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Hazard Prioritization Summary

Provision of a scoping study to assess the current landscape of early warning and Impact-based Forecast initiatives across Africa

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1. Overview

A methodology was applied to characterize, prioritize, and select weather- and climate-induced hazards in support of two key outputs: (1) hazard prioritization summary at the regional and country level, and (2) regional narrative storylines. Section 2 explains the methodology for the data-driven characterization and prioritization of hazards. Prioritization combines indicators from multiple sources across key dimensions: hazard prevalence, geographic scale, impacts, future relevance, cascading hazards. Section 2.2 explains in more detail how the cascading hazards dimension is assessed. Section 2.4 describes the data sources used, whereby Annex A gives more in-depth information. Together, these inputs produced a final ranked list of hazards for each African region, which guided the selection of events for the regional storylines to ensure the most significant hazards were represented.

The results for the hazards scores are available through this link Africa Hazard Scores (by country).

2. Methods and Data

2.1. Overall hazard ranking framework

Figure 1 shows our systematic process for identifying who and what is at risk within a defined hazard and geographic context (continental, regional, and country level). We perform the selection and prioritization of hazards based on the following core dimensions: (a) hazard type(used to structure the assessment by hazard class, not as a scoring criterion), (b) hazard impact, scale, and prevalence quantified using standardized indicators extracted from the selected databases (e.g., event frequency for prevalence, affected population for impact, and spatial extent measures for scale) and then normalized to a common scoring range to enable cross-hazard comparison, (c) hazard cascade assessed qualitatively using evidence from multi-hazard interaction datasets and the literature to characterize the likelihood of co-occurrence or trigger pathways and the expected severity of knock-on effects, and (d) stakeholder interest scored from workshop rankings to reflect regional stakeholder priorities.

Figure 1 Hazard Characterization and Prioritization Process

(a) Hazard type: following the Invitation to Tender (Ref: SEWA_01) the climate-related hazards to be considered are drought and dry spells, dust storms, flash floods, riverine floods, Tropical cyclones, Thunderstorms, wildfires and smoke, and Heatwaves.

(b) Hazard impact, scale, and prevalence:

  i) **Prevalence** captures how often hazards occur.

  ii) **Impact** captures the severity of consequences for people,

iii) **Scale** reflects the geographic extent of hazard impacts and the scale of exposed populations and assets.

(c) Future relevance: captures how hazard exposure is expected to change under climate change.

(d) Hazard cascade: cascading impacts capture the cascading effects of a hazard triggering secondary hazards and leads to successive impacts across systems. An extensive review of cascading and compound effects was conducted and included as an additional analytical dimension.

(e) Stakeholder interest

Dimensions and their Indicators were assessed at the country level and then aggregated to the regional scale, accounting for differences in country size through population-weighted scoring. This population-weighted scoring should be interpreted with caution, as it uses total country population rather than the population specifically exposed to each hazard. In the absence of consistent hazard-specific exposure data, total population was used as a proxy, meaning the weighted results may partly reflect country size rather than actual exposure. For each hazard, we compute dimension scores and combine them (equal weighting across dimensions) into an overall ranking score.

- Country-level dimension scoring for each hazard (e.g., Scale, Prevalence, Impact, Future Relevance).
- Regional aggregation of country scores into four regions.
- Population-weighted adjustment so that countries contribute proportionally to their population.

Population weighting helps ensure regional prioritization reflects people potentially affected, not only the number of countries where a hazard appears.

For hazard h, dimension d, region R with countries c:

$$Score_{R,h,d} = \frac{\sum_{c \in R} \left(Pop_c \times Score_{c,h,d} \right)}{\sum_{c \in R} P\,op_c}$$

Where:

- Score_{c,h,d} = country-level score for hazard h and dimension d
- Pop_c = population of country c
- The denominator normalizes by total regional population

To complement the indicator-based hazard ranking, stakeholder perspectives were also gathered to capture users' interest for hazard prioritization across regions. Through regional consultations workshops, participants ranked hazards based on their interest in prioritization, reflecting where they see the greatest need for early warning system strengthening. Stakeholder perspectives were then presented side by side with the quantitative results, based on insights collected during the workshops. Because workshop participation may have been dominated by hydrometeorological agencies, these perspectives may not fully represent the broader range of relevant sectors and institutions.

2.2. Calculating the compounding and cascading hazard dimension

This dimension captures multi-hazard interactions where impacts are shaped not only by individual hazards, but also by how hazards co-occur or trigger one another. Two distinct (but sometimes overlapping) interaction types are assessed: compound and cascading hazards.

Compound hazards arise when two or more hazards impact the same area simultaneously or in rapid succession, resulting in combined effects that are not merely the sum of their individual impacts. Such interactions may intensify or, in certain instances, mitigate consequences due to shared constraints and competing demands on available coping resources. Key characteristics of compound hazards include: the potential for combined effects to exceed or fall short of the aggregate effects of separate hazards; overlapping shocks that place additional demands on services, supply chains, and response capacities; and the occurrence of hazards either together or sequentially within a single affected system. For example, in East Africa, the 2020–2023 drought likely left soils compacted and less able to absorb rainfall in some areas, which can increase runoff when heavy rains return. In 2024, this created conditions for severe flooding, and the resulting damage to water and sanitation systems created conditions for cholera outbreaks, with impacts compounding across livelihoods, infrastructure, and public health compared to each hazard occurring in isolation (UNDRR).

Cascading hazards refer to cause–effect chains wherein a primary hazard initiates secondary or tertiary hazards, resulting in a succession of impacts across interconnected systems. The defining features of cascading hazards include a distinct initiating event that produces subsequent hazards; the potential for secondary hazards to generate additional hazards and failures; and the propagation of impacts through physical infrastructure, environmental processes, or service dependencies. For instance, an earthquake may trigger a landslide, which then leads to dam failure and subsequent flooding demonstrating how a geophysical event can escalate impacts over time by setting off a chain of secondary hazards. In applied contexts, individual events may display both cascading and compound dynamics. As an example, a tropical cyclone causing flooding exemplifies a direct cascading relationship, while a cholera outbreak occurring alongside flood impacts represents a compound scenario in which simultaneous stresses such as displacement, disruption of water, sanitation and hygiene (WASH) services, and health system overload amplify overall consequences.

