



Adaptation and mitigation strategies in the Netherlands/Apeldoorn

Sjaak de Ligt
Climate Alliance the Netherlands





- Sea level in the Netherlands



Danger threatens by climate change:

- From the west (the rise in sea level)
- From the east (the rivers Rhine and Maas)
- From above (excessive precipitation/excessive evaporation)




Underlying problems:

- Cumulative effect of urbanisation
- Regulated water levels for agriculture
- Decline of the surface level

→ Loss of flexibility for temporary storage of water



Mitigation Strategy

- National level:
 - Climate action plan
 - Reduction energy consumption
 - Renewable energy (10% in 2010)
 - Reduction other greenhouse gases
 - Underground storage of CO₂
 - Carbon credit's.
- Local Level:
 - Agreement between local authorities and government  (EUR 30 mln) subsidy for energy reduction schemes and sustainable energy programmes)



Adaptation Strategy National Level:

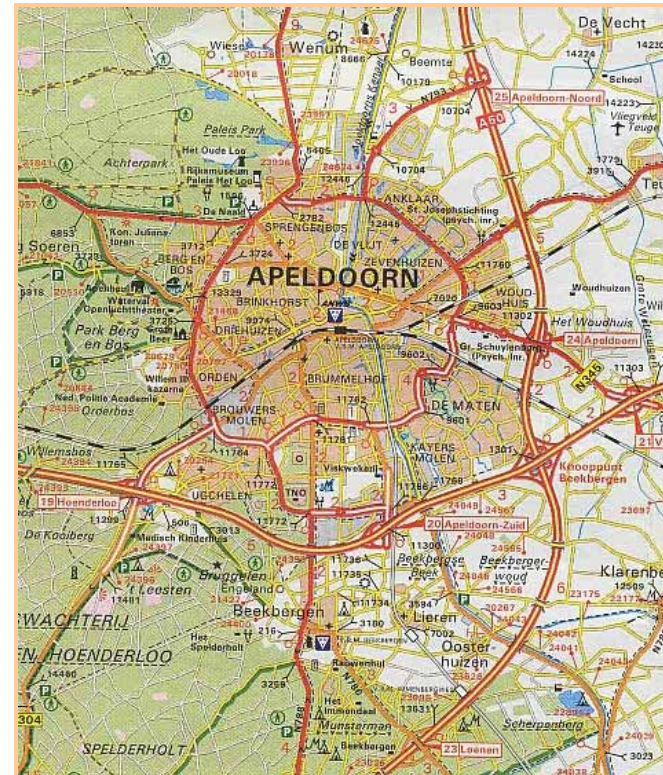
- Several programmes:
 - Adaptation Space and Climate
 - Living with Water
 - Climate for Space

