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Risk of the residents, infrastructure and water bodies by flash floods and sediment transport – assessment for scale of the Czech Republic

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Pluvial and flash floods, related to massive sediment transport become phenomenon nowadays, under conditions of climate changes. Storm events, related to material damages appear at unexpected places and their effective control is only possible in form of prevention. To apply preventive measures, there have to be defined localities with reasonable reliability, which are endangered by surface runoff and sediment transport produced in the subcatchments, often at agriculturally used landscape. Classification of such localities, concerning of potential damages and magnitude of sediment transport shall be also included within the analyses, to design control measures effectively.

Large scale project for whole territory of the Czech Republic (ca 80.000 km2) has therefore been granted b the Ministry of Interior of the Czech Republic, with the aim to define critical points, where interaction between surface runoff connected to massive sediment transport and infrastructure or vulnerable water bodies can occur and to classify them according to potential risk.

Advanced GIS routines, based on analyses of land use, soil conditions and morphology had been used to determine the critical points – points, where significant surface runoff occurs and interacts with infrastructure and vulnerable water bodies, based exclusively on the contributing area – flow accumulation. In total, ca 150.000 critical points were determined within the Czech Republic.

For each of critical points, its subcatchment had then been analyzed in detail, concerning of soil loss and sediment transport, using simulation model WATEM/SEDEM. The results were used for classification of potential risk of individual critical points, based on mean soil loss within subcatchment, total sediment transport trough the outlet point and subcatchment area. The classification has been done into 5 classes. The boundaries were determined by calibration survey and statistical analysis, performed at three experimental catchments area of 100 km2 each.

Concentrated flow trajectory had then been analyzed trough urban areas and potential vulnerability of incident structures has been determined. Total hazard of infrastructure has been classified again into 5 categories for each individual critical point using risk matrix, combining threat and vulnerability features.

Generalized control measures (changes in land-use, changes in agrotechnology, diverting linear measures or retention structures) were then introduced into mathematical model WATEM/SEDEM in number of scenarios, to allow effective design of control measures against surface runoff and sediment transport for each individual critical point.

Result of the project will be public available by WEB application and shall be useful for government, local decision makers, for planning of development of communities and also optimization of effective design of flash floods control measures.

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