



## **PLUVIAL FLOODS – CRITERIA FOR THE PRELIMINARY FLOOD RISK ASSESSMENT IN THE SOUTH OF GERMANY**

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### **Abstract**

The methodology described in the following is the result of a workshop held in Karlsruhe on the 12th April 2010. The workshop was participated by representatives of German and Swiss authorities, science, engineering and other institutions involved in the implementation of the European Floods Directive (EG - FD).

In the south of Germany pluvial flood incidents are caused typically by local intense rainfall of convective cells.

The following part describes criteria for the assessment of pluvial floods, considering those having occurred in the past and an estimation if such impacts have to be expected for similar events in the future. The conclusion is arrived, that floodings of surface runoff, due to intense precipitation are not significant in the sense of EG-FD.

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## **1 Introduction**

The aim of the EG-FD is the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods. Therefore, all types of floods should be taken into consideration. Besides floodings along surface water bodies, there are also appearing those caused by surface runoff due to intense rainfall.

In the context of the preliminary flood risk assessment, according to articles 4 and 5 of the EFD, available information on pluvial floods is analysed for mapping the areas with a significant flood risk by surface run-off where appropriate.

## **2 Surrounding conditions in the south of Germany**

Flood incidents are natural appearances having different causes and characteristics, especially hydro-meteorological and geomorphologic ones.

The south of Germany is located in temperate climate zone, having a moderate-warm rain climate. The oceanic influence provides mild winters and moderate hot summers. In the warm season, convective cells occur, which provide intense precipitation of large height. These convective precipitation cells are at small scale – in most cases less than a few square-kilometres. They can occur anywhere in the south of Germany, which makes it not possible to map areas with a significant flood risk.

For those torrential precipitation incidents in the south of Germany, which have caused appreciable impacts, where gauged precipitation heights of 240 mm within three hours or less. These values exceed far those mentioned in the statistical convective precipitation analysis (KOSTRA) of the German state weather service (DWD). For this reason, they have to be considered as an extreme incident with a very low occurrence probability.

The relief of the south of Germany is highly structured and shaped by the low mountain ranges, covered of woodlands in a high percentage. Only 5-8 % of the territories are sealed. Water storage capacity in the area can



be considered as high, according to the rank vegetation and the abundantly covered soil. Due to the highly structured relief and the widely ramified water distribution network the drainage capability can be regarded as convenient. During torrential rainfall, the surface runoff can easily reach the next water body within a short range. Therewith the sub-basins to survey in the context of surface runoff are comparatively small. This also means, that accumulations of surface runoff have only little adverse impact.

### **3 Summary of previous incidents**

Within the research project “Forecasting and management of pluvial floods in urban areas (URBAS)” previous pluvial flood incidents in Germany have been analysed. The database of URBAS contains 422 incidents within a period of rather 30 years. The given sums for the adverse impacts base on uncertain estimations, mixing different kinds of damages. Mainly, there are documented singular incidents with relatively high damage sums, with an average of 160 million € per year in Germany. Almost all damages of such torrential rainfalls are located in very small areas. Often only a district of a municipality is affected. Pluvial floods are hydrological reactions of areas due to convective precipitation with short durations and large precipitation heights respectively intensities. According to the widely ramified water distribution network and the relatively small sub basins, precipitation incidents of middle (return period 100 years) or high (return period 10 years) occurrence probability do not cause noteworthy damages. Only extreme incidents cause higher damages.

### **4 Assessment of future flood incidents in Baden-Württemberg**

In addition to Bavaria and Rhineland-Palatinate, where only previous incidents of pluvial were surveyed, Baden-Württemberg has done a further analysis for the assessment of future incidents. The model is based



available data for soil, geologie, topography and soil-sealing. It displays surface runoff and infiltration by using physical equations.

The essential results of this analysis are:

- In slope areas the water depths of surface runoff are less than 5 cm.
- The duration of surface runoff is very short.
- Floodings with depths more than 50 cm appear only in the flood plains in the bottom of the valley; due to fluvial floods.
- Asserted damages in slope areas are mostly related to soil erosion or alluvial sedimentation.

## **5 Assessment of the potential significant flood risk**

As described above, intense rainfall appears at small scale and does only activate appreciable surface runoff at incidents with a return period considerable over 100 years. Such events can occur anywhere in the south of Germany, so that areas with a significant higher risk can not be identified. Previous incidents have shown, that adverse impacts to the EG-FD subjects of protection occur only in a local scale.

In Germany, the assessment of the significance of flood risks, is also linked to the public interest in flood protection infrastructure. Measures of public interest are required, where human lives or health are affected in a larger number or economic activities are impacted in a regional scale. Flood protection against pluvial floods can easily be realised by individuals.

For this reasons, in our point of view, for floodings of surface runoff a potential significant flood risk does not exist nor could it be considered likely to occur.

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