

# Community-based flood early warning system: Current practice and Future directions

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## Introduction

- Climate change is anticipated to have significant repercussions on hydrology, including the occurrence of extreme rainfall and alterations in precipitation patterns. These changes are likely to lead to increased urban flooding and negatively impact existing urban infrastructure [1].
- Social media applications have emerged as reliable communication channels, especially when traditional methods falter [1]. Their integration into emergency management presents significant advantages, including enhanced situational awareness during unfolding events, rapid dissemination of news and alerts to broader audiences, and improved coordination among decision-makers and stakeholders [2]. Both remote sensing and social media data offer distinct advantages in large-scale flood monitoring and near-real-time flood monitoring [3].

## Aim and Objectives

The aim of this research is to develop the use of social networks during disasters, analyze patterns, and create a plan to identify best practices for utilizing social media during crises. In the future, a framework and mapping tool can be developed to automatically extract information from social media through text and image analysis. By integrating this data with other existing information sources, more accurate flood maps can be produced in real time.

## Methodology

- This study provides a systematic review of the existing literature on social media communications and recent advancements in disaster-related social media informatics. The review reveals significant challenges present in current research. Various software platforms, such as Twitter, YouTube, and other social media networks, were analyzed. Data extraction from these platforms was conducted using Python programming. These findings offer valuable insights for researchers exploring the connection between social media and disaster management.

## References

- [1] Piadeh, F., Behzadian, K. and Alani, A.M. (2022). A critical review of real-time modelling of flood forecasting in urban drainage systems. *Journal of Hydrology*, 607, p.127476.
- [2] Piadeh, F., Ahmadi, M., Behzadian, K. (2020). A Novel Planning Policy Framework for the Recognition of Responsible Stakeholders in the of Industrial Wastewater Reuse Projects. *Journal of Water Policy*, 24 (9), pp. 1541–1558.
- [3] Bakhtiari, V., Piadeh, F., Chen, A., Behzadian, K. (2024). Stakeholder Analysis in the Application of Cutting-Edge Digital Visualisation Technologies for Urban Flood Risk Management: A Critical Review. *Expert Systems with Applications*, p.121426.

## Key Findings

- Figure 1 illustrates the number of pertinent research studies conducted each year from 2014 to 2024.5
- Additionally, Figure 2 provides an analysis of the number of articles on different types of floods, while Map 3 displays the distribution of articles published on community-based flood early warning systems. Table 1 provides an overview of social media applications, analysis, modelling frameworks and their associated input parameters.

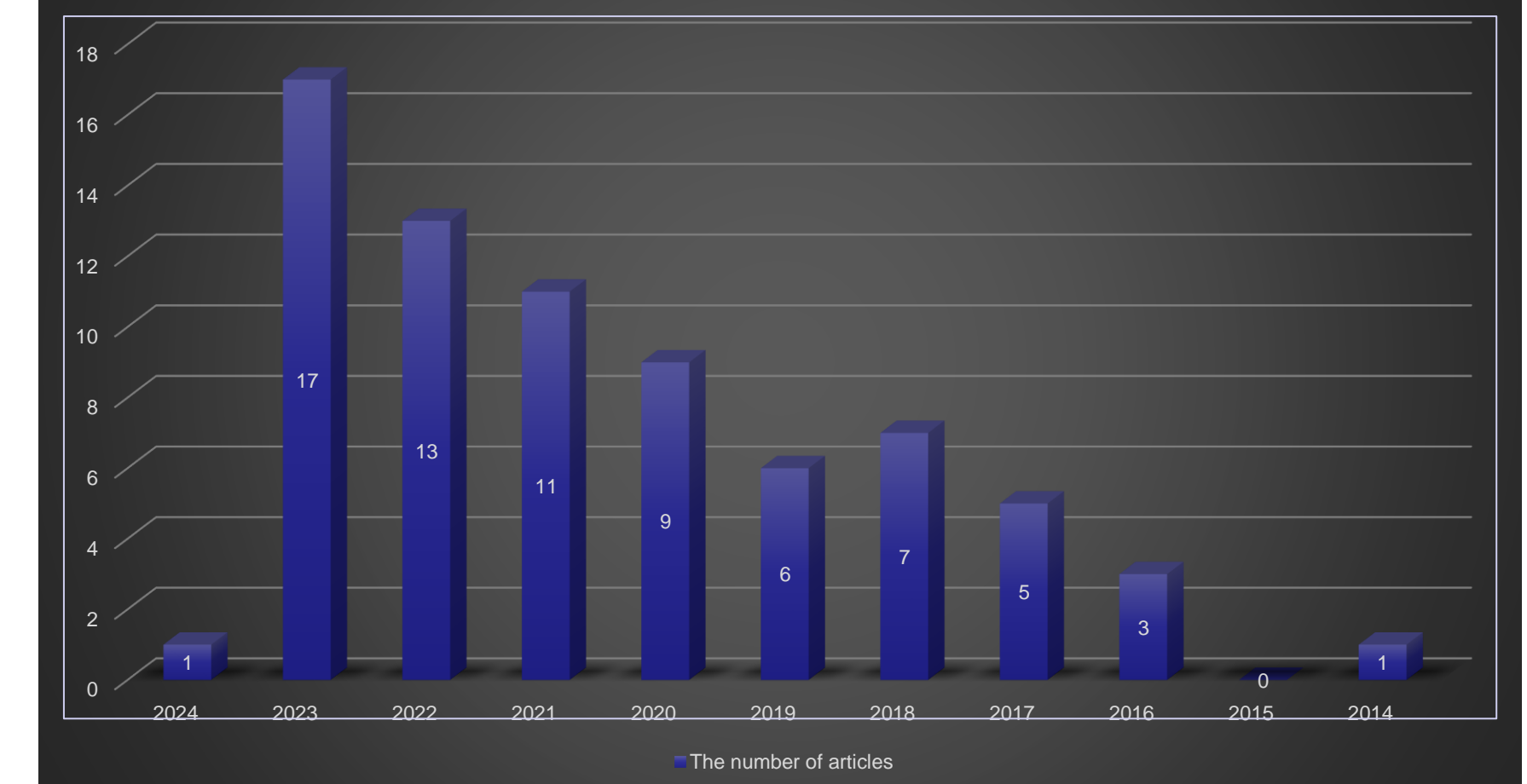
**Table 1. Illustrations of social media applications, Analysis, Modelling and input parameters**