Adaptation strategy Local Level

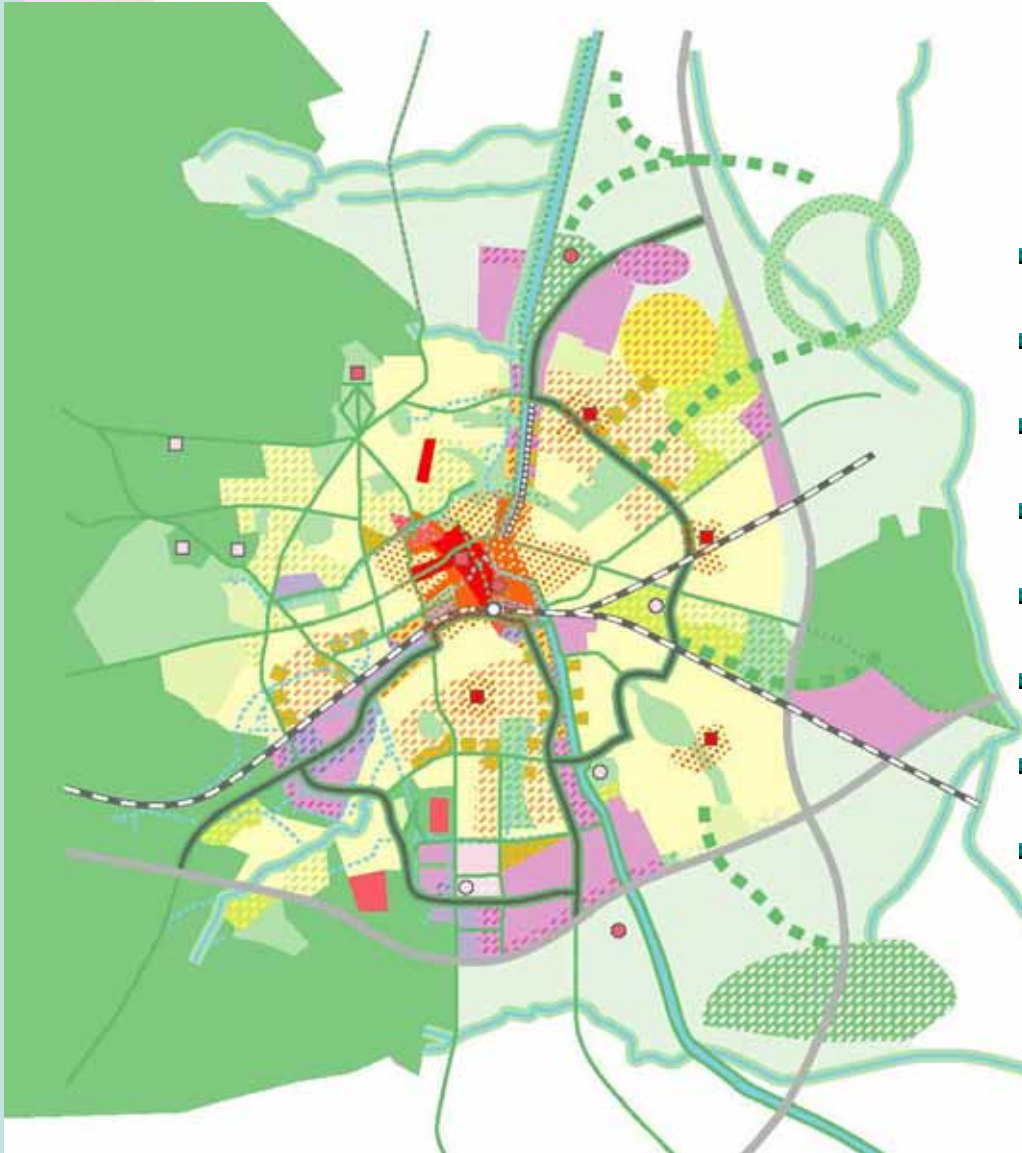
- All municipalities make urban and rural water plans based on the forecast of 2050 combining:
 - (ground)water conservation
 - enforcing infiltration
 - rising groundwater levels
 - water quality
 - energy storage/production

Apeldoorn









- 156.000 inhabitants;
85.500 workers
- Large area (for NL);
34.000 ha
- 1 city + 10 villages



