Climate robust infrastructure

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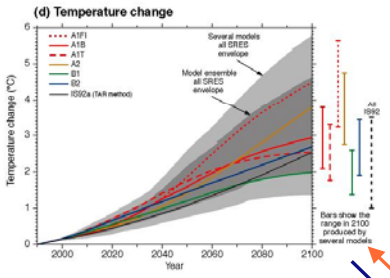
COP 15

TNO | Kennis voor zaken

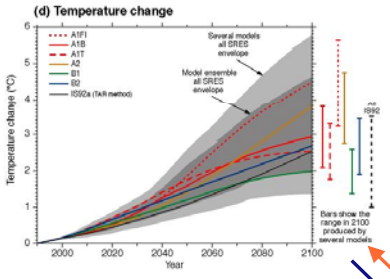
Outline

- Climate change and infrastructure
- Key questions
- Directions for solutions
- Closure

Climate change and infrastructure



Climate change and infrastructure

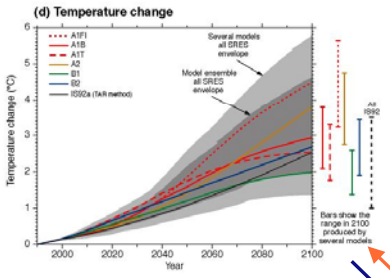


Sea level rise:
- e.g. flood risk

Temperature:
- e.g deformed rails

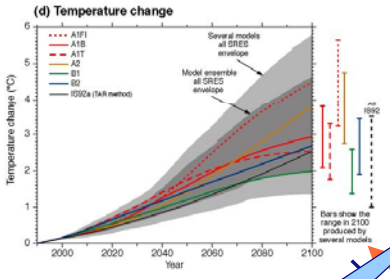
Ground water level:
- weakening road foundation
- ….

Climate change and infrastructure



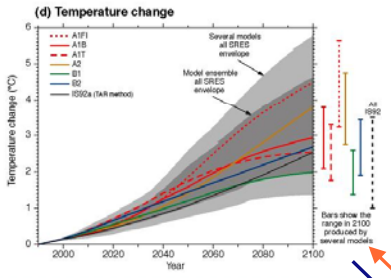
Materials
• e.g. cement
Construction process
• e.g. road construction

Climate change and infrastructure



Extreme rainfall, mist:
• accidents, safety
• congested traffic
• …
Wind :
• branches/leaves and debris on (rail)road
•….

Climate change and infrastructure



Traffic:
- Co_2-producing vehicles, airplanes, …

Key questions

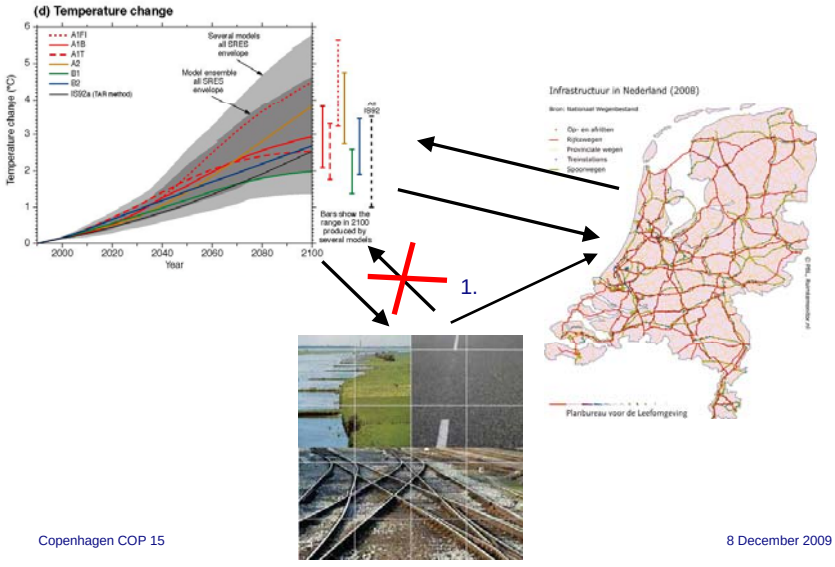
Mitigation
- What can infrastructure contribute to a sustainable future?
- Which solutions should be developed?
- How do they also serve other purposes?

