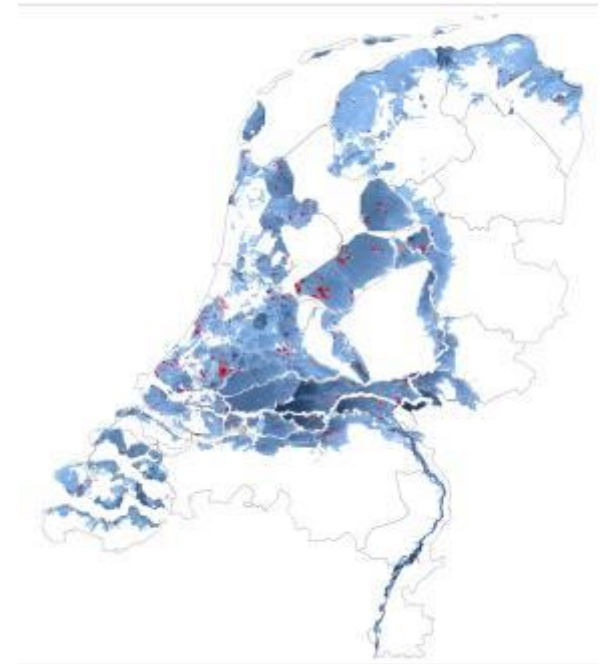


transport & climate adaptation

Piet de Wildt
Ministry of Infrastructure and the
Environment
The Netherlands

the Netherlands' exposure profile

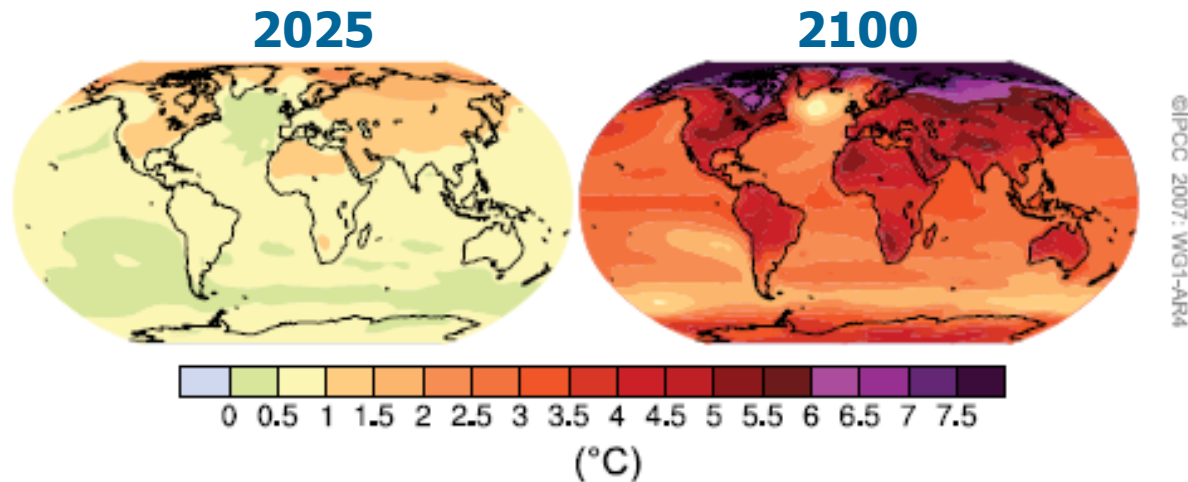
- About 400 km of Rhine river
- 60% flood prone
- About 9 million inhabitants below flood level
- GDP 600 bln euro
- High protection level
- 3500 km of flood defences,
- hundreds of locks, sluices, pumping stations



Global Circulation Models

- changes in temperature, wind precipitation at a global level
- overall picture, limited use for local impacts
- grid 200 x 200 km

