Response to Reviewers #2

RC: The discussed problem is highly interesting from a scientific perspective but principally in terms of operational safety of this type of structures. All aspects listed below require detailed explanations. If the above requirement is met, necessary information in ICOLD can be supplemented. There are numerous doubts at present. The study is a monograph and addresses a wide range of problems; this impedes arriving at conclusions for ICOLD and for an international Journal.

Thank you very much for this general opinion. Following the suggestions of the reviewer we summarised additional data on the Niedów dam and on the conditioning of the catastrophe next to information already provided. We would also like to note that our paper has not been meant to be a full report of the Niedów dam failure or as a monograph (we consider this as a valuable suggestion). It is difficult to provide a full set of data relevant from different perspectives and interests in such a short communication. In the following, there are responses to the issues raised by the reviewer.

1. Functions to be performed by the structure – a description

The reservoir function is given, in lines 107-110:
The Niedów dam on the Witka river (in km 2.2) is located in the south-west Poland, near the Polish-Czech and Polish-German borders. It was constructed in 1962 to supply water to the Turów coal power station for cooling purposes and for drinking water supply to nearby settlements, including the town of Bogatynia. In essence, the reservoir function was not to mitigate the flood hazard.

2. Geomorphological and hydrological conditions

Basic information are given in the text (l. 112) and in Fig. 6. As the failure of the dam was due to the overtopping, details on geomorphological conditions are considered not that essential as it would be the case of other dam break causes.

It is further not clear what kind of additional information are meant by the reviewer in terms of hydrological conditions. They are described in section 2.2. and 2.3. The inflow hydrograph is further depicted in Fig. 13.

3. Design guidelines (applicable during design work), data adopted for designing purposes, obtained final flow capacity parameters of the structure, geotechnical parameters of the structure, device output curves

The former text l. 164-165 is extended into:

"Three tainter steel gates, with a width of 6.7 m and a height of 6.6 m each, controlled the water outflow from the reservoir, see Fig. 4. The maximum yield of the weir, when the gates are elevated by 5 m and water level in the reservoir reaches 210 m a.s.l., is 500,0 $m^3 s^{-1}$. This corresponds to the design flow with an exceedance probability of 1 %. This yield can reach a value of 655 $m^3 s^{-1}$ for the designed maximum water level of 210.4 m a.s.l. In addition, the pillars of the central section contained bottom outlets with size of 2m x 1m, equipped with vertically moving flat closures. The yield capacity of each outlet was 10 $m^3 s^{-1}$ at water level upstream of 210 m a.s.l. and 202,20 m a.s.l. downstream. In normal conditions these openings were utilized to empty the reservoir.

4. A short operational description of the structure, technical assessments made, hydrological events, structure condition (maintenance status), changes in geotechnical parameters, dislocation of land-surveying points, filtration through the structure and results of control operations

Relevant information is added to the text:

The dam was technically supervised regularly, and was stable and in good condition. A number of maintenance and restoration works were executed in the years from 1998 to 2009, including the repair of the steel and concrete structures, the repair of the upstream slope, and the replacing of the road pavement on the top of the dam in 2009.

5. Complete probabilistic and physical characteristics of the input function that directly caused the disaster

This comment is rather general and we can hardly meet it in our response and in the paper. We suppose that this may form a separate study, which is not the basic goal of the paper. Nevertheless, the flood magnitude is described by a reoccurrence period of 100-200 year, l. 129. The inflow hydrograph is further depicted in Fig. 13.

6. Indirect conditions, here e.g. instructions for water management in the reservoir as a principal document binding upon the operator and deviations in control processes with their reasons

We added information on the dam operational instructions:

The dam was operated accordingly to a complete dam documentation. In total there were five major documents: i) guidelines for the operation of the water intake, ii) guidelines for flood management in the reservoir area, iii) technical instruction of the dam operation during the flood, iv) manual for gate control, v) manual for the power plant operation.

During the catastrophic flood, to control the water level in the reservoir the crew initially followed the operational manual. The procedure was to gradually elevate the gate by 0,2 m in order to maintain the desired water level. When the control of one gate was insufficient, the additional gate was also raised by 0.2 m. In the course of this unpreceded water level rise, the gate opening was accelerated. However, the water level exceeded the edge of the repaired gate at the inlet to the hydroelectric power plant (which was undergoing renovation at the time). As a result, the control room was flooded, the crew was evacuated from the rooms to the top of the dam, and the power supply to the dam was turned off. Finally, the crew tried to open more gates manually from the dam's crest. The event took place on Sunday, which influenced the transmission of information. The crew did not have full knowledge of the scale of the flood and the damage in the territory of Chechia (incl. the information concerning the destruction of the Frydland water gauge station on the Smeda/Witka River above the reservoir).

7. An analysis of simulation results and an assessment of potential differences compared to ICOLD data, applicable assessment methods that were used (e.g. empirical formulae)

The authors performed an analysis and assessment on the dam breach dynamics in reference to several formulas available in the literature along with making use of hydrodynamic modelling. What kind of ICOLD data was meant by the reviewer is not clear. We do not feel obliged to obey the ICOLD methodology, publicly not available. If desirable, it can be executed in other way, we will accept further kind suggestions.

8. If a structure with the same cross-section is to be reconstructed, a rationale must be given with applicable regulations and new characteristics of devices

The dam has been reconstructed by 2016. The new dam is a concrete dam equipped with an labyrinth overflow structure in place of the right side dam, as shown in figure below. Information on the design and construction of the new dam are in a technical report Kostecki, S., Rędowicz, W. (2011). Physical model testing for the reconstruction of the Niedów dam (in Polish). Institute of Geo- and Hydraulic Engineering, Wrocław University of Science and Technology.

Figure 1: The Niedów dam after reconstruction (fot. Wojciech Rędowicz)