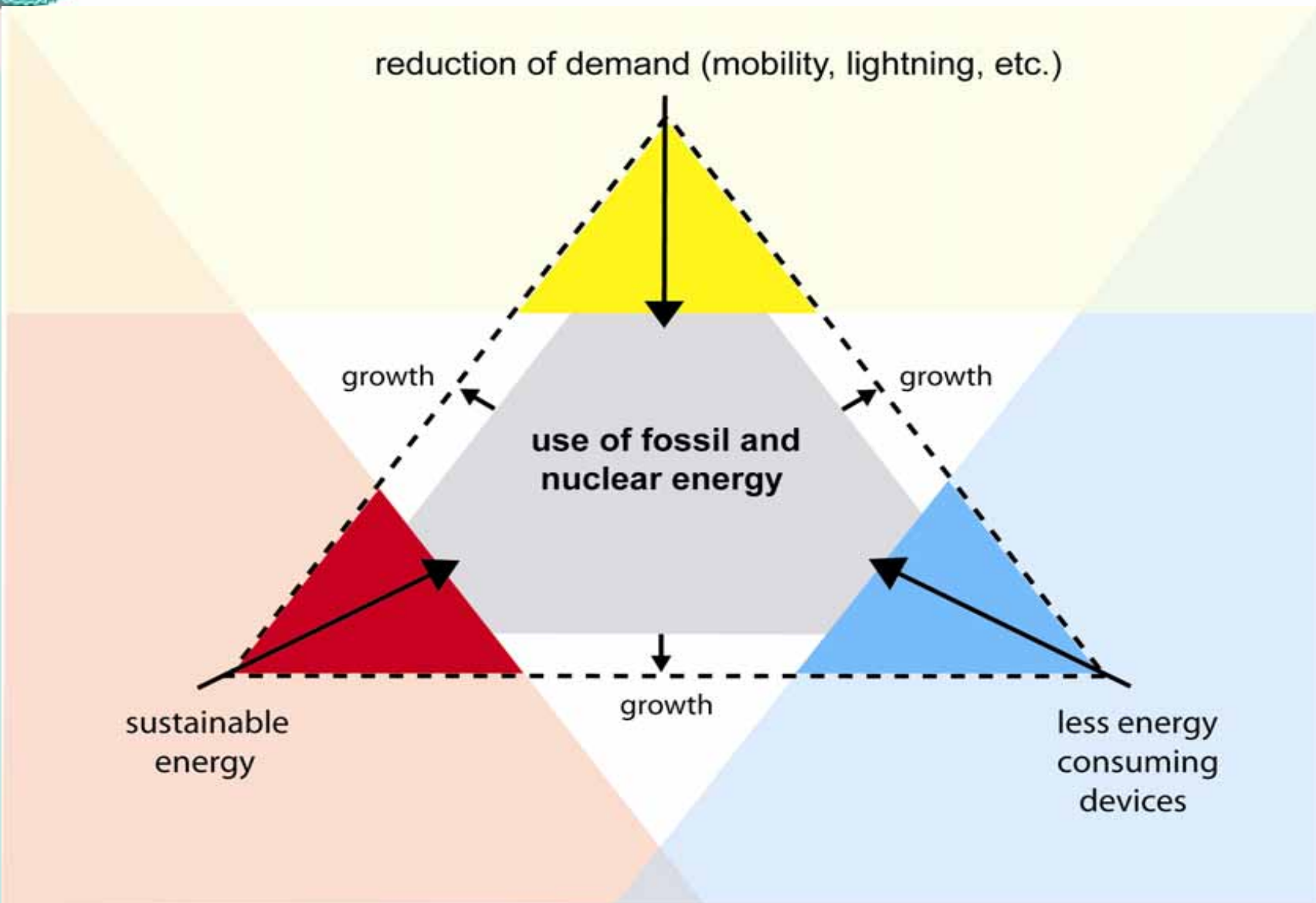
Apeldoorn Sustainable



High ambitions

-  sustainable building
-  energy neutral
-  green template
-  housing
-  industry
-  services
-  park management
-  etc

Apeldoorn Energy neutral



Results in Apeldoorn

- Agreement with social housing companies for energy reduction in their properties
- Houses in new urban areas: 90% climate neutral (sustainable energy based heating and cooling system)
- Own operations based on 100% sustainable electricity
- Development of 50% less energy consuming bus for public transport (Whisper)
- Dry and free guarded bicycle parking in city center
- Bus tickets for local transport € 1,- (per day)

