

The Ahr disaster 2021: Path to a scenario-based mission profile for HEMS with hoists using historical evidence and reconstructed peak discharges

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Background

On the 14th/15th July 2021, the district of Ahrweiler (Germany) (**Fig. 1**) was hit by a flash flood (**Fig. 1; A-D**) of catastrophic and extreme proportions; 134 people died and more than 750 were injured [17]. Scenario-based knowledge in relation to the expected main areas of operation for HEMS with hoist, taking into account reconstructed peak discharges (Q_{mean}) (**Fig. 1, D, Fig. 3-5**) and historical reports, are currently not available.

Method

Comparative analysis of the 2016 Flood of the Century [1] (**Fig. 2**) and the Ahr disasters of 2021, 1910 and 1804 (**Fig. 1, 3-4**) in terms of discharge dimensions (**Fig. 1-4, D**) and the resulting damage pattern [2], with particular consideration of relevant mission profiles (**Fig. 1-4, E**) for HEMS with hoist in 2016/2021.

Results

134 dead in 2021 (**Fig. 1**), 52 dead in 1910 (**Fig. 3**) and 63 dead in 1804 (**Fig. 4**). Centenary flood 2016 - Rescue and evacuation of campsites, no fatalities. In 2016, a total of 42 people were rescued from life-threatening situations (34 with a hoist), no fatalities. **Focus 2016:** Rescue and evacuation of campsites (**Fig. 2, E₁**).

In 2021, hundreds of houses were destroyed (**Fig. 1**), hundreds of people were rescued with a hoist the day after the flash flood - discharge was 1120 [m³/s] and is most likely reflected in the Ahr disaster of 1804 (discharge: 1210 [m³/s]). In 1804, 129 houses disappeared and 469 were badly damaged. **Focus 2021:** Rescue from house roofs (**Fig. 1, E₂**).

Conclusion

In the context of reconstructed historical discharge, current and historical disaster reports offer an *initial basis for scenario development*, training and preliminary planning of priority tasks for emergency services and HEMS with hoist.

Whether an *impact forecast* (**Fig. 5a-b**) for heavy rain and flash floods with high spatial and temporal resolution allows a preemptive allocation (**Fig. 5b**) of HEMS with hoist requires further evaluation.

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