

Climate change and land use

Landgebruik en klimaatverandering

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Earth System Science – Climate Change



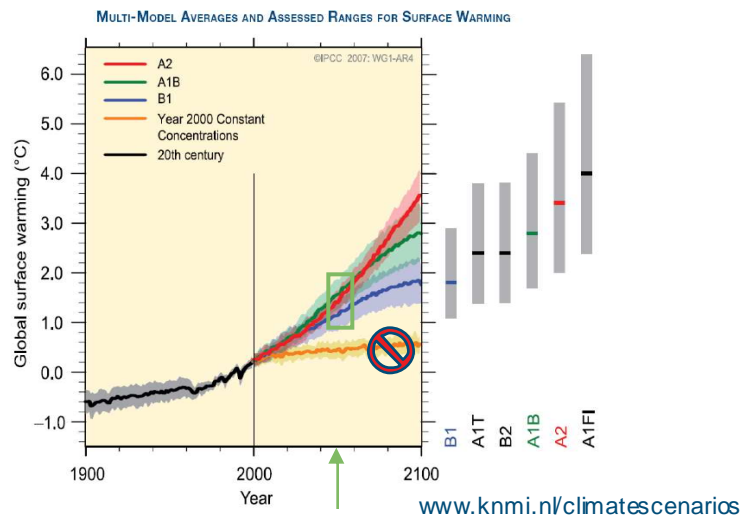
Contents

- How accurate are climate predictions?
- Prioritization of adaptation measures
- Adaptation in the Rhine basin
(Effects of land use feedbacks on precipitation)
- Conclusions

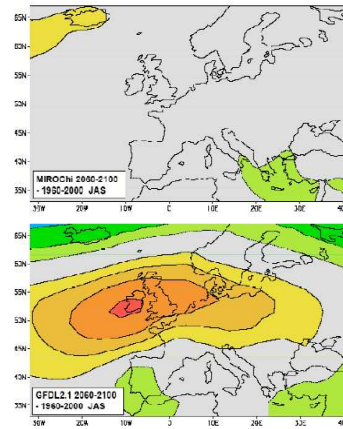
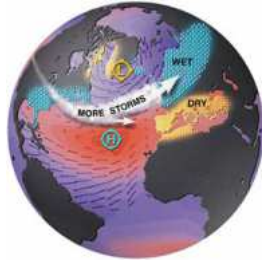
What is uncertainty?

- un-cer-tain-ty (ŭn-sŭr'tn-tē)
n., pl. -ties.
- The condition of being uncertain; doubt.
- The state of mind of an individual who is unable to make any estimate of future events.
- Something uncertain: *the uncertainties of modern life.*
- *Statistics.* The estimated amount or percentage by which an observed or calculated value may differ from the true value.
- Often, the uncertainty of a measurement is found by repeating the measurement enough times to get a good estimate of the **standard deviation** of the values.

Climate predictions: global temperature change



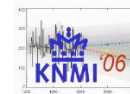
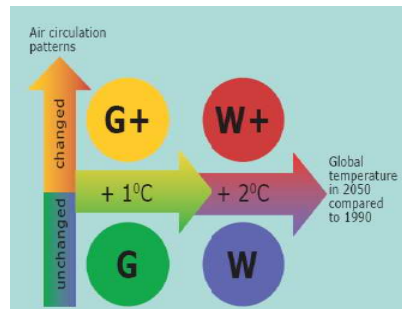
Atmospheric circulation change



How to present uncertainty?