Water problems in urban areas

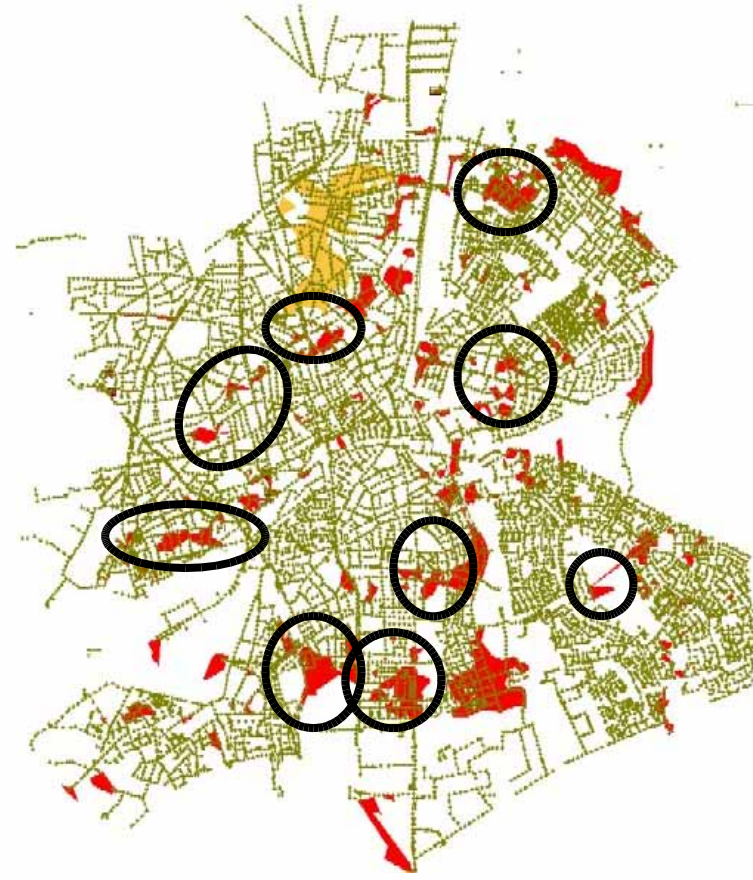


Water in the urban area

Middle scenario National Watermanagement Agreement



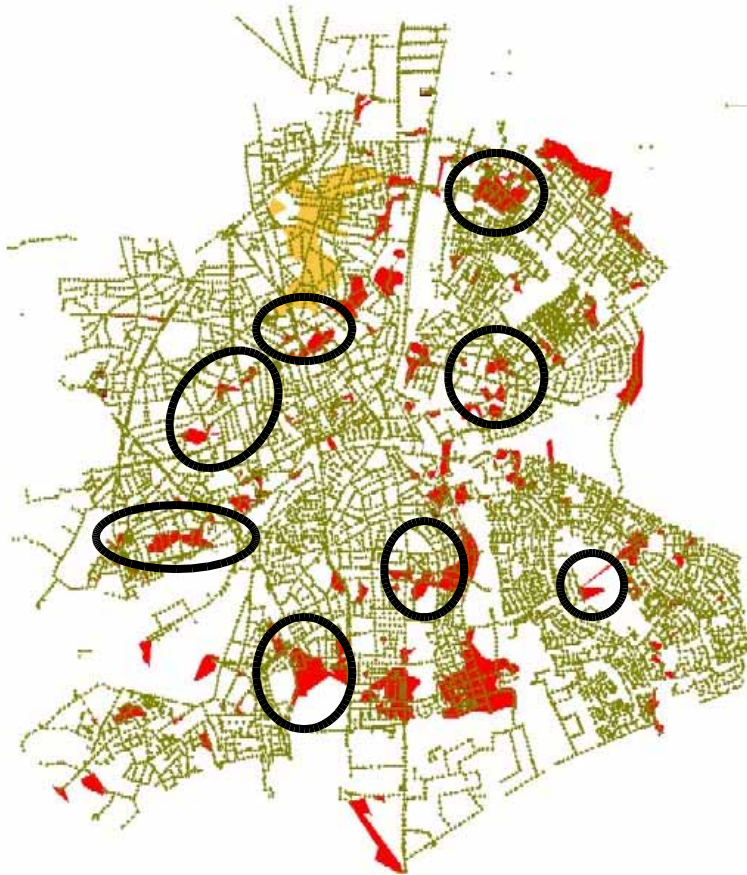
Standard shower



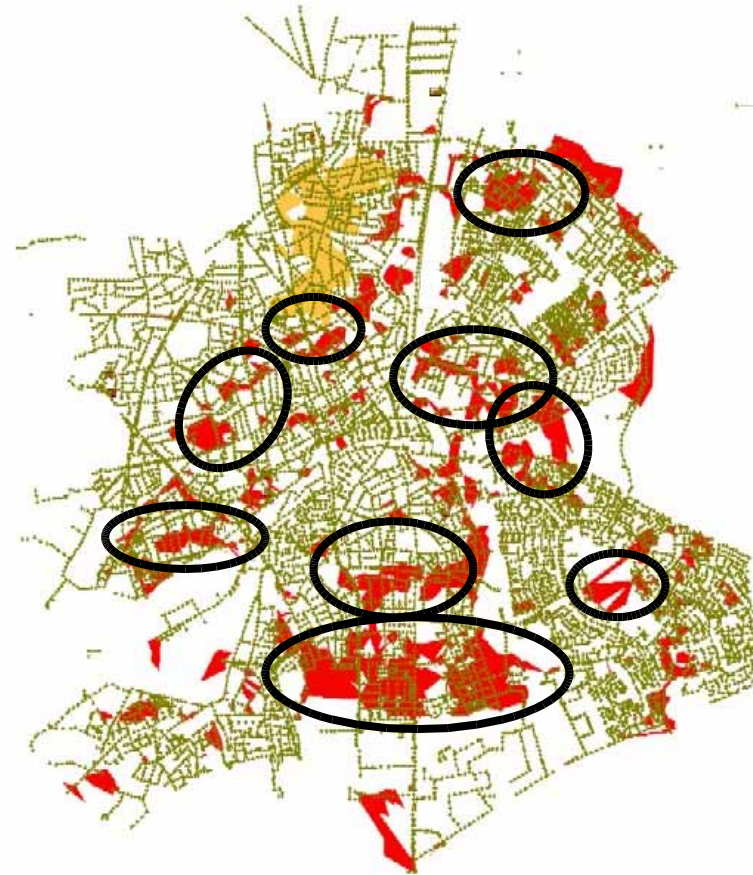