We quantified cascading and compounding hazards using multi-hazard event datasets that document when hazards overlap, occur in succession, or trigger others. This data-driven approach avoids relying solely on expert opinion, instead characterizing hazard interactions through actual event sequences.

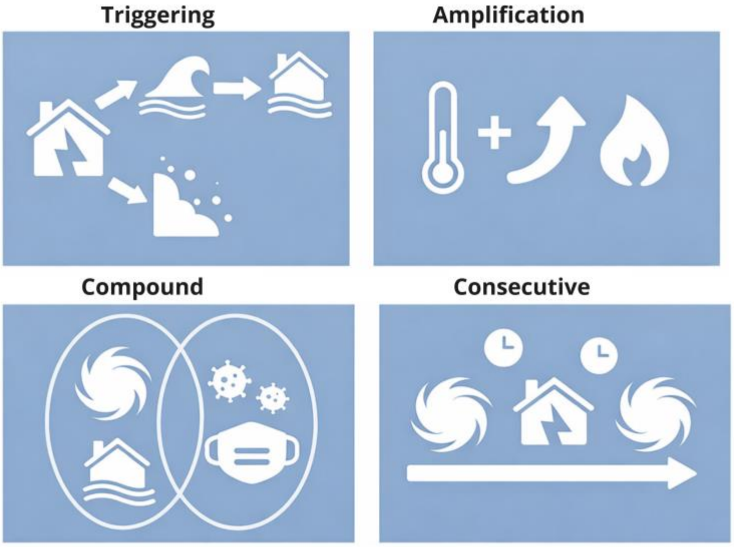


Figure 2 Overview of triggering and amplification relationships and compound vs consecutive events.

2.3. Stakeholder interest

Stakeholder perspectives on hazard prioritization were collected through SEWA Scoping Study workshops convened in four regions: East Africa, Central Africa, West Africa, and Southern Africa. These workshops brought together representatives from National Meteorological and Hydrological Services (NMHSs), ministries responsible for water resources, river basin organizations, and regional climate centers, providing region-specific insights to inform the prioritization process.

2.4. Data sources for prevalence, impact, scale, future relevance and hazard cascade

This assessment is based primarily on openly available datasets used to populate the indicators for the hazard dimensions: prevalence, impacts, scale, future relevance, and cascading/compounding interactions. Disaster risk data availability remains a constraint in many African contexts, particularly for consistent, long-term, and subnational risk information. To ensure methodological robustness despite these limitations, the hazard prioritization analysis prioritized established indicator databases that are widely applied in disaster risk and climate risk assessments and are supported by clear documentation. Relying on these data sources provides several advantages:

- Standardization: consistent event definitions and processing methods across countries and hazards.
- Comparability: enables cross-country and cross-regional comparison using common evidence base.
- Coverage: sufficient geographic and temporal scope to assess multiple hazard dimensions and
- Transparency and reproducibility: data and methods can be referenced, validated, and the ranking analysis can be repeated.

Overall, this method makes the hazard ranking easier to explain and interpret, because it applies consistent definitions and scoring steps across countries and regions. At the same time, the results still depend on the completeness and consistency of the underlying datasets, which vary by hazard and by country. We therefore present the outputs as evidence-informed prioritizations rather than definitive measures of absolute risk, and we explicitly document data gaps, uneven coverage, and key uncertainties to guide interpretation. Below is a summary of the main data sources, repositories, and organizations that were used for the prevalence, impact, scale, and future relevance dimensions, along with a description of each one's contributions to the hazard prioritization indicator dimensions:

- WorldRiskIndex (WorldRiskReport) – Provides a comparable, country-level disaster risk index combining exposure and societal vulnerability/coping components, useful as a cross-check for overall risk patterns.
- INFORM Risk Index – Open, standardized global risk framework (hazards & exposure, vulnerability, lack of coping capacity) used to support consistent comparison across countries.
- UNDRR – As the leading global reference body for disaster risk reduction and the host of the Sendai Framework monitoring platform, UNDRR supports alignment with established DRR standards; its DesInventar Sendai system provides national and local disaster loss databases that capture smaller, more frequent events often missing from global datasets, making it particularly useful for estimating event frequency and impacts where country data are available.
- EM-DAT – A global disaster events database that compiles reported event occurrence and impact information (e.g., deaths, people affected, and economic losses). While it provides a consistent structure, the completeness of reporting varies by hazard and by country, and some events or impact fields may be missing. In this analysis, EM-DAT is used as one input to characterize historical impacts, and it is complemented with DesInventar to strengthen coverage.
- World Bank Climate Change Knowledge Portal – Provides consistent climate baselines and projections to inform the “future relevance” dimension (changing hazard conditions).

