Using an extended 2D hydrodynamic model for evaluating damage risk caused by extreme rain events: Flash Flood Risk Map Upper Austria

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Damage Risk Assessment

function of base damage, building density and max. water depth per category

12 different categories, derived and reclassified from:
- zoning plan maps
- vector layers for streets and railways
- VHR landcover products (Urban Atlas, USA)

Different damage functions per category

Based on proposed algorithm of Austrian Federal Ministry for cost-benefit analysis for flood protection works:
\[ D_{\text{tot}} = D_{\text{min}} + 1000 \times B \times \text{sqr}(\text{wd}) \times \text{density} \]
(\(B\): “use-specific factor”; corresponds to damage in 1000€ at water depth of 1m without \(D_{\text{min}}\))

Risk = function (max. water depth, landuse category, damage function)

Tools for stormwater management derived from FFRM methodics:
- inundation maps at high detail level
- hazard analysis considering buildings, garden walls, tubings etc.
- action plan for possible protection measures

Validation

Parameters have been tested and validated with rain gauge and discharge measurements of a rainstorm event in June 2012 for areas of Waldzell and Micheldorf, Upper Austria.

Fluvial <> Pluvial

Where are flash flood endangered areas?
- fluvial inundation areas mostly well known
- how to delineate spontaneous overland flow induced by heavy rainfall?
- after calculating hazard, can we estimate the damage risk?
- and what can we do against it?

Data & Hydraulics

Rainfall: Design precipitation values (T100 / 60 min duration) from Austrian Hydrological Service as basis for rainfall event

DEM: resolution freely selectable - FFRM based on 25m DEM (resampled ALS data), refined with WFD stream network (heights from 10m DEM) as breaklines. Maps for planning purposes based on 1m/0,5m ALS DEM.

Rainfall-Runoff model: two different approaches (SCS-CN, initial and continous loss), based on soil type, landcover and degree of imperviousness

Landcover: CORINE / Urban Atlas
Soil: Austrian Soil Map (1:25.000)

Hydraulics:
2D finite difference scheme, calculation stepwise by
1. calculating effective netto rain with temporal and spatial variation,
2. applying on every node
3. hydraulic calculation leads to water depth and velocity
\(\Rightarrow\) input water depth for next step starting again at point 1

Looking for additional information? see waterviewer.com or water-switch-on.eu/products.html

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