Climate change in the Netherlands depends on:

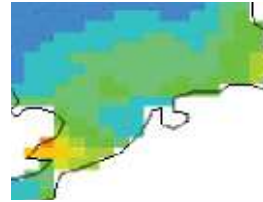
- global temperature rise
- change in local wind regime



Uncertainty in sea level rise

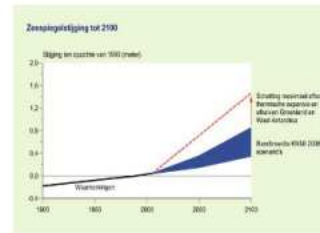
■ IPCC 2007 WG1 "The physical system":

- 0.18-0.59 m (globally 2071-2100).
- 0.6-0.8 m (North-Sea 2071-2100)
A2 scenario (Lowe and Gregory, 2005)



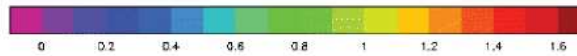
■ KNMI:

- 0.35-0.85 m (2100, 4°C)
- ~1.5 m (2100, max. estimate)
but without increased melting rate ice sheets, (Rhamstorf, 2007)
- 1.0-2.5 m (2300)



■ IPCC 2007 WG3 "Mitigation":

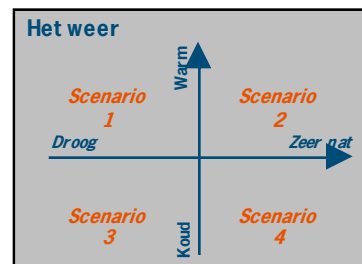
- 4.0-6.0 m (Meehl *et al.*, 2007)



Omgevingsscenario's

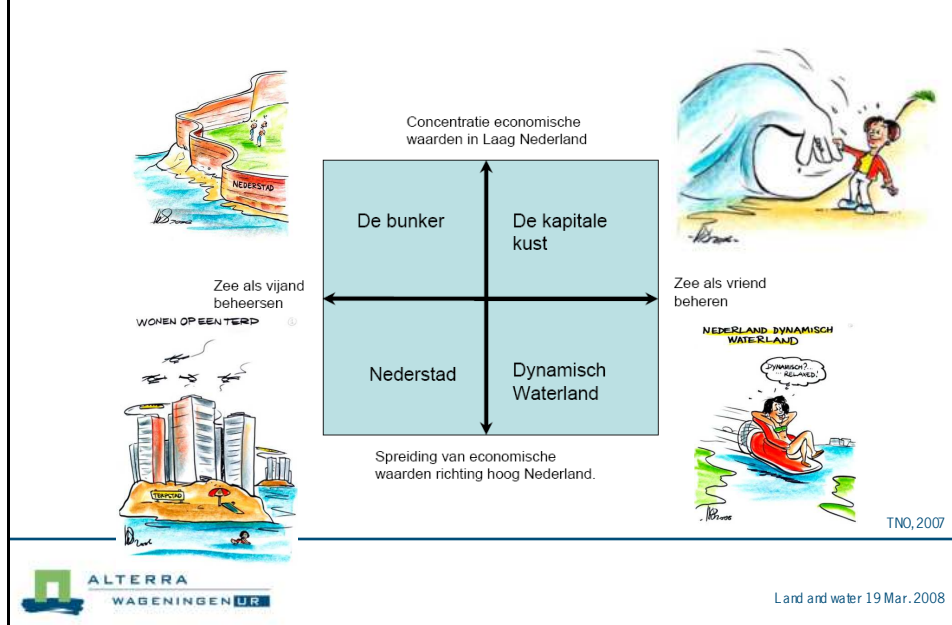
■ Ontwikkelingsstappen:

- Identificeer de belangrijkste autonome processen en **onzekere trends**
- Verken de extremiteiten van deze trends
- Stel aan de hand hiervan een aantal scherp contrasterende scenario's op (bijv. 2x2)
- Beschrijf voor elk scenario hoe in het uiterste geval de onzekere trends kunnen doorwerken
- Formuleer strategieën die anticiperen op de beschreven ontwikkelingen
- Beoordeel de effectiviteit van de strategieën.
- Is sprake van z.g. **robuuste strategieën**?



