The Dutch series of climate change scenarios for local adaptation strategies

Janette Bessembinder ***et al.***




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KNMI06 climate scenarios

- In 2006, KNMI issued 4 general climate scenarios, which describe the local changes in the Netherlands

www.knmi.nl/climatescenarios

- Provide common basis for the national adaptation goal of ‘climate proofing’ the Netherlands

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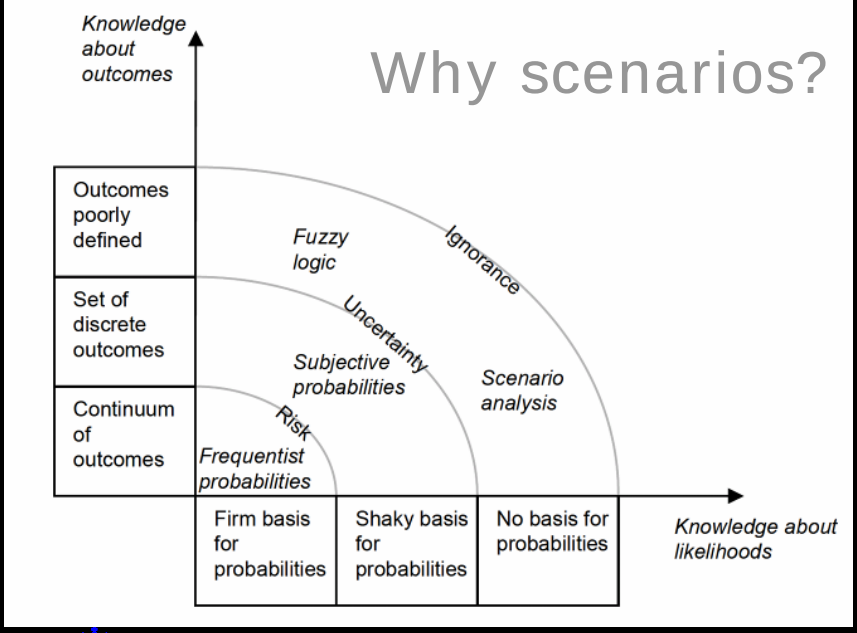
Why scenarios?



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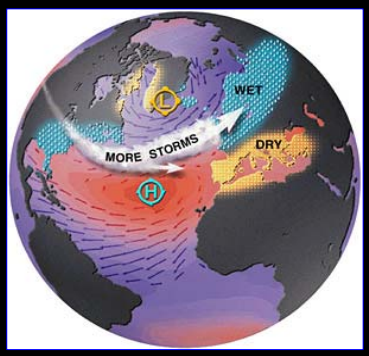
KNMI06 climate scenarios

Global climate models
(IPCC-AR4 model archive)

- global warming
- sea level rise
- large scale circulation change



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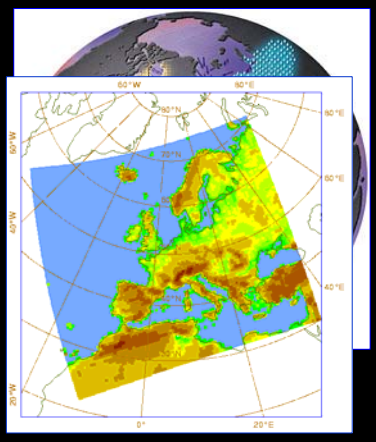
KNMI06 climate scenarios

Global climate models
(IPCC-AR4 model archive)

Regional climate models
(RACMO + RCMs from PRUDENCE)

temperature and precipitation details for Western Europe derived by statistical (down) scaling



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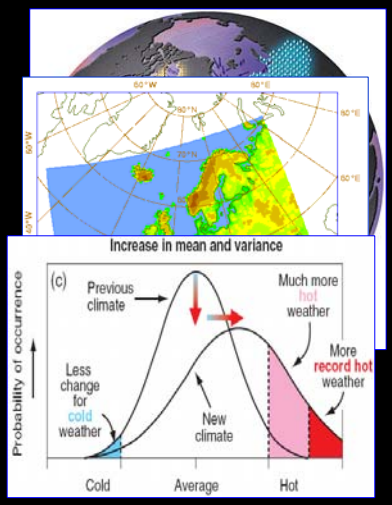
Observations

long observation series for assessing changes in local extremes and for generating representative time series