Mean temperature change SRES A2 scenario



regional climate models

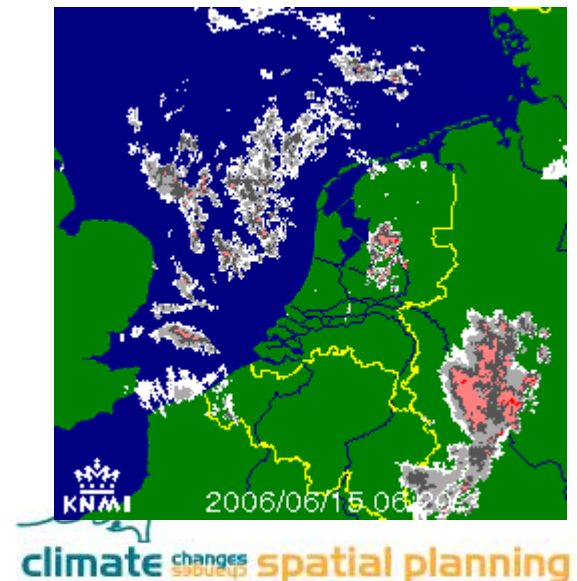
- better representation spatial detail: land-sea interaction, topography
- better representation small scale events: precipitation extremes, wet-day-frequency, land atmosphere interaction
- grid up to 10 x 10 km

RCM used for regional scenarios



GCM

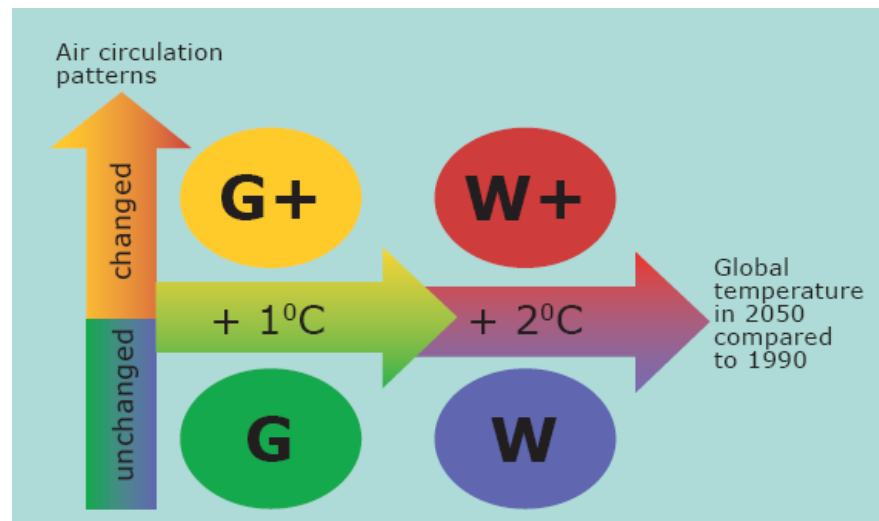
RCM



climate change in the Netherlands

climate change in the Netherlands depends on

- global temperature rise
- change in local wind regime



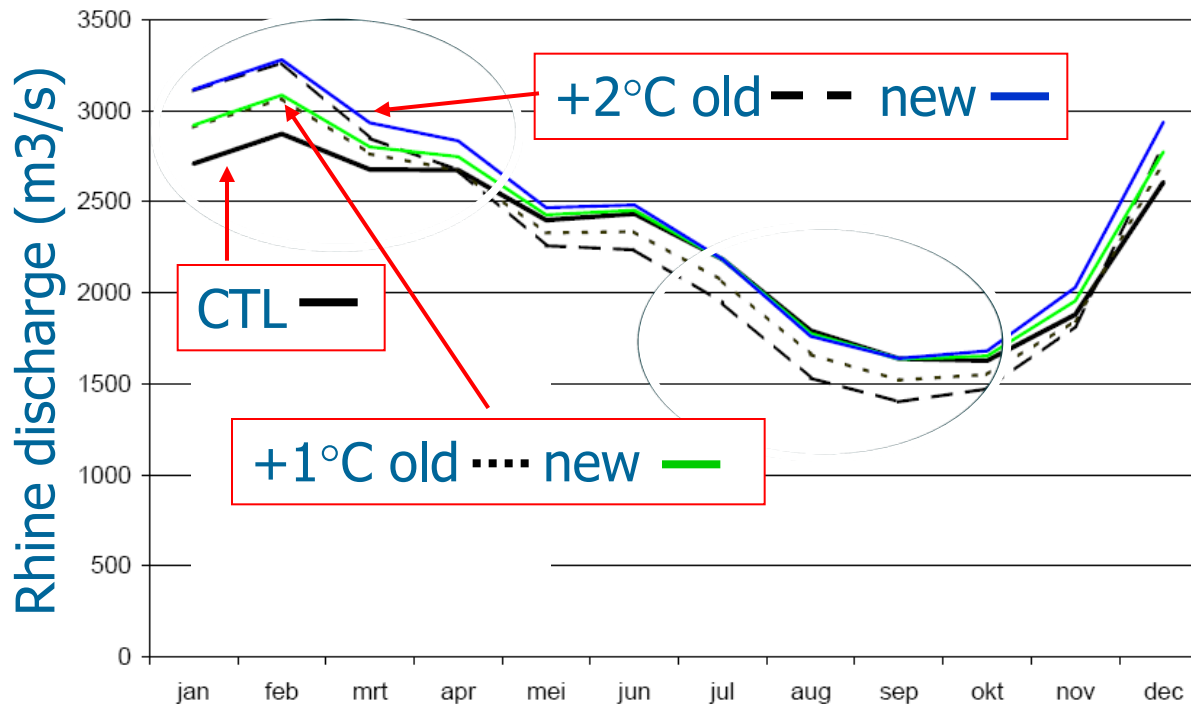
the KNMI climate scenarios: change in 2050 relative to 1990

