Royal Netherlands Meteorological Institute
Ministry of Transport, Public Works and Water Management

Climate Services

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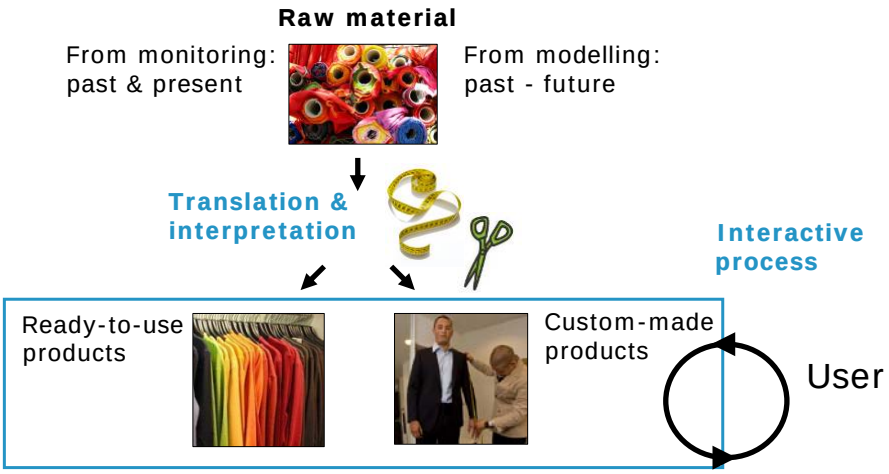
Link between KNMI departments

Monitoring
For a reference climate, and for monitoring change

Services
Translating science to users

Modelling
Understanding processes and climate change

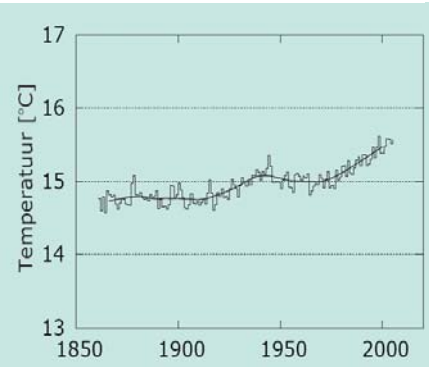
Process of climate services



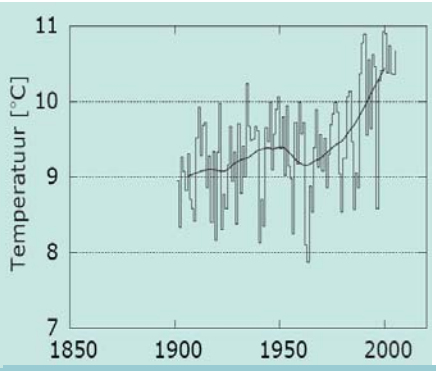
Monitoring: temperature

Significant increase of yearly average temperature on most of the European weather stations
Larger year-to-year variation for region than globally

