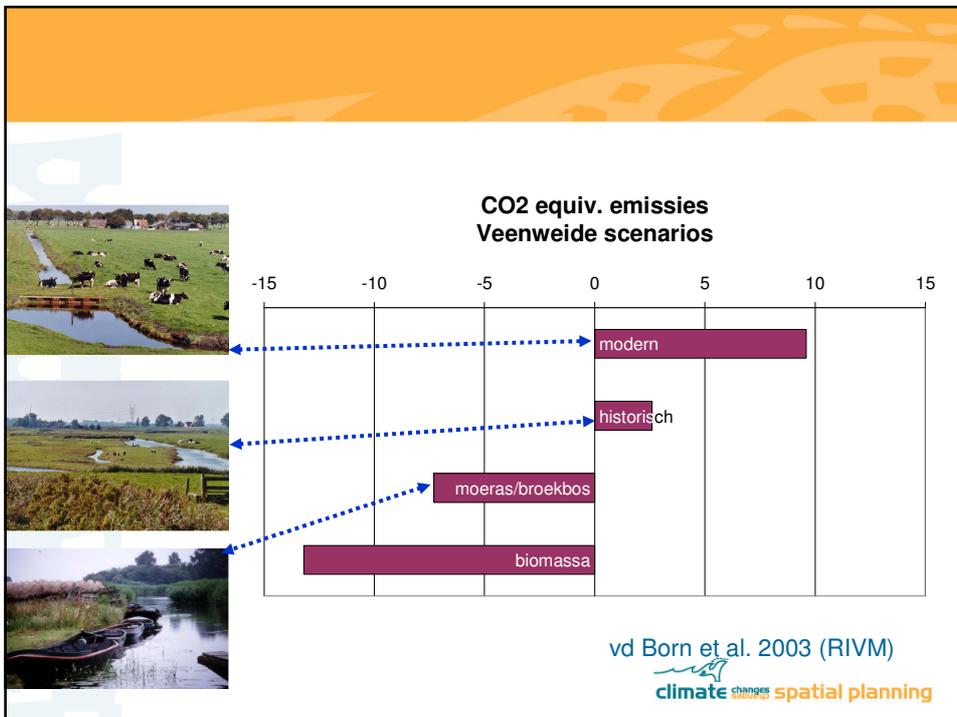
"BE CAREFUL! ALL YOU CAN TELL ME IS 'BE CAREFUL'?"

- **(re)design of existing production systems**
 - Dairy farming/Arable farming/Greenhouses
- **New production systems**
 - Biomass production (biobased economy)
 - Saline/stress tolerant crops
- **Changes in land use**
 - Exit from agriculture (Nature/Recreation)
- **Regional combinations of land use**
 - Multifunctional land use (agriculture, recreation, nature water retention and storage)
 - Linking (farming) systems/closing C & N cycles
- **Processing & transport**
 - Increase energy use efficiencies

Land use planning: adaptation & mitigation



climate changes spatial planning



Make many with greenhouse gas....



....all fine and well?

Summer

summer temperate
 Rough winds summer hot
 fair nature fair
 summer fair shade
 time life

Shall I Compare Thee To A Summer's Day?
 by William Shakespeare

Shall I compare thee to a summer's day?
 Thou art more lovely and more temperate.
 Rough winds do shake the darling buds of May,
 And summer's lease hath all too short a date.
 Sometime too hot the eye of heaven shines,
 And often is his gold complexion dimm'd;
 And every fair from fair sometime declines,
 By chance or nature's changing course untrimm'd;
 But thy eternal summer shall not fade
 Nor lose possession of that fair thou ow'st;
 Nor shall Death brag thou wander'st in his shade,
 When in eternal lines to time thou grow'st:

if investing in adaptation requires accurate and precise
 climate prediction ...

and if regional climate scenarios are still very
 uncertain/imprecise ...

then do we give up on adaptation?