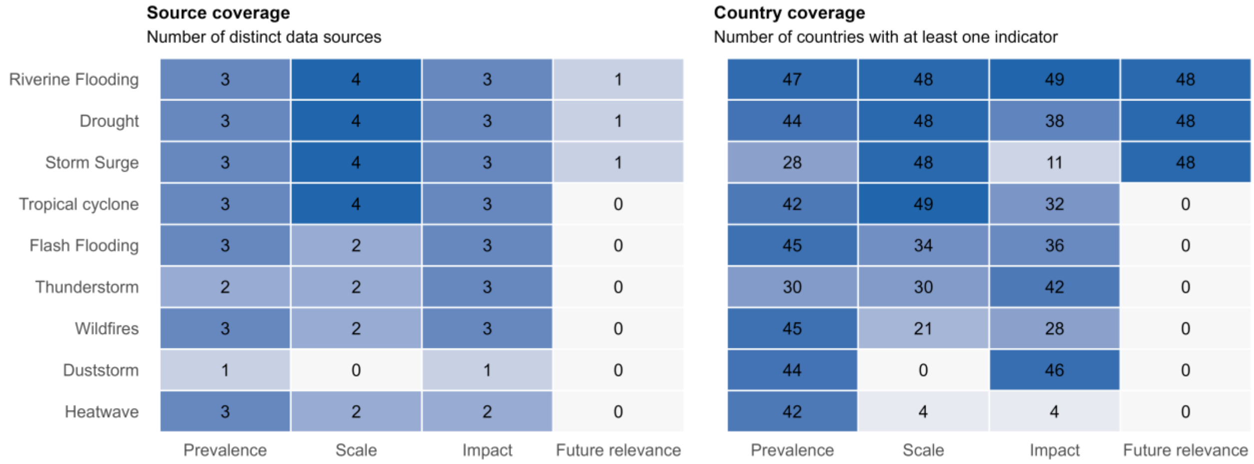
- GFDRR ThinkHazard! – Hazard information and methods to contextualize hazard presence/severity and provide an additional consistent reference layer.
- IDMC (Global Internal Displacement Database) – Displacement metrics used as an impact proxy (human consequences) for relevant hazards (e.g., floods, storms, drought-related displacement).
- The SYNOP dust frequency dataset (1974–2012) was used as a proxy indicator of dust storm activity. The dataset is derived from station-based synoptic present weather observations, using WMO dust-related weather codes that are aggregated to estimate the relative frequency and spatial distribution of dust occurrence. It is therefore useful for comparing the relative spatial pattern and intensity of dust activity across countries, although it does not represent a direct inventory of discrete dust storm events (Shao et al., 2013).
- The Global Burden of Disease Study 2023 ambient particulate matter pollution indicator was used as a proxy for dust-related air pollution exposure. This indicator measures exposure to ambient particulate matter pollution (PM2.5), which reflects fine particulate matter from multiple sources, including mineral dust as well as combustion-related and other anthropogenic emissions. As a result, it should not be interpreted as a dust-specific metric. However, it remains relevant in the African context because mineral dust is an important contributor to particulate pollution in North Africa, the Sahel, and parts of West Africa, even though its relative contribution varies across countries and regions (WHO)

The detailed indicators used for each dimension are listed in Annex A and Annex B provides detailed metadata for the indicators.

The data sources used for the cascading and compounding hazard is as follows.- Cascading and compound hazards were included as an additional criterion to ensure the hazard ranking reflects system-wide consequences, not only direct hazard frequency or impacts. We reviewed available open datasets and tools on compound events and interconnected risks (e.g., CETD, MYRIAD-HES, DOMINO-SEE, MhAST/MvCAT, and related catalogues) to identify where hazards tend to co-occur, trigger one another, or amplify impacts through time and across locations. This evidence was used to qualitatively assess each hazard’s potential for compound extremes (e.g., hot–dry conditions) and cascading failures (e.g., flooding disrupting transport, health services, and livelihoods). The criterion therefore captures both multi-hazard interaction likelihood and the severity of knock-on effects across critical sectors. Integrating this dimension helps prioritize hazards that may generate disproportionate disruption due to their ability to compound and cascade beyond the initial event.

2.5. Data Coverage and Gaps

Indicator coverage is inconsistent across both hazard and countries (Figure 3). Drought, riverine flooding, and tropical cyclones are well represented, being covered by multiple data sources across multiple dimensions. Gaps are more pronounced for flash flooding, thunderstorms, wildfires, and dust storms (more missing fields). As depicted in Figure 3, data availability for the Future Relevance dimension was limited, with only three hazards supported by suitable datasets. This constraint reduced the completeness of the quantitative scoring for climate change influence across the full hazard set. To ensure forward-looking climate change considerations were still captured in the prioritization, we complemented the analysis on this dimension with an additional methodology based on targeted literature review, synthesizing evidence on the expected direction and magnitude of climate change impacts for those hazards for which we had no source on the future relevance.



Source coverage
Number of distinct data sources

	Prevalence	Scale	Impact	Future relevance
Riverine Flooding	3	4	3	1
Drought	3	4	3	1
Storm Surge	3	4	3	1
Tropical cyclone	3	4	3	0
Flash Flooding	3	2	3	0
Thunderstorm	2	2	3	0
Wildfires	3	2	3	0
Duststorm	1	0	1	0
Heatwave	3	2	2	0

Country coverage
Number of countries with at least one indicator

	Prevalence	Scale	Impact	Future relevance
Riverine Flooding	47	48	49	48
Drought	44	48	38	48
Storm Surge	28	48	11	48
Tropical cyclone	42	49	32	0
Flash Flooding	45	34	36	0
Thunderstorm	30	30	42	0
Wildfires	45	21	28	0
Duststorm	44	0	46	0
Heatwave	42	4	4	0

Figure 3 Indicator coverage by hazard and dimension. The left panel shows the number of distinct data sources available for each hazard–dimension combination, while the right panel shows the number of countries with at least one available indicator for each hazard–dimension combination. Cells display the corresponding counts. Notably, for the future relevance dimension, data are available for only three hazards.

Figure 3 shows varied indicator coverage across hazards and dimensions, leading to uneven rankings. Some hazard–dimension pairs have multiple sources and wide country data, while others rely on few indicators or a single source. This variation, along with differences in indicator quality and consistency, affects reliability.

2.6. Uncertainty assessment of the hazard ranking

To help interpret the hazard ranking results, reliability was assessed for each country–hazard score using two main criteria: evidence coverage and source dependency. For evidence coverage, the analysis calculated an average of normalized scores across four dimensions for every country and hazard. Robustness was then evaluated based on how many of these dimensions were represented and the total number of unique indicators for each dimension. If data was missing for a particular dimension, that part was given a score of zero to highlight the gap. As for source dependency, the uncertainty analysis method looked at how many different data sources contributed to each score; any score based on just one source was considered less reliable due to the risk of bias. Confidence ratings were assigned as follows: High (at least 3 dimensions, 5 indicators, and 2 sources), Medium (at least 2 dimensions and 3 indicators), and Low (anything below those thresholds). The proportion of low-confidence results shows what percentage of country–hazard scores in a region fall into the “Low” confidence category according to this system. Figure 4 shows that many scores are based on just one or two indicators and limited dimensions, especially in Central Africa, where confidence is lowest. Heatwaves and dust storms usually lack strong evidence, while thunderstorms, wildfires, and flash floods often depend on one dimension or source. Drought and riverine flooding, however, benefit from broader coverage and more consistent evidence. Overall, the hazard rankings should be interpreted with caution, as their robustness depends on the strength of the underlying evidence base. At the same time, better coverage for some hazards may also reflect their greater prominence in existing monitoring and data systems, rather than only their underlying risk. Despite the uncertainties described above, the ranking exercise presented here is still informative in providing a quantitative analysis to support hazard prioritization, based on currently available data. Use of publicly available and standardized databases means that the analysis can be easily updated in the future as more data become available. The uncertainty analysis also highlights key areas where future initiatives could focus to strengthen our understanding of hazard impacts in Africa. It highlights areas that warrant further investigation by the wider community – are some hazards, such as dust storms and heatwaves genuinely less impactful, or are their impacts less well understood or less directly evident?