World



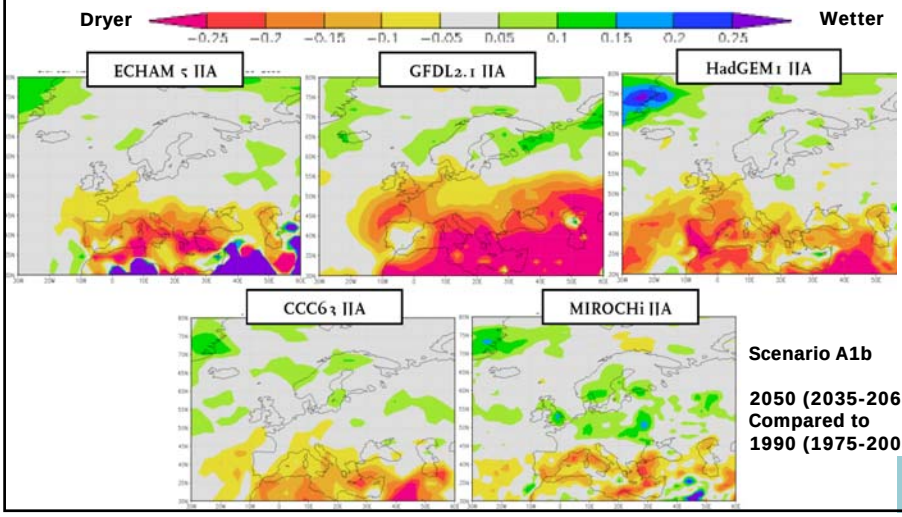
Netherlands



Modelling: Summer precipitation

Southern Europe: decrease

Northern Europe: **increase or decrease**



Scenario A1b

2050 (2035-2065) Compared to 1990 (1975-2005)

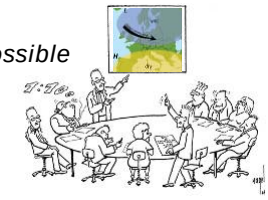
Climate services: interactive process

Finding out the real question of the user

Precipitation extremes, but which one? Per hour? Per day?

Pointing out limitations of knowledge

Climate information at the scale of hectare is not possible



Guidance in interpretation and use

How to use different time horizons? What do details on maps mean?

Wide range of users and requirements

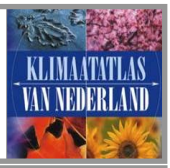
	1 	2 	3 
	Energy	**Urban water management**	**Coastal protection**
Preferred climate data	Wind speed	Rainfall extremes	Sea level rise
Time resolution	Day-month-year	5-6 minutes	Yearly
Preferred time horizon	2015-2020	2050-2100	2050-2200

Ready-to-use products, examples

Ready-to-use products

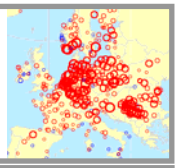
Climate atlas

1971- 2000



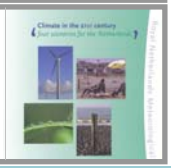
Online climate data

1950 - 2008



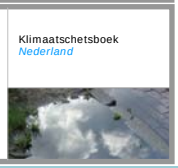
Climate scenarios

2050 -2100



Maps: climate & impacts

2050-2100



Regional climate scenarios

A wide range of sectors: “How do we deal with uncertainty about climate change?”

Climate atlas | Online climate data | **Climate scenarios** | Maps: climate impacts

Climate scenarios

Consistent pictures of a possible future climate

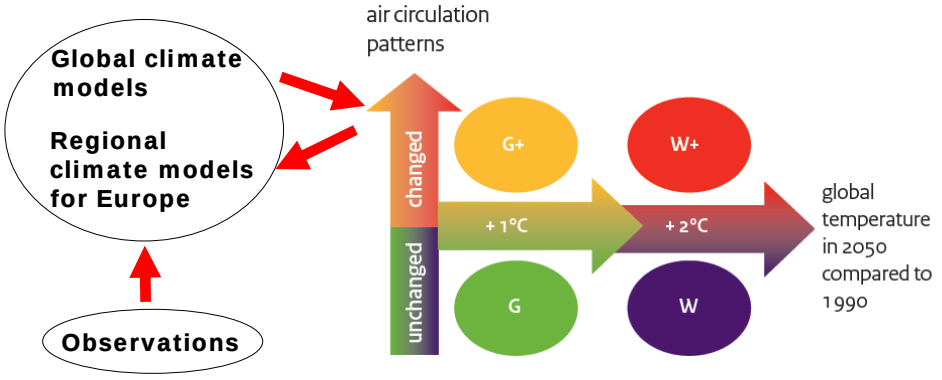
They indicate the magnitude of changes in e.g. temperature, precipitation, evaporation, wind and sea level

For adaptations in:

water management, coastal protection, agriculture, energy, environmental protection, tourism, etc.