Accuracy versus Precision in Climate Information

High accuracy
Low precision



'Global mean temperature will increase between 1.4° and 5.8°C by the end of the century'

Low accuracy
High precision



'Maximum temperature in July will increase by 3.7°C in Rotterdam in 2088...'

Accuracy versus Precision

Probability density

'True' value

Precise, but inaccurate

'Accurate', but imprecise

e.g. 20th
percentil
e

Climate variable

Probabilistic multi model ensemble & Bayesian methods

Figure 5: A schematic diagram showing the progression from UKCIP02 to UKCP09, using temperature as an example. The single estimate of change in temperature from UKCIP02 (left, for a given emissions scenario, location, time period, etc.) gives no information about uncertainty. A range of changes in temperature from different climate models (centre) gives no information about which model to use, and only partly reflects uncertainties. The PDF given in UKCP09 (right) shows the probability of different outcomes, that is, different amounts of change in temperature.

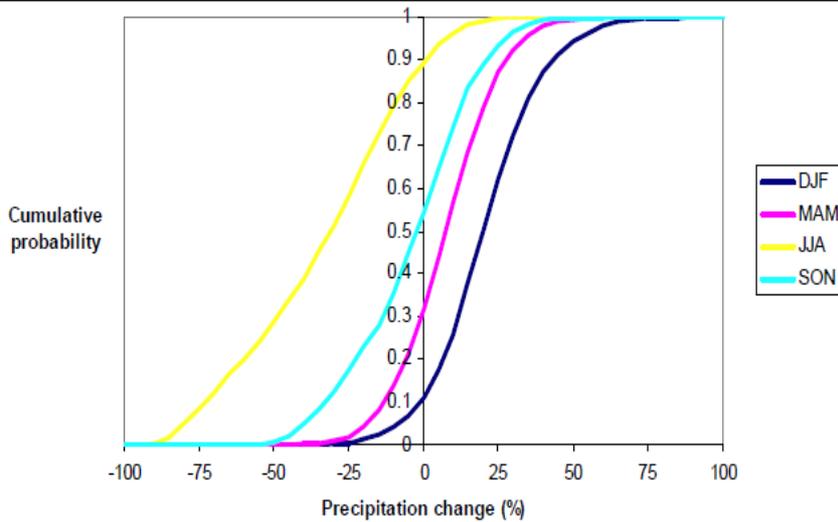
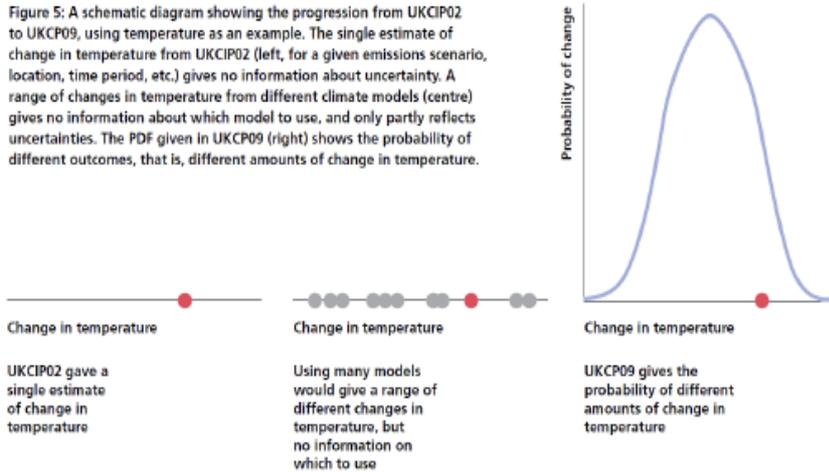


Figure 5.3 Cumulative density function of seasonal mean precipitation change (2xCO₂ compared to 1xCO₂) over the Netherlands for the winter (DJF), spring (MAM), summer (JJA) and Autumn (SON) seasons.

So is climate adaptation limited by uncertainty in climate scenarios?

