

# Trend and Impacts of Flood in Tanzania: Evidence from Open Sources Database

**Bernard Baraka Komba**

The Open University of Tanzania

ORCID: 0009-0007-7400-8936

Corresponding email: [bernard.komba@out.ac.tz](mailto:bernard.komba@out.ac.tz)

## **Abstract**

*Climate change and climate variability have increased the frequency of flood events in many parts of Tanzania. Data related to flood events are limited at national, regional and district levels. In order to fill the gap on flood data at global to local level several open databases have been established in place such as International Disaster Database (EM DAT CRED), and UNDRR desInventar Sendai mentioning few of them. The study examines the trends of flood events and their associated impacts in Tanzania. The study purposively uses secondary data from EM DAT CRED online open database in studying the trend of flood in the united Republic of Tanzania. Data for 24 years have been considered as from 2000 to December 2024. The study relies on descriptive statistical analysis especially frequencies to express number of deaths, injuries, homeless and affected people. Study revealed that, 133 flood events have been recorded in the country. About 66% of all flood events within 24 years involved in this study documented to occur between 2014 and 2024. Morogoro (15%), Dar es Salaam (12%) and Arusha (8.2%) regions are far most leading in flood events. 21 flood events were experienced in 2018. Within the first quarter of 21st century, EM DAT CRED recorded 576 deaths, 547 injured people, 44 thousand homeless and 3.4 million people were affected by flood events. Although mortality and injury records are not consistently available, the existing data show an increasing trend. The study concludes that there is increasing trend of flood events and so does impacts (death, injury, homeless and total affected population). The study recommends that United Republic of Tanzania need to commit itself in developing disaster database that will enable determination of trend hence setting priorities for disaster management.*

**Keywords:** Database, EM DAT, Flood, Open Source, United Republic of Tanzania,

## **1.0 INTRODUCTION**

The 21<sup>st</sup> century recorded many flood events in many parts of the globe. Many deaths, injuries, and homeless impacts were associated with those floods. Tin et al. (2024) estimates that 54% and 20% of flood death occurs in Asia and America respectively. Climate change and climate variability have contributed to the increasing frequency of flood events

across Tanzania (United Republic of Tanzania [URT], 2004; URT, 2014; URT, 2022; Sakijege et al., 2014). Flood disaster in Tanzania is leading in its occurrence by 40% compared to other kinds of disasters (EM DAT in URT, 2022). However, reliable data on the impacts of floods such as deaths, injuries, displacement, and affected populations remain limited in many parts of Tanzania (Sakijege et al., 2014).

International global databases have been in use in most of developing countries as means of overcoming problem of data availability. Some of these databases are commercial while others are open sources (Ahmad et al., 2022; Bhuiyan et al., 2022; Tin et al., 2024; Delforge et al., 2025). These databases offer valuable statistical information that supports the analysis of disaster trends. Common open disaster databases include Emergency Events Database (EM-DAT) and DesInventor Sendai while more than 40 items EM DAT uses in collection of disaster information (Delforge et al., 2024). A study done by Tin et al. (2024) by using secondary data from EM DAT especially from 1995 to 2022 which revealed that hydrological disaster category took lead by 45% in African continent compared to other global regions and other categories of disasters. Open sources databases for disaster specifically EM-DAT open ways for making comparison of disasters herein floods event in both macro and micro level, international to local areas, regional to countries and sub countries.

Reviewed literature revealed that many studies relied on EM-DAT in studying disasters at the level of the globe. The study by Ahmad et al. (2022) focused on 210 countries on pandemic and epidemic disaster. Other studies focused on making review of literature established with dependency to open-source databases (Bhuiyan et al., 2022). Limited researches have focused on single types of natural disasters such as floods. Furthermore, attention given to a single country on specific natural disaster particularly flood is limited. Thus, this paper entails to analyze trend of flood events in Tanzania as from 2000 - 2024 (24 years). It also entails to examine trend of the impact of floods especially on death, injuries, homeless and others.

