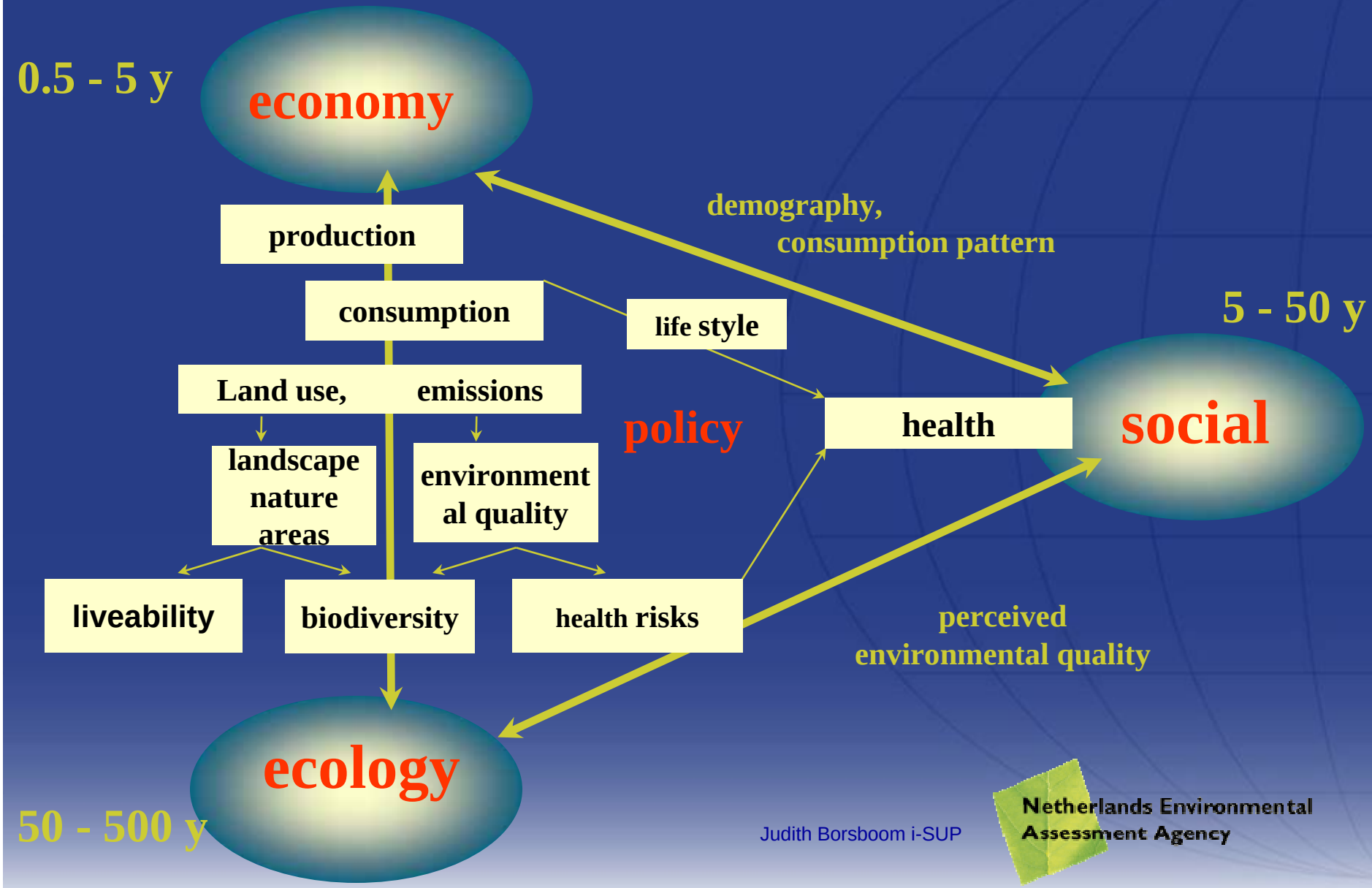
Judith Borsboom

Land Use Modelling for Environmental and Ecological Policy Assessment:

Sustainable Netherlands Study

in collaboration with:
Wageningen University & Research centre
WL | Delft Hydraulics
Arcadis

Research domains and sustainable development

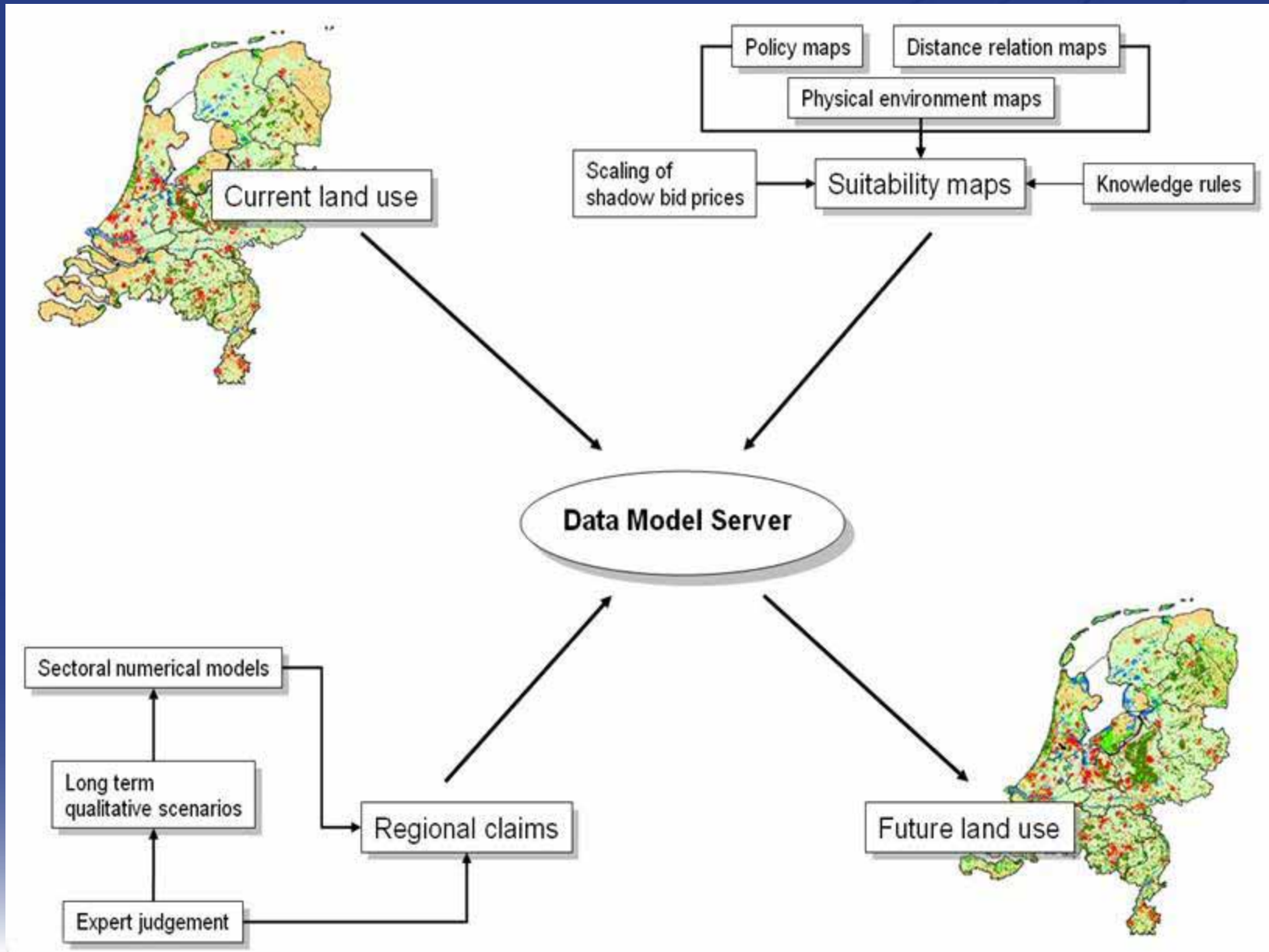


Netherlands Environmental Assessment Agency

Why interest in land use modelling?