		Strategieën		
		Jas mee	Jas thuis	Jas altijd in tieltase
Scenario's	(+) Warm & Droog	Jammer	OK	OK
	(-) Koud & Zeer nat	OK	Dikke pech!	OK

Duurzaam leven aan zee: De Nederlandse kust in 2080



De Nederlandse kust in 2080

Belangrijkste drijvende krachten:

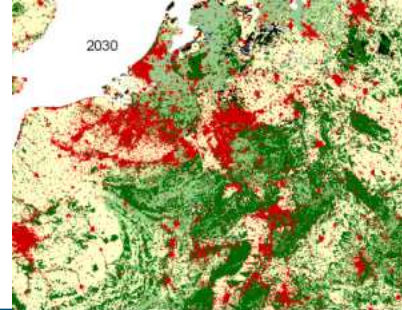
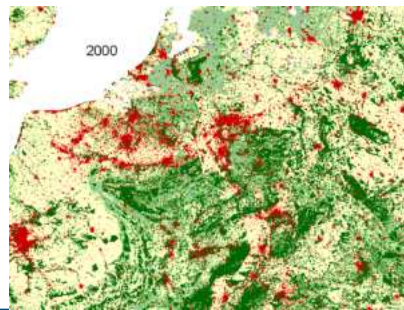
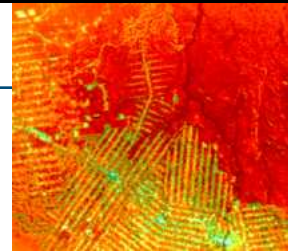
- De economische ontwikkeling (volume, structuur, geografische spreiding van activiteiten).
- De maatschappelijke attitude ten opzichte van de zee. Wordt de zee vooral gezien als een bedreiging of juist als een bron van mogelijkheden?

Opvallend is dat de stijging van de zeespiegel niet als één van de belangrijkste onzekerheden werd aangemerkt.

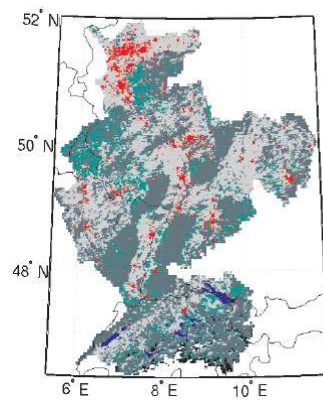
De overweging hierachter is dat men in de periode tot 2080 enerzijds geen grote veranderingen verwacht (maximaal 1 meter) en anderzijds dat deze ontwikkeling ook vrij zeker is.