Standard shower + 10 %

Water in the urban area

High scenario National Watermanagement Agreement



Standard shower +10%



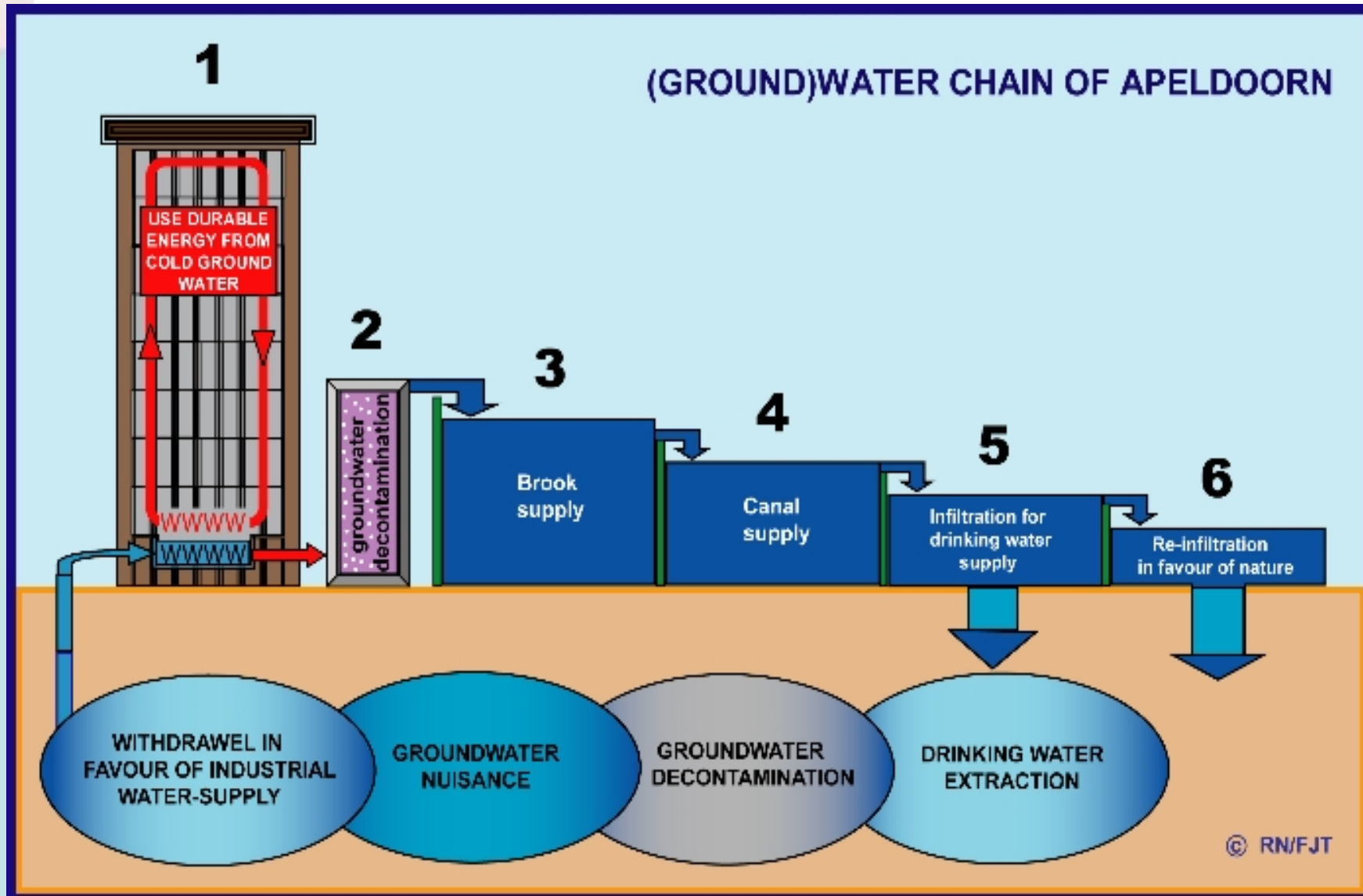
Standard shower + 40 %

Task for Apeldoorn

In consequence of policy of other authorities