- Many environmental and ecological problems related to developments in land use e.g.
  - habitat fragmentation
  - deterioration of landscapes
  - increased flooding risks
  - air quality and noise pollution
- Gain insight in spatial changes:
  - development multi-nomial logit based Land Use Scanner (1997) and CA-based Enviroment Explorer (1998)
- Applied for the Netherlands in
  - Environmental Outlooks
  - ex-ante evaluation National Spatial Policy Plan
  - Sustainability Outlook 1 and 2
- Intermediate step in model-chains

Structure Land Use Scanner



Example: Second sustainability outlook

a request of the Dutch government

Sustainability Outlook published in 2 parts:

- "Sustainable Netherlands"
- "The Netherlands in a sustainable world"

Relevant questions from Upper and Lower House

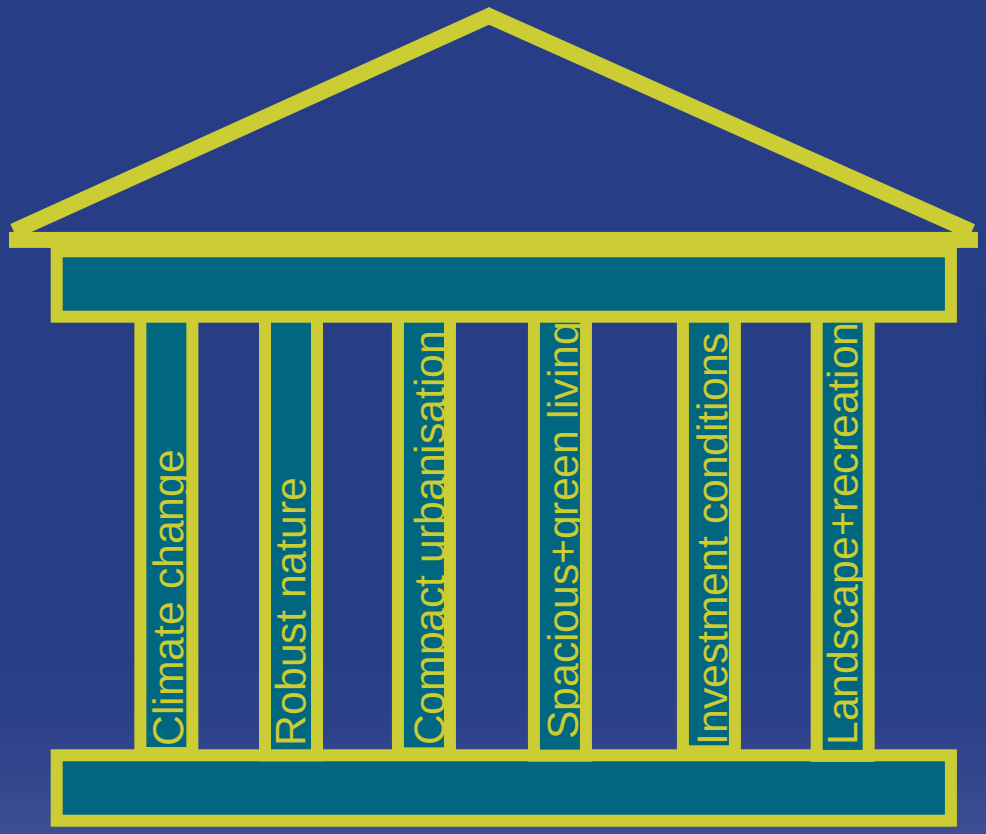
- Motion Lemstra (Upper House): long-term strategic vision
- Motion Bochove/ Depla (Lower House): worst-case climate change

Framing actual policy discussions

Does the government wish to:

- ..consider and tackle challenges due to long term climate change and associated changes in the water system ?
- ..take international agreements (EU) seriously ?
- ..put effort into compact urbanization ?
- ..improve spatial conditions for (international) business and investment ?
- ..take people's wishes for high quality housing seriously ?
- ..invest in the cultural identity and quality of the Dutch landscape and living environment ?

Set up “Sustainable Netherlands”



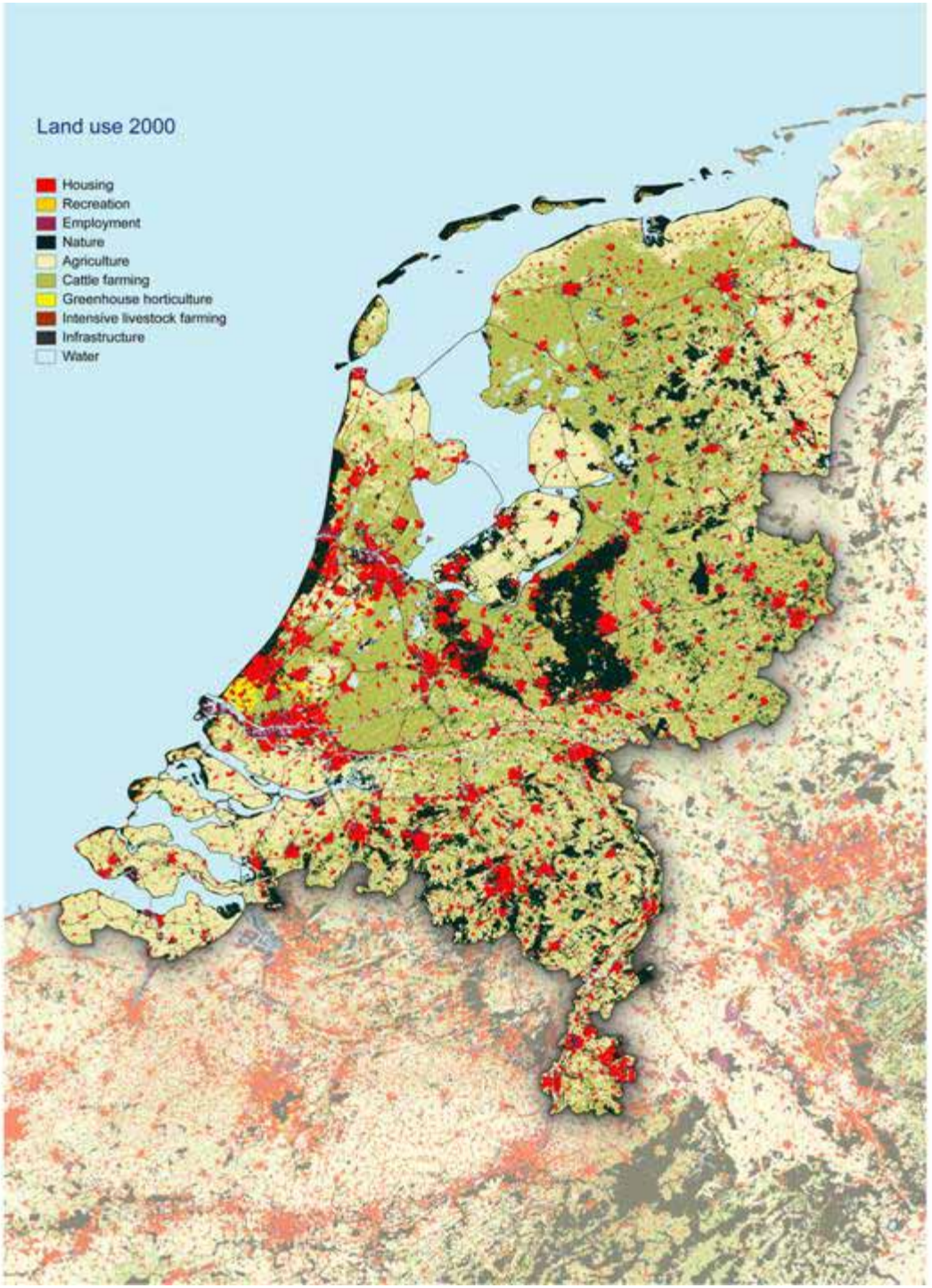
Combination variant
Integration pro’s and con’s

