Photo:Jozef van Brussel

Key findings

of the international water security symposium:
Flood and integrated catchment management

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ecorisQ - International association for natural hazard risk management

1 Introduction

Following the catastrophic floods of July 2021 in the area covering NW-Germany, the province of Liège in Belgium and the most southern part of the Netherlands, ecorisQ organised an international knowledge exchange on flood and integrated catchment management in June 2022. This was done in close collaboration with the Waterschap Limburg (provincial water board) and the municipality of Valkenburg aan de Geul, with support from the BFH-HAFL.

Traditionally, floods in many of the impacted catchments occurred generally during the winter and spring. The event has shown that long duration precipitation with large rainfall quantities (approx. 200 mm in 24h) during the summer period is not a future climate change scenario but the current reality we have to deal with. Moreover, flood events with even larger magnitudes are possibles.

The main conclusions and recommendations presented here originate from the observations and reflections of some of the participants. They are grouped according to the three main components of the integrated flood risk management cycle (response, regeneration, prevention) used in Switzerland, shown below.

Figure 1.1: Simplified version of the flood risk management cycle as applied in Switzerland since 2005.

2 Conclusions and recommendations

2.1 Response during a flooding event

1. Effective and appropriate response during a flooding event is key at the municipal level. This needs to be organised, strengthened and trained, but also supported financially as well as with data and information from the regional and national level.
2. Difficulties caused by reduced sight during evacuation and rescue at night without functioning electricity is a normality during flood events. Therefore, additional problems due to disorientation and lacking communication have to be dealt with. This stresses the importance of redundant systems.
3. Rigorously control access to dangerous locations (e.g., areas with flood levels > 50 cm with flow velocities > 1 m/s and bridges).
4. Anticipate rescues from dangerous situations. These can be related to a) physical flood related hazards such as high velocities of flowing water and debris as well as high flood levels (e.g., in underground car parkings) and b) hazards related to polluted flood water.
5. Disaster coordination units have to be located well beyond potential risk areas to remain operational during extreme events and be able to coordinate response. This also is required for response services (such as location of fire-departments, police offices, hospitals). If not, these need to be relocated prior to a large event is forecasted to happen (e.g., moving of essential materials out of the buildings located in hazard zones)

2.2 Regeneration after a flooding event

1. Invest in thorough event analyses to better understand the occurred flooding event and the given response to be able to learn lessons from mistakes and successes and to make sure to information on the occurred hazard (flooded area, flood levels and estimated of flow velocities at different locations) is securely stored in a database for improving hazard analyses of a wide range of scenarios, varying from frequent to very rare events. To do so, practitioners and applied science should work jointly, also across national boundaries.
2. Since long-term data on peak discharge are rare, invest in the analysis of historical flooding events which allow for a more robust definition of statistical return periods.
3. Collect data on public and private damage costs, as detailed as possible, as a basis for improving the risk based management of flood hazards.

2.3 Prevention before the next flooding event

1. Flood management across national boundaries requires significant additional efforts and willingness of all parties to establish and implement a common or compatible approach at all stages of a risk-based approach.
2. Hazard zonation based on different frequency-magnitude scenarios plays a key part in such an approach.
3. This zonation provides a basis for spatial planning, but also for emergency planning (evacuation zones, escape routes, fire brigade locations, observation posts, areas for intense warning and alarm).
4. Develop and maintain a flood event record database linked to a geoportal.

5. Develop a package of flood risk reduction measures for the hot-spots, such as Valkenburg, based on benefit-cost considerations. Thereby the currently defined protection reference levels should be reviewed and possibly be updated.
6. Different types of (structural, recurring and temporal) flood mitigation measures have different effects at different time and spatial scales, making it increasingly important to better understand the nuances and effectiveness of green-grey infrastructure interventions for flood risk reduction.
7. Building dams and reservoirs often provide a viable option, also to tackle drought risks, but accurate meteorological data is required to be able to manage these for flood risk reduction.
8. Nature restoration projects provide valuable contributions to the improvement of soil water infiltration and storage capacity and many other ecosystem services. The mitigating effect on the peak discharge of large floods resulting from long duration precipitation is small, since the (improved) soil water storage capacity is likely to be fully utilized at the time an extreme event takes place. Although very much required and important, the same accounts for erosion reduction measures on agricultural fields. Nevertheless, they all should be an integral part of the portfolio of flood risk reduction measures as they will contribute to reducing the cumulative damage done of a series of smaller extreme events that happen with a higher frequency. Every little bit helps.
9. Innovative financing, including private financing from the Bond and Carbon Market will increasingly become available for land-owners and water managers to pro-actively invest in hybrid green-grey measures for flood risk reduction.
10. The two Geul branches in the center of Valkenburg have a rather unfavourable rectangular profile which is also not always constant. Use simulation-based hydraulic tests to find out where problematic changes in the current cross-section need to be adjusted in order to prevent future scour leading to infrastructure collapse.
11. Be mindful of quick-wins: measures for flood risk reduction that can be implemented rapidly and/or at relatively low costs. Mobile dikes and small boats that are needed for evacuation need to be available at municipal level. Teams who are responsible for using them need to be trained in doing so to be effective just before or during the event. Annual exercises with mobile dikes could also contribute to actively raising the risk awareness of the population.
12. Initiate a risk culture to raise awareness of and capacity to adapt to flood and other natural hazard risks (such as extreme storms and droughts).
13. In collaboration with the insurance sector, object protection and adaptation of individual buildings needs to be initiated.
14. Flood protection largely based on insurances alone does not work - it only works in combination with risk prevention, including all aspects shown in Fig. 1.1, and according to the principle of solidarity.

We can never entirely prevent flooding in the future, but we can ensure that adequate risk and crisis management will prevent flood disasters. This calls for an integrated risk-based approach that also tackles other challenges, such as drought, water quality and biodiversity, and whose organisation ties in with committed and cooperative public - private - civil society partnerships.