

# Understanding the Current State of Deep Learning Application to Water-related Disaster Management in Developing Countries

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## Abstract

Availability of abundant water resources data in developing countries is a great concern that has hindered the adoption of deep learning techniques (DL) for disaster prevention and mitigation. On the contrary, over the last two decades, a sizeable amount of DL publication in disaster management emanated from developed countries with efficient data management systems. To understand the current state of DL adoption for solving water-related disaster management in developing countries, an extensive bibliometric review coupled with a theory-based analysis of related research documents is conducted from 2003 - 2022 using Web of Science, Scopus, VOSviewer software and PRISMA model. Results show that four major disasters - pluvial / fluvial flooding, land subsidence, drought and snow avalanche are the most prevalent. Also, recurrent flash floods and landslides caused by irregular rainfall pattern, abundant freshwater and mountainous terrains made India the only developing country with an impressive DL adoption rate of 50% publication count, thereby setting the pace for other developing countries. Further analysis indicates that economically-disadvantaged countries will experience a delay in DL implementation based on their Human Development Index (HDI) because DL implementation is capital-intensive. COVID-19 among other factors is identified as a driver of DL. Although, the Long Short Term Model (LSTM) model is the most frequently used, but optimal model performance is not limited to a certain model. Each DL model performs based on defined modelling objectives. Furthermore, effect of input data size shows no clear relationship with model performance while final model deployment in solving disaster problems in real-life scenarios is lacking. Therefore, data augmentation and transfer learning are recommended to solve data management problems. Intensive research, training, innovation, deployment using cheap web-based servers, APIs and nature-based solutions are encouraged to enhance disaster preparedness.

**Keywords :** Disaster preparedness, Deep learning, Drought, Flood, LSTM

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