

# Four severe flood events within 11 years - measures and results of the flood risk management in the Free State of Saxony (Germany)

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## INTRODUCTION

Within 11 years, four partly extreme flood events occurred in the Free State of Saxony. In August 2002, the western two thirds of the state were affected by the extreme floods of the Elbe River and especially of the mid-range mountains rivers in the Ore Mountains. In spring 2006, mainly the Elbe River basin was affected by a flood. Heavy rainfall in August and September 2010 caused again several flood events, this time in the eastern third of Saxony where the river catchments of Schwarze Elster, Spree and Lausitzer Neiße were affected. The extreme runoffs especially in the Czech and Polish part of the Lausitzer Neiße catchment caused the destruction of the embankment of the reservoir Niedów at the Witka River in August 2010 (Figure 1) in a tragic way. In June 2013, all river catchments in the Free State of Saxony including the Elbe River basin were affected by extreme flood events. Each of the mentioned flood events had different hydrometeorological reasons. The event in August 2002 was distinguished by almost physical maximum possible precipitation amounts. In contrast, during the event in June 2013, much smaller precipitation amounts coincided with saturated soil. Concerning the mountain rivers, the events of 2002, 2010 and 2013 were characterised by vast solid matter processes that caused a significant part of the damages. While there were 124 dyke breaks in 2002, only 37 dyke breaks occurred in 2013.

## METHODS

Since the flood event in August 2002, the events are analysed not only in terms of meteorology and hydrology but also comprehensive risk assessments are carried out by means of detailed hydraulic investigations. The occurred damage processes and the resulted damages are analysed to suggest resulting preventive measures of risk and damage

potential reduction. In case studies, particular events are described and analysed in detail to draw conclusions for the future. Such events are for example the damn break in Glashütte in August 2002, the destruction of the water reservoir Niedów at the Witka River in August 2010, the control and the retention of the flood around the city of Leipzig in June 2013 and the consequences of the flooding of the open-mining lakes by the flood as it happened in 2010 and 2013. Further, the flood event management and the flood message service are also analysed. For the first time, social networks represented a new experience concerning the flood defence in 2013 in Saxony. And such networks will play an important role in the future.

## RESULTS AND CONCLUSIONS

Based on the experience of the flood event in August 2002, the Saxon flood protection strategy was re-arranged and comprehensive improvements were initiated in all field of action in flood risk management. Besides the flood event analysis, important organizational and technical improvements of the flood warning and forecasting system were also initiated. As an important consequence for the technical planning and realization of flood protection measures, the development of flood protection concepts and risk maps for all Saxon water bodies was commissioned.

Resulting from these analyses, about 1.600 suggestions of measures to improve the flood protection in Saxony were made for the rivers under state responsibility of maintenance and prioritized concerning economical and technical categories based on a special developed method. This conceptual basis enabled the initiation of a long term governmental flood protection investment program in 2005. By means of this program, a multitude of preventive measures could be realised in Saxony during the last 10 years, especially also concerning

the technical flood protection in Saxony. To achieve (and to preserve) a statewide adequate level of flood protection, the measure plans have to be continued and in addition to the investments, e.g. for technical flood protection measures, also the expenditures for the maintenance of constructions have to be ensured on the long term. With the introduction of the EU flood risk management directive in 2007, the realization of further requirements especially for the issue of flood risk management plans began in addition to the already initiated measures of avoidance, protection and prevention. The present contribution is meant to show the development from damage disposal to flood risk management in Saxony within 13 years. Although the flood intensity in 2013 was similar to that in 2002 and the spatial extend in 2013 was

even higher the resulting damages amounted only one third of these in 2002. The reasons for this much better compensation of flood events shall be explained here. In this regard, the considerably improved flood forecasting, the already realised technical and non-technical flood protection measures, the preventions in constructions, the new method of damage registration, the land use and further aspects of integrated flood risk management are presented. This „Saxon way“ is illustrated with the help of practical examples.



Figure 1. The valley of the river Witka with the broken embankment of the reservoir Niedów (Photo: SMI)

## KEYWORDS

event analyses; flood risk management; level of flood protection

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