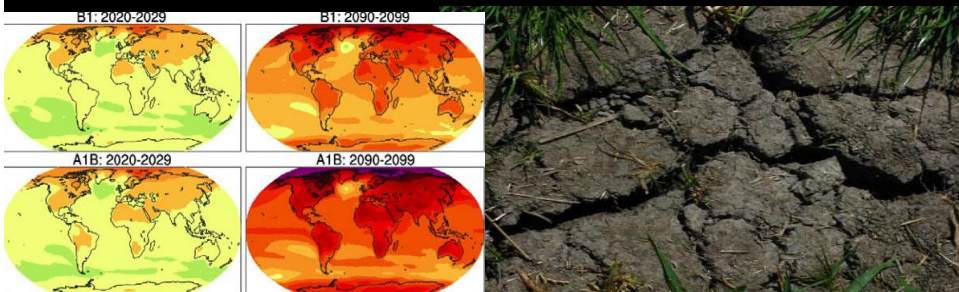
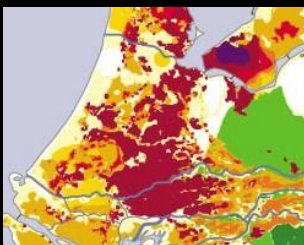




Preserving the **Green Heart** of Holland in a **Changing Climate** Holland Climate House, December 15 2009, Copenhagen



Contents of this presentation

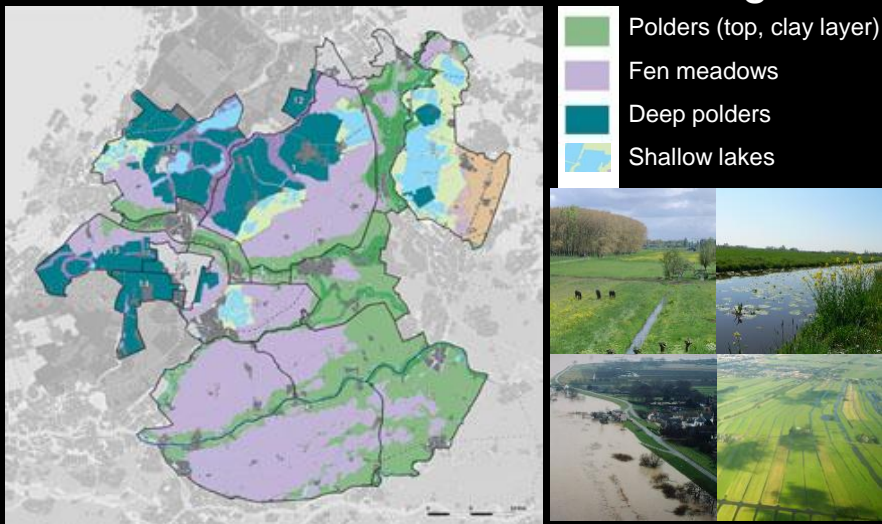


- The Green Heart
- Effects of Climate change
- Adaptation strategy
- Research and policy agenda

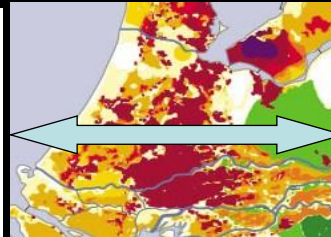
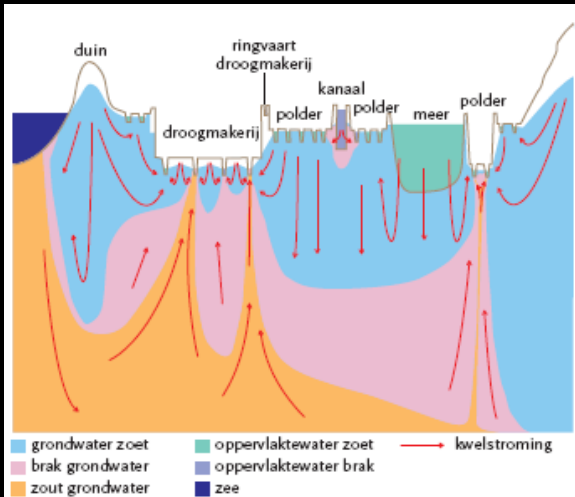
The Green heart: an open area surrounded by cities and cut through by infrastructure