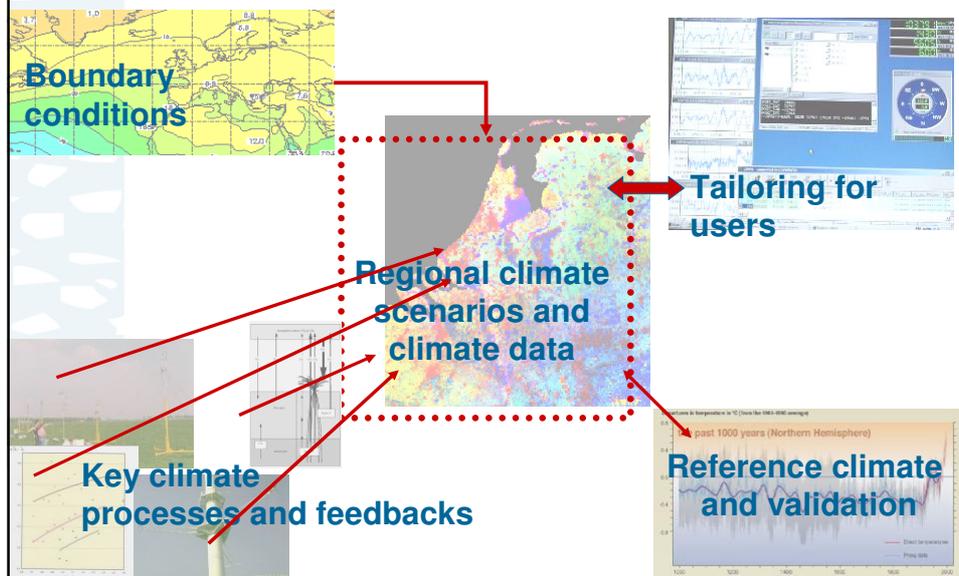
Not if we understand the *wider contexts* in which adaptation has to take place ...

... spatial planning, technical regulation, economic priorities, adaptive management, risk management, cultural preferences, risk psychology

Main ingredients of ...(a success?)

- (1) User specific climate scenarios
(tailoring of climate scenarios)
- (2) Incorporating existing uncertainties in adaptation strategies
- (3) Innovative adaptation solutions (climate as business opportunities)
- (4) Continuous dialogues and communication between science, policy and users
(Principle of co-creation principle)

Climate Scenarios



Other examples of tailoring

Gas production: Will the probability of extremely low effective temperatures significantly decrease up to 2030?

Petroleum industries: Inventory of potential effects of climate change on Dutch petroleum industries up to 2030 and 2050 (extreme rainfall and temperatures, wind)

Road safety: Data on weather conditions around 2020 that may affect safety (e.g. extreme precipitation, heat waves)

Urban water management: Does intensity of extreme rainfall during 5-60 min. change in the same way as daily extreme rainfall up to 2050-2100?

Spatial planning provinces: maps with spatial variability in climate variables and effects of climate change for current situation and around 2050

Working together with water
A living land builds for its future

Findings of the *Deltacommission 2008*

www.deltacommissie.com/en/advies

Nature Geoscience | VOL 2 | JULY 2009 |

commentary

Dutch coasts in transition

Pavel Kabat, Louise O. Fresco, Marcel J. F. Stive, Cees P. Veerman, Jos S. L. J. van Alphen, Bart W. A. H. Parmet, Wilco Hazeleger and Caroline A. Katsman

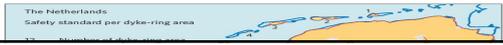
The Netherlands has a long and varied history of coastal and river flood management. The anticipation of sea-level rise during the twenty-first century has renewed the push for sustainable solutions to coastal vulnerability.

