Erosion modelling Baden-Württemberg

IPROconsult

Development of a processing strategy for soil erosion modelling for Baden-Württemberg based on the Glems catchment area

Client:
State Office for Geology, Raw Materials and Mining (LGRB) in the Freiburg Regional Council

Cooperation partner:
geomer GmbH

Services provided:
Erosion modelling

Execution period:
2021 - 2022

Published results:
Project report "Erosion modelling for Baden-Württemberg (Glems region)" LGRB technical report 2023/1: https://produkte.lgrb-bw.de/docPool/c717_data.pdf
Digital appendix to the project report Pilot area Glems: https://doi.org/10.5281/zenodo.7680734

Project background and objective

The background to the pilot project was the heavy rainfall risk management already implemented in Baden-Württemberg, in which municipal heavy rainfall hazard maps are created, which include information on flow paths, flow velocities and overflow heights of the surface runoff. In order to be able to identify the surfaces threatened by erosion due to heavy rain, in terms of potential erosion and input of displaced soil material, it is necessary to complement the heavy rainfall risk management with soil erosion modelling.

The aim was to develop a processing strategy for erosion risk modelling for the state of Baden-Württemberg. Due to their methodological advantages, physically-based soil erosion models were to be used for this purpose (EROSION-3D and open-LISEM).

The pilot project was initiated in the German federal state of Baden-Württemberg by a broad alliance of specialised authorities within the Ministry of the Environment and Ministry of Agriculture: In the selected pilot area (Glems), a catchment area of about 195 km², located northwest of Stuttgart, agricultural use dominates on the fertile, particularly erosion-prone loess loam soils.

Work steps

- Identification of primary data sources (including digital terrain model, digital landscape model, agricultural crop data, soil map, heavy precipitation data) and development of a processing methodology according to the requirements of the erosion models based on the pilot area Glems
- Derivation of the required soil and land cover parameters from the land use and soil information for the soil erosion models

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- Implementation of simulation runs for the Glems pilot area with the two physically-based erosion models EROSION-3D and openLISEM for various land use and precipitation scenarios, evaluation and plausibility check of the results, map creation and design for the erosion hazard maps
- Development of instructions for model application and criteria for model selection regarding the different fields of application of the various stakeholders
- Workshops with the stakeholders, regarding their requirements and expectations of the modelling, as well as the plausibility of the modelling results
- Development of principles and recommendations for the further procedure for soil erosion modelling (in connection with heavy rainfall risk management): Proposal of a combined approach from a state-wide processing ("Erosion hazard maps Baden-Württemberg" for initial assessment of the significance within the framework of heavy rainfall risk management) coupled with a municipal erosion risk management process (ERM)
- Development of a digital data collection form for field documentation of soil erosion events (for collection in a standardised state-wide database), e.g. for use in the validation of erosion modelling

Figure 1: Project meeting in Stuttgart

Figure 2: Validation workshop with farmers in Ditzingen

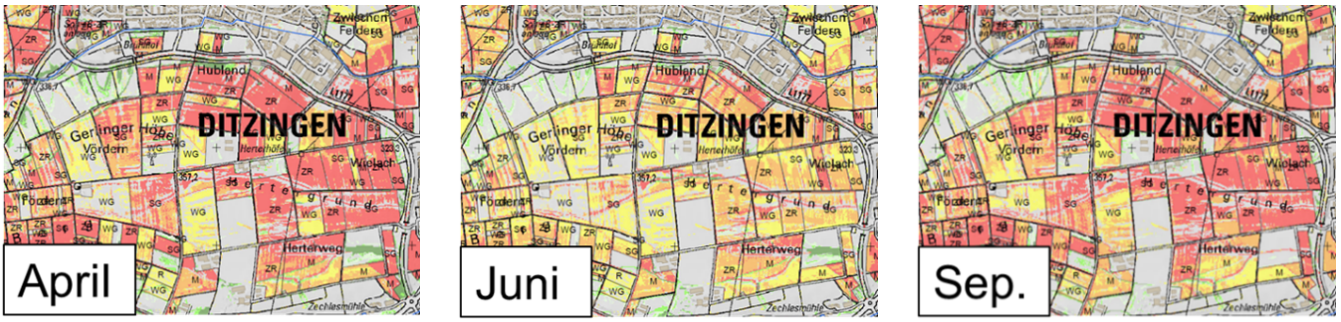

Figure 3: Section of the erosion hazard maps (Glems pilot area) for scenario simulations at three different time points

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