The Green Heart: a patchwork of (deep) polders, fen meadows, shallow lakes, farmland and villages



The green heart: a complicated man made water system (Ground water system: cross-section)



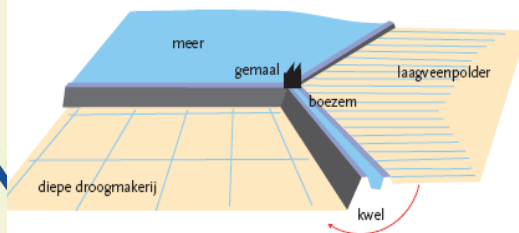
**Sea level rise
increases flow
of brackish
water in near
sea areas**

Fresh water from the Rhine feeds the system in summer

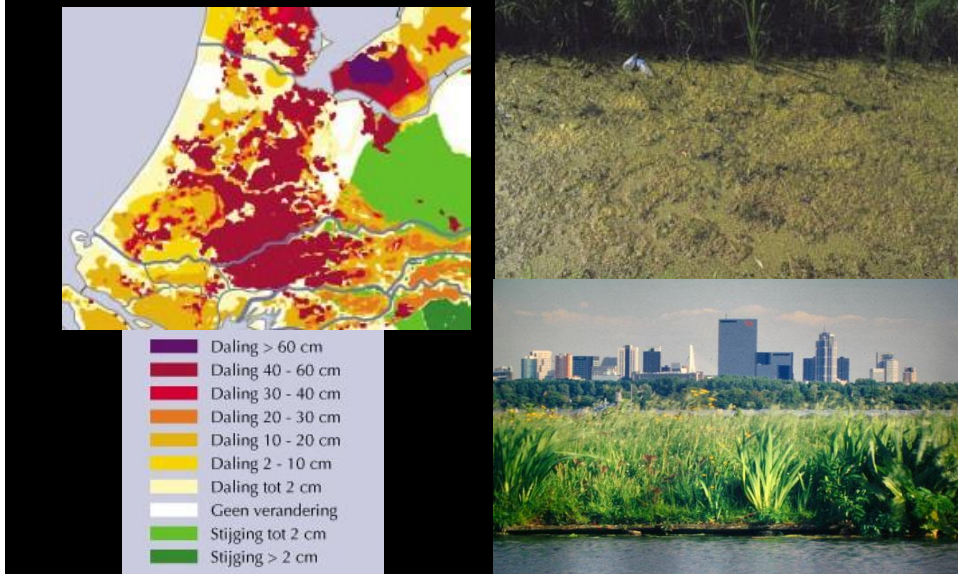


Precipitation < evaporation

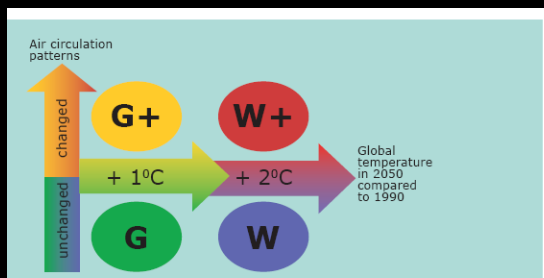
**Reducing salt concentrations
in deep brackish polders**



Environmental problems: soil subsidence, a water system lacking quality and urban pressure



Effects of climate change (2050)



