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Comment on nhess-2021-199

Anonymous Referee #2

Referee comment on "The catastrophe of the Niedów dam – the causes of the dam's breach, its development and consequences" by Stanisław Kostecki and Robert Banasiak, Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-199-RC2>, 2021

The problem is very interesting, but its discussion is sadly incomplete. Analysing the current version of the article, clear conclusions for the ICOLD cannot be drawn, and thus the acceptance of the submitted description for publication in an international journal is problematic.

I wish to analyse a diagram that is crucial for a discussion of disasters affecting hydraulic structures, such as dams. Key details for an analysis include:

- Functions to be performed by the structure – a description
- Geomorphological and hydrological conditions
- 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
- 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
- complete probabilistic and physical characteristics of the input function that directly caused the disaster
- 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
- 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)
- 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 items indicated above are not explained in the article (items 3, 5, 7, 8) or are incompletely explained (all remaining items). The title indicates that the article was aimed to describe the causes of disaster, its development and consequences. All those elements can be identified but cannot be characterized as scientific. The article is structured as a superficial report on a failure, without any scientific commentary and references to formulas that are currently used to assess and analyse disasters (an attempt to analyse the problem scientifically was made in the previous version). The manuscript lacks a scientific commentary substantiated by calculations.

The proposed formula (1) ignores the physics of the phenomenon and is erroneous. Additionally, the concept of iteration is introduced without a precise equation / system of equations explaining that concept.

One of the most important tasks in analysing this type of disasters is to compare inflows with throughput capabilities of the structure (a capacity curve of discharge and spill devices - here omitted). In the description of hydrological background (precipitation and flow rates), hyetograph information is omitted, and there is no reference to the probability of maximum annual flow rates being exceeded. The discharge and spill devices in the structure were designed for a 1,000-year flood (estimated in the 1960s at about 650 m³/s). There was no applicable regulation then in force, other guidelines were followed, namely Soviet standards). The guidelines in force at present (Journal of Laws Dz.U. 2007 no. 86 item 579) require that the structure be designed with parameters meeting the requirements for Class 1: a 5,000-year flood (Wp⁵⁰⁰⁰ w stanu technicznego na katastrof⁵⁰⁰⁰ zapory zbiornika wodnego Niedów, Kostecki S., R⁵⁰⁰⁰dowicz W., Machajski J., Politechnika Wroc⁵⁰⁰⁰awska, Przegl⁵⁰⁰⁰d Budowlany – 2012) – but is designed for a 1,000-year flood. There is no information about this aspect, and no comment explaining the reason for a reduced class of that hydraulic structure. The key cross-sections, referring to Figure 10, do not contain flow hydrographs. Table 2 contains a surprising example of consistency between calculation results and measurements, unattainable in bivariate modelling. This requires comments, especially considering that the measurements were not taken during the process but after some time.

The article is unsuitable for publication in its current version, it has to be supplemented and thoroughly restructured. Its technical language must be corrected.