TNO, 2007

Land use change

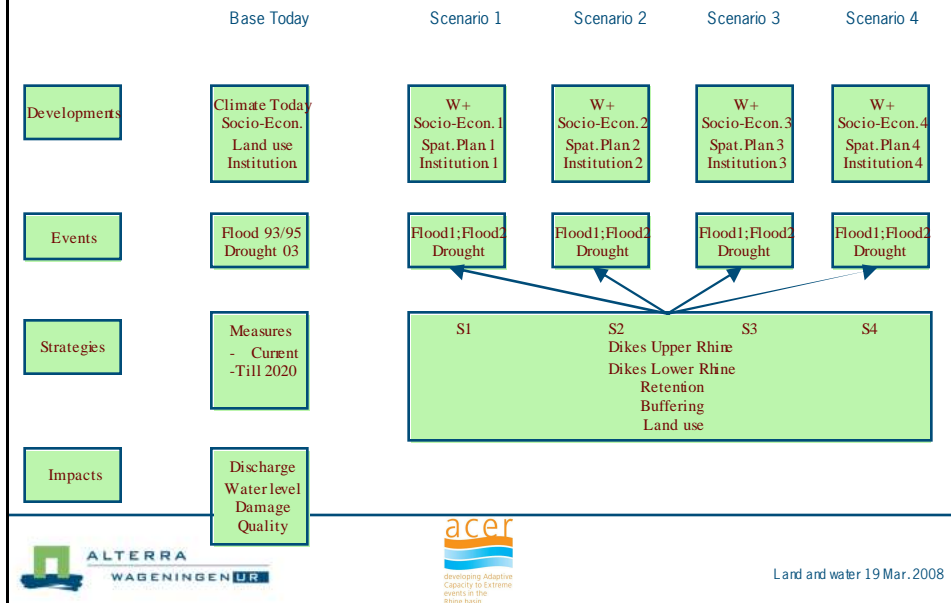


ACER: developing Adaptive Capacity to Extreme events in the Rhine basin



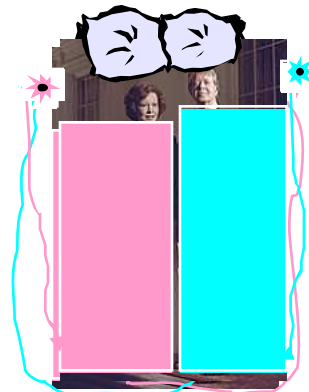
- Forest
- Crop land
- Grass land
- Urban land
- Snow / Ice
- Other
- Water

Scenario Structure ACER



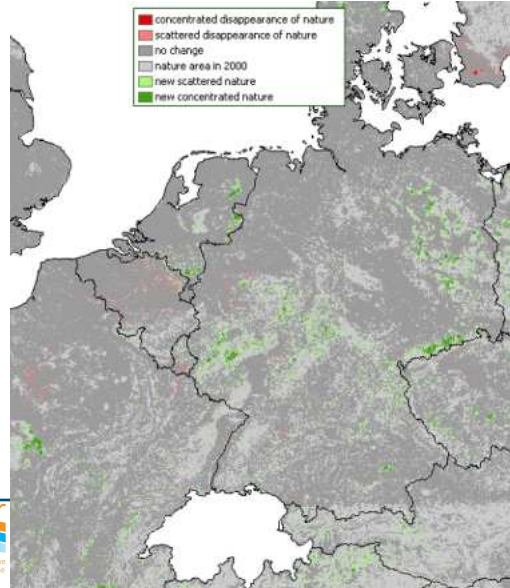
Analysis at regional and global scales: systems, components, state, couplings and feedbacks

- The US president's family created a positive feedback loop resulting in a continuous winter discomfort



Effect of land use change on precipitation

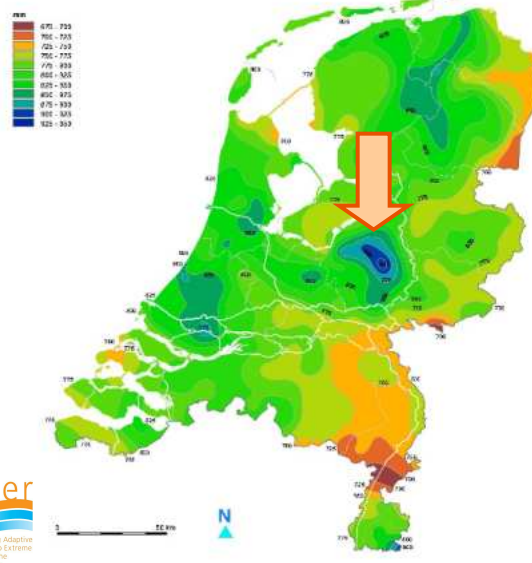
- Abandonment of croplands
(EURURALIS – 2030)



