


Kennis voor Klimaat

Knowledge for Climate



Theme 6 Climate projections - work package 3

project 4: Linking hydrology and land use

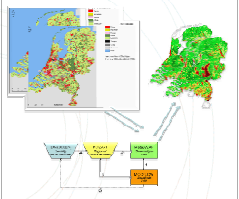
Coupling land-use and hydrological modelling systems

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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:

- 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?
- 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?
- 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 MetSWAP, the groundwater component of the National Hydrological Modelling System?; how sensitive is this model to scenario-based changes in land use input?

Biophysical factors	Land use	Economic factors	Non-spatial factors
<ul style="list-style-type: none"> • Land cover • Soil type • Topography 	<ul style="list-style-type: none"> • Urban • Agricultural • Forest • Water 	<ul style="list-style-type: none"> • Agricultural technological options • Investment cost • Carbon sequestration • Crop market prices 	<ul style="list-style-type: none"> • Agricultural technological options • Investment cost • Carbon sequestration • Crop market prices

Land Use Scanner
Economics-based land use model

Answering question 3: How can changing hydrologic conditions be included in a land use model? More specifically, which the impact of hydrologic changes (e.g. resulting from climate change) on 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) Adopting urban land use in a time of climate change: Optimizing future land-use patterns to decrease flood risk. Chapter 2 in: Lal, R. and Augustin, B. (eds.) Carbon Sequestration in Urban Ecosystems. Springer, Dordrecht, pp. 21-41.
- van Huisen, K., Wateroverlast in stedelijk gebied ten gevolge van extreme neerslag: een quickscan voor de initiatiegevoeligheid voor wateroverlast. Bachelor thesis Earth and Economics Vrije Universiteit, Amsterdam, 2010.
- Verhagen, S., De optimale huisvestingslocatie van Nederland. Wanneer agglomeratieknoorden en overstromingsrisico's tegen elkaar worden afgewogen., Bachelor thesis Earth and Economics, Vrije Universiteit, Amsterdam, 2010.

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