

EGU25-4234, updated on 18 Apr 2026

<https://doi.org/10.5194/egusphere-egu25-4234>

EGU General Assembly 2025

© Author(s) 2026. This work is distributed under the Creative Commons Attribution 4.0 License.



Curtailing flash flood impacts on vulnerable communities in data-scarce regions through the utilization of digital innovations

Meron Teferi Taye¹, Haileyesus Belay Lakew¹, Oscar Lino², and Ellen Dyer³

¹International Water Management Institute, East Africa and Nile basin office, Addis Ababa, Ethiopia (meron.taye@cgiar.org)

²Department of Meteorology, University of Nairobi, Nairobi, Kenya

³School of Geography and the Environment, Oxford University, Oxford, United Kingdom

Flash floods cause substantial hazards, particularly in regions with limited hydro-meteorological data availability that hinder the development of forecasting models and post-hazard impact assessments. The absence of comprehensive on-ground datasets regarding flood hazard characteristics, exposure elements, and vulnerability can impede accurate evaluations and effective risk management strategies. With advanced technology, integrating remotely sensed imagery products with machine learning can enhance flash flood prediction capabilities in data-scarce regions. This study applies remote sensing and machine learning techniques to enhance the identification of rainfall sources that cause flash floods and improve inundation detection in Lodwar Town, Kenya. Considering the area's frequent flash floods, this methodology is crucial for assessing flood risks and the sudden and severe impacts on the local community. This analysis used remotely sensed rainfall products, CHIRPS, MSWEP, IMERG, and TAMSAT, and Normalized Difference Water Index (NDWI) from Aqua MODIS satellite representing flood-inundated locations. Correlation analysis was conducted between rainfall and NDWI at a daily timescale for 2002-2022.

The results show that among the rainfall products, CHIRPS and MSWEP showed better performance in terms of 0-day lag time correlation with NDWI values of Lodwar town with a 0.51 correlation coefficient. To enhance the predictive capabilities of the NDWI in Lodwar Town, a machine learning technique with the Decision Tree Regressor model was applied to the finer spatial resolution CHIRPS rainfall data. The findings indicate that the model improved the correlation coefficient between rainfall and NDWI to 0.64 with a 0-day lag time, demonstrating its effectiveness in identifying potential rainfall areas causing flooding in the town. These are in the west, north-west, and south-west of Lodwar Town. Rainfall observed in identified flash flood source areas with elevations ranging from 508m to 648m can lead to rapid flooding in the town. This flooding occurs with a 0-day lag time, as the town is situated at approximately 500m elevation. If forecasted rainfall data from the identified areas that trigger flash floods is available, this study showed that it is possible to anticipate potential flooding events in the town. The methodology proposed in this study is particularly important in regions that lack comprehensive hydro-meteorological datasets that can support needed information to prepare and minimize the impacts of flash floods.