| | | 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 |
| | 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% |
| Summer ³ | maximum average daily wind speed per year | 0% | +2% | -1% | +4% |
| | 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 once in 10 years | +13% | +5% | +27% | +10% |
| Sea level | potential evaporation | +3% | +8% | +7% | +15% |
| | absolute increase | 15-25 cm | 15-25 cm | 20-35 cm | 20-35 cm |

scenario tailoring

assessment of impact of new scenarios on
Rhine discharge

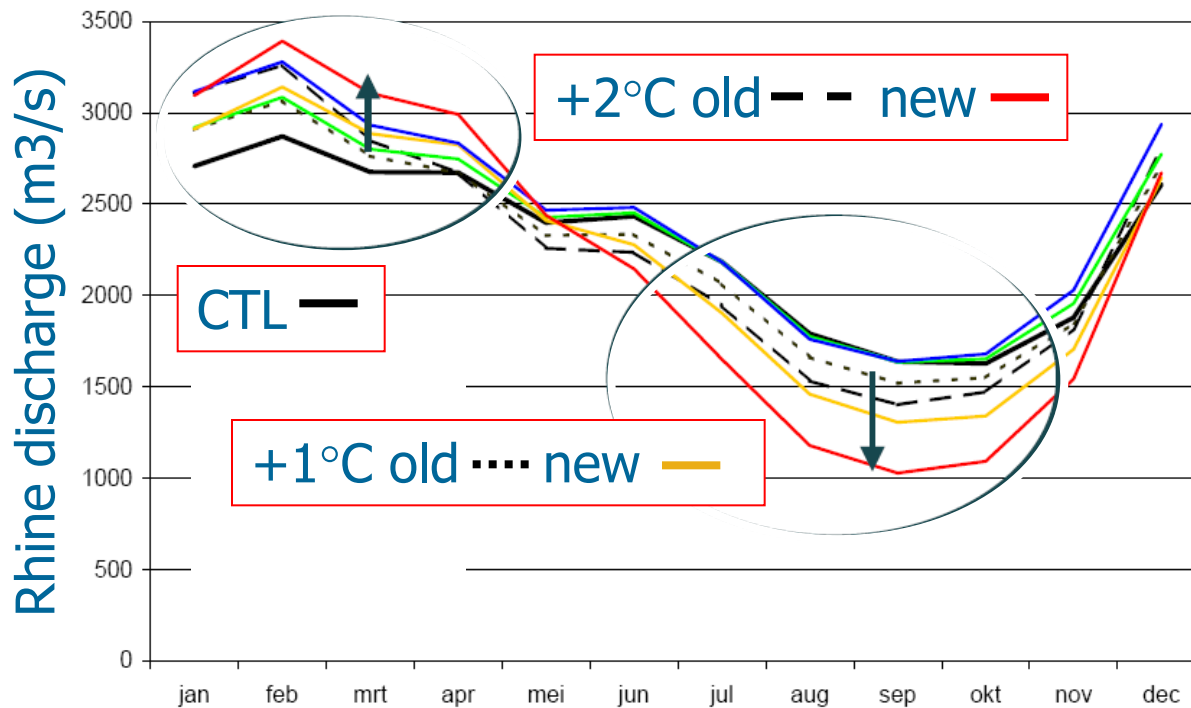
Without circulation change



scenario tailoring

assessment of impact of new scenarios on
Rhine discharge