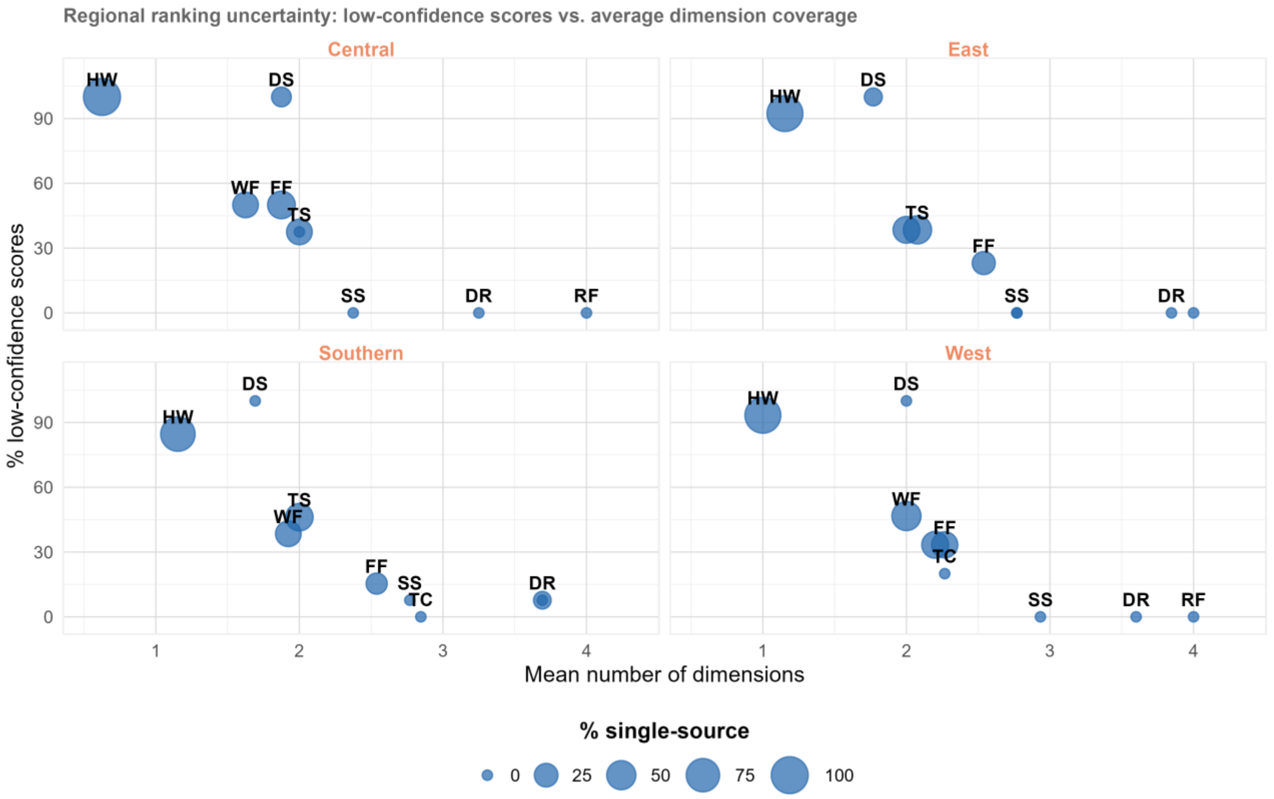


Figure 4 Uncertainty profile of hazard rankings by region. Each point represents one hazard within one region and is labeled using a two-letter hazard code: DR = Drought, DS = Dust storm, FF = Flash Flooding, HW = Heatwave, RF = Riverine Flooding, SS = Storm Surge, TS = Thunderstorm, TC = Tropical cyclone, and WF = Wildfires. The horizontal position shows the mean number of dimensions contributing to country-level hazard scores, the vertical position shows the percentage of country scores classified as low confidence, and bubble size indicates the percentage of scores that are highly source-dependent. Hazards positioned higher, further left, and with larger bubbles reflect weaker evidence bases and less robust rankings.

3. Results of hazard prioritization

3.1. Ranking-based indicators from risk databases

The hazard ranking analysis shows that riverine flooding is the most consistently high-ranking hazard across the four regions in Africa (Table 1). When all dimensions are included, including future relevance, riverine flooding ranks first in Central, East, and West Africa under both unweighted and population-weighted approaches, and second in Southern Africa. This indicates that it is both a major current driver of risk and likely to remain highly relevant in the future. Comparison of the unweighted and population-weighted results shows that regional hazard prioritization is broadly consistent across both approaches, especially for the top-ranked hazard, which remains unchanged in all four regions. Differences are more apparent among the hazards ranked second and third, suggesting that these are more sensitive to the concentration of population across countries. In particular, population weighting tends to increase the relative importance of hazards that are especially significant in more populous countries. However, this population-weighted approach should be interpreted with caution, as it relies on total country population rather than the population specifically exposed to each hazard. Ideally, hazard-specific exposed population would be used, as this would better reflect the number of people actually at risk. In the absence of consistent exposure data across hazards and countries, total population was used as a proxy. This means that the weighted results may partly reflect country size rather than hazard-specific exposure. Hazard rankings also vary within regions (Figure 5).

Nevertheless, the presence of consistent patterns in the ranking of hazards such as tropical cyclones, dust storms, and storm surge increases confidence in the results, despite the uncertainties outlined above. These patterns are generally consistent with those described in WP1–D3 (Synthesis Summary of Literature Review and Mapping), and should help guide SEWA in deciding which hazards to prioritize in each region.

