

***Interactive comment on “Groundwater vulnerability assessment to assist the measurement planning of the water framework directive – a practical approach with stakeholders” by K. Berkhoff***

**Anonymous Referee #2**

Received and published: 13 July 2007

General comments: The manuscript is well-organised, understandable and presents a balanced combination of quantitative results combined with qualitative aspects. This paper presents an evaluation scheme to assess groundwater vulnerability - based on the definition of the IPCC - according to the requirements of the European Water Framework Directive (WFD). As the title promises beside other methods a participatory approach in terms of an actor's platform was chosen for the analysis. For the calculation of the exposure of the study region Hase river the nitrogen model STOFFBILANZ delivered values for the nitrogen load and nitrogen concentration. For the estimation of

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the sensitivity of the area the author chose the DRASTIC index. For the identification of adaptive capacity measurements an actor's platform was installed where stakeholders from different interest groups came together regularly for discussing the issue. The stakeholders end up with 14 groundwater protection measures.

I consider this manuscript in its present form acceptable for publication. Nevertheless, I suggest some eventual modifications.

1. The particular advantage of this study is the fact that the chosen models STOFF-BILANZ and DRASTIC allow a spatially explicit calculation of exposure and sensitivity and the results shown in fig.2 show an interesting picture of high quality. Nevertheless, the description of the used models (inputs and performance) is too short and could be extended. 2. Most difficult in my opinion seems to be the integration of the stakeholders' experiences. After identifying 14 measurements the stakeholders obviously had to calculate the costs of each measure. So this study tries to include these estimated costs for different measures and as expected those measures that results in a clear nitrogen reduction are the most expensive measurements. At this point the author should go one step further - what does this mean? This seems to be a kind of dilemma. 3. Furthermore, the question arises what are beside the economic effects the social impacts of the discussed measurements. For an integrated analysis in terms of sustainability the social dimension should be a little bit more elaborated at least in a descriptive manner in the results and conclusion chapter. For example the discussed strategy transformation of fields to grassland has a lot of implications on several levels (change in production for farmers, change of required technology, change of demand of new products) 4. In the conclusion chapter all important issues for a successful implementation in the stakeholder process are listed. What's missing here is a description of the effects of the use of the model in the participatory process. What were the main implications of the model in the actor's platform after confronting the stakeholders with the results? Did the stakeholders learn more about the system dynamics? Did the results change their opinions on certain issues?

To conclude, I think the presented study is a very interesting and innovative groundwater vulnerability assessment approach that should be published. The results of the exposure and sensitivity calculations are sound. But I would recommend a stronger effort in discussing the meaning of the combination of very quantitative modelling approaches like STOFFBILANZ and DRASTIC with a participatory approach and how these different outcomes can be combined and above all interpreted.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 1133, 2007.

**HESSD**

4, S533–S535, 2007

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