Score on indicators

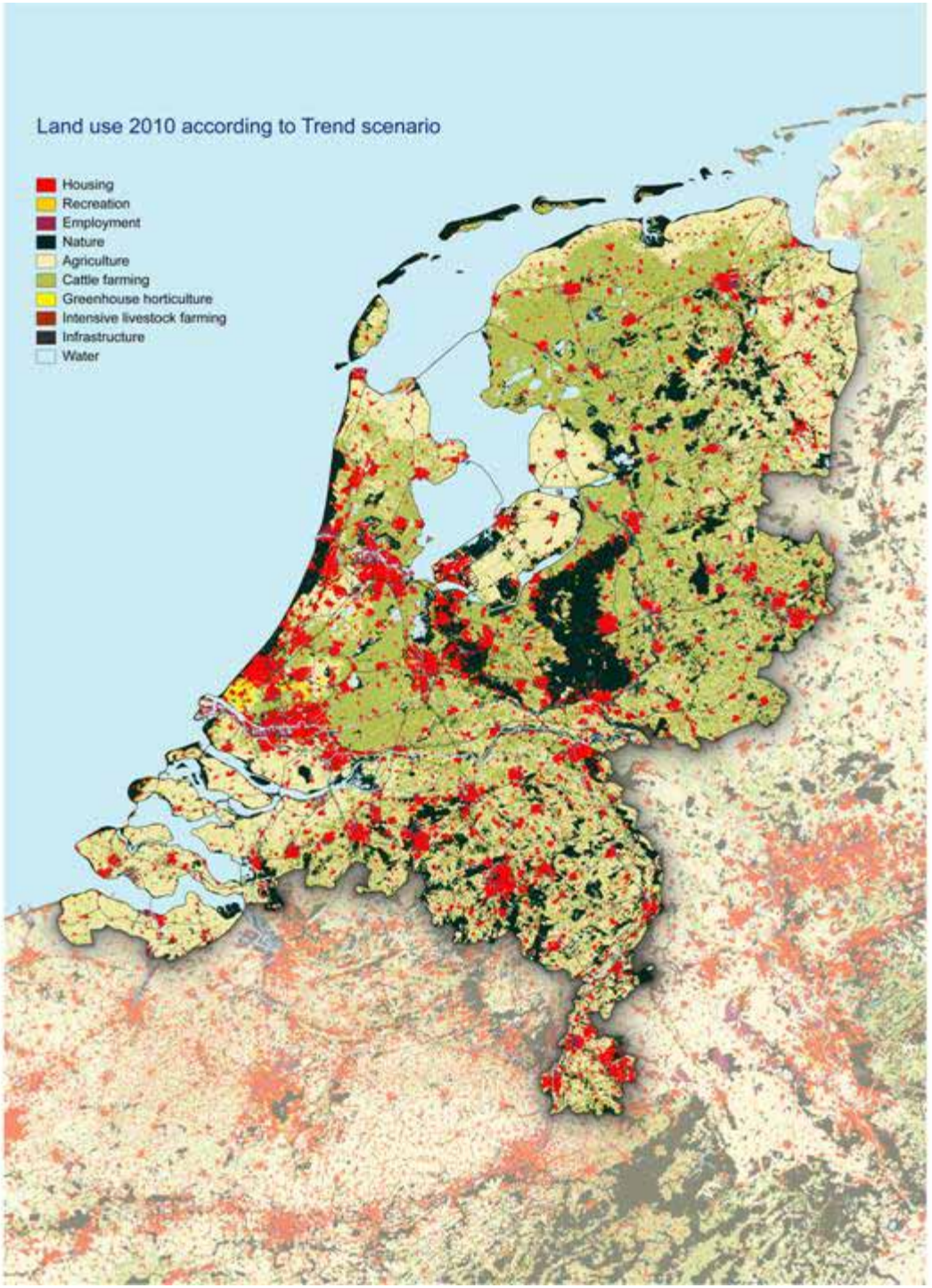
6 thematic viewpoints
linked to actual challenges

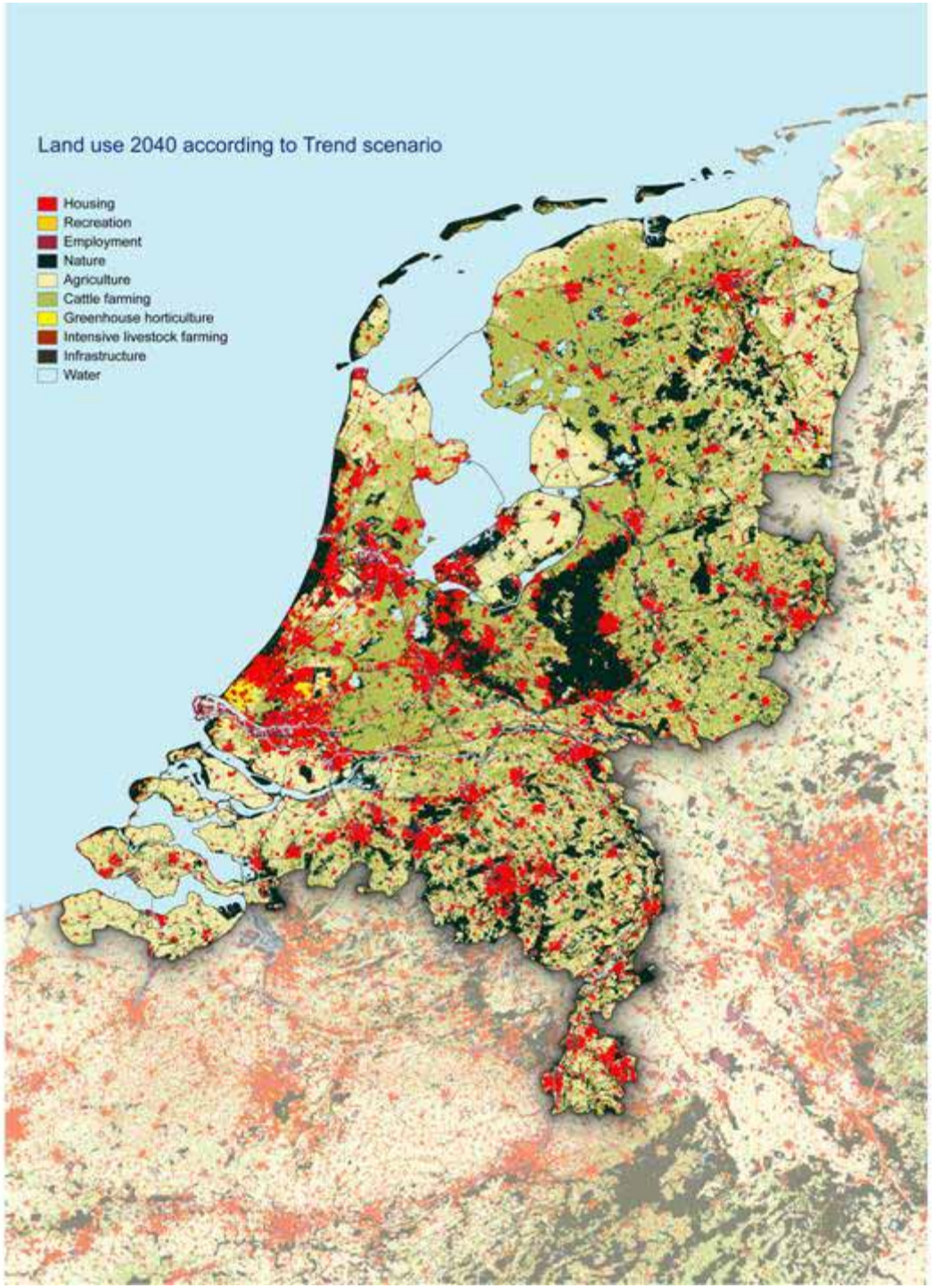
Trend scenario 2040
Increased spatial pressure