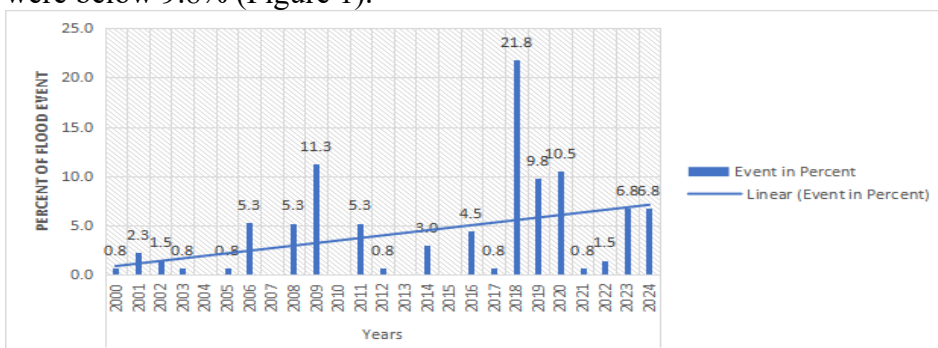
## **2.0 MATERIALS AND METHODS**

The study relied on secondary data from Emergency Events (EM-DAT) from 2000 to 2024. A 24-year period was selected to provide a clear picture of long-term trends in relation to recent climatic and environmental variability in the country. The data were extracted from the website of EM-DAT on 05<sup>th</sup> December 2024. Since the data were in

spread sheet format, data were filtered through country column to extract United Republic of Tanzania. Then after, data were filtered again to obtain only flood related disasters. The data-cleaning process included removing columns that were not relevant to the study. Finally, the study remained with key columns namely, type of disaster, places floods occurred, number of death, injured, affected and homeless/displaced population. Again, more than one flood event occurred in the same year over different location was combined to obtain total number of death, injured, affected and homeless/ displaced populations. Finally, cells with no data were labelled as “ND” implying No Data and were excluded from the study. Analysis was done by using Microsoft Office especially excel. Ethical considerations regarding secondary data usage have been adhered while developing this study.

### 3.0 FINDINGS

Finding from secondary data stored in EM DAT revealed that 133 flood events have been recorded in the United Republic of Tanzania in period lying between 2000 – 2024. The events were analyzed basing on the specific aspects namely year and region. Years with zero record of flood event were 2004, 2007, 2010, 2013 and 2015 while years with one to five events include 2000, 2001, 2002, 2003, 2005, 2012, 2014, 2017, 2021 and 2022. Years with five to 10 flood events are 2006, 2008, 2011, 2019, 2023 and 2024. Finally, years with more than 10 flood events include 2009, 2018, 2019 and 2020. Figure 1 indicates flood events from 2000 to 2024 presented in percentage. Years 2018 takes highest records (21.8%) then followed by 2009 with 11.3%, 2020 (10.5%), 2019 (9.8%) and rest were below 9.8% (Figure 1).

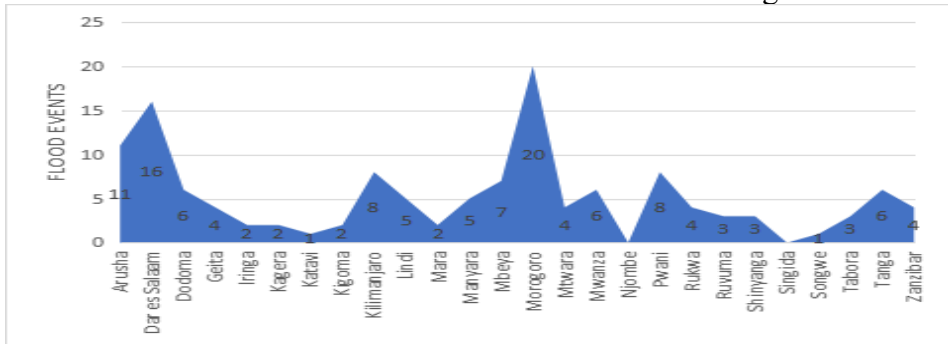


**Figure 1: Yearly flood events in Percent**

Source: EM -DAT 2024

On the side of flood events per region; Morogoro Region leads in flood event records with 20 (15%), followed by Dar es Salam 16 (12%), Arusha 11(8.2%) records, Kilimanjaro and Pwani each 8 (6%) records, Mbeya 7