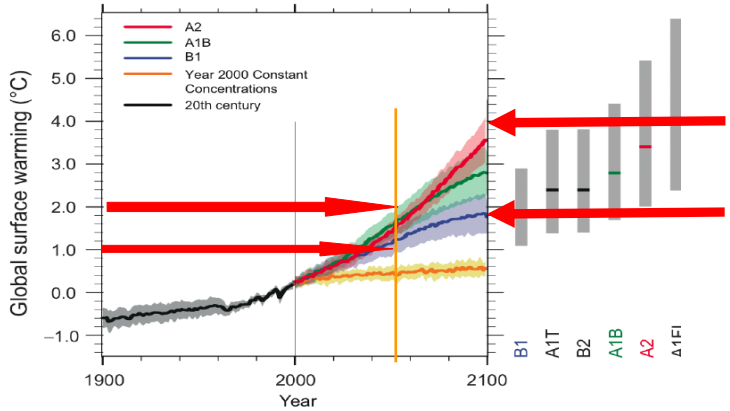
Regional climate scenarios

Product: "KNMI '06 climate scenarios" - Four scenarios for the Netherlands in 2050 and 2100



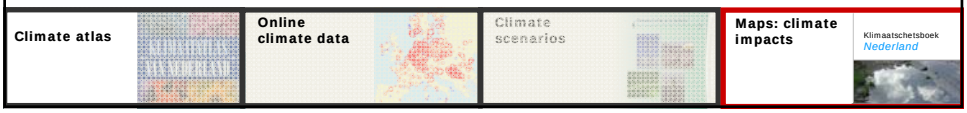
Regional climate scenarios

Together, the KNMI '06 climate scenarios depict the range of the most plausible changes



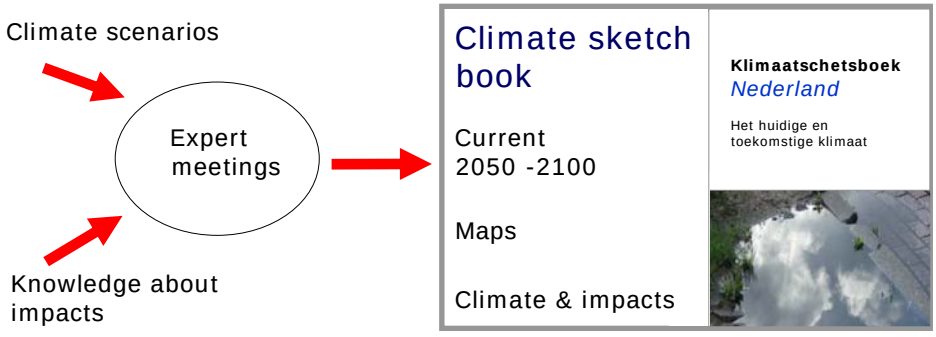
Climate sketch book

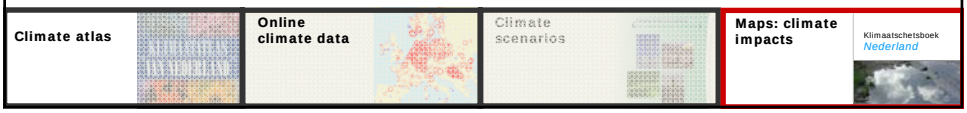
Provinces: “For spatial planning and adaptation we need an overview of spatial differences in climate & impacts of climate change”



Climate sketch book

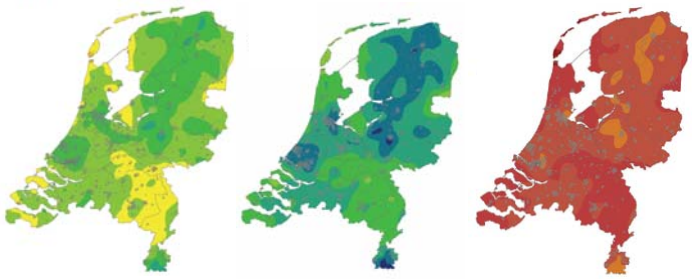
Product: “Climate sketch book” - maps of current and future climate and impacts