With circulation change



take away messages

Climate change effects: where, what, when
on infrastructure, modes, logistics

- sealevel rise: port infrastructure/accessibility
- river discharge: inland transport
- downpour: road safety, capacity

but not only technology, effects on human behavior are important as well.

take away messages

awareness raising is necessary

waterway: medium

road/rail: rather low

action is urgent

do we have a message for UNFCCC
CoP 21 (Paris, December 2015)

transport & climate adaptation

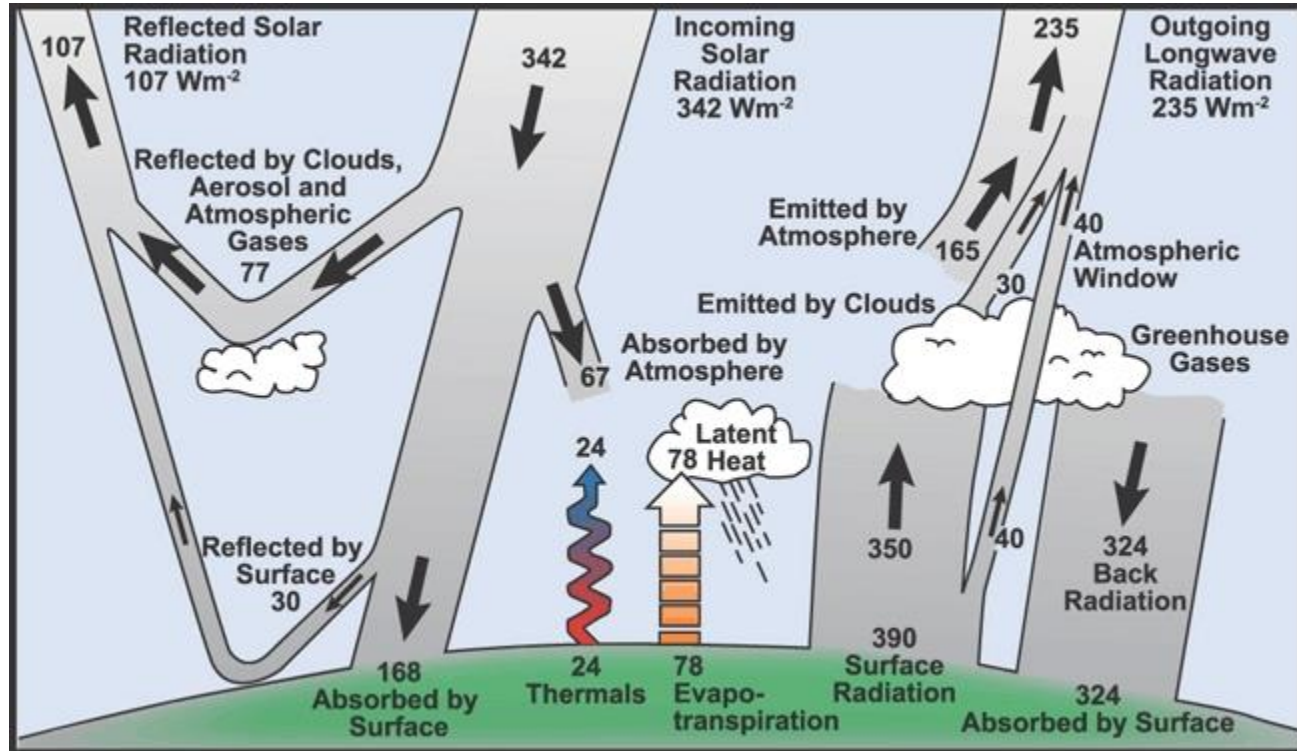
thank you

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the climate system



uncertainty