Adaptation
- How vulnerable are our infrastructural systems?
- What will the impact of climate change on which timescale?
- Which adaptation strategies are adequate?

Directions for solutions

1. Low CO_2 footprint binders in concrete
2. Roads as solar energy collectors
3. Multi-functional dikes
4. Robust (core) networks

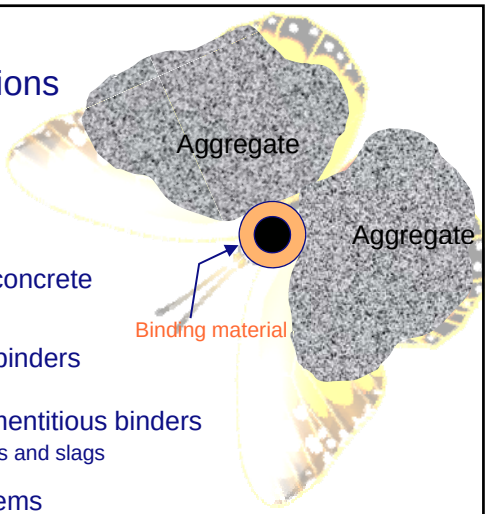
1. Low CO_2 footprint binders in concrete



Drivers for low CO_2 footprint binders in concrete

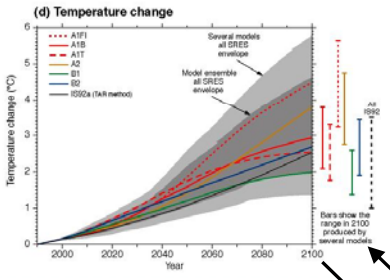
- Cement is an essential component of concrete
- The cement production is responsible for 7% of the world CO_2 output, the same level as civil air transport
- Per capita per year the cement consumption is 350 kg in NL, 570 kg in Belgium

Outlook on possible solutions



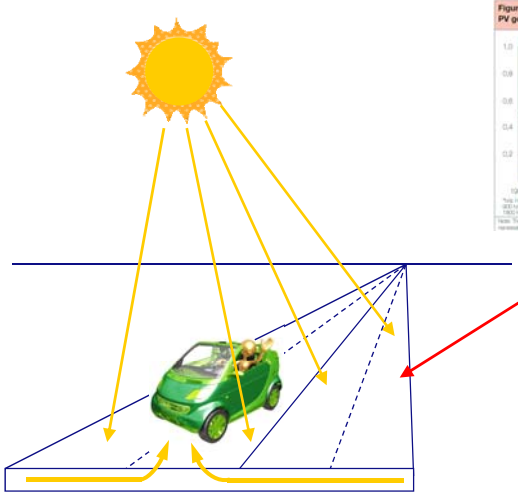
- Reduce the cement content of concrete
  - Use only where necessary
- Replace cement by secondary binders
- Convert waste streams into cementitious binders
  - e.g. by decontamination of fly ashes and slags
- Develop alternative binder systems
  - e.g. geopolymers

2. Roads as solar energy collectors



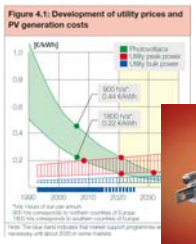
2.