Base map 2000



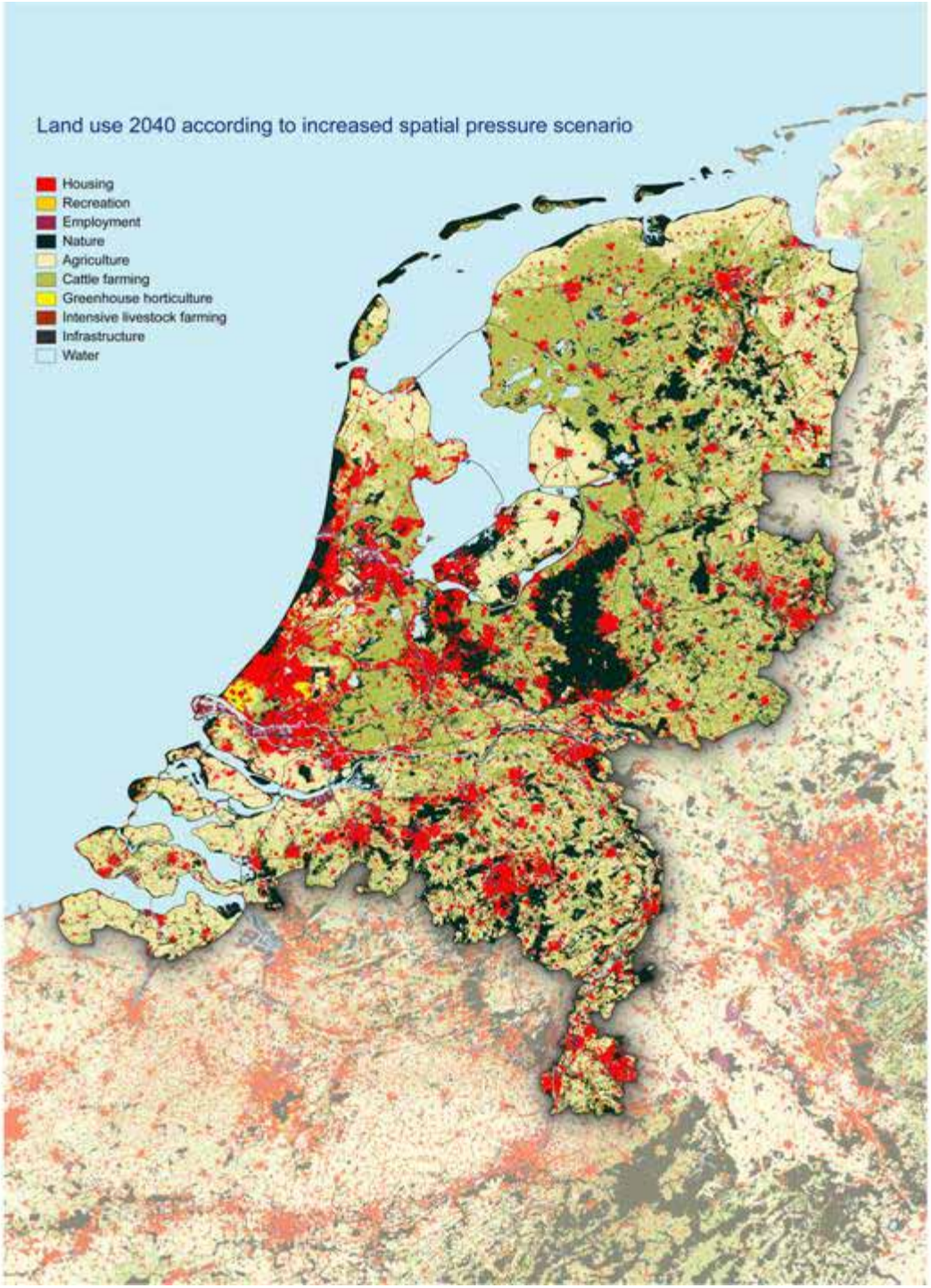
Trend scenario 2010





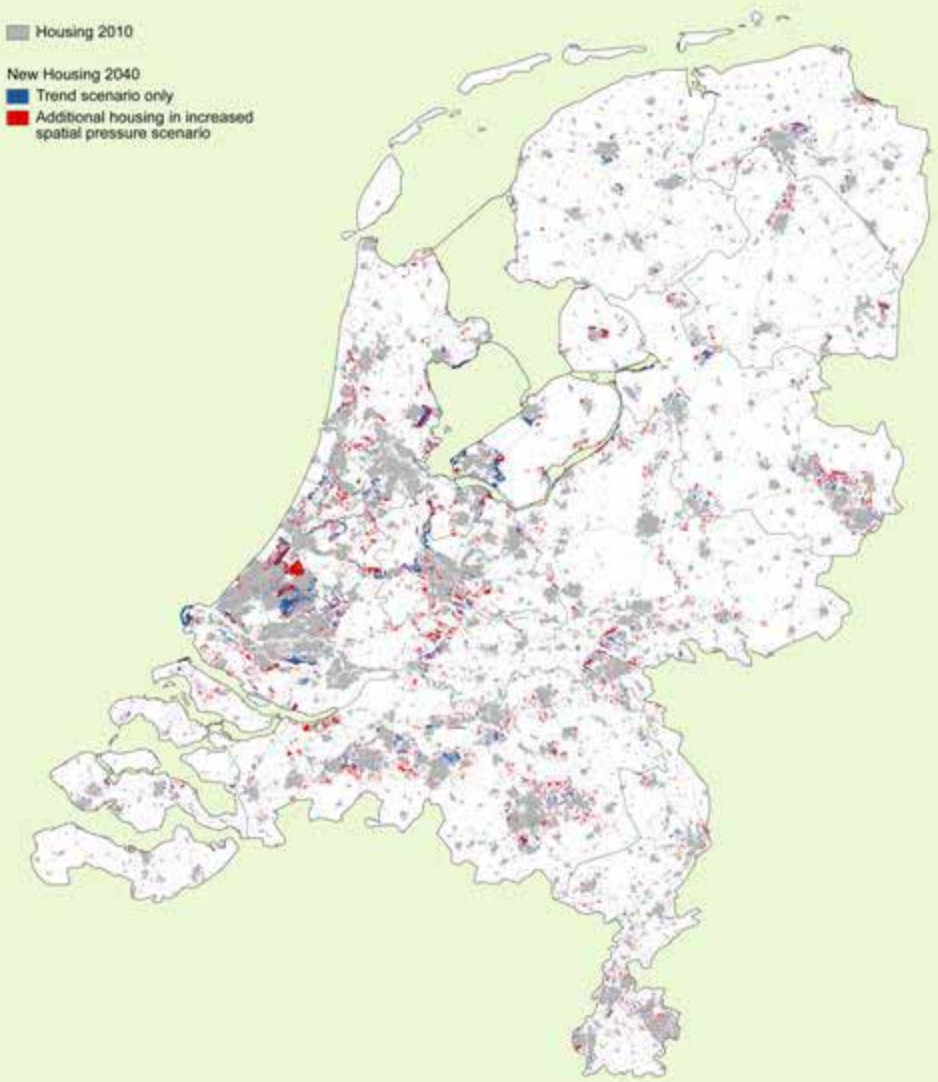
Trend scenario 2040

- moderate spatial pressure
- stabilizing population
- moderate economical growth



Trend scenario 2040

- high spatial pressure
- growing population
- high economical growth



Trend scenario

Development 2010-2040

- moderate spatial pressure
- high spatial pressure

Effects Trend scenario

Indicator	Explanation	Development: Trend scenario	Development: Increased spatial pressure scenario	Development: Policy objective reached in Trend scenario	Explanation
Protection against flooding	Risk of damages and human casualties				Overdue maintenance caught up by 2020, because of strengthening primary dams
Adaptation climate change	Space in river area				Realisation Space for the River
Biodiversity	Biodiversity in nature areas				Nature areas increase, but remain scattered. Biodiversity objectives are not met.
Accessibility	Congestion, accessibility workplace, financial accessibility benefits				Congestion main road network increases. Accessability of workplace by car and public transport decreases.
Quality physical living environment	Greenery surrounding the city and noise pollution in living environment				Noise pollution increases, while greenery surrounding the city decreases.
Spatious and green living	Space for personal wishes regarding living in green surroundings				No explicit policy objective
Conditions for establishment of international business	Congestion, risk perception, growth of Northern Randstad areas				No explicit policy objective
Quality of the landscape	Quality national landscapes, appreciation experience, recreational value				Open national landscapes decrease
Spatial segregation	Spatial division of income groups				No explicit policy objective

1. Climate change and safety against flooding

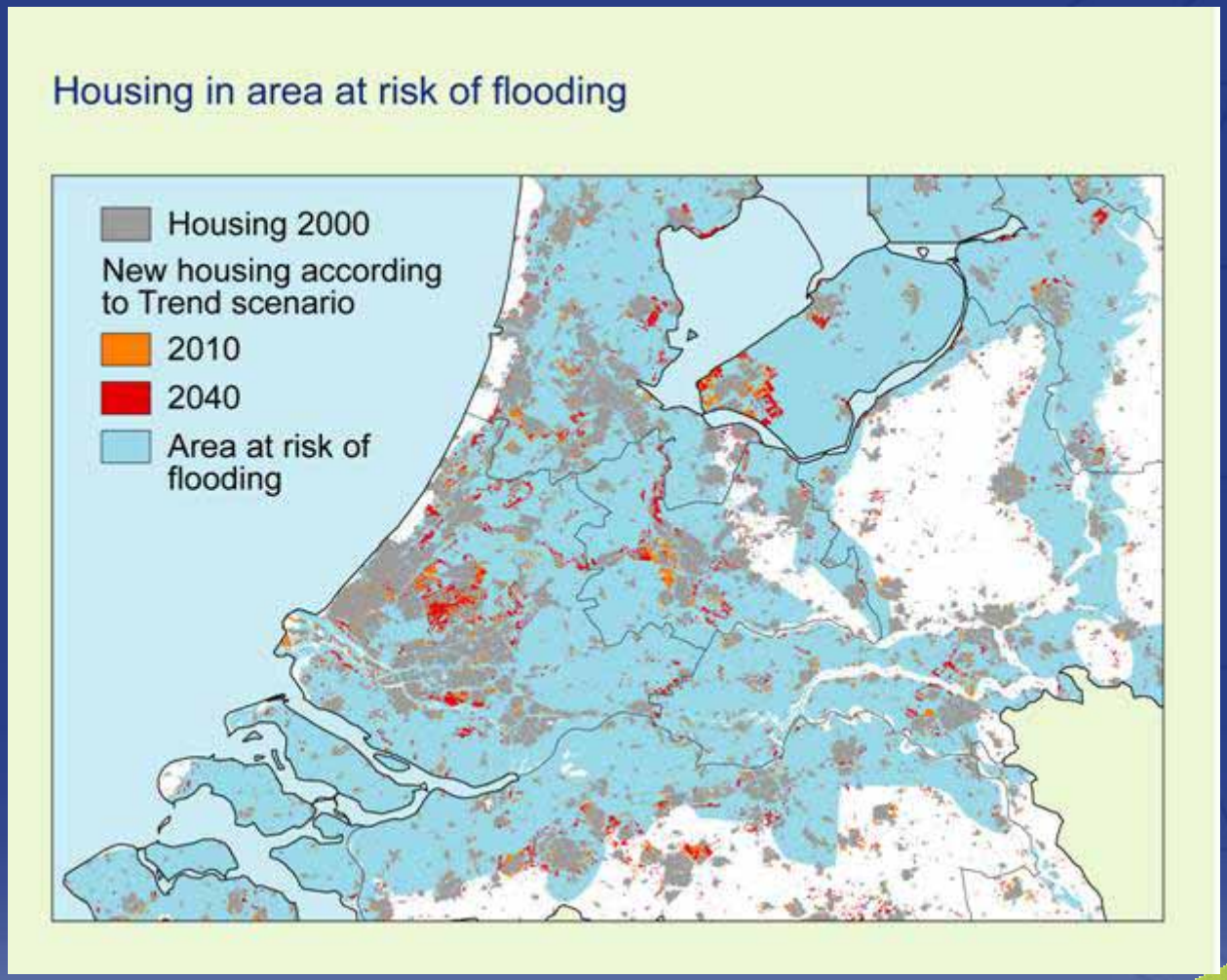
Problems:

- Current dikes do not meet current safety standards
- Safety standards are not in tune with damages and victims
- Climate change: rising sea levels and high water drainage of rivers

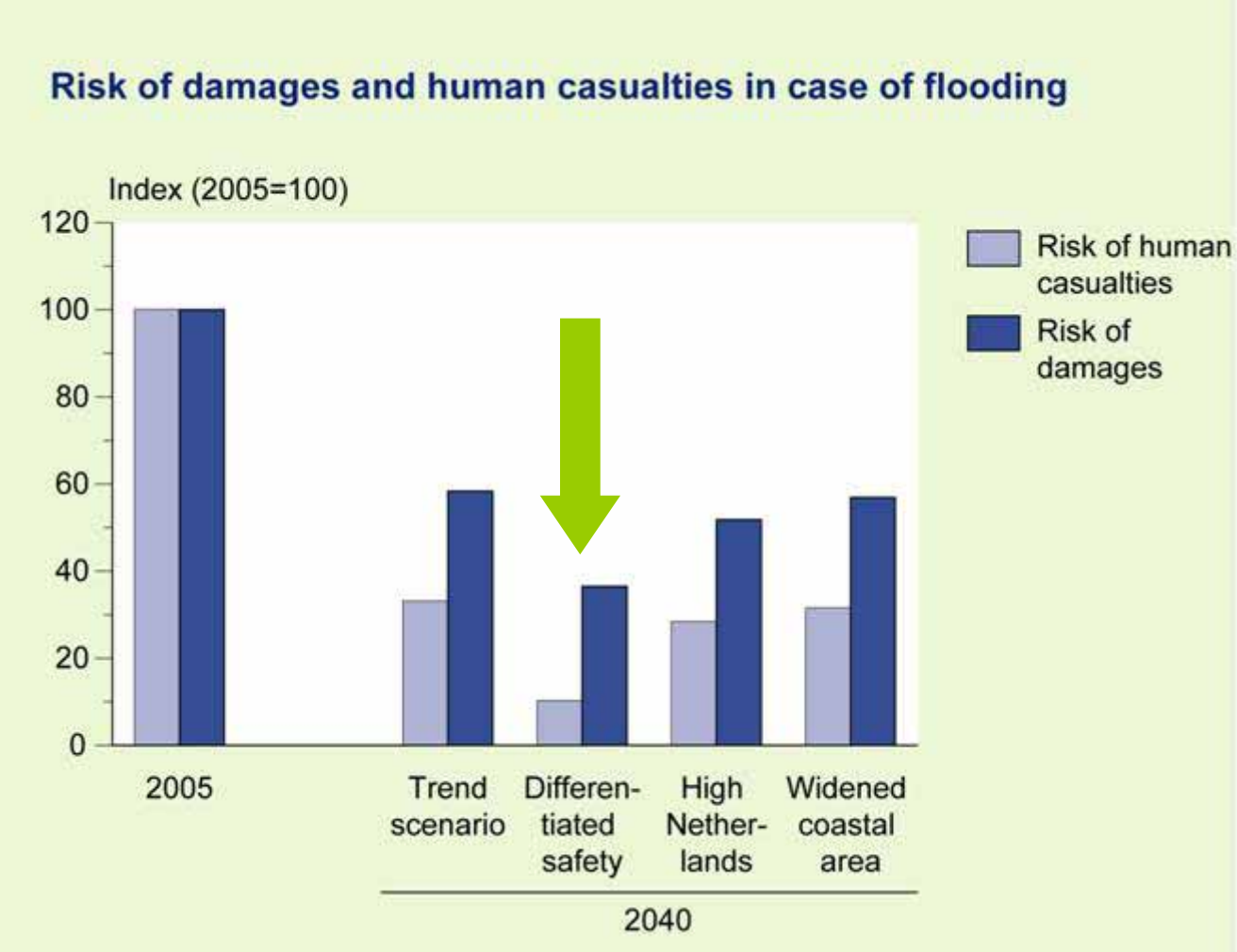
Solutions studied:

adjusting safety levels,
coastal development
withdrawal to high lying areas

Urbanization 2000-2040: main developments in areas at risk of flooding



Solutions studied: effects



Messages Climate and safety

- Adjust urbanization to differentiation of safety levels
- (coming centuries no need for withdrawal from low-lying Netherlands)
- Rising sea levels from 1.5 meters: large problems in delta areas → spatial reservation widened IJssel and IJsselmeer (incl. Markermeer and IJmeer) → coupling nature and compact urbanisation
- Coastal safety controlable; seaward extension not necessary
- NB: uncertainties storms and desintegration ice caps

2. Robust nature

Problems:

- Natura 2000 -species outside the Natura 2000 -areas
- Environmental quality Natura 2000
- Insufficient spatial coherence Natura 2000

Solutions studied:

- Concentration nature development within and around Natura 2000
- Protection of catchment areas

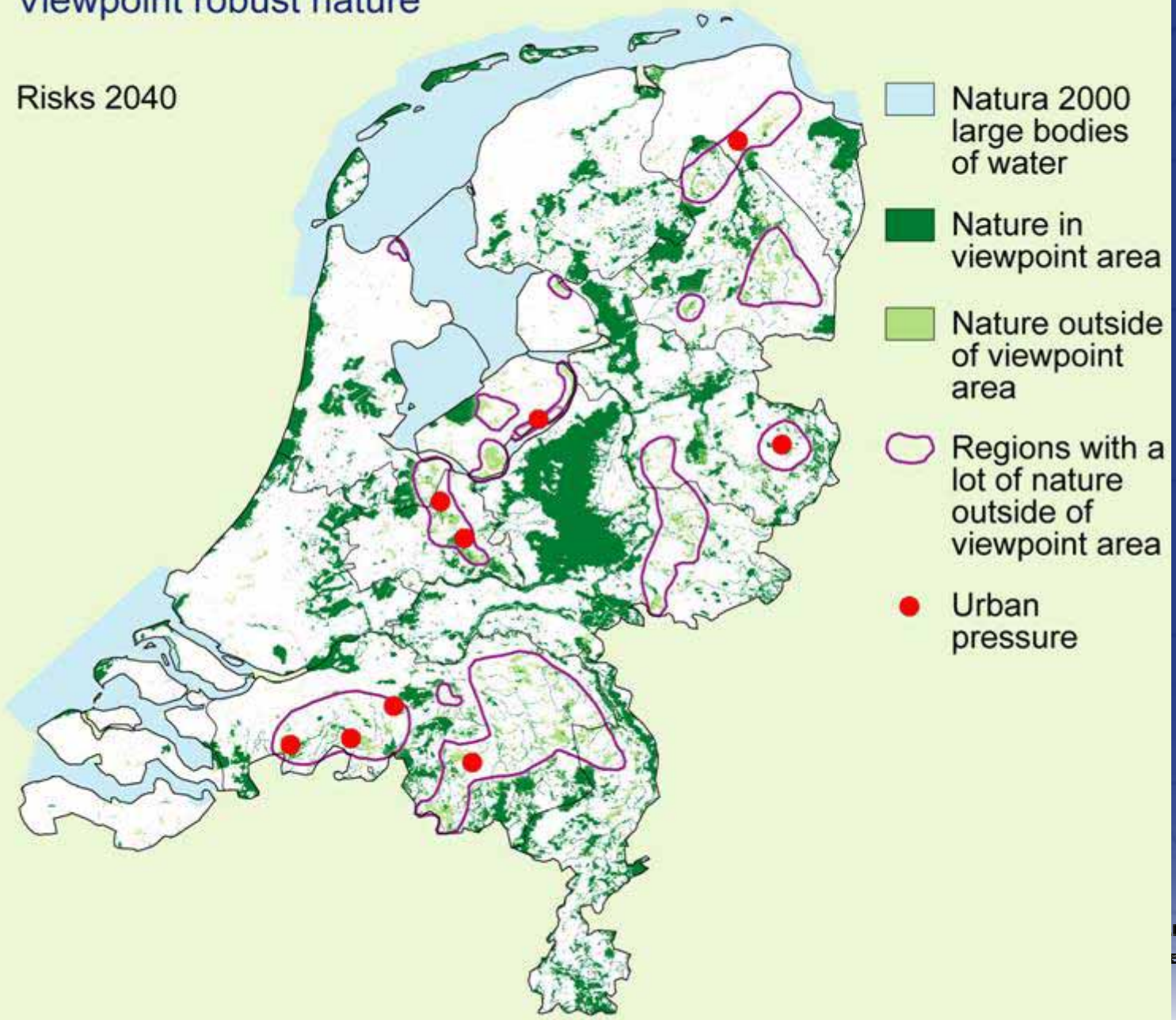
Viewpoint robust nature

2040

ds Environmental
nt Agency

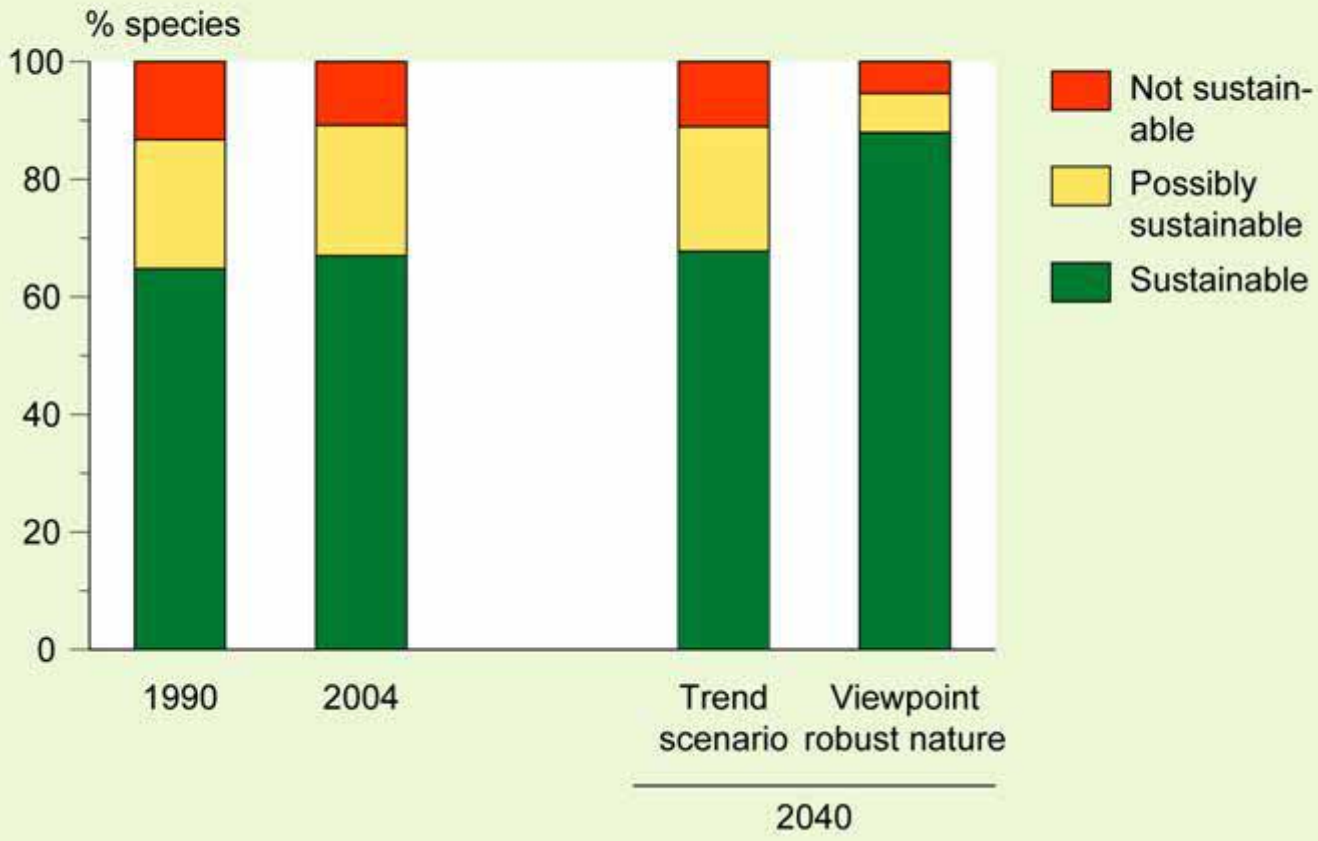
Viewpoint robust nature

Risks 2040



nds Environmental
ent Agency

Spatial conditions fauna species



Messages Robust nature

- Concentrating nature development in and around Natura-2000 areas improves long term conditions for biodiversity
- Combinations with climate change adaptation strategy possible
- Compensational measures agriculture within catchment areas needed for improving environmental conditions
- Good national protection of nature needed, when not internationally protected (Utrechtse Heuvelrug)

3. Compact urbanisation

Problems:

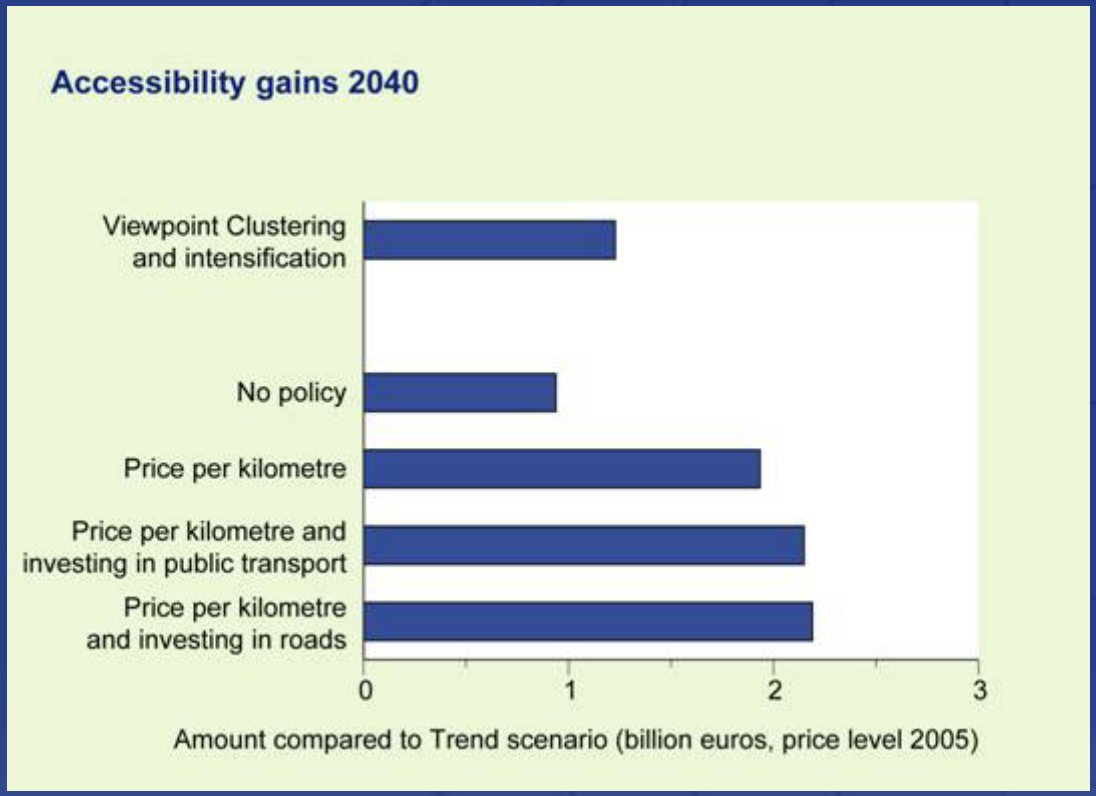
- Infrastructure and urbanization not optimally attuned
- Accessibility of cities, congestion main road network
- Pace of intensification and restructuring

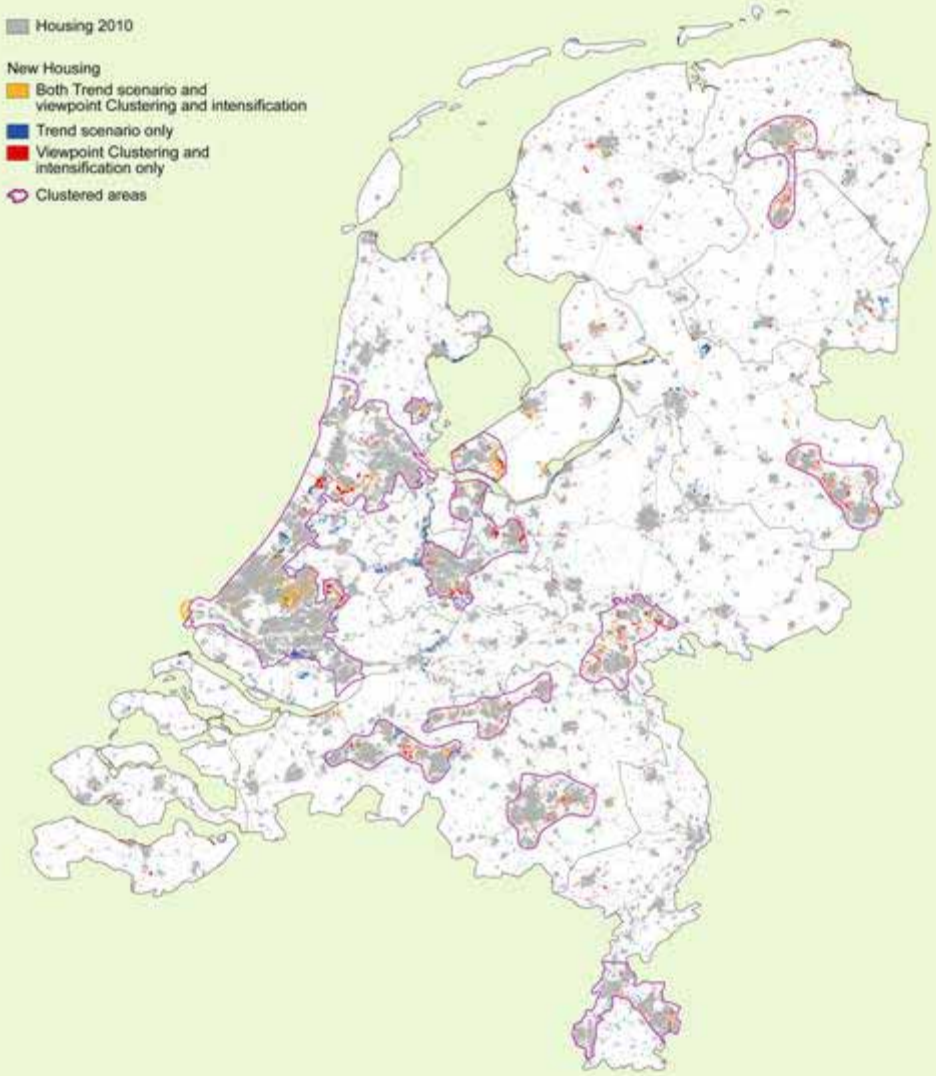
Solutions:

- 50% intensification and remainder in clustered areas near railway stations

Accessibility gains of compact urbanisation

- Accessibility gains highest due to roadpricing (differentiated to place, time, environment)
- Followed by compact urbanisation.
  Benefits (with modest development of mobility) higher than additional packet Mobility Policy Document (14.5 billion euros)





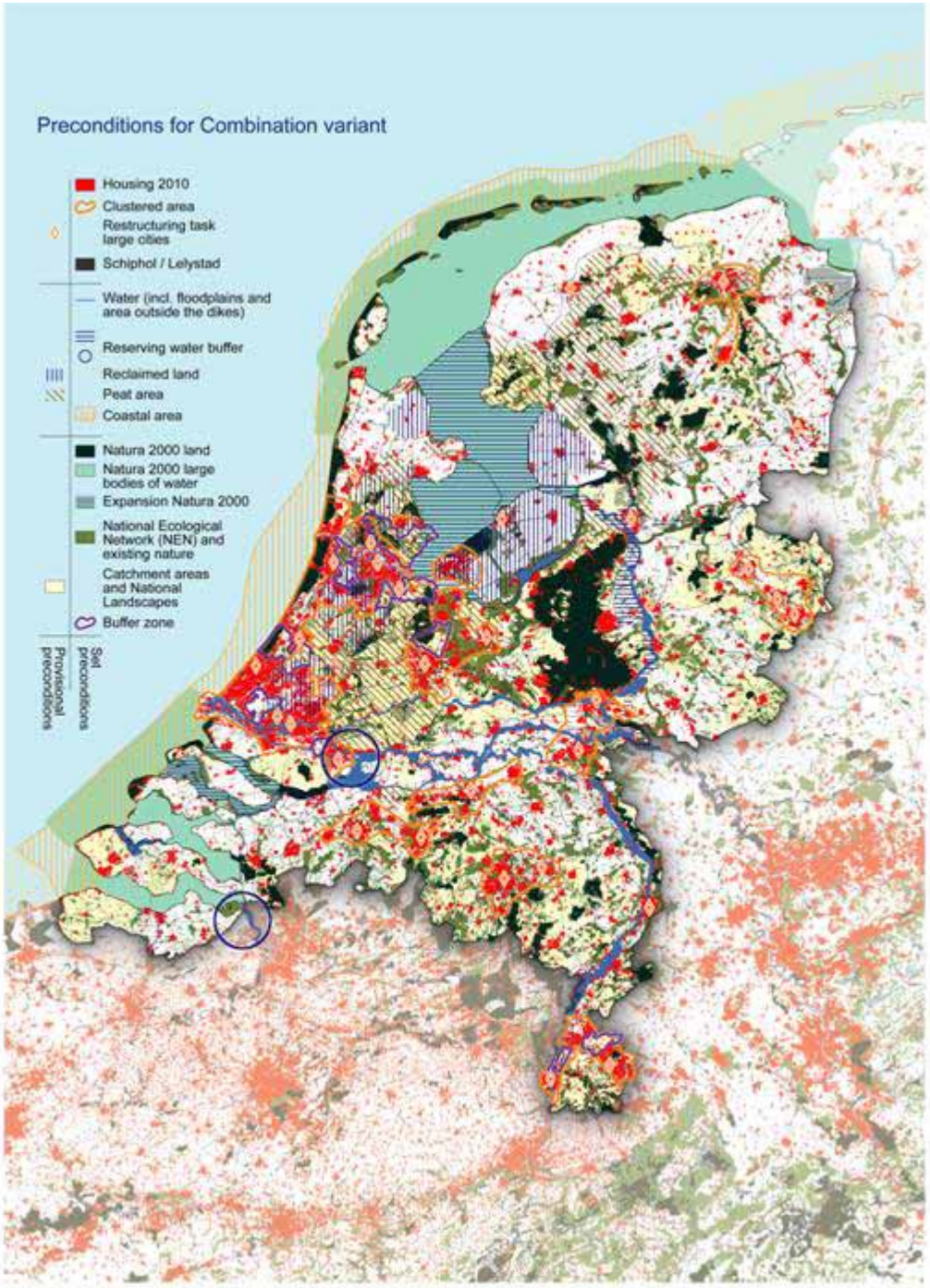
Compact urbanisation

Differences with Trend scenario

Effects mono-thematic maps versus Trend

Sustainability indicators	Explanation	Coverage Trend scenario	Effect viewpoints versus Trend scenario					
			Climate and safety	Robust Nature	Clustering and intensification	Spacious and green living	Conditions international business establishment	Landscape, tourism and recreation
Protection against flooding	Risk of damages and human casualties							
Adaptation to climate change	Potential areas for inundation within risk areas							
Biodiversity	In Natura 2000 areas							
Accessibility	Social financial accessibility benefits							
Quality physical living environment	Greenery surrounding the city and noise polution							
Conditions international business establishment	Congestion, perception of risks, growth in Northern Randstad areas							
Spacious and green living	Low density housing, close to amenities and within attractive landscapes							
Quality of the landscape	Main qualities, perception and recreational values of the landscape							
Spatial segregation	Spatial distribution of the various income brackets							
Management costs	Maintenance and management of public areas							
Transformation costs	Net transformation costs of changes in land use							

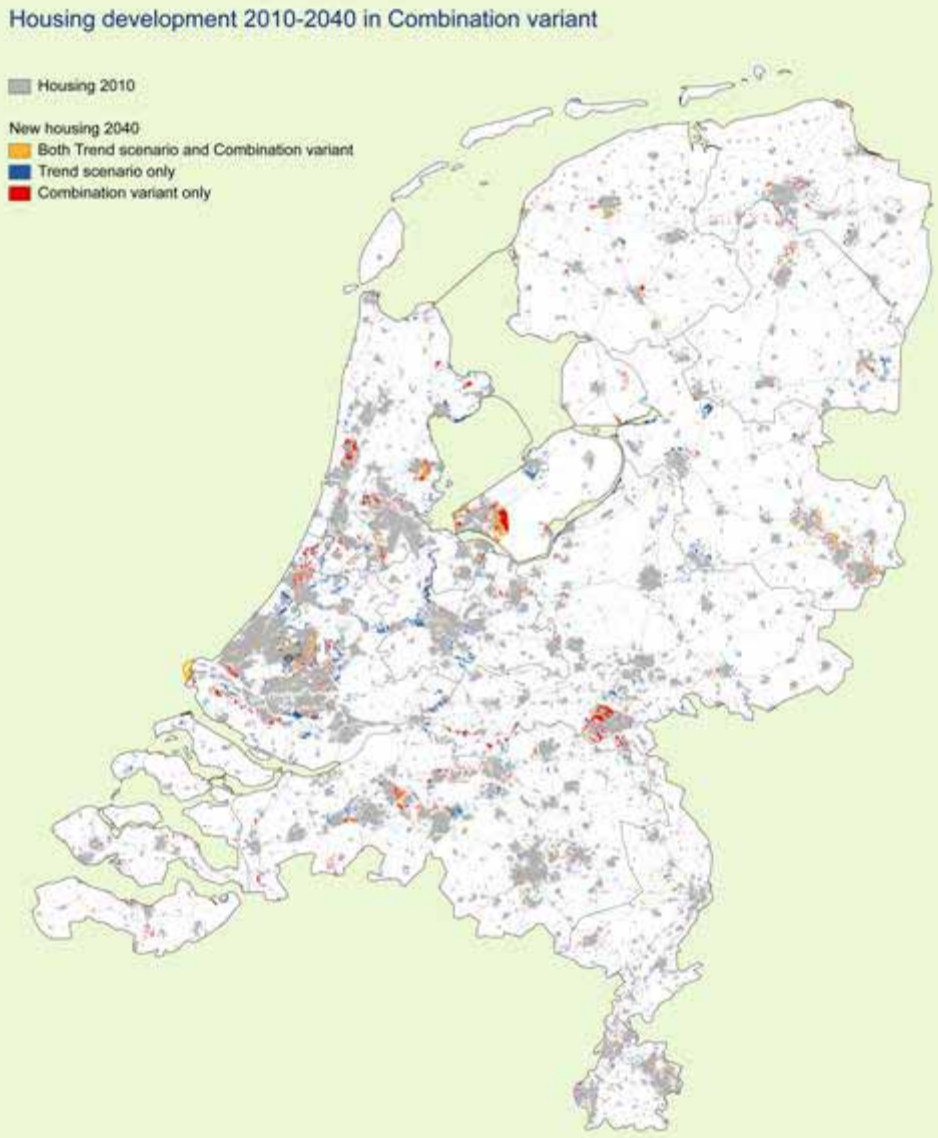
Netherlands Environmental Assessment Agency



Sustainability:

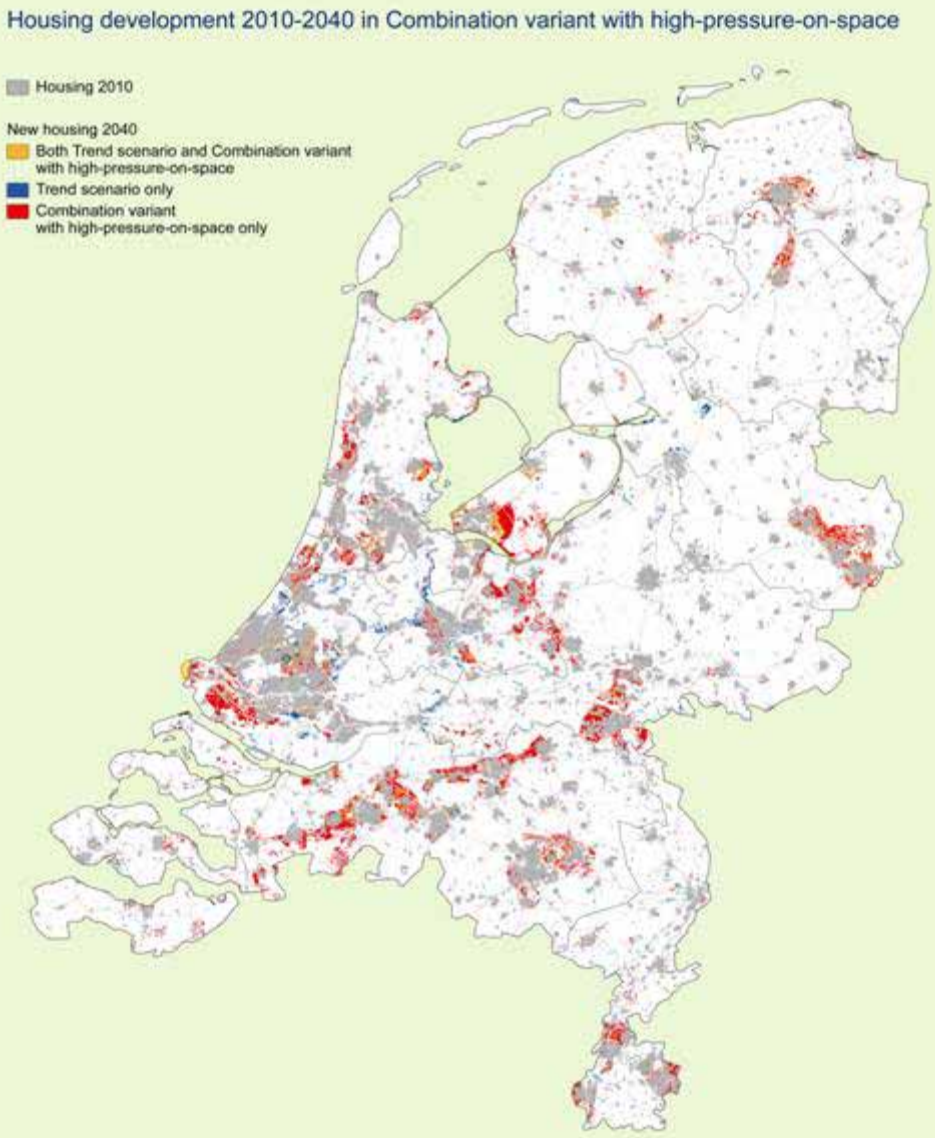
Long term cohesion in spatial developments

Integration by combining preconditions for spatial development based on the six mono-thematic outlooks



Combination map:

differences with Trend scenario as to urban development



Combination map with high spatial pressure:

differences with Trend scenario as to urban development

Conclusions

- Compact urbanisation offers long term opportunities for nature, landscape and climate adaptation,
- Completely new policies not needed, but much more cohesion between sectoral policies is required and a long term spatial framework for consistent choices
- Consistency and cohesion will require steering on various spatial levels :
  - for taking into account the long-term spatial consequences of rising sea levels and river discharges,
  - for spatial choices on land use and transformation of urban land (housing, businesses and greenhouses),
  - for spatial choices enabling sustainable conservation of internationally important nature,
  - for the protection of the national landscapes.