Climate sketch book

Examples of maps: Change in mean summer precipitation



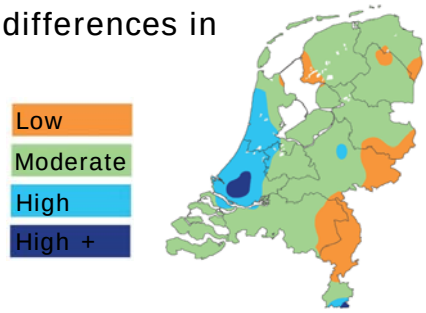
Current climate **1976-2005**

W scenario **2100** ***wetter***

W+ scenario **2100** ***dryer***

Climate sketch book

Examples of maps: Regional differences in extreme precipitation



mm per 24 hours	Current climate 1906-2003	W scenario 2100	W+ scenario 2100
High+	62	95	74

Custom-made products, examples

Custom-made products

Urban water management
change in precipitation per hour

Health organizations
heat stress

Railway
change in ice formation

Gas plants
change in low temperatures

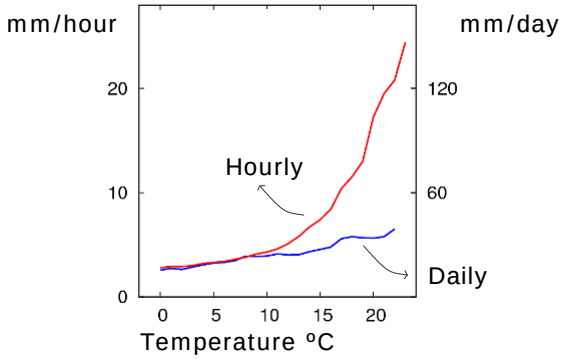
Urban water management

Planners of sewage systems: “Will events with extreme rainfall in short periods occur more frequently in future?”

Egmond aan Zee, August ’06

Urban water management

Result: The intensity of hourly extreme showers increases more than the intensity of daily extremes with increase of day temperature

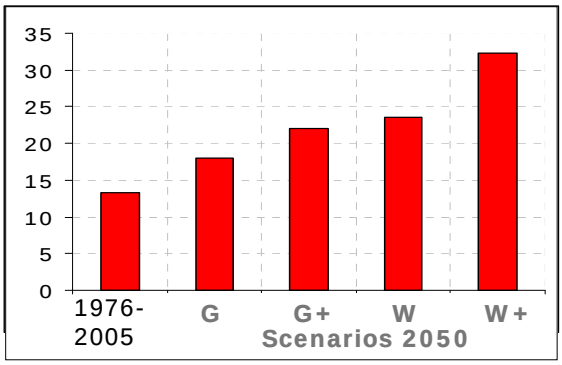


Health organizations: heat stress

Team National Heat Plan 2007: “Will summers with heat stress like 2003, 2006, become more common?”

Heat stress: future projections

Result: Average number of days with a maximum temperature > 27°C increases



Public warning in case of 5 consecutive days with temperatures higher than 27°C

Railway: change in ice formation

Team Betuwe Track: “Will the risk of freezing of fire extinguishing waters along railway tracks change in future?”

Railway: change in ice formation

Result: The chance on freezing temperatures will decrease

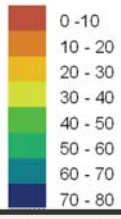
Current climate
1976-2005

W scenario
2050
Less freezing

W+ scenario
2050
Less freezing

Betuwe track

Days with minimum < 0ºC



Urban water management | Health organizations | **Railway** | Gas plants

Gas plants: change in low temperatures

Gas production company: “Will peak gas demands during extreme cold periods occur less frequently due to an increase in temperature?”

A critical threshold is the effective temperature of -16.5ºC. “Effective” means that wind is also included.

Urban water management | Health organizations | Railway | **Gas plants**

Gas plants: change in low temperatures

Result: The return period for years with effective temperatures < -16.5ºC will increase for all four KNMI climate scenarios

Current climate 1904-2007	G scenario 2030	G+ scenario 2030
37 years	54 years	66 years
	Less frequent -	*Less frequent --*