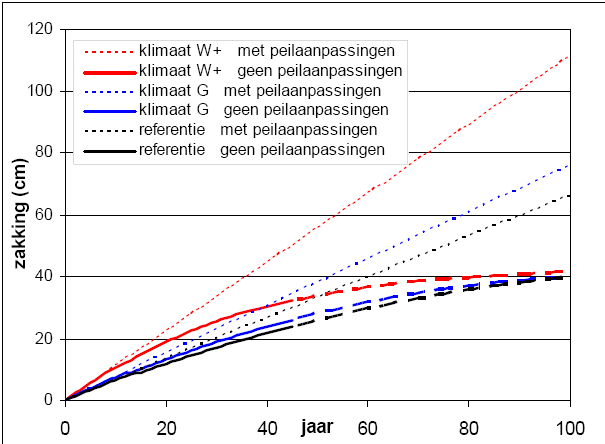
Dutch Climate Scenarios (IPCC AR4)

G	Moderate*	1°C temperature rise on earth in 2050 compared to 1990 no change in air circulation patterns in Western Europe
G+	Moderate +	1°C temperature rise on earth in 2050 compared to 1990 + milder and wetter winters due to more westerly winds + warmer and drier summers due to more easterly winds
W	Warm	2°C temperature rise on earth in 2050 compared to 1990 no change in air circulation patterns in Western Europe
W+	Warm +	2°C temperature rise on earth in 2050 compared to 1990 + milder and wetter winters due to more westerly winds + warmer and drier summers due to more easterly winds

Extreme drought: negative effect on stability of dikes in fenland areas

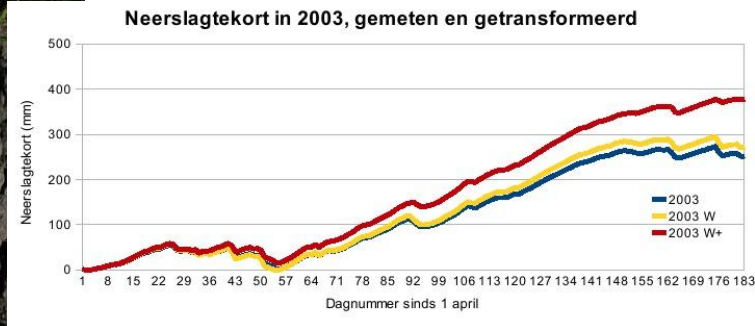
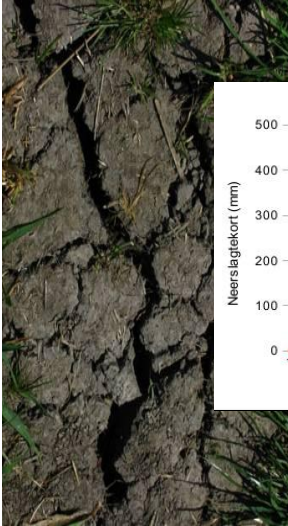


Climate change: increases soil subsidence and CO₂-emissions



Figuur 4-12 Maaiveldddaling voor de referentiesituatie en de klimaatscenario's G en W+ voor situaties met en zonder peilaanpassingen

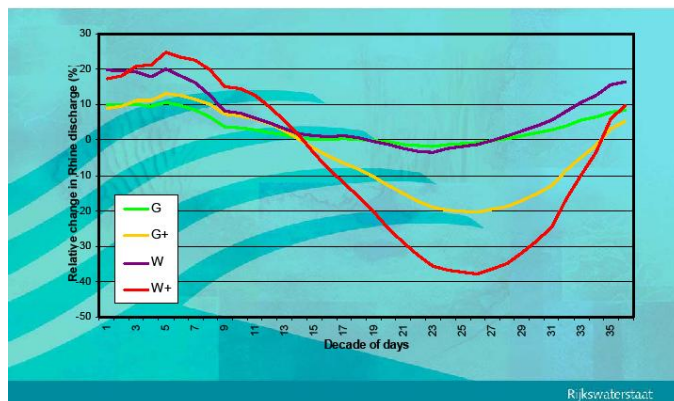
Demand for fresh water will rise
(increase in precipitation deficit)