Table 1 Top three ranked hazards by region under unweighted and population-weighted scoring, based on indicator-derived dimension scores

Region	Rank	Unweighted hazard	Population-weighted hazard
Central Africa	1	Riverine Flooding	Riverine Flooding
Central Africa	2	Drought	Wildfires
Central Africa	3	Flash Flooding	Drought
East Africa	1	Riverine Flooding	Riverine Flooding
East Africa	2	Drought	Flash Flooding
East Africa	3	Flash Flooding	Drought
Southern Africa	1	Drought	Drought
Southern Africa	2	Tropical Cyclone	Riverine Flooding
Southern Africa	3	Riverine Flooding	Tropical Cyclone
West Africa	1	Riverine Flooding	Riverine Flooding
West Africa	2	Drought	Drought
West Africa	3	Wildfires	Heatwave

As shown in Figure 3, only three hazards include indicators for the future relevance dimension. Removing this dimension alters the rankings, although riverine flooding remains among the highest-ranked hazards. The rankings without future relevance are more sensitive to population weighting, with notable shifts in East Africa, Southern Africa, West Africa, and Central Africa. This indicates that, when future relevance is excluded, the relative importance of several lower-ranked hazards becomes more dependent on how population is distributed across countries in the region.

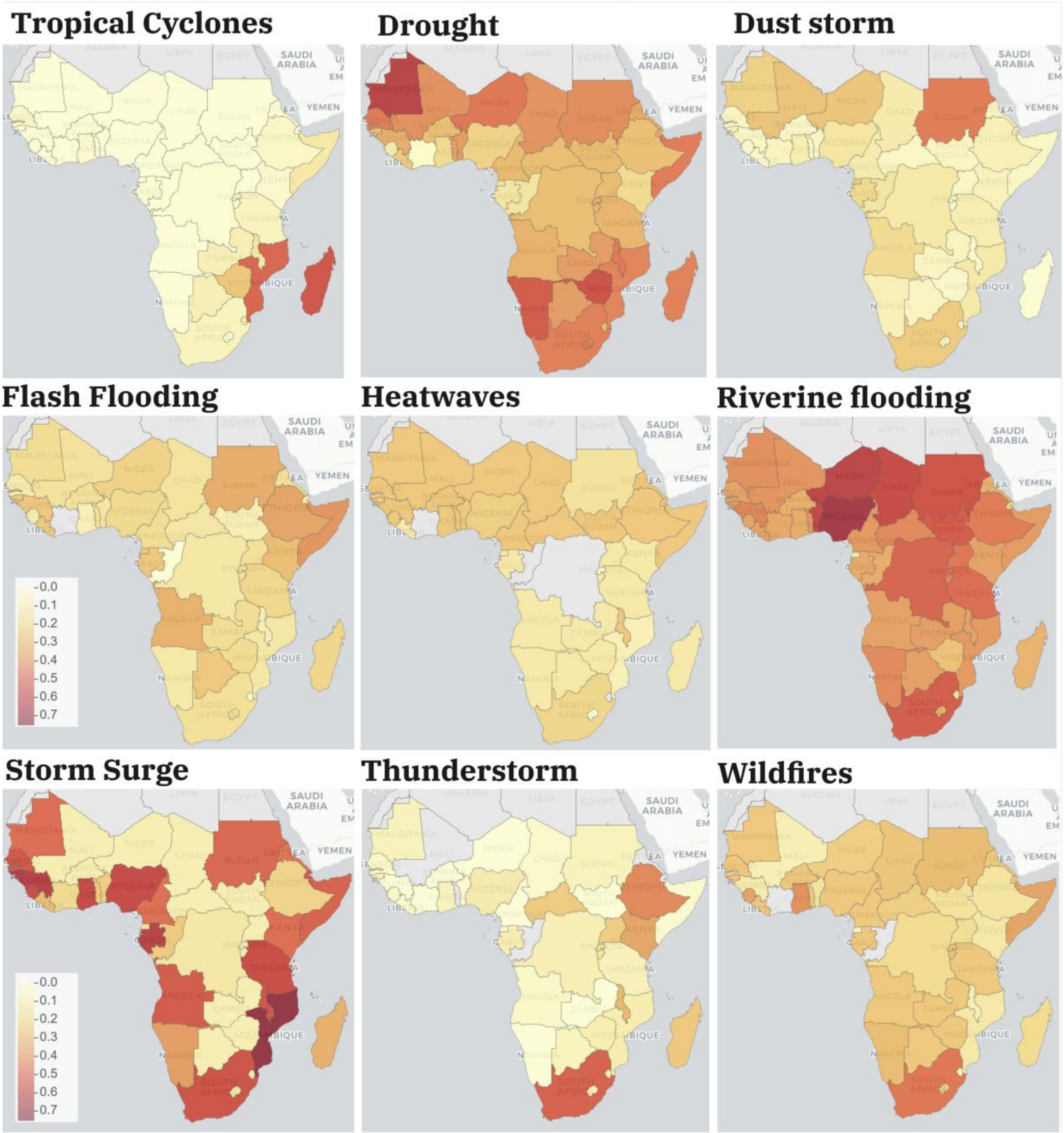


Figure 5. Country-level hazard ranking scores across Africa. The maps present the composite national hazard ranking score for each hazard across Africa, based on four dimensions in the applied scoring framework: prevalence, impact, scale, and future relevance. Darker shading indicates a higher score and thus a higher relative ranking. For an interactive overview of the results, see [Africa Hazard Scores (by country)]

3.2. Ranking based on stakeholders' interest

To complement the indicator-based hazard ranking, stakeholder perspectives were also gathered to capture users' interest for hazard prioritization across regions. Through regional consultations workshops, participants ranked hazards based on their interest in prioritization, reflecting where they see the greatest need for early warning system strengthening. Table 2 summarizes the top hazards per region as identified by stakeholders.

