Time Trend Analysis for Fatal Dam Accidents

Internship

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Abstract

In this study, a time trend analysis is presented of fatal dam accidents that occurred worldwide in the period 1896 – 2015. Fatal accidents are merged into time windows of six years to avoid overfitting, and 50% overlap among the time windows is introduced to filter the noise. The fatal accidents dataset is divided into subsets according to the country where the accident occurred (OECD or non-OECD country), dam type and dam purpose. A Bayesian Hierarchical Model is used to perform time trend analysis, and its performance is compared with the results of three basic and broadly adopted statistical methods, namely the ARIMA model, the Ordinary Least Squares and the Mann-Kendall Trend test. Results show that the Bayesian Hierarchical Model, able to pool information from different data subsets, is robust against the limited dataset available. On the other hand, the ARIMA model is the method that more severely is affected by the data shortages, leading to unreliable results. Results show that time trends for OECD countries are more negative compared to non-OECD countries, meaning that over the period of observation the frequency of fatal accidents decreases more effectively, which is in line with their stronger safety culture, identified in previous literature results. Nevertheless, negative trends are recorded for all dam types and dam purposes in OECD and non-OECD countries, with limited disagreements between the methods that may be justified by the limited datasets and by the different algorithms used by the four trend analysis methods. Finally, attention is paid to identify any time trend difference between dams with and without hydropower functionality, however no remarkable differences between these two categories is noticed.