Social media application	YouTube	twitter	We chat	Google map	Mobile telephone operator	CNN
Analysis	LISFLOOD-FP	STM-LDA-API	EMMFPO-hierarchical division	GCV API	Microsoft Excel- Smart PLS 3.0.- PLS SEM	Machine learning
Modeling	prototype web portal (Apache Tomcat and Geoserver)	HEC-RAS	MaxEnt algorithm	hydrodynamic model	PRICAM project (combining Fuzzy DELPHI, MCA, and GIS techniques)	Tweepy python library, API version 1.1.VGG16 Dense-VGG16 GAP-CNN LSTM-VGG16 LSTM-VIT
Input parameters	Sentinel-1 GRD images	matrix of training dataset	emotional classification of individuals	storm flooding related data-check in data-flood points data	Instantaneous Unit Hydrograph-width function	rainfall intensity-duration and coverage area-the heavy rainfall



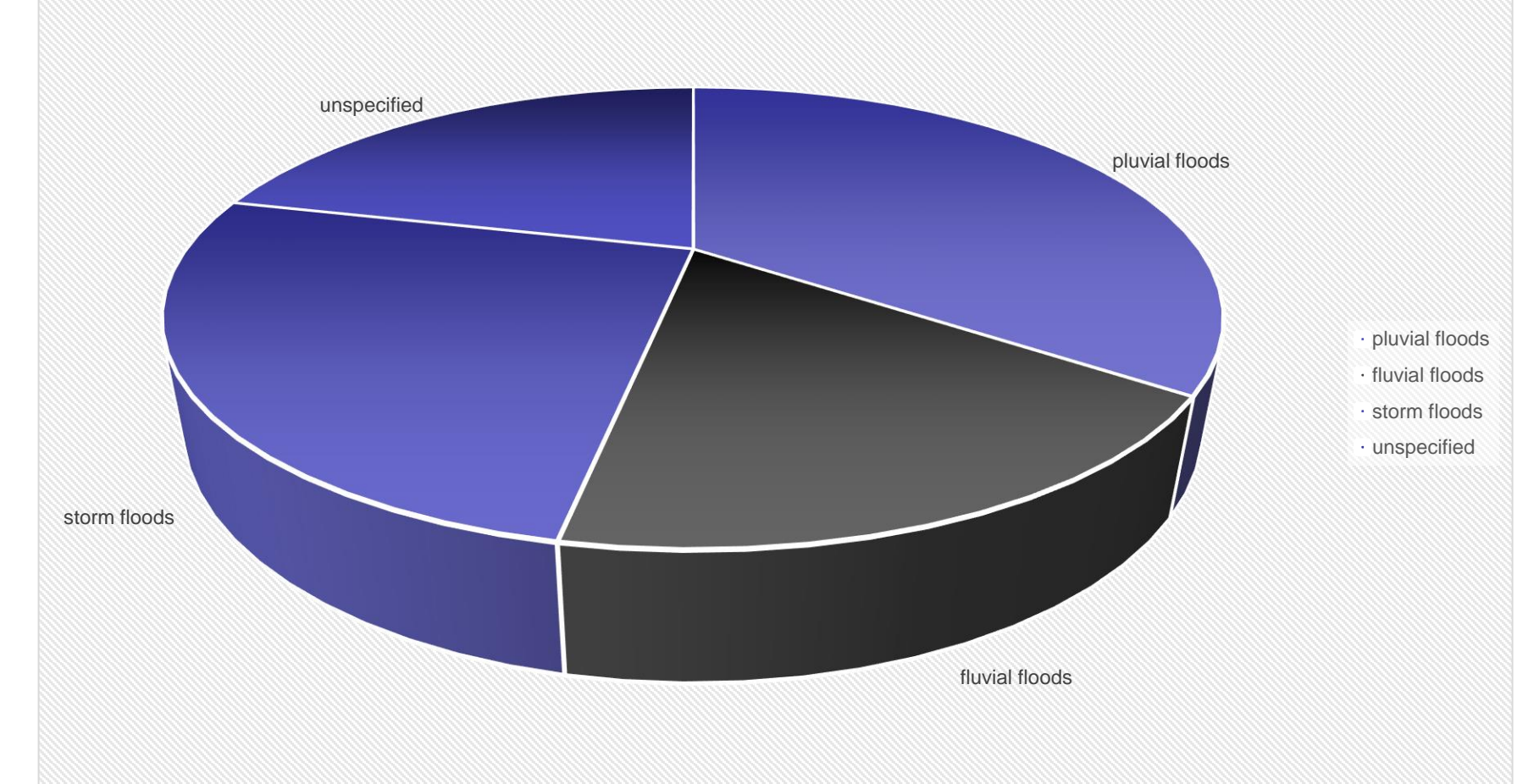
**Figure 1. Distribution of papers published/presented on the use of Internet of Things in urban flood risk management in various countries in the last decade**

**The number of articles**



**Figure 1 illustrates the number of pertinent research studies conducted each year from 2014 to 2024.**

**Number of studies conducted on each type of flood**



**Figure 2. provides an analysis of the number of articles on different types of floods**