Table 2 Hazard prioritization of stakeholders for each region

Region	Top hazards (stakeholder interest)
Central Africa	Flash floods; Riverine floods; Thunderstorm
East Africa	Flash floods; Droughts & dry spells; Riverine floods
West Africa	Flash floods; Riverine floods; Thunderstorm
Southern Africa	Cyclones; Flash floods; Thunderstorms

3.3. Comparison of indicator-based ranking and stakeholders' interest

In summary, stakeholder priorities are broadly consistent with indicator-based findings: flash flooding and riverine flooding consistently emerge as dominant regional priority hazards, appearing among the top concerns in all four regions. This aligns with the quantitative ranking, in which riverine flooding is the most consistently high-ranking hazard across Africa and flash flooding frequently features among the top-ranked hazards. However, there is a notable difference when it comes to thunderstorms; in Central, West, and Southern Africa, stakeholders consider thunderstorms a major hazard, whereas quantitative analyses prioritize hazards such as storm surge and wildfires, ranking thunderstorms lower. This likely reflects the fact that stakeholder inputs emphasize high-frequency, operationally disruptive weather events that affect day-to-day preparedness and response, while such hazards may be underrepresented or less consistently captured in global indicator datasets.

3.4. Assessment of cascading and compounding hazards

Cascading and compounding hazard dynamics characterized by the tendency of major climate hazards to co-occur (compound) and to trigger or intensify subsequent hazards (cascade) were evaluated using harmonized multi-hazard event records from 2004 to 2017, supplemented with an extended reconstruction for 2017 to 2025 across Eastern, Western, Central, and Southern Africa. The aim was to characterize interaction pathways that are not reflected in single-hazard metrics and to incorporate these findings into hazard prioritization processes. Over the analysis period, a consistent continental trend was identified: both compounding and cascading interactions predominantly centered on slow-onset climatic hazards, specifically drought and heatwaves. These hazards frequently create antecedent conditions conducive to wildfire occurrence, thereby resulting in repeated co-occurrence or sequential multi-hazard events. Notably, Eastern Africa demonstrates the most stable interaction structure, with drought–heatwave–wildfire forming a closely connected system. Western Africa presents a similar core cluster, although interactions are comparatively more heterogeneous and less uniformly structured. In contrast, Central and Southern Africa did not display clear compounding or cascading patterns, likely due to limitations in dataset completeness, reporting density, and consistency in hazard classification for these regions during the study period. The overall assessment aligns with the future relevance dimension literature review, which underscores the significance of heatwaves particularly in Western Africa and offers additional insights by identifying specific interaction pathways. Importantly, the drought–heatwave–wildfire cluster is identified as a recurring multi-hazard sequence with considerable potential to amplify impacts and propagate risks across temporal and spatial scales, emphasizing its importance for multi-hazard preparedness and prioritization efforts.

3.5. Summary of Hazard rankings

Table 3 provides a comparative overview of the top three hazards by region, based on quantitative analysis and stakeholder consultation. The quantitative ranking incorporates scale, impact, and prevalence dimensions, while the table also includes hazards identified as priorities by stakeholders. As summarized in Table 3, the highest-ranked hazard differs slightly between the four regions: riverine flooding ranks first in

Central, East, and West Africa, while drought ranks first in Southern Africa. The main differences appear in the second- and third-ranked hazards. Population weighting increases the relative importance of wildfires in Central Africa, flash flooding in East Africa, riverine flooding in Southern Africa, and heatwave in West Africa. This indicates that the top-ranked hazard at regional level is relatively consistent across countries within each region, while the ranking of lower-ranked hazards is affected by the extent to which those hazards are concentrated in more populous countries.

Table 3 Comparison of the top three hazards by region from the quantitative analysis (unweighted and population-weighted scores) and stakeholder consultation.

Region	Rank	Unweighted hazard	Population-weighted hazard	Stakholder consultation
Central Africa	1	Riverine Flooding	Riverine Flooding	Flash Flooding
Central Africa	2	Drought	Wildfires	Riverine Flooding
Central Africa	3	Flash Flooding	Drought	Thunderstorm
East Africa	1	Riverine Flooding	Riverine Flooding	Flash flooding
East Africa	2	Drought	Flash Flooding	Drought and dry spell
East Africa	3	Flash Flooding	Drought	Riverine flooding
Southern Africa	1	Drought	Drought	Tropical cyclones
Southern Africa	2	Tropical Cyclone	Riverine Flooding	Flash floods
Southern Africa	3	Riverine Flooding	Tropical Cyclone	Thunderstorm
West Africa	1	Riverine Flooding	Riverine Flooding	Flash flooding
West Africa	2	Drought	Drought	Riverine Flooding
West Africa	3	Wildfires	Heatwave	Thunderstorm

4. Results of storyline hazard selection

Based on the multi-source hazard prioritization analysis, a final set of hazards was selected to anchor the regional storylines. Selection was guided by the overall ranking results, regional representativeness, and the need to reflect hazards with emerging climate-driven risk. For Central Africa, riverine flooding was selected, reflecting its consistently high ranking across the regions. For East Africa, the storyline will focus on flash flooding, given its high ranking and strong relevance to recent and recurring events affecting densely populated and rapidly growing urban and peri-urban areas. For Southern Africa, Tropical cyclone was selected to represent a major driver of damage and disruption, including its association with severe storms and cyclonic systems in the region. In West Africa, heatwave is proposed for the regional storyline. Although heatwave ranks third in the regional prioritization, it was selected to ensure the storylines adequately capture projected future relevance under climate change. The IPCC AR6 reports that "hot days, hot nights and heatwaves have become more frequent; heatwaves have also become longer (high confidence)," and notes that drying is projected particularly for West and southwestern Africa (high confidence).

5. Conclusion

In this report, we used a structured methodology to characterize, prioritize, and select weather- and climate-induced hazards across four African regions Central, East, West, and Southern Africa. Our approach supported two main outputs: (i) regional and country-level hazard prioritization and (ii) the selection of hazards for regional narrative storylines. The prioritization framework combined several dimensions prevalence, impact, scale, future relevance under climate change, and cascading or compounding interactions by using indicators primarily drawn from open and well-documented global and national risk databases, including INFORM, EM-DAT, DesInventar Sendai, ThinkHazard!, IDMC, and climate projection repositories. We also incorporated stakeholder perspectives from SEWA scoping workshops to capture regional user priorities for strengthening early warning systems.

Across the four regions, the quantitative results reveal that riverine flooding consistently ranks as the highest hazard. It holds the top position in Central, East, and West Africa under both unweighted and population-weighted methods and remains among the leading hazards in Southern Africa. Drought also stands out as a major regional priority, especially in Southern Africa where it ranks first, while flash flooding is particularly prominent in East Africa and appears among the top hazards in several regional analyses. Stakeholder perspectives largely confirm the indicator-based findings, especially in emphasizing riverine flooding and flash flooding as priority hazards for early warning improvements. However, stakeholders rank thunderstorms highly in Central, West, and Southern Africa, while our quantitative analysis generally ranks them lower. This difference likely arises because stakeholders recognize frequent and operationally disruptive hazards that global risk datasets do not always represent consistently.