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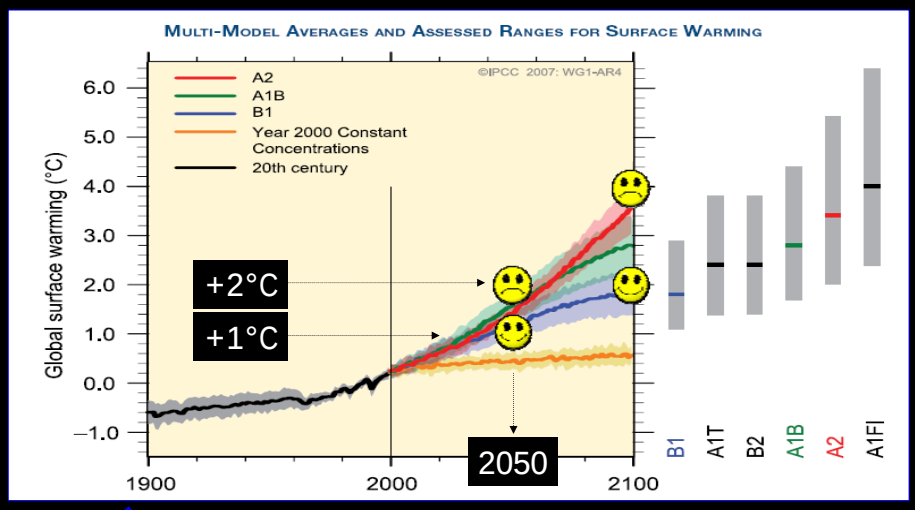
Global warming



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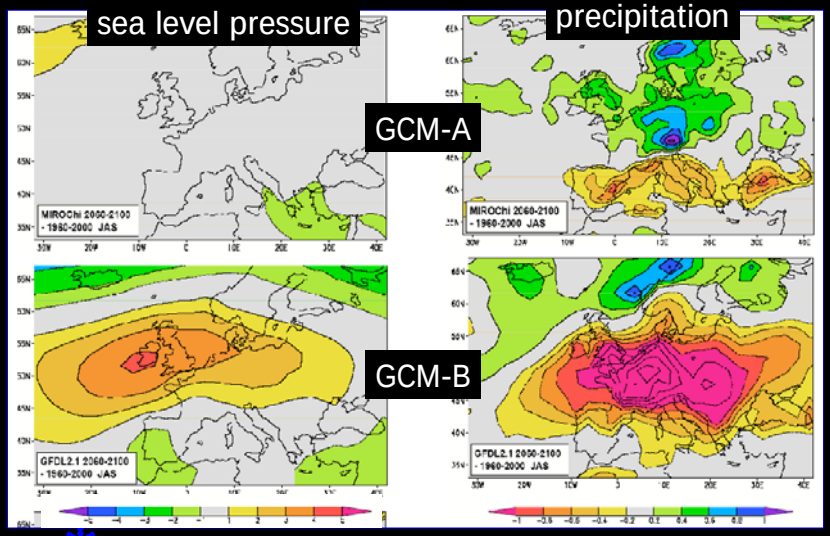
Circulation change (e.g. summer)



Van Ulden and Van Oldenborgh, 2006

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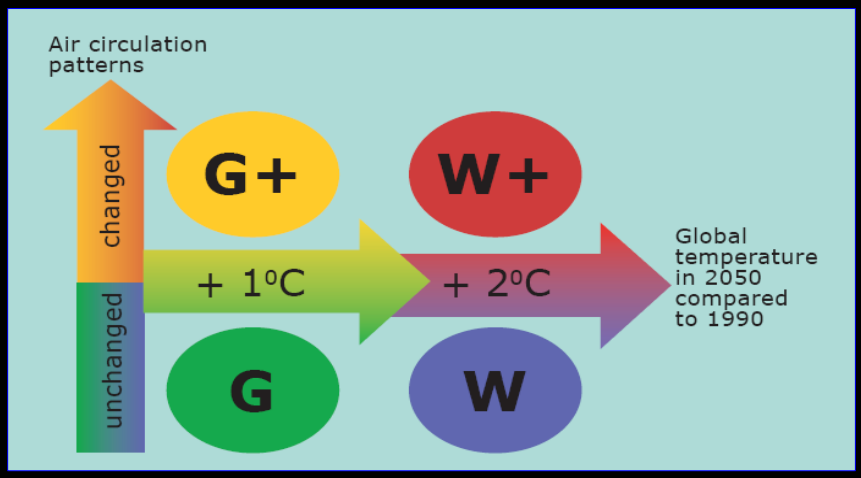
KNMI06 climate scenarios