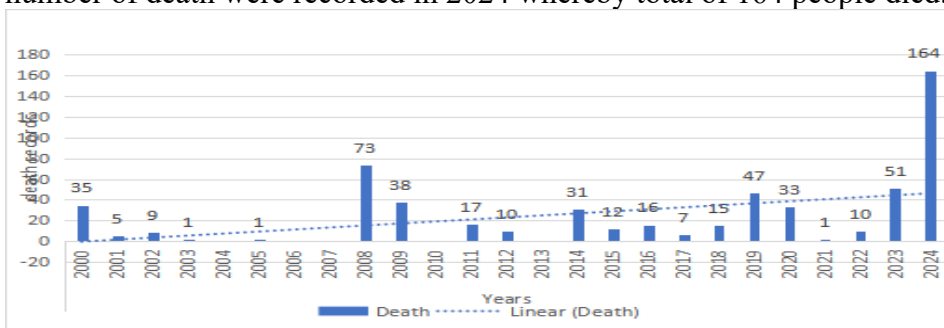
(5.3%), Tanga, Dodoma and Mwanza 6 (4.5%) records each, Lindi and Manyara each 5 (3.8%) records. Only Singida and Njombe regions did not record any flood events within specified time of the study. Figure 2 indicates number of flood events recorded in the level of region.



**Figure 2:** Flood Events in Regions from 2000 -2024

Source: EM-DAT, 2024

Deaths associated with flood events were recorded in multiple years throughout the study period. A total of 576 people were reported dead following flood events in 24 years. In 2000 death were 35 people, 2001 (5 people), 2002 (9 people), 2003, 2005 and 2021 (1 person in each year), 2008 (73 people), 2009 (38), 2011 (17 people), 2012 and 2022 (10 people each), 2024 (31people), 2015 (12 people), 2016 (16 people), 2017 (7 people), 2018 (15 people), 2019 (47 people), 2020 (33 people), 2022 (10 people), 2023 (51 people) and 2024 (164 people). Figure 3 display number of deaths resulted from flood as from 2000 to 2024. Highest number of death were recorded in 2024 whereby total of 164 people died.

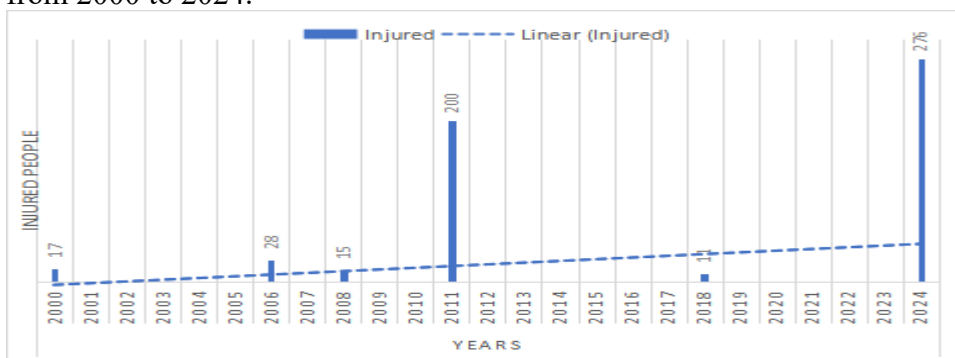


**Figure 3:** Death recorded in each year with flood event(s)

Source: EM – DAT, 2024

Number of injured cases was also recorded in number and percent of flood events. Total injuries recorded were 547 people. Injured people were recorded in only six years out of all years experienced flood events. In 2000, total of 17 (3.1%) people was injured, 2006 they were 26(5.1%),

and in 2008 were 15(2.1%), 2011 total of 200 (36.5%) people before decreasing in 2018 to 11 (2%) people and rise to 276 (50.5%) people in 2024. Figure 4 presents the number of people injured by flood events from 2000 to 2024.