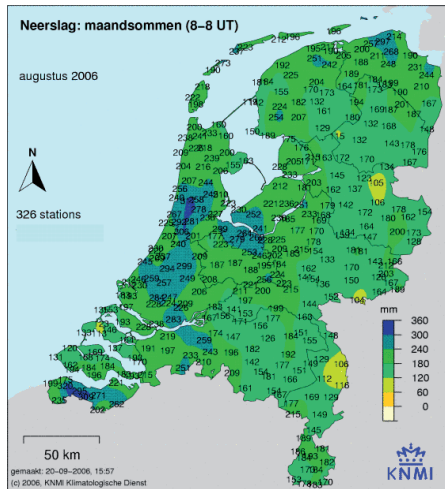
Rhine discharge: increase in
winter, decrease in summer

Effect of low flows on the delta area of the Rhine river 22
25 september 2007

Effects of Climate Change



Extreme precipitation

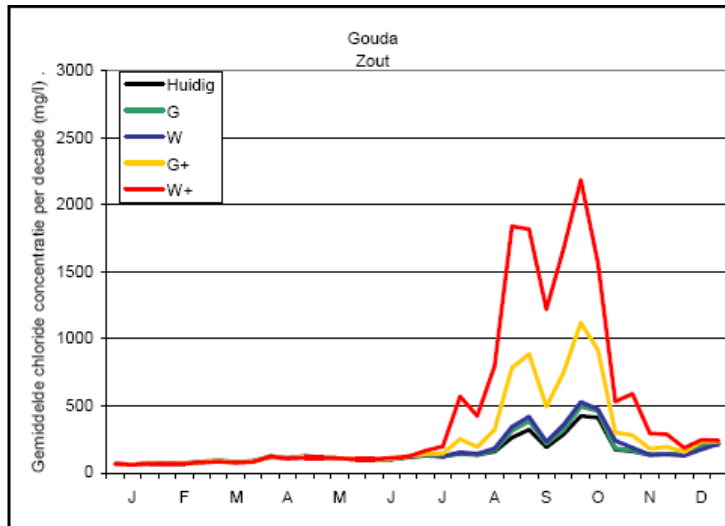


Salt intrusion during the dry period of 2003

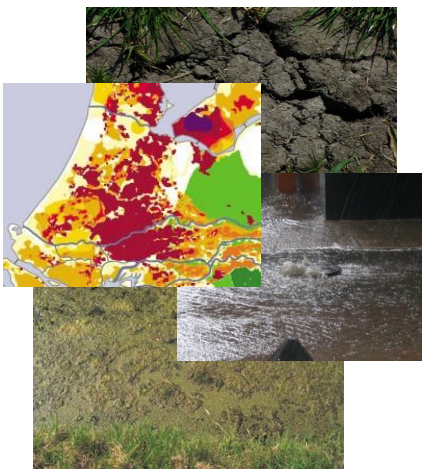


Achterwaarts e verzilting tijdens de droogteperiode 2003 (RWS-DZH, 2004).

Effect on chloride concentration (2050)



Adaptation under uncertainty



**Increase resilience
of the Green Heart
environmental and
economic system
as a strategy
for climate proofing**

Green Heart adaptation strategy

(1)

- Stop the process of soil subsiding / CO₂ emissions:
 - Raise water levels in sensitive areas
- Reduce the need for fresh water intake:
 - Nature areas: create self supporting water systems
 - Deep polders: except higher levels of chloride (e.g. less flushing with fresh water)



Green Heart adaptation strategy

(2)



- Nature: connect isolated areas
 - Create a permeable landscape
 - Realise a 'Green backbone'
- Anticipate new EU policy regarding climate proofing the Natura 2000 network.

Green Heart adaptation strategy (3)

- Realise a sound and sustainable future for dairy farming:
 - Green blue services
 - Ecosystem services
 - Increase possibilities for recreation
- Anticipate and influence changes in EU-agricultural policy (CAP-reform in 2013)



Research agenda

- Fresh water demand and supply in 2050
- No regret measures for 2021
- Effect of short periods of high salt concentrations on aquatic ecosystems
- Re-evaluation of salt standards for agriculture and nature
- Possibilities of seasonal groundwater storage
- Effects of climate change on the stability of the Green backbone network.