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Local change in 2050

		G	G+	W	W+
Global temperature rise		+1°C	+1°C	+2°C	+2°C
Change in air circulation patterns		no	yes	no	yes
Winter [3]	average temperature	+0.9°C	+1.1°C	+1.8°C	+2.3°C
	coldest winter day per year	+1.0°C	+1.5°C	+2.1°C	+2.9°C

change in temperature extremes > change in mean

	10-day precipitation sum exceeded once in 10 years	+4%	+6%	+8%	+12%
	maximum average daily wind speed per year	0%	+2%	-1%	+4%
Summer [3]	average temperature	+0.9°C	+1.4°C	+1.7°C	+2.8°C
	warmest summer day per year	+1.0°C	+1.9°C	+2.1°C	+3.8°C

... in particular for the scenarios with change in circulation

	daily precipitation sum exceeded once in 10 years	+13%	+5%	+27%	+10%
	potential evaporation	+3%	+8%	+7%	+15%
Sea level	absolute increase	15-25 cm	15-25 cm	20-35 cm	20-35 cm

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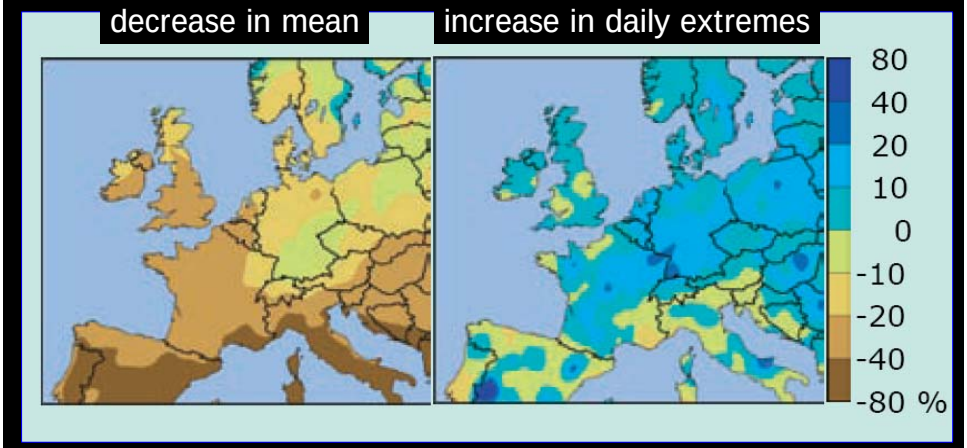
Summer rainfall



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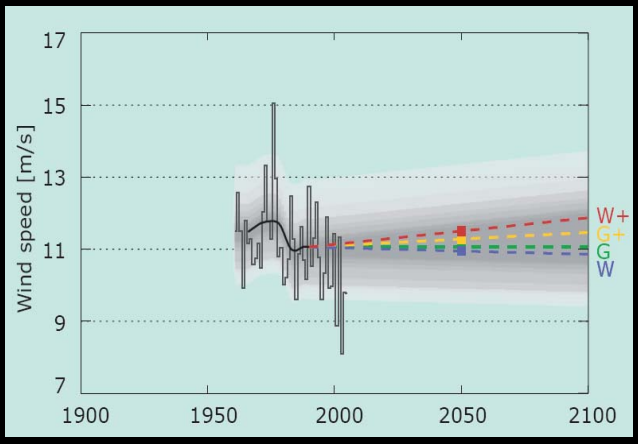
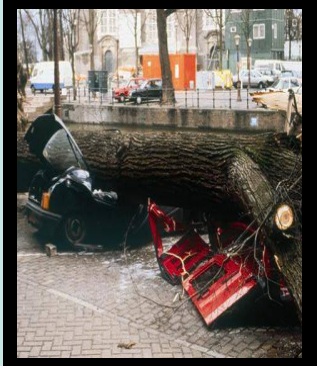
Change in wind storms