**Figure 4:** Injured people from 2000 to 2024

Source: EM DAT, 2024

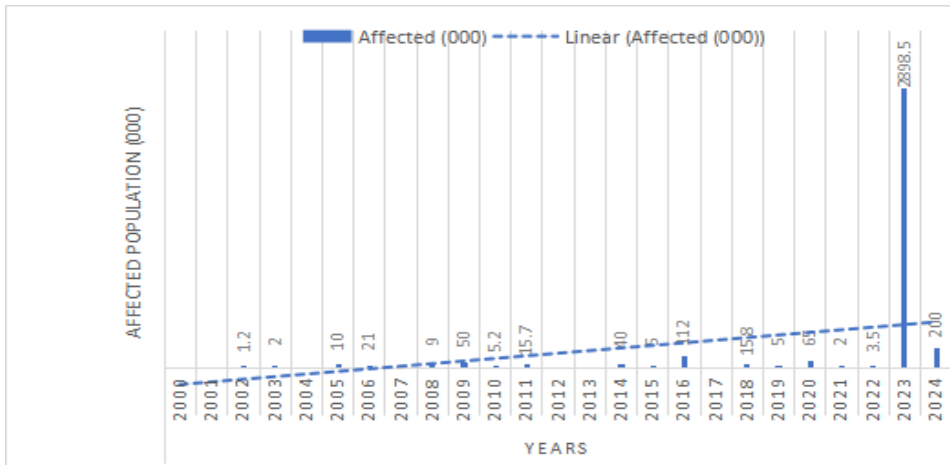
Thousands of people reported to be affected following flood events recorded over study period. In 2000, no record for affected population, similarly in 2001, 2004, 2006, 2007, 2012, 2013 and 2017. Finding reveals that total of 3460900 people was affected by flood. Year 2023 hold highest record of affected people whereby it reaches 83.5% (2,898,500) and 2024 hold second position with 5.8% (200,000) and 2016 with 3.2% (112,000) being in third position. Table 1 portrays affected population and Figure 5 indicates population affected by flood as from 2000 to 2024.

**Table 1: Flood Affected population from 2000 to 2024**

Year	Population	%	Year	Population	%
2000	ND	ND	2013	ND	ND
2001	ND	ND	2014	40,000	1.2
2002	1200	0.0	2015	5,000	0.2
2003	2000	0.0	2016	112,000	3.2
2004	ND	ND	2017	ND	ND
2005	10000	0.3	2018	15,800	0.5
2006	ND	ND	2019	5,000	0.1
2007	ND	ND	2020	6,500	1.9
2008	9000	0.3	2021	2,000	0.1
2009	50000	1.5	2022	3,500	0.1
2010	5200	0.2	2023	2,898,500	83.7
2011	15700	0.5	2024	200,000	5.8
2012	ND	ND	<b>Total</b>	<b>3,460,900</b>	<b>100</b>

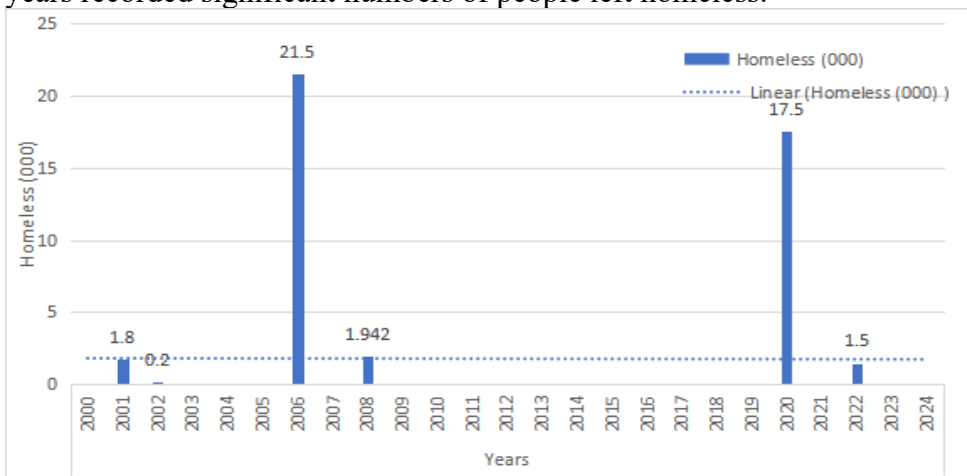
\*ND= No data recorded

Source: EM DAT, 2024



**Figure 5:** Flood affected population as from 2000 – 2024  
 Source: EM- DAT, 2024)

Homeless was among aspects considered in the study. Records revealed that 1800 (4.1%) were left homeless after flood in 2001. In 2006, more than 21500 (48.4%) were left homeless, 2008 were 1942 (4.4%), 2020 were 17500 (39.4) and 2022 were 1500 (3.4%). Figure 6 indicates records of population left homeless from 2000 to 2024. The homelessness data show no clear increasing or decreasing trend, largely because only a few years recorded significant numbers of people left homeless.



