GLOWA Danube

VEGAS Versuchseinrichtung zur Grundwasser- und Altlastensanierung

Erstellung eines integrierten, dynamischen Grundwasserqualitätsindex zur Analyse der regionalen Auswirkungen von Global Change

Development of an Integrated, Dynamic Groundwater Quality Index to analyze the Regional Influences of Global Change

BMBF: German Federal Ministry of Education and Research

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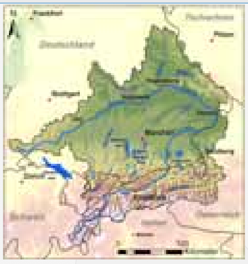
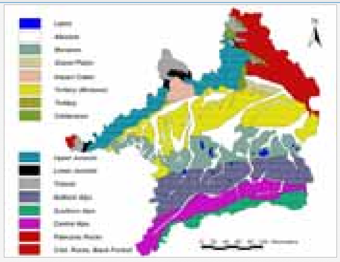
GLOWA-Danube (www.glowa-danube.de) is one of five projects within the GLOWA program (www.glowa.org). Its aim is to provide an integrated approach to predicting changes in the hydrological cycle due to Global Change in the Upper Danube Catchment (approx. 77.000 km^2). GLOWA-Danube considers both the influence of natural changes in the ecosystem, such as climate changes, as well as social changes, e.g., changes in land use or water consumption.

The Upper Danube Catchment (UDC) is a mountainous, heterogeneous catchment. Its altitude ranges from 287 to 4049 m.a.s.l., precipitation from 650 to over 2.000 mm/a, average annual temperature from -4.8 to +9 °C, evaporation from 0 to 550 mm/a, and runoff from 150 to 1600 mm/a. Seasonal and inter-annual temperature and precipitation variations are considerable.


Upper Danube Basin


Geological units

Required Data, Workflow and Results of the Dynamic Groundwater Quality Index Calculations

GEODATABASE GLOWA PROJECT

DRASTIC Method [1]

- **D**epth to water table
- **R**echarge
- **A**quifer
- **S**oils
- **T**opography/slope
- **I**mpact vadoze zone
- Hyd. **C**onductivity

DRASTIC Maps

Intrinsic Vulnerability Map

Intrinsic Vulnerability Map (Pesticides)

Land-Use Data

Arable land
- Cropsilage
- Forage
- Hop
- Maize
- Legumes
- Oat
- Oleaginous
- Potato
- Rye
- Sugarbeet
- Barley and Wheat

Forest

Natural areas

Water

Glacier

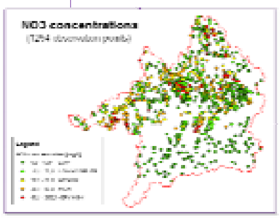
Urban areas industrial areas

LAND-USE RISK maps [2a,b,c,d]

Land-use Risk Map

Landuse Risk Map Industrial-urban

NO_3 Concentrations



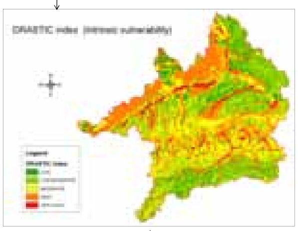
Observations points used for the punctual comparison and consecutive validation with the other maps.

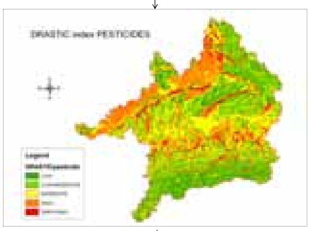
Groundwater Quality Index (GWQindex)

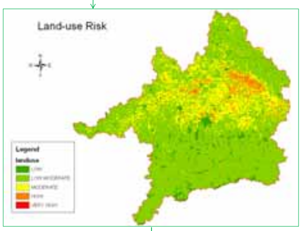
Parameters used(mg/l)
- NO_3
- pH
- PO_4
- SO_4
- Cl
- NH_4
- K
- B
- Na
- Electrical Conductivity

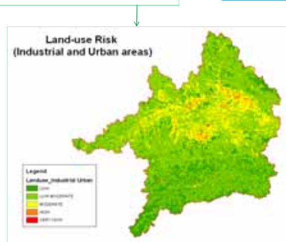
The chosen parameters represent some of the most representative and recommended by the Water Framework Directory (WFD) for Groundwater Quality intended for drinking purposes. The maximum values accepted are those defined by the German standards for Drinking water. A major aspect is **regional availability of data.**

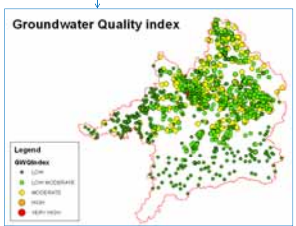
Groundwater Quality Index Map GWQindex [3]



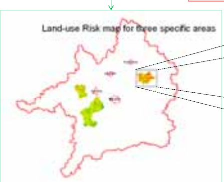


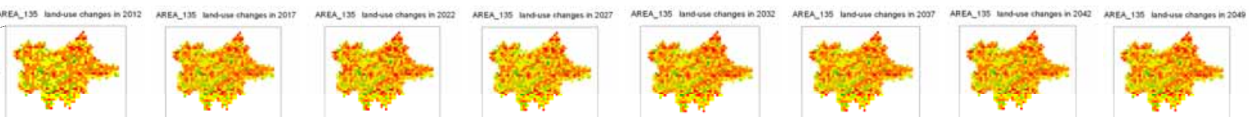






VALIDATION with NO_3 Observations [4] & [5]



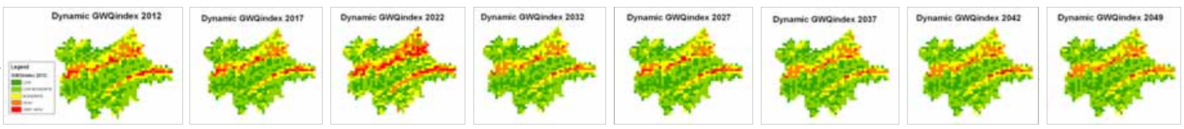


The results were created using the climate scenario "REMO-Baseline" (based on the trends provided by the UBA-MPI REMO model for the region) combined with the socioeconomic scenario "Performance" (free is fair policy). [8]

Intrinsic Vulnerability Map

Dynamic GWQIndex [6] & [7]

Land-use Risk Map



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