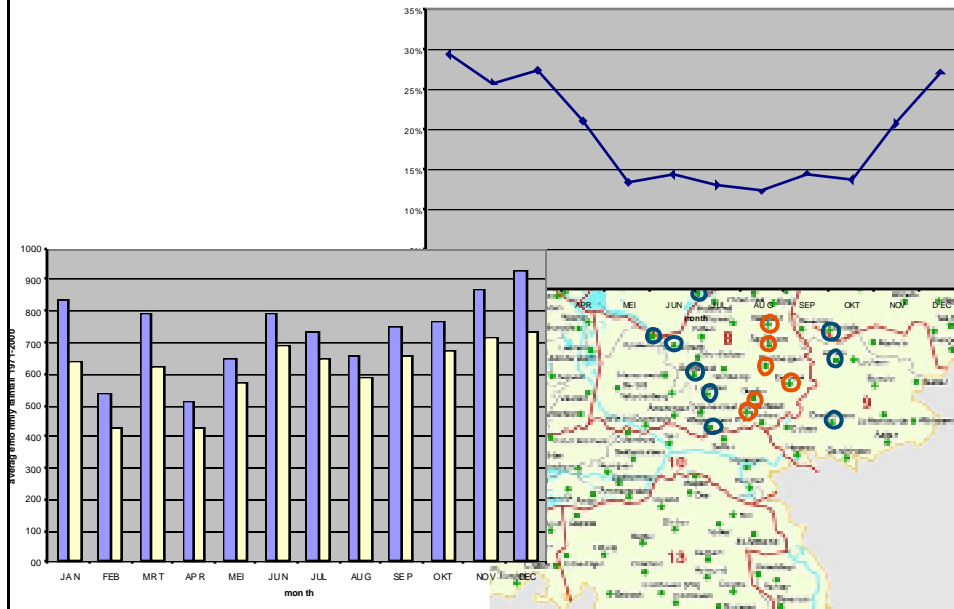
Effect of land use change on precipitation

(A numerical experiment)

- Obvious precipitation maximum in 30-yr average
- Reason: topography or land cover ?



VELUWE precipitation maximum

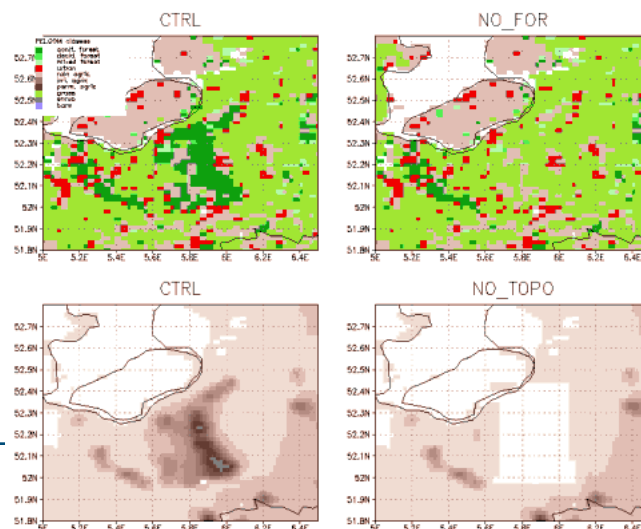


VELUWE precipitation maximum

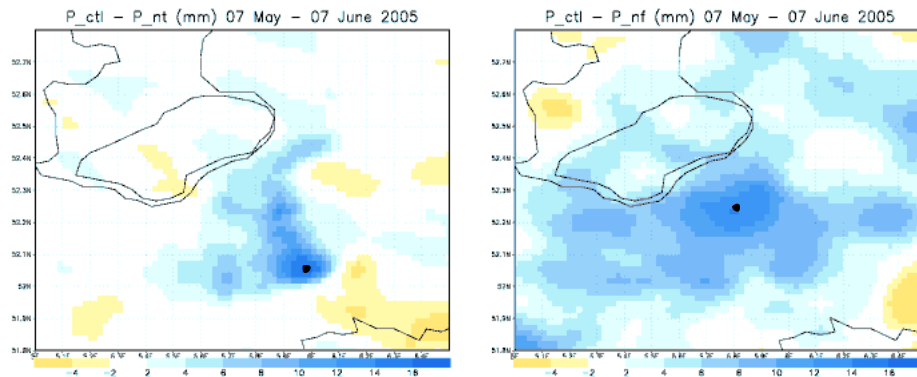
Why? Topography or land cover ?

Model runs

- Control
- No forest
- No topography



Differences in precipitation (spatial) – May 2005



Conclusions

- Uncertainty in sea level rise is high
- Scenario's for a daptation strategies should take this uncertainty into account
- Prioritization should focus on robust (no regret) options
- Land cover change may have significant effects (10%) on precipitation
- Spatial planning may be used to adapt to increased floods and droughts

Discussion

- Adaptation or mitigation
- Albedo rapeseed
- Water quality: algae growth, turbidity

Thanks for your attention