Kennis voor Klimaat

Knowledge for Climate

Theme 6 Climate projections - work package 3 project 4: Linking hydrology and land use

Coupling land-use and hydrological modelling systems

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Future socio-economic developments are likely to influence the amount and location of urban, agricultural and natural areas. These developments will affect hydrological conditions such as local amounts of sealed surface and potential evapotranspiration and may thus lead to changes in groundwater recharge or river runoff. This project studies the interrelationships between land-use and hydrology by coupling existing, state-of-the-art modelling systems.

We aim to answer the following questions:

1. How can hydrologic and land-use models be coupled?

• Which demands does the groundwater module of the National Hydrological Modelling System pose to a land-use model in terms of spatial, temporal and thematic resolution; and to which extent can the Land Use Scanner model meet these requirements directly?

• How can different flood risk assessments be related to land-use patterns; and how can these assessments be used in spatial planning?

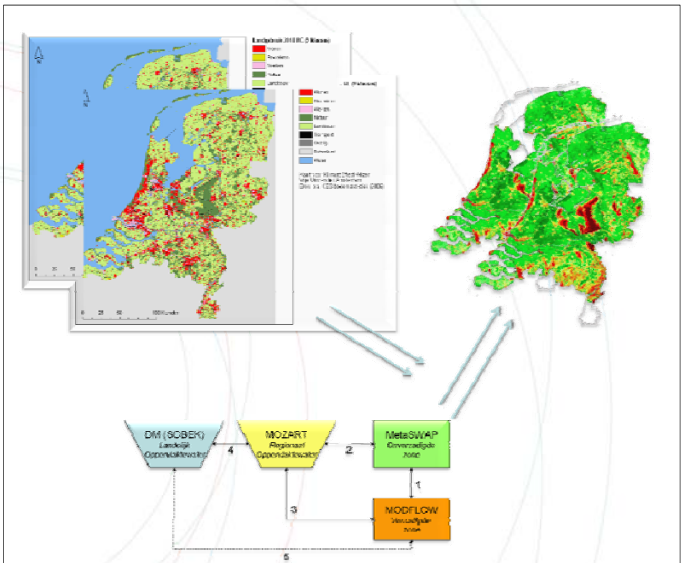
2. To which extent does the propagation of errors and uncertainty influence the validity of the simulation outcomes?

• Will small changes in the specification of input parameters cause large changes in the output?

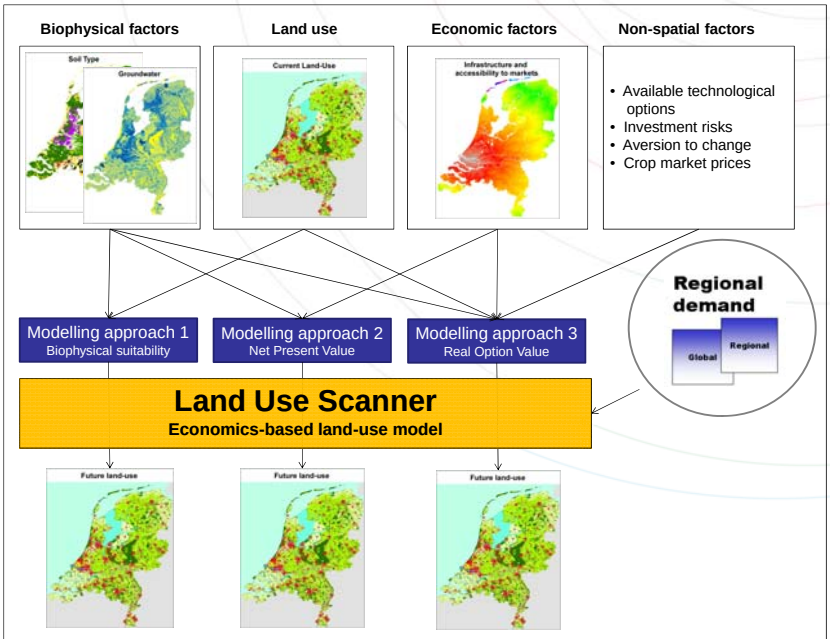
3. What does the coupling of the hydrologic and land-use models imply about the future hydrologic conditions and land-use patterns in (selected parts of) the Netherlands?

• Which hydrologic impacts (in terms of, for example, evaporation and groundwater table) can be expected from the Dutch climatic and socio-economic scenarios?

• How will these influence land-use patterns?



Answering questions 1 and 2: how can output from Land Use Scanner be used in MetaSwap, the groundwater component of the National Hydrological Modelling System?; how sensitive is this model to scenario-based changes in land-use input?



Answering question 3: How can changing hydrological conditions be included in a land-use model? Or, more specifically, what is the impact of hydrological changes (e.g. resulting from climate change) in local suitability for agriculture? How do these changes influence future land-use patterns?

Initial results:

• Koks. E.E., Moel, H. de., Koomen, E. (2012) Comparing extreme rainfall and large-scale flooding induced inundation risk- Evidence from a Dutch case-study. Chapter 1 in: Dr. Kumarasamy, M. (ed.) Studies on water management issues. Intech, Rijeka, pp. 3-26.

• Van Leeuwen, E., Koomen, E. (2012) Adapting urban land use in a time of climate change; Optimising future land-use patterns to decrease flood risks. Chapter 2 in: Lal, R. and Augustin, B. (eds.) Carbon Sequestration in Urban Ecosystems. Springer, Dordrecht, pp. 21-41.

• van Hussen, K., Wateroverlast in stedelijk gebied ten gevolge van extreme neerslag; een quickscan voor de intrinsieke gevoeligheid voor wateroverlast, Bachelor thesis Earth and Economics2010.

• Verhagen, S., De optimale huisvestingslocatie van Nederland. Wanneer agglomeratievoordelen en overstromingsrisico's tegen elkaar worden afgewogen., Bachelor thesis Earth and Economics, Vrije Universiteit, Amsterdam, 2010.