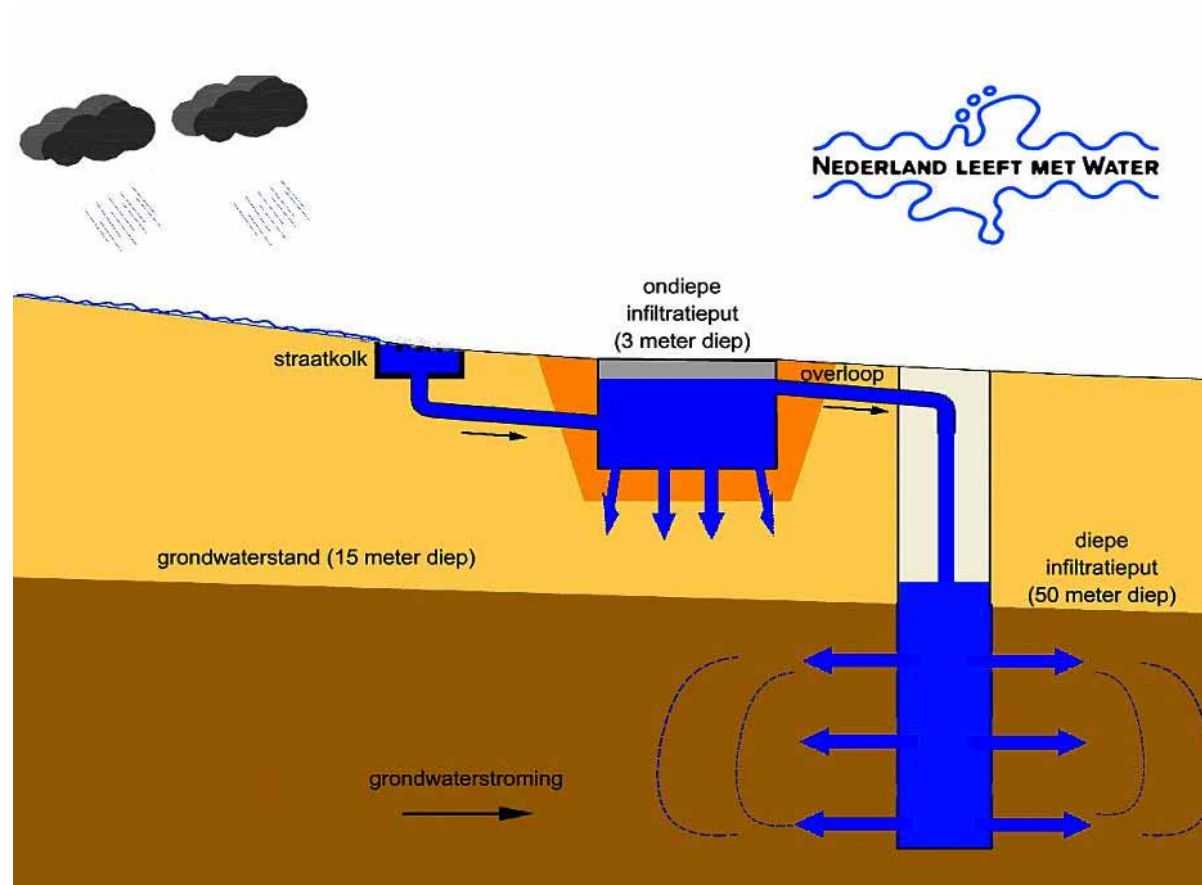
- **1x per 100 years flooding of surface water**
- **No groundwater inconvenience in urban areas**
- **Disconnecting 5% of hard surface (pavements, roofs) from the sewerage before 2009**
- **No inconvenience out of sewerage**