Our analysis also shows broad consistency between the unweighted and population-weighted approaches for regional hazard prioritization, especially for the highest-ranked hazard in each region. We notice more differences among the second- and third-ranked hazards, indicating that these are more sensitive to how populations are distributed across countries. However, we advise caution when interpreting the population-weighted results. The weighting uses total country population, not the population specifically exposed to each hazard, so it only serves as a proxy for hazard-specific exposure. As a result, the weighted rankings may partly reflect country size as well as the underlying hazard relevance.

One important limitation of our assessment is the uneven availability and quality of evidence across hazards, dimensions, and regions. Hazards such as drought and riverine flooding benefit from broader and more consistent evidence across multiple dimensions, while hazards including heatwaves, dust storms, thunderstorms, and wildfires suffer from more limited or fragmented coverage. In particular, we could only quantify the future relevance dimension for a subset of hazards. To address this gap, we conducted a targeted literature review to capture the likely influence of climate change for hazards that lack suitable quantitative indicators. Overall, these results should be interpreted as evidence-informed prioritizations rather than definitive measures of absolute risk. Stronger coverage for some hazards may reflect their better representation in existing monitoring and reporting systems, not just their actual risk levels.

When we analyzed cascading and compounding interactions, we found that some hazards can cause disproportionate disruption through multi-hazard pathways. For example, the recurring drought–heatwave–wildfire interaction cluster identified in parts of Africa highlights the need to consider not only direct hazard impacts, but also the ways hazards can co-occur, reinforce each other, and spread across systems and sectors.

When selecting hazards for the regional storylines, we considered more than just ranking results. We also prioritized regional representativeness and the need to reflect emerging climate-related risks. This approach led us to select a final set of storyline hazards that balances currently high-ranking hazards with those that are likely to become more important as climate change progresses.

Overall, our analysis provides a transparent and reproducible basis for regional hazard prioritization across Africa. At the same time, you should interpret the results with appropriate caution, given the uneven evidence base, the use of total population as a proxy in weighted aggregation, and the limited availability of quantitative indicators for some hazards and dimensions.

Annex A – Hazard Ranking Indicator Catalogue and Definitions

Dimension	Definition	Indicator name (plain)	What it measures / how to interpret
Prevalence	This definition focuses on how common a hazard is by using indicators that describe its frequency or likelihood. It includes how often events occur on average each year or decade, how frequently an event of a given magnitude is expected (its return period or recurrence interval, like a 1-in-50-year storm), and the probability that the hazard will exceed a defined intensity threshold. It also considers whether the hazard is seasonal - occurring predictably in certain months and whether its frequency is changing over time (increasing, stable, or decreasing)	Events per year (EM-DAT, 2000–2024)	Mean number of recorded hazard events per year in EM-DAT during 2000–2024. Higher = the hazard shows up more frequently in the historical record.
		Events per year (DesInventar, 2000–2024)	Mean number of recorded hazard events per year in DesInventar during 2000–2024. Higher = more frequent occurrence as captured in national/local reporting.
		ThinkHazard hazard level (8 hazard types)	Categorical/ordinal “hazard level” per hazard type from ThinkHazard (e.g., very low → very high). Interprets baseline hazard propensity/severity (often reflecting probability and intensity thresholds). Higher level = greater underlying hazard concern.
Impact	This definition focuses on the impacts of a hazard—the consequences if it occurs—by using indicators that capture the severity of outcomes for people, systems, and the economy. It includes human impacts such as mortality rates and injury or illness cases (including hospitalizations or disease outbreaks linked to the event), as well as financial impacts measured through economic losses (in USD or as a share of GDP, using sources like EM-DAT or national databases). It also looks at damage to critical infrastructure (e.g., schools, hospitals, power, and water systems), impacts on agriculture and food systems (crop losses, livestock mortality, fisheries disruption), and broader livelihood effects such as displacement and the number of days of work or school lost.	People affected per 100,000 (EM-DAT, 2000–2024)	Average annual number of people reported as “affected” by the hazard, normalized per 100,000 population over 2000–2024. Higher = larger human impact on people’s lives (injuries, homelessness, needing assistance, etc., depending on EM-DAT definitions).
		Deaths per 100,000 (EM-DAT, 2000–2024)	Average annual disaster deaths, normalized per 100,000 population over 2000–2024. Higher = higher lethality / mortality burden from the hazard.
		People affected per 100,000 (DesInventar, 2000–2024)	Average annual number of people affected, from DesInventar, normalized per 100,000 population over 2000–2024. Higher = larger reported impact; often captures smaller/local events better than global datasets in some countries.
		Deaths per 100,000 (DesInventar, 2000–2024)	Average annual disaster deaths from DesInventar, normalized per 100,000 population over 2000–2024. Higher = higher mortality burden in national/subnational reporting streams.

