

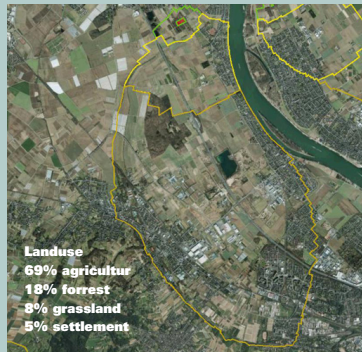
Assessing groundwater vulnerability to contamination using the HÖLTING METHOD

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INTRODUCTION & OBJECTIVES

The so-called Hölting-method has been elaborated in the nineties by the Geological Surveys of the German Federal States (Bundesländer) and was published in 1995 (HÖLTING et al., 1995). It is a point count system that uses a combined approach considering the entire unsaturated zone. Since its development the method has been modified (WILDER, SCHÖBEL, 2006). At present this method is still relevant in groundwater protection areas by consulting farmers on reducing the risk of nitrogen immission to aquifers.

The presented investigation area is situated at the lower Rhine Basin. It shows a catchment area of wells for the public water supply. Despite of being a groundwater protective area the groundwater is highly polluted by nitrogen components, basically nitrate. The order to examine was given by the chamber of agriculture.

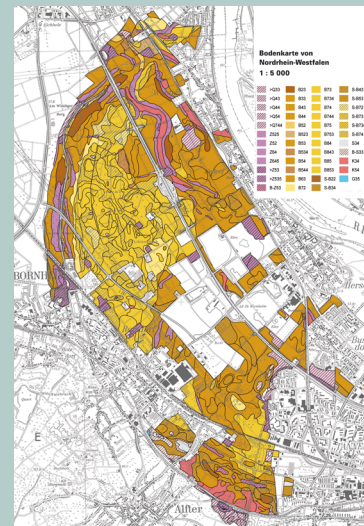


Landuse
69% agricultural
18% forest
3% grassland
5% settlement

Investigation area
(Water extraction plant Wesseling-Urfeld)

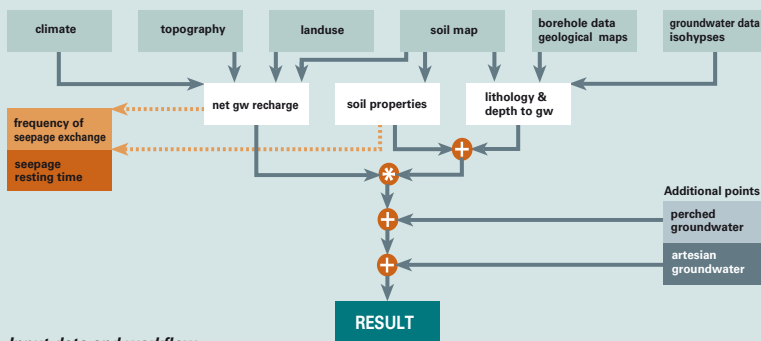


Geology & nitrate conc. in groundwater (mean)



Soil map

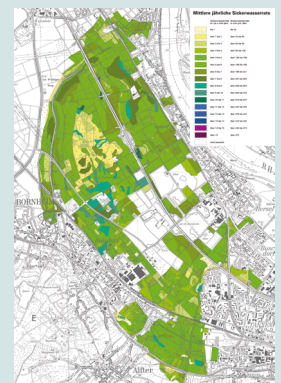
METHODOLOGY



Input data and workflow



frequency of seepage exchange

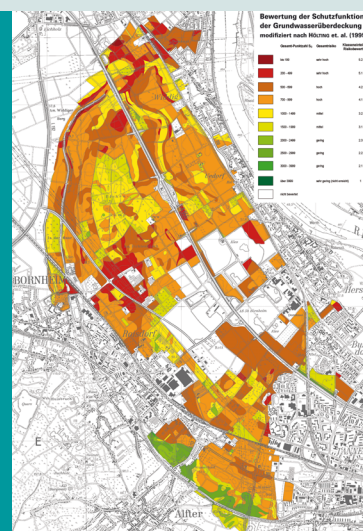


groundwater recharge rate

RESULTS

By-products of this module-based method are the above shown maps of seepage rate (groundwater recharge) and a map of the frequency of seepage exchange (and one of its reciprocal values the resting time in soil).

The finale result is the overall vulnerability map in the sense of the Hölting method. The vulnerability map uses the traffic light colours ranging from very low risk (green) up to very high risk (red). These maps were delivered as GIS-files for usage by the consultants at the chamber of agriculture.



vulnerability map:
areas of different risks
(or attenuation capacity)
very high, high ...
... very low risk

Conclusions, Outlook

The assessment of the groundwater vulnerability using the described method leads to a distinct detection of those sections of land that are highly at risk. The next major step is the adaption of the agricultural management in order to reduce additional nitrate input in accordance with the state of risk of the land. For this purpose an investigation scale of 1:5.000 is the most suitable. This needs a high coverage of input data. At present the 'Hölting method' is still relevant. An appliance of the method in the context of WFD-groundwater bodies that are at risk may be expedient. For this purpose surveillance maps in a smaller scale should be adequate.



HÖLTING, B.; HAERTLÉ, T.; HOHBERGER, K.-H.; NACHTIGALL, K. H.; VILLINGER, E.; WEINZIERL, W.; WROBEL, J.-P. (1995): Konzept zur Ermittlung der Schutzfunktion der Grundwasserüberdeckung. – Geol. Jb., C63: 5 – 24, 5 Tab.; Hannover.
WILDER, H., SCHÖBEL, T. (2006): Leitfaden zur Schutzfunktionsbewertung der Grundwasserüberdeckung. – GeoLog 2006. GD NRW
www.flussgebiete.nrw.de/index.php/Grundwasserüberdeckung