Wouldn't it be great if…



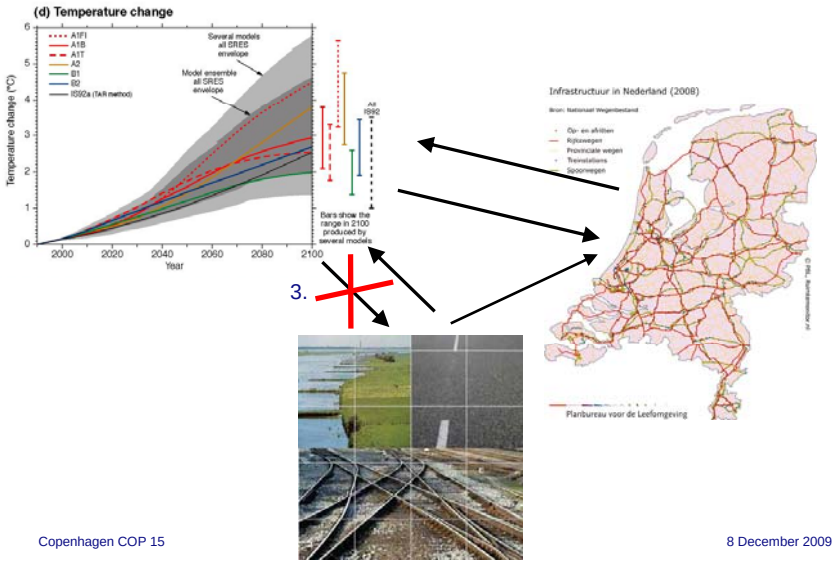
zon-e-weg

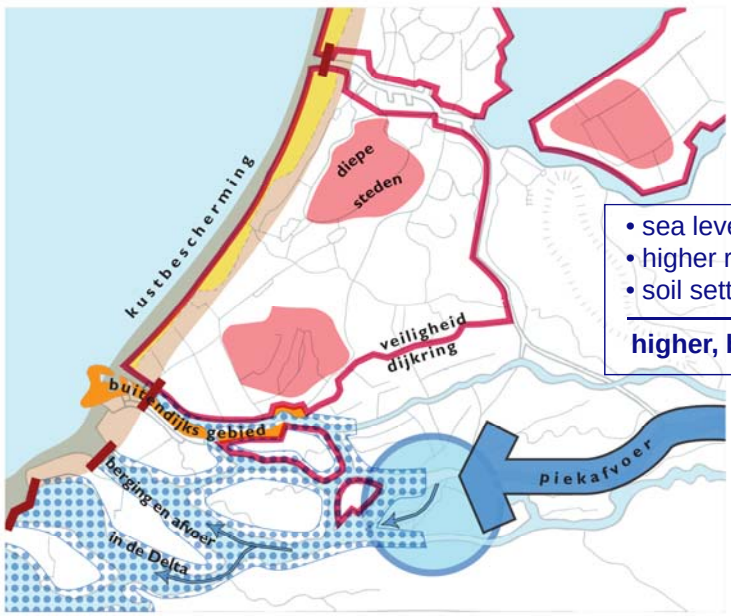
…it's time to do it



- Energy neutral
- Clean
- CO_2-low
- Silent

3. Multifunctional dikes





Het risico neemt toe

3.1 b

- sea level rise
- higher river discharges
- soil settlement

\+

higher, broader dikes

RWS-RIZA

3. Multi-functional dikes

- Dikes require more space
- Cities lack space

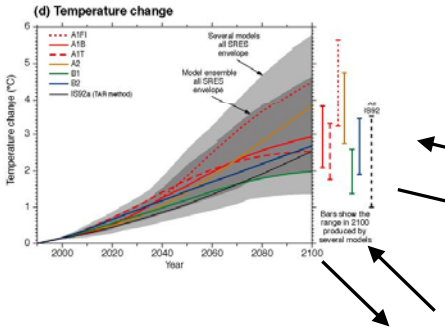
→ combine functions

Katwijk

Key questions:

- who is responsible for the dike?
- what to do in case of an imminent flood

4. Robust core networks



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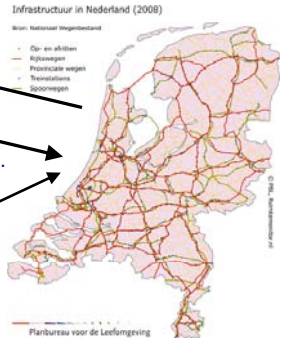

Example: effect of rain combined with accident

Rain/storm causes major problems on the road

This will probably happen more often in future

Impact of rain increases as network becomes more densely populated

Robust core network

- Robust road network is less vulnerable for disruptions such as heavy rainfall and accidents.
- Examples of measures to increase robustness:
  - A designated core network:
    - no trees alongside the road
    - heated top layer
    - maximum incident/traffic management
  - Alternative routes over the underlying road network
  - Buffers in the network
  - Use of weather forecasts / weather alarm
  - Complementary road and rail networks

Closure

- Wide variety of directions for solutions
- Many solutions have also other advantages
- Let’s think in opportunities, not (only) in problems