**Figure 6:** Homeless population from 2000 to 2024  
 Source: EM-DAT, 2024

#### 4.0 DISCUSSION

Total of 133 flood events recorded to occurs in Tanzania and about 66.35% of all flood events has occurred between 2014 and 2024. The finding of the study concurs with study performed by Delforge et al.

(2025) and Ringo et al. (2025) which identified flood increased in occurrence among natural disasters. The increased number of flood events in the past decade suggests a growing frequency of extreme rainfall in several parts of Tanzania. Also, factors such as introducing settlements in flood prone areas and urban development of all which increase surface running water while reducing percolation of water to the soil.

The regions of Morogoro, Dar es Salaam, and Arusha experienced the highest number of flood events between 2000 and 2024. 47 (35%) flood events out 133 flood events recorded from 2000 to 2024 are from those three regions. Nevertheless, floods in these regions have reported in almost all constituting districts. For example, Morogoro regions districts including Kilosa, Morogoro, Malinyi, Ulanga, Gairo and Kilombero have entered in the EM-DAT database particularly floods in not less than 15 years with floods events considered in this study. The findings of the study concur with studies done in Morogoro, Dar es Salaam and Arusha (Michael et al., 2023; Kemwita et al., 2023; Mhache, 2023) which expressed recurrence of flood, impact and adaptation to flood.

Njombe and Singida regions are only two regions with no record of flood event in any year. Contrary to study done in Singida which expressed flood event occurred in 2019 (Kimati *et al.*, 2022). Lack of flood records in these regions might be influenced with number of reasons including means and sources used to gather data that are entered in the EM DAT database. According to Delforge et al. (2024) EM DAT can be affected by systematic bias which influenced with reporting protocols, threshold and geographical biases. Thus, Singida and Njombe might be affected by one among these factors.

Number of deaths, injured people, affected and homeless resulted from flood events occurred between 2000 and 2024 have been analyzed based on years and not regions. The finding of the study concurs with what Tin et al. (2024) observed that trend of death and injured people increased in African, America and Asia continents. Since, one particular flood event used to record summation of all deaths, injured people, affected and homeless populations occurred in different regions then it is difficult to develop a clear cut of which geographical location is directly affected much. However, the trend of death, injured and affected realized to increase in the recent decade. Increased trend of death and injured people imply that during flood events people encounter shortage of food, humanitarian aids and breakdown of communication including roads, and bridges.

Only loss of settlements (homeless) events has shown that not occurring frequently as only two years experienced mass population reported flood events have left them homeless. Therefore, trend estimates remain uniform throughout. The finding of the study contradicting with observation made by Ringo et al. (2025) whereby 1734 household left homelessly following flood occurred in 2018 in Kilosa District. The finding of the studies implies that people remain in their places despite flood incidences or they quit for some hours to allow water being drained out from their houses.

## **5.0 CONCLUSION AND RECOMMENDATIONS**

Climatic change has caused increase in flood events in the United Republic of Tanzania. Since, 2014 Tanzania has experienced frequent flood events and general trend seems to increase. Within 24 years, all Tanzanian regions recorded number of flood events except Njombe and Singida regions. Morogoro, Dar es Salaam and Arusha take a lead in terms of floods. The study recommends that Tanzanian government should commit itself in developing disaster database that will enable determination of trend hence setting priorities for disaster management. Also, promote land use planning while considering factors such as elevation, slope, and nature of the soils to reducing occurrence of flood.

Open-source database including EM-DAT play vital role in filling the gap of “no data” on disaster cases especially in country like Tanzania. However, Open sources particularly global databases face some limitations: missing data in several aspects such as estimate loss and damage, database lacks spatial specificity as many regions/districts and even ward as flood events in different place generalized together. Apart from weakness observed still developing countries including URT have opportunity to utilize open source in decision making relating to disasters particularly flood. This study offers an opportunity for other researches focusing on building flood resilience in parts recorded to experience many floods events.

## **6.0 LIMITATION**

Although EM DAT open databases contain records of flood events in Tanzania, still flood events lacks consistency of the data. There are many missing data particularly in number of deaths, injuries, homeless and affected groups. This situation affects scientific researches. However, Tanzania has opportunity to continue using ED DAT and other open

databases while setting a platform for having national disaster database that will record all disaster in the country.