Groundwater chain





Storage in deep layers



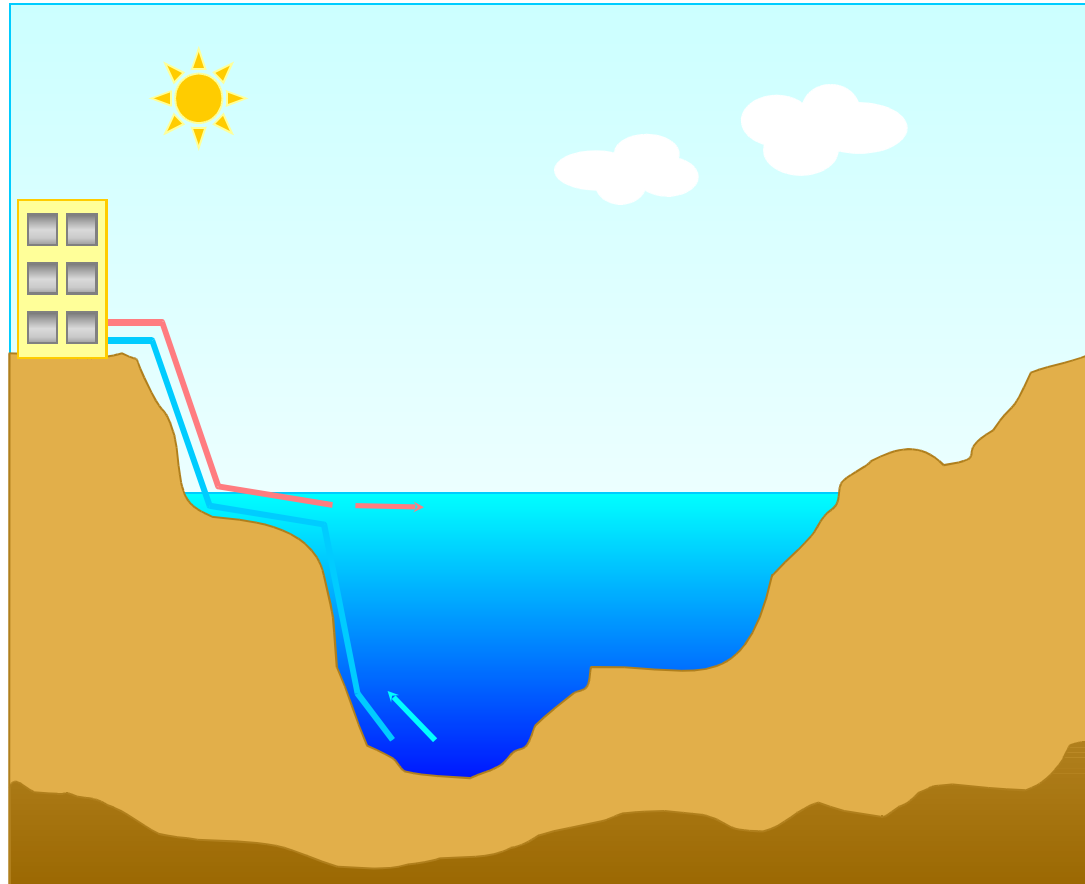


Adaptation in rural areas

- Use excess of water in wet periods for dry periods
- Prevent flooding in periods of excessive rainfall
- Use water retention for creating interesting housing/agricultural areas
- Use water retention for energy storage