		Ambient particulate matter pollution(PM2.5)	Global Burden of Disease Study 2021. IHME, 2023."
Scale	This definition describes the scale of a hazard in terms of its geographic reach and how long it lasts, using indicators that capture size, coverage, and duration. It looks at the spatial extent of the affected area (for example, km² or the share of an administrative unit), how many people are exposed within the hazard zone, and which critical infrastructure falls inside the hazard footprint (such as roads, schools, and hospitals). It also considers the duration of impacts how many hours or days an area remains affected and whether the hazard is confined locally or spreads across regions or even national borders.	INFORM hazard exposure index (Coastal, Drought, River Flood, Tropical Cyclone)	INFORM's standardized exposure score for each hazard type. Higher = more people/assets likely exposed (relative scale within INFORM methodology). Useful for comparing "exposure magnitude" across countries.
		WRI drought exposure indicator (EI_06)	Drought-specific exposure/impact-related metric from WRI's Aqueduct/related framework Higher = greater drought exposure pressure (interpretation depends on the exact WRI dataset version used).
		Mean event magnitude (EM-DAT, 2000–2024)	Average of EM-DAT "magnitude" field for the hazard over 2000–2024 (only for events where magnitude is reported). Higher = historically stronger/more intense events as recorded (note: magnitude definitions differ by hazard).
Cascade impacts	This dimension captures the cascading effects a hazard can trigger across sectors and systems where one impact leads to another. It also considers compound impacts, where multiple hazards or stressors occur together or in sequence and amplify harm, increasing overall risk beyond the impact of individual hazard.	Based on multi-hazard event datasets, primarily the MYRIAD-HES / MYRIAD-HESA hazard event sets, to quantify compound co-occurrence and cascading sequences between hazards.	Because multi-hazard event coverage in the data source is incomplete across countries, we used a qualitative assessment to identify the most credible cascading and compounding pathways by hazard and region, drawing on MYRIAD-HES to extract and compare event spatial footprints where available
Future relevance	This dimension describes how climate change is influencing the hazard's behavior now and in the future, whether it is making the hazard more frequent, more intense, longer-lasting, or affecting new places/seasons.	INFORM Climate Change – projected change in hazard exposure (Riverine flooding, Drought, and Storm surge)	INFORM Climate Change metrics describing projected change in hazard exposure. Higher (or more positive) = exposure is expected to increase more under climate change assumptions, relative to INFORMCC methodology.

Annex B Metadata for indicators

Hazard	Dimension	Indicator used	Data source	Definition used in this study	Unit or scale	Notes
Drought	Future relevance	INFORMCC.CHG_HAZEX.DROUGHT.2050.pessimistic	INFORM Climate Change	Projected change in drought hazard and exposure by around 2050 under the pessimistic scenario	Index / model output	Scenario- and model-dependent; reflects projected exposure change rather than observed impacts
Drought	Impact	DESINVENTAR.AFFECTED_PER100K_2000_2024	DesInventar Sendai	Total affected (2000–2024) expressed per 100,000 population	People per 100k	Country-managed; completeness varies; records may be disaggregated by admin units
Drought	Impact	DESINVENTAR.DEATHS_PER100K_2000_2024	DesInventar Sendai	Total deaths (2000–2024) expressed per 100,000 population	Deaths per 100k	Country-managed; completeness and attribution vary
Drought	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) expressed per 100,000 population	People per 100k	Underreporting and uneven completeness across countries/hazards; inclusion criteria apply
Drought	Impact	IDMC.DISPLACEMENTS_PER100K_2000_2024_POPREF	IDMC	Disaster-related internal displacements (2000–2024) per 100,000 population	Displacements per 100k	Impact proxy (mobility), not hazard occurrence; sensitive to attribution/reporting and vulnerability
Drought	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT disaster event counts averaged per year (2000–2024)	Events/year	Represents recorded major disasters; smaller/local events may be missing
Drought	Prevalence	TH.DG_LEVEL	ThinkHazard (GFDRR)	ThinkHazard hazard level classification for drought	Ordinal category	Screening-level classification from global layers; indicative only
Drought	Scale	DESINVENTAR.MAGNITUDE_MEAN_2000_2024	DesInventar Sendai	Mean reported magnitude value for 2000–2024, where available	Varies by country/hazard	Magnitude scales may not be standardized; interpret primarily as relative signal
Drought	Scale	INFORM.HAZEX.DROUGHT	INFORM Risk	Drought hazard & exposure component used as relative exposure signal	Index component	Composite framework; depends on global hazard layers; screening-level

Drought	Scale	WRI.EI_06	WorldRiskIndex	Weighted Mean of Sums of Affected Raster Cell counts/Shares; Weights Given by Inverse of Return Periods	Index/exposure metric	WorldRiskIndex exposure-related indicator used as a relative exposure signal in this study
Dust Storm	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) per 100,000 population	People per 100k	Dust/sand storm impacts often underreported; completeness varies
Dust Storm	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT dust/sand storm events averaged per year (2000–2024)	Events/year	Event capture uneven; smaller events often missing
Flash Flooding	Impact	DESINVENTAR.AFFECTED_PER100K_2000_2024	DesInventar Sendai	Total affected (2000–2024) per 100,000 population	People per 100k	Country-managed; flash flood coding may vary; record counts may reflect admin disaggregation
Flash Flooding	Impact	DESINVENTAR.DEATHS_PER100K_2000_2024	DesInventar Sendai	Total deaths (2000–2024) per 100,000 population	Deaths per 100k	Completeness and attribution vary by country
Flash Flooding	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) per 100,000 population	People per 100k	Smaller/local flash floods often missing; reporting varies
Flash Flooding	Impact	IDMC.DISPLACEMENTS_PER100K_2000_2024_POPREF	IDMC	Disaster-related internal displacements (2000–2024) per 100,000 population	Displacements per 100k	Impact proxy; attribution to flash flooding may not be explicit in all records
Flash Flooding	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT flash flood events averaged per year (2000–2024)	Events/year	Represents recorded major disasters; uneven completeness
Flash Flooding	Prevalence	TH.UF_LEVEL	ThinkHazard (GFDRR)	ThinkHazard hazard level classification for urban flood, used here as a proxy indicator for flash-flood prevalence	Ordinal category	Screening-level indicator from a global hazard screening tool
Flash Flooding	Scale	EM-DAT.MAGNITUDE_MEAN_2000_2024	EM-DAT (CRED)	Mean recorded magnitude (2000–2024) where available	Hazard-dependent	Magnitude meaning/unit varies; often missing
Heatwave	Impact	DESINVENTAR.AFFECTED_PER100K_2000_2024	DesInventar Sendai	Total affected (2000–2024) per 100,000 population	People per 100k	Heat impacts frequently under-recorded; national attribution practices vary

Heatwave	Impact	DESINVENTAR.DEATHS_PER100K_2000_2024	DesInventar Sendai	Total deaths (2000–2024) per 100,000 population	Deaths per 100k	Heat-related mortality attribution is difficult; undercounting likely
Heatwave	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) per 100,000 population	People per 100k	Heat events and impacts can be underreported; attribution challenges
Heatwave	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT heatwave events averaged per year (2000–2024)	Events/year	Heatwave recording varies; not all events meet EM-DAT thresholds
Heatwave	Prevalence	TH.EH_LEVEