

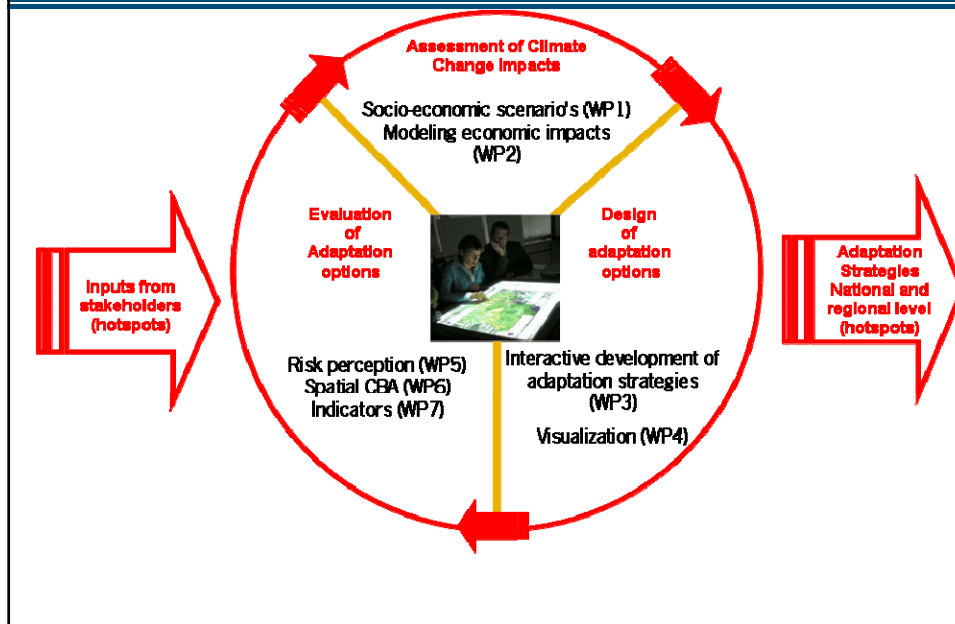
Tools for adaptation strategies

KvR, IC05 COM30 KvK Theme 8:

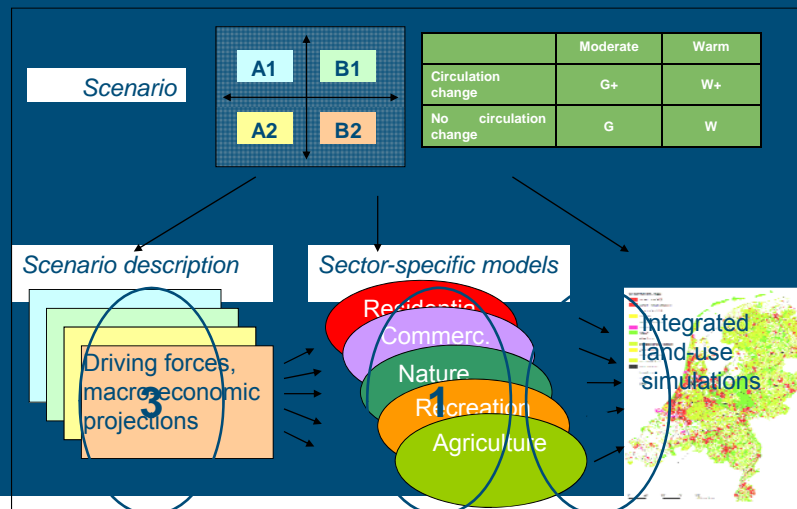
Ekko van Ierland, Marianne Kuijpers-Linde and consortium members



General structure



WP1: Integrating and downscaling national socio-economic scenarios



Sub projects in WP1

1. Better align and integrate the sector-specific models for, amongst others, residential, commercial and agriculture development.
2. Revise the model to allow the incorporation of functional units (e.g. residences) rather than hectares, enabling flexible inclusion of issues such as land-use intensity and multifunctionality.
3. Investigate the links between changes in urbanization patterns, transport systems and their adaptation and mitigation potential.

Instruments supporting strategic spatial planning

- Knowledge** (Potential) information from an enhanced land use model in combination with a transport model:
- Future **spatial distribution of population and employment**, also in relation to economic networks, and of **objects** as real estate, and **land use**
 - **Links** between urbanisation patterns, transport systems
- Hotspots**
- **Risks of flooding** in terms of casualties and economic damage
 - Possible **combinations of land use**, multifunctional, water storage
 - **Adaptation and mitigation potential** of changes in urbanisation patterns and transport systems, as reduced heat stress, sustainable urban transport
- Work to be done**
- Contribute to further development of **LUMOS framework** (see Rietveld)
 - **Policy responses** to the effects of different land use configurations in relation

WP 2: Assessing economic impacts of flood risks

- Indirect economic effects of floods: production loss, long-term damage to firm supply chains, migration of households and firms, real estate prices, labour markets
- Spatial Computable General Equilibrium (SCGE) model RAEM-E3: strong regional focus, market imperfections approach based on New Economic Geography
- Results applicable for vital policy issues like spatial planning, flood protection and insurance.
- RAEM-E3 model expanded by multi-agent modelling - powerful tool for adaptive behaviour and disequilibrium: learning, increasing returns, path dependence
- In addition, investigate how perceptions of flood risks in networks lead to different investment strategies towards built environment

WP2: Approach

1 PhD:

- Regional economic effects of flood risks

Supervision: Prof. Dr Marjan Hofkes (IVM-VU) Dr Olga Ivanova (TNO-I&R),

Applicability of results

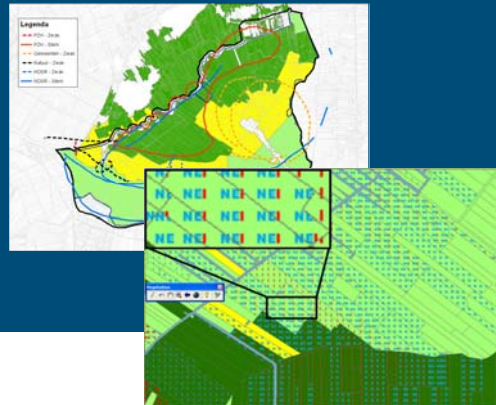
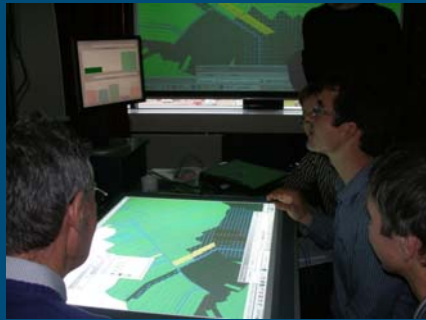
- Vast experience with indirect effects modelling in flood scenarios guarantees model extension results within 1.5 years
- Vast experience in economic trade-offs and disequilibrium economics; multiple models readily available
- Application extends to (sub)urban (spatial planning), rural (environment, flood risk) and encompassing (insurance, land use)
- Continuous applied modelling possible in hotspots cases

Novelty of approach WP2

- The approach combines an existing Computable General Equilibrium (CGE)-model with elements from multi-agent modelling.
- While the CGE-model is well-suited for an analysis of the ripple-effects resulting from the direct impact of a flood, it lacks certain features necessary to capture the complex dynamics involved in a post-disaster scenario.
- Multi-agent models, which assume heterogeneous and interacting agents, can provide the elements needed for such an analysis. The combination of the two modelling traditions is highly relevant in a flood context.
- It represents a novel contribution in modelling.

WP3 Interactive development of spatial adaptation strategies

- Design maps as design language
- Analysis maps as research model
- Negotiation maps as decision agenda



Objectives WP3

- Hotspots
Develop, implement and test a map based interactive workshop DSS for the design of adaptation strategies. To be used to develop the spatial component of adaptation strategies in all hotspots
- Research questions
Use of information in a participatory workshop setting, optimization heuristics, design and negotiation tools, negotiation strategies, use of maps as interface and workshop design.

Workshop

Expert knowledge + Spatial multicriteria analysis + Maps



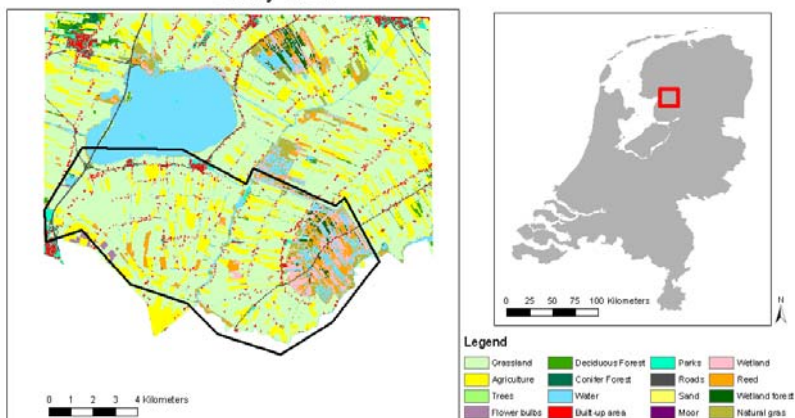
Approach:



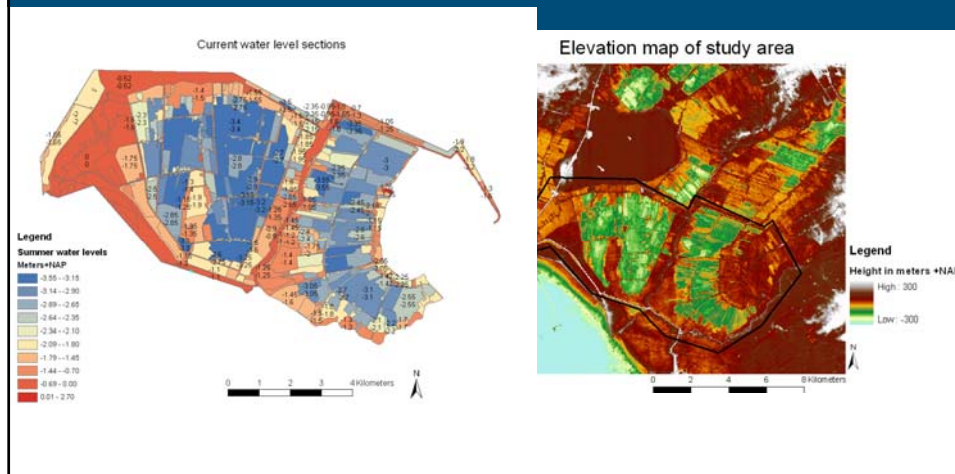
Case study Friesland

Polders located south of Tjeukermeer

Study area

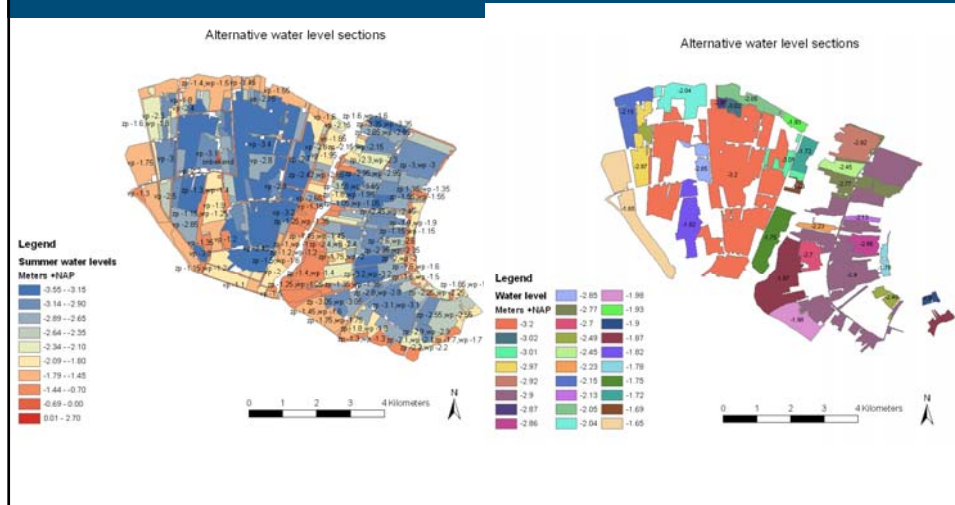


Problem description



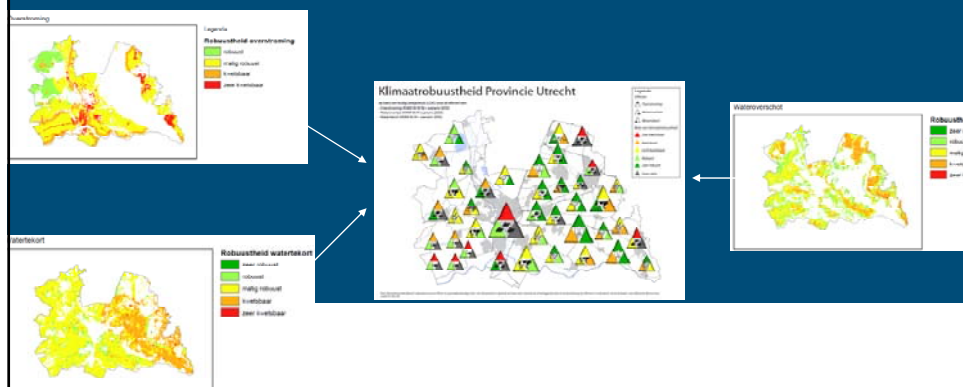
Water level units

Alternatives current climate and W+ scenario



WP4 Visualisations (WUR, VU-IVM)

■ Geo-ICT visualisations



Connection to Hotspots

- Practical track: climate effects (effect atlas, National Adaptation Strategy) through visualization more direct communication with stakeholders
- Scientific track: analysis of effectiveness of visualisation, legitimacy and credibility, users perception
- In principle relevant for all hotspots

WP5: Economic modeling of fresh water supply and demand

■ **Aim:**

- a) Design climate robust fresh water supply

■ **Method:**

- a) Economic hydrological modelling

Result: Tool for decision making and policy proposals

Innovation in WP5

- The development of consistent up and downscaling procedures of economic transactions and relationships at river basin scale.
- One of the biggest challenges will be to match economic and hydrological spatial scales (e.g. grid vs administrative boundaries) and temporal scales (e.g., half-yearly or annual)
- The focus of the project will be on intra- and inter-basin economic trade and water transfers.
- A modular modelling approach, allowing sufficient level of detail for both the economic and hydrological system.

WP6 Cost benefit analysis and evaluation

- Adaptation options
- Sectors:
 - Agriculture
 - Nature
 - Water
 - Energy & transport
 - Housing & infrastructure
 - Health
 - Recreation & tourism



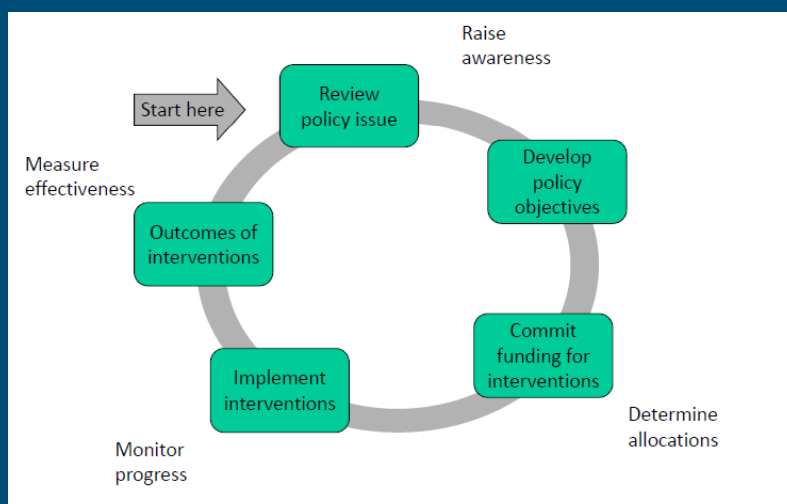
Specific topics and interactions with hotspots

- Optimal timing of options (when?, now or later?)
- Discounting (constant, hyperbolic, risk factors)
- Irreversibilities in investment and in impacts
- Stochastic analysis, probabilities of climate scenarios; real option theory;
- Case studies: benefits of water retention; ancillary benefits (e.g. agric., recreation, nature conservation, housing); dikes; ecosystems;
- Hotspots: e.g. Haaglanden, Noord Brabant;
- Deltacommissariaat

WP7 : Monitoring and indicators

- Objective: to identify or develop instruments and indicators to *monitor and evaluate* the *implementation of adaptation measures* and *the climate-robustness of plans, programmes and projects*, at *different spatial scales* and for different purposes in *different phases* of the adaptation policy cycle.
- Links and collaboration:
 - National: ARK/Klimaatwijzer
 - International: EEA/European Commission actions on vulnerability and adaptation indicators; EU member states (e.g., UBA Germany)
 - Haaglanden

Monitoring and indicators



Questions to be addressed

- Which indicators to measure which goals?
 - Raising awareness
 - Determine allocations
 - Monitor progress
 - Measuring effectiveness/level of “climate proofness”
- Which priority sectors?
 - Initial emphasis on water, spatial planning
 - Ex ante, ex post?
- Which frequency, by whom, what costs?
- How to link them to existing sets of (sustainable development) indicators?
- How to visualize them?

Spatial planning and climate change in practice

The Case Overijssel



SEA as part of Policy making process



SEA

Questions:

1. What are current planning dilemma's?
2. What are the effects of alternative spatial planning strategies for sustainable development?

Research design SEA

Strategic assessment

Story telling

Scores indicators

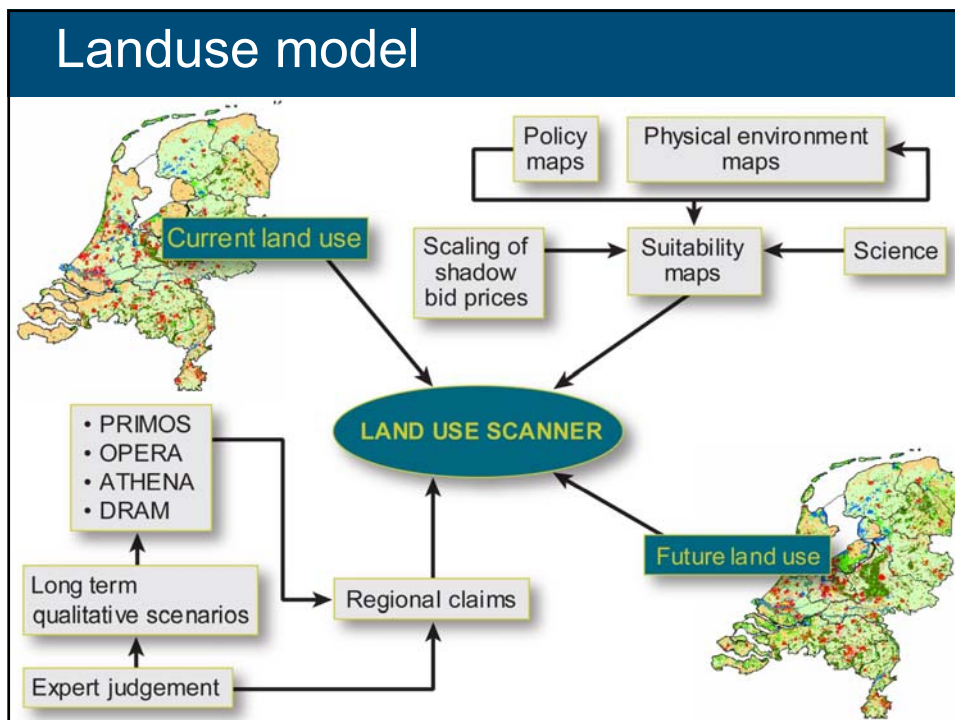
Trendscenario's 2020 +2040

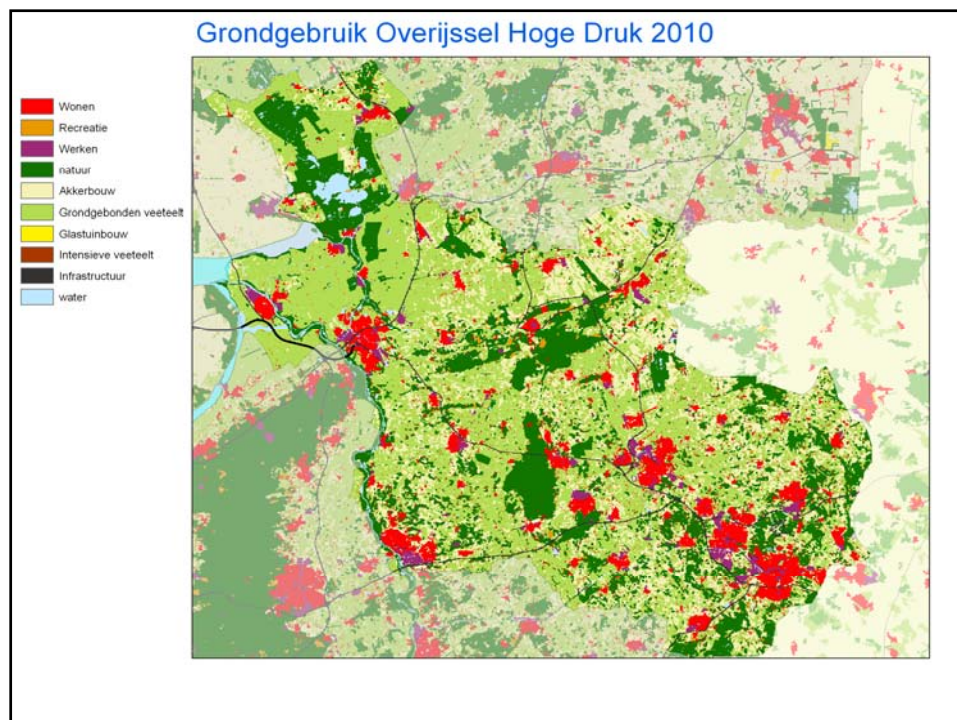
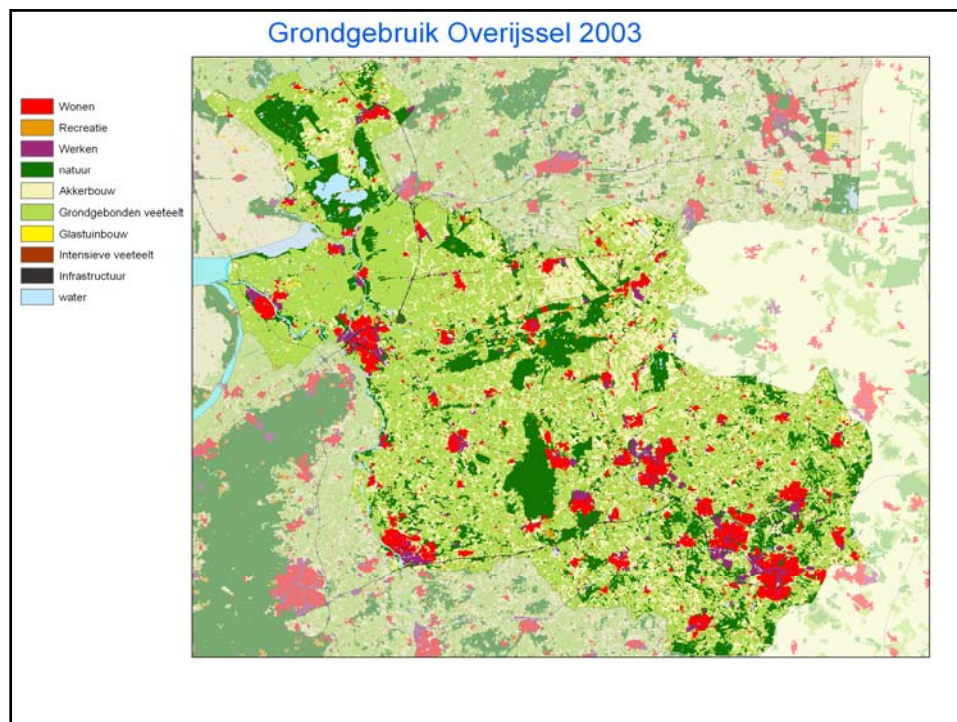
Conceptual framework scenario's

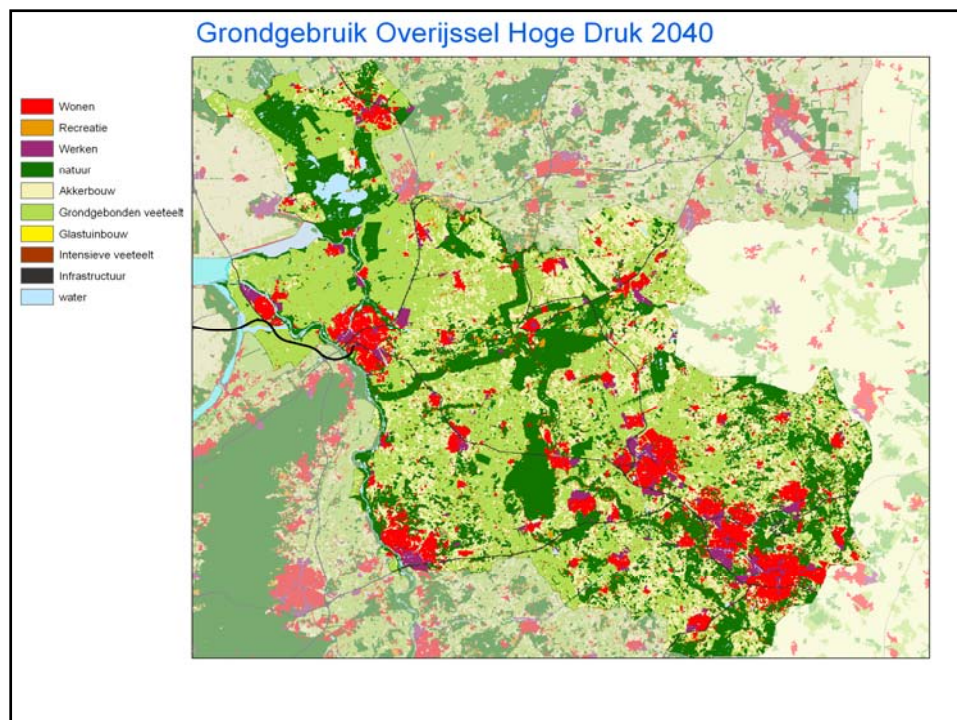
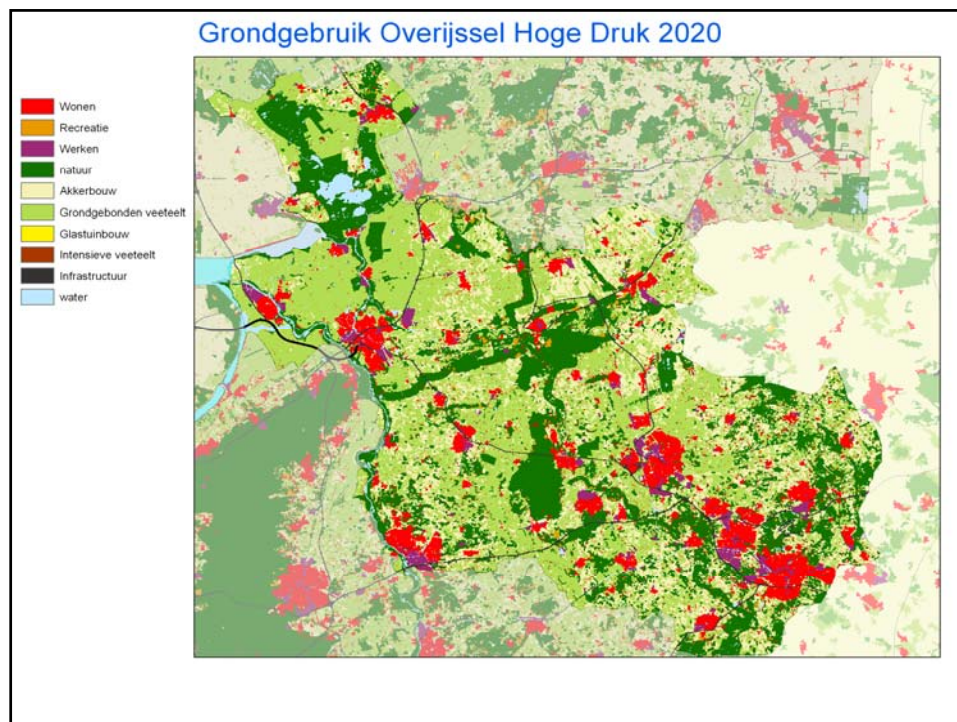
Selection indicators