Lake energy





Making better use of water retention: Blue City and new urban area





Adaptation strategy in agricultural greenhouse areas

Problems with flooding and drought

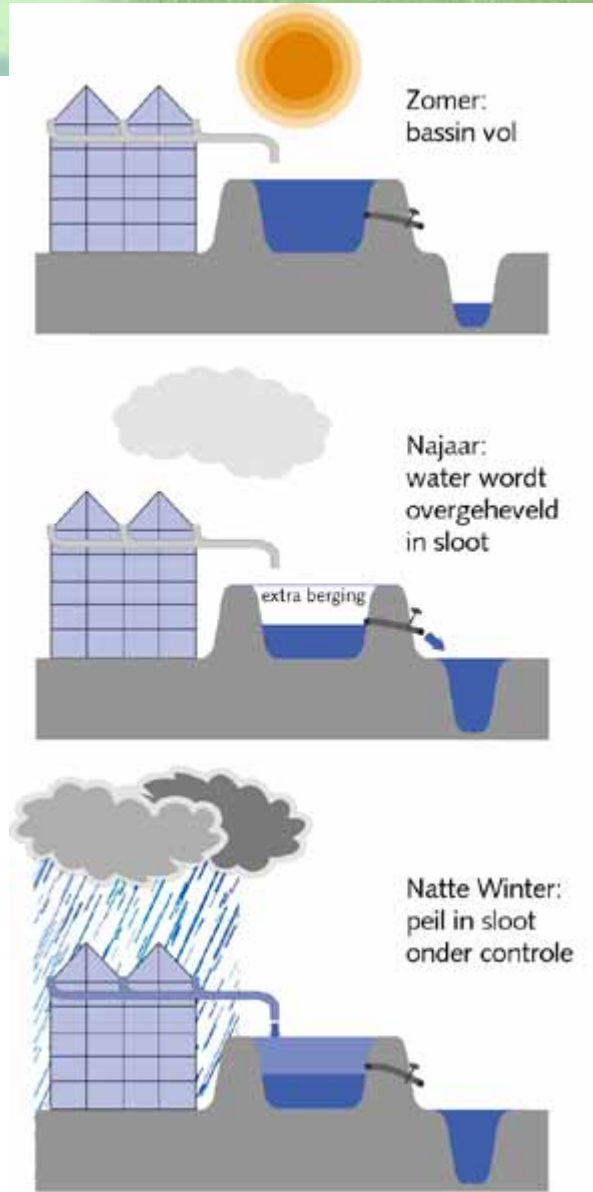
- storage in irrigation basins
- storage under the greenhouses
- floating greenhouses



Klimaatverbond Nederland

Adaptation strategy in agricultural greenhouse areas

Storage in irrigation basins





Klimaatverbond Nederland

Adaptation strategy in agricultural greenhouse areas

Storage under the greenhouses





Klimaatverbond Nederland

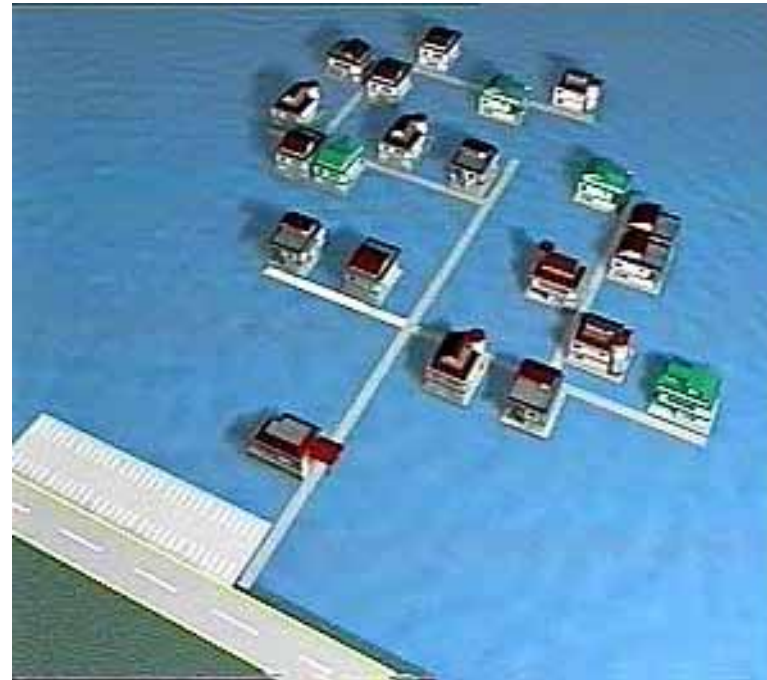
Adaptation strategy in agricultural greenhouse areas

Better use of retention areas





Floating houses







Living with water