## REFERENCES

- Ahmad, J.; Ahmad, M. M.; Su, Z.; Rana I. A.; Rehman, A.; & Sadia, H. (2022). A Systematic Analysis of Worldwide Disasters, Epidemics and Pandemic Associated Mortality of 210 for 15 Years (2001-2015). *International Journal of Disaster Risk Reduction* 76 (2022) 103001. <https://doi.org/10.1016/j.ijdr.2022.103001>
- Bhuiyan, T. R.; Er, A. C.; Lim, S.; Muhamad, N.; Bakar, A. A.; & Pereira, J. J. (2022). Disaster Loss Indicators for Reporting to DesInventar Sendai and Enabling Rapid Valuation in Malaysia. *Weather and Climate Extremes* 37 (2022) 100488. <https://doi.org/10.1016/j.wace.2022.100488>
- Delforge, D.; Wathelet, V.; Below, R.; Sofia, C. L.; Tonnelier, M.; Van Loenhout, J. A. F.; & Speybroeck, N. (2025). EM-DAT: The Emergency Events Database. *International Journal of Disaster Risk Reduction* 124 (2025) 105509. <https://doi.org/10.1016/j.ijdr.2025.105509>
- Kemwita, E.F., Kombe, W. J., Ngulima, H. M. & Mwanyoka. I. R. (2023). Local Artisans of Flood Resilient Construction and Adaption of Residential Buildings in Flood – Prone Informal Settlement in Dar es Salaam- Tanzania. *Central European Journal of Geography and Sustainable Development* 2023, Volume 5, Issue 2, Pages: 5-23 <https://doi.org/10.47246/CEJGSD.2023.5.2.1>
- Kimati, A.; Munishi, S. & Kongo, V. (2022). Development of Operational Satellite-Based Flood Monitoring Model for Tanzania. *Tanzania Journal of Engineering and Technology* 2022, 41(4):58-70. DOI: <https://doi.org/10.52339/tjet.v41i4.874>
- Mhache, E. P. (2023). Flood Recurrences and Effect on Social-Economic Livelihoods of Communities in Dar es Salaam, Tanzania. *Journal of Meteorology and Climate Science* 21(1): 140-163 (June, 2022) 140 -194.
- Michael, P. S., Mwakyusa, L., Sanga, H. G., Shitindi, M. J., Kwaslema, D. R., Herzog, M., ...& Massawe, B. J.H. (2023). Flood Stress in Lowland Rice Production: Experience of Rice Farmers in Kilombero and Lower Rufiji Flood Plain-Tanzania. *Front. Sustain. Food Syst.* 7:1206754. doi:10.3389/fsufs.2023.1206754
- Ringo, J.; Sabai, S. & Mahenge, A. (2025). Contribution of Flood Early Warning Response Measure in Reducing Flood Effects in

- Kilosa District. Tanzania. *Climate Services* 37 (2025) 100534.  
<https://doi.org/10.1016/j.cliser.2024.100534>
- Sakijege, T.; Sartohadi, J.; Marfa, M. A.; Kassenga, G. R. & S. E. Kasala. (2014). Assessment of Adaptation Strategies to Flooding: A Comparative Study Between Informal Settlements of Keko Machungwa in Dar es Salaam, Tanzania and Sangkrah in Surakarta, Indonesia. *Jambá: Journal of Disaster Risk Studies* 6(1), Art. #131, 10 pages.  
<http://dx.doi.org/10.4102/jamba.v6i1.131>
- Tin, D.; Cheng, L.; Le, D.; Hata, R.; & Ciottone, G. (2024). Natural Disaster: A Comprehensive Study Using EMDAT Database 1995 -2022. *Public Health* 226 (2024) 255e260.  
<https://doi.org/10.1016/j.puhe.2023.11.017>
- United Republic of Tanzania [URT] (2004). *National Disaster Management Policy*. Dar es salaam. Government printer
- URT (2014). *Guideline for Management of Environmental Emergencies*. Vice President Office.
- URT (2024). *National Disaster Management Strategy (2022-2027)*. Prime Minister's Office. Disaster Management Division.