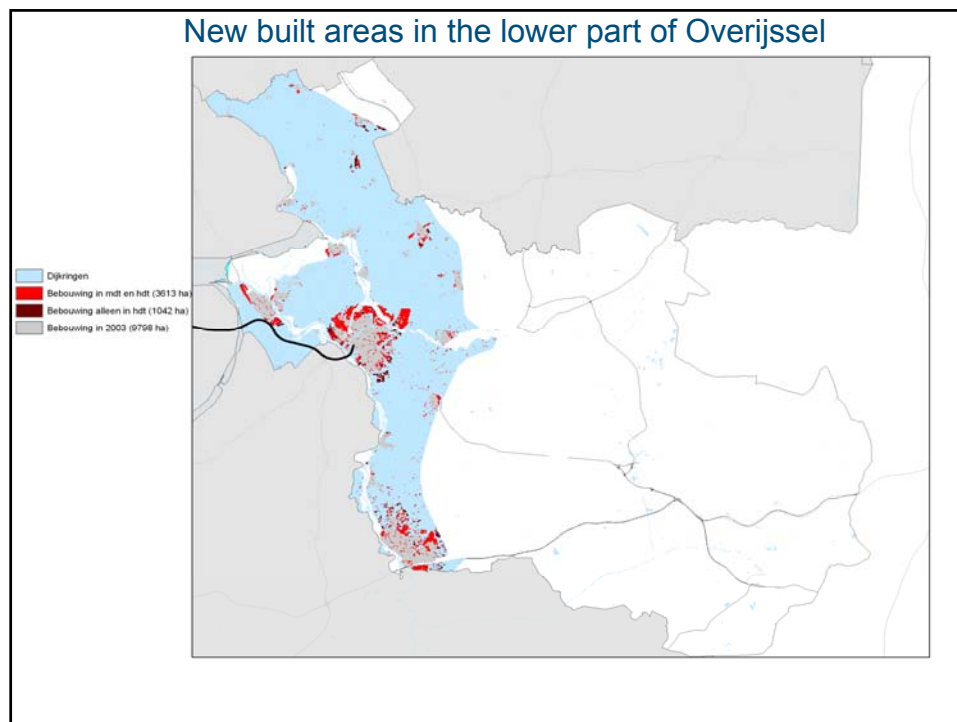
Adaptation to climate changes,
Landscapes and nature
Urban development and
traffic/transport systems
Changes in national ecological
network

People	Profit	Planet
Supply of different types of Residential areas Services supply	Availability of business parks Intensive livestock farming agriculture	Realisation of the national ecological network Abiotic constraints Natura2000 network
Identity and diversity Accessibility of green areas Identity and quality of built-up Area in cities	Urban: -car -public transport and bike Rural -car -public transport	Water quality aridity Drinking water production Space for water systems
Quality of life Flood risk Verontreiniging + Saneren asbestwegen	Reduction energy consumption in built-up area % sustainable energy production	Land subsidence disturbance Natural resources









How can assessment and evaluation tools be applied for adaptation in the various regions in the Netherlands

- Spatial planning law provides instruments (tools) that are very useful for transferring climate change knowledge to the regional spatial planning policy
- Experiences show that linking digital maps to text clarifies policy choices at an early stage in policy decision making
- New ict-techniques like interactive map tables may strengthen the use of this type of research

Some publications

- **Peer reviewed key publications:**
- De Bruin, K., Dellink, R.B., Ruijs, A., Bolwitt, L., Van Buuren, A., Graveland, J., De Groot, R.S., Kuikman, P.J., Reinhard, S., Roetter, R.P., Tassone, V.C., Verhagen, A., Van Ierland, E.C. Adapting to climate change in the Netherlands: An inventory of climate adaptation options and ranking of alternatives (2009) *Climatic Change*, 95 (1-2), pp. 23-45.
- De Moel, H., Aerts, J.C.J.H., Koomen, E. (2011) Development of flood exposure in the Netherlands during the 20th and 21st century, *Global Environmental Change*, doi:10.1016/j.gloenvcha.2010.12.005.
- Jonkman, S.N., Bočkarjova, M., Kok, M., Bernardini, P. Integrated hydrodynamic and economic modelling of flood damage in the Netherlands (2008) *Ecological Economics*, 66 (1), pp. 77-90.
- Koomen, E., Koekoek, A. and Dijk, E. (2011) Simulating land-use change in a regional planning context. *Applied Spatial Analysis and Planning*, doi: 10.1007/s12061-010-9053-5.
- Koomen, E., Rietveld, P. and De Nijs, T. (2008) Modelling land-use change for spatial planning support, *Annals of Regional Science* 42 (1): 1-10.
- Koomen, E., Stillwell, J.C.H., Bakema, A. and Scholten, H.J. (2007) Modelling land-use change; progress and applications, *GeoJournal Library* Vol. 90, Springer, Dordrecht.
- Veraart, J.A., van Ierland, E.C., Werners, S.E., Verhagen, A., de Groot, R.S., Kuikman, P.J., Kabat, P. Climate change impacts on water management and adaptation strategies in The Netherlands: Stake-holder and scientific expert judgements (2010) *Journal of Environmental Policy and Planning*, 12 (2), pp. 179-200.

Overall conclusions

- Consistent program focusing on knowledge gaps for demonstrating scientific excellence
- Strong integration of disciplines
- Focus on innovative applications in hotspots, jointly with stakeholders
- Strong links with PBL, CPB, Ministries, ...
- Strong past experience; ready for use.