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	coldest winter day per year	+1.0°C	+1.5°C	+2.1°C	+2.9°C
	average precipitation amount	+4%	+7%	+7%	+14%
	number of wet days (≥ 0.1 mm)	0%	+1%	0%	+2%
	10-day precipitation sum exceeded once in 10 years	+4%	+6%	+8%	+12%
	maximum average daily wind speed per year	0%	+2%	-1%	+4%
Summer [3]	average temperature	+0.9°C	+1.4°C	+1.7°C	+2.8°C
	warmest summer day per year	+1.0°C	+1.9°C	+2.1°C	+3.8°C
	average precipitation amount	+3%	-10%	+6%	-19%
	number of wet days (≥ 0.1 mm)	-2%	-10%	-3%	-19%
	daily precipitation sum exceeded				
Sea level	absolute increase	15-25 cm	15-25 cm	20-35 cm	20-35 cm

much discussion on sea level rise

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Delta committee scenarios	KNMI'06 scenarios
'Plausible upper limit' of possibilities	Range of most likely outcomes
Specifically for the objective of this committee: long-term safety against flooding	General for everyone: wide range of applications
Targeted at 2100 and later	Targeted at 2050 and 2100
Basis is IPCC 'likely' upper estimate of global temperature rise (+6°C in 2100 w.r.t. 1990)	Basis is IPCC 'best estimates' for global temperature rise (+2°C or +4° in 2100 w.r.t. 1990)
Extreme extrapolation of uncertainty ice sheet dynamics	Less extreme extrapolation of uncertainty ice sheet dynamics
⇓	⇓
Maximum sea level rise in 2100 of 120 cm (excl. 10 cm subsidence)	Highest scenario for sea level rise in 2100 is 85 cm (excl. subsidence)

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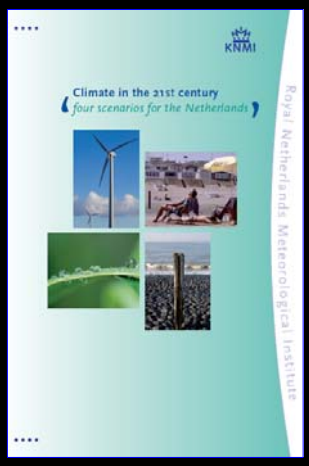
Conclusions

1. Strategies for local adaptation to changing climate conditions are needed for many sectors of society
2. KNMI06 climate scenarios address uncertainties at global, regional and local scales



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Outlook

1. KNMInext will include new research results (AR5)
2. EC-EARTH and RACMO2 will be used, but in the context of other models, because single GCM or RCM projections don't sample the full range of possible future climates

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Outlook

3. At present no spatial differentiation in the scenarios (all spatial variation results from the present climate), but indications for coastal effects, etc.

4. Fastly growing number of customer services (tailoring climate information) for various stakeholders (professional users and policy makers); they require smart combinations of observations and scenarios/projections

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What is “Tailoring”?

- Dialogue about user requirements (which data, detail, intended way to use)
- Deliver data in requested format
- Guidance during use (e.g. pre-processing for impact models)
- Guidance during use in policy processes (how deal with uncertainties)

→ Interactive process



Examples of “Tailoring”

Gas production: Does the chance at extreme low temperatures change up to 2030?

Refineries: potential effecten of climate change in the Netherlands around 2030 and 2050 (extreme rainfall and temperatures, wind)

Road safety: Data on “dangerous weather”-conditions around 2020 (extreme rainfall, heat waves)

Spatial planning provinces: maps with spatial variation in climate variables around 1990 and 2050

Urban water management: Do extreme rainfall intensities per hour and per day change in the same way around 2050-2100?