The Netherlands is a densely populated country situated primarily in coastal lowlands. The Dutch coast, which is entirely along the North Sea, is 350 km long. At present, nine million residents of the Netherlands live in the coastal areas — vast regions at an elevation below sea level. Roughly 65% of the country's gross national product — about €400 billion — is generated in this region; the harbours and airports scattered throughout the lowlands are vital to the country's infrastructure and serve as important international transport routes for

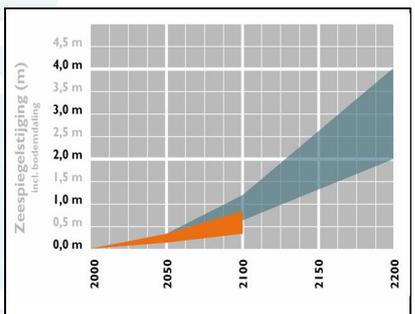
However, as revealed in the 2006 audit conducted by the Ministry of Transport, Public Works and Water Management, current coastal defences do not even meet the old standards (see Fig. 1). And of course, the number of people and the value of the property that need to be protected from flooding has grown steadily.

A changing climate and the anticipated rise in sea level will only add to the challenges faced by the aging flood defence system. The Dutch government not only recognized the growing vulnerability of



Sea level rise: “plausible high end scenarios”



- 2100: + 0.55 - 1.20 m
- (0.65 – 1.35 incl. soil subs.)
- Key importance of **adaptive management**: **adaptation measures** must be flexible, no-regret (robust) and hand in hand with monitoring & ability to incorporate new scientific insights

climate changes **spatial planning**

“Building with Nature”

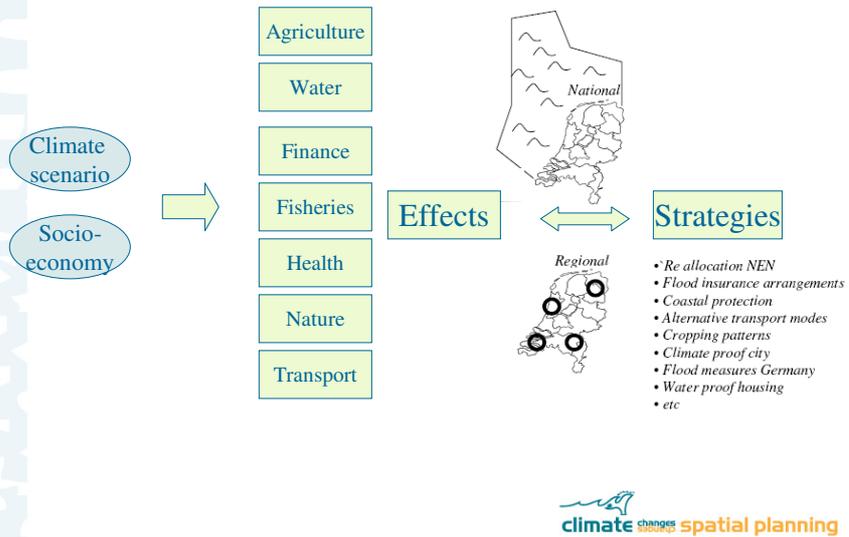


- Flexible regarding changing conditions and societal values, and increased understanding
- Cost-effective
- Opportunities for integrated and multifunctional approach

Innovations in Adaptation

- Sectoral Approach
 - Assessment through sectoral case studies
 - National and Regional
- Follow climate proofing methodology
 - Use consistent climate and socio economic scenarios in all adaptation projects
 - Seek for robust long term adaptation strategies
- Linking science and policy through:
 - Cases & Hotspot projects
 - Participatory methods

Adaptation and Innovation: cross-sectoral approach



Co-creation, continuous dialogue...

→ Hotspot projects

- New urban areas (Zuidplaspolder)
- Nature & water (Biesbosch)
- Climate / city (Tilburg)



→ Participatory approach

- Stakeholder/specialist workshops
- Adaptation strategy development



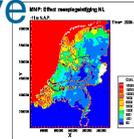
Communication: some activities

II. Knowledge transfer: participative approach

Developing new instruments for regional and local governments in which results of research are integrated: climate atlas and adaptation scan

Debates between scientists and practitioners aimed to articulate research questions of relevance to the stakeholders

Klimaatdebat Nederlands Natuurbeleid
donderdagmiddag 4 oktober 2007
Buitenlocatie Kamerijk



Climate atlas



Adaptation scan

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Thank you



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