

Supplementary material

Table S1: Input data for the RAUMIS model

Data	Source
Agricultural land use	IACS data
Livestock	IACS data, Animal Origin Assurance and Information System, Animal Disease Funds, Thünen-Agraratlas
Yields, agricultural use of compost and mineral fertilizer	Statistical data
Sewage sludge	Sewage sludge registers, statistical data
Biogas data	Biogas plants: Federal Network Agency National network operators Biogas substrate: Daniel-Gromke et al. (2017) Federal state authority data
Explanation for the Thünen-Agraratlas: Processed data, original data from statistical offices of the federal states (district data from agricultural census 2016); research data center of Germany and the federal states, agricultural census 2010 and und AFiD panel "Agrarstruktur" 1999, 2003, 2007, 2016 (own calculations: 1999-2016. Cluster estimator); © GeoBasis-DE/BKG (2016).) derived using the method of Gocht & Röder (2014). Version 2020	

Table S2: Input data for the models mGROWA, DENUZ, WEKU and MEPhos

Data	Source
Land use	Federal Agency for Cartography and Geodesy (BKG): Digital land cover model for Germany (LBM-DE2015)
Degree of imperviousness	Copernicus Land Monitoring Service: High Resolution Layer Imperviousness (2012) with 20 m grid space
Digital elevation model	Federal Agency for Cartography and Geodesy (BKG): Digital elevation model for Germany with 25 m grid space (DGM25)
Watershed boundaries	European data from WasserBLiCK database
Groundwater bodies	European data from WasserBLiCK database
River network	- European data from WasserBLiCK database - Federal Agency for Cartography and Geodesy (BKG): Digital land cover data for Germany (ATKIS DLM 250)
Soil profiles with data at horizon level: e.g. depth, soil moisture, texture Groundwater levels in the soil profile	Federal Institute for Geosciences and Natural Resources (BGR): Soil map 1:200,000
Agriculturally used land with potential artificial drainage	Research Centre Jülich, IBG-3: method after Tetzlaff et al. (2008)
Climate data: Precipitation	German Weather Service (DWD): CDC (Climate Data Center), time period 1981–2010 https://opendata.dwd.de/climate_environment/CDC/
Potential grass reference evapotranspiration	
Hydrogeological unit areas with conductivity data	Federal Institute for Geosciences and Natural Resources (BGR): Hydrogeological Map 1:200,000

Data	Source
River discharge measurements and gauging stations	Federal Institute for Hydrology (BfG): Discharge data in daily resolution
Atmospheric N-deposition	Works from Geupel, Federal Agency for the Environment
Groundwater quality data	State Agencies for the Environment

Table S3: Input data for the MONERIS model

Data	Source
urban areas, share of imperviousness	Federal Agency for Cartography and Geodesy (BKG): Digital land cover model for Germany (LBM-DE2015)
Precipitation	Provided by FZJ, see Table S2
Population and waste water collection and treatment at municipality level	Research Data Center (Forschungsdaten Zentrum) - Statistical Offices of the Federal Government and the Länder, Survey status 2013: Survey on the water supply and disposal of private households (EVAS 32251), Survey on public wastewater treatment (EVAS 32213), Survey on public wastewater disposal (EVAS 32212). MUGV. (2013). Municipal Wastewater Disposal in the State of Brandenburg - Status Report 2013. In Ministry of the Environment, Public Health and Consumer Protection (MUGV) (pp. 107).
person specific daily water consumption	Statistics portal. (2013): Statistical offices of the federal and state governments - connection rate, water consumption at district level, https://www.regionalstatistik.de/genesis/online?language=de&sequenz=statistikTabellen&selectionname=3221%2A#abreadcrumb
Inventory of waste water treatment plants	Pollutants of the PRTR - Situation in Germany - Reporting years 2007 – 2022, Umweltbundesamt, https://www.umweltbundesamt.de/sites/default/files/medien/376/publikationen/pollutants_of_the_prtr-situation_in_germany-reporting_years_2007-2022_v1.pdf
Hydrogeology	IHME. (2018). IHME 1500 - International Hydrogeological Map of Europe, https://www.bgr.bund.de/EN/Themen/Wasser/Projekte/lau-fend/Beratung/Ihme1500/ihme1500_projektbeschr_en.html

All data processing as well as the entire map creation has been performed with the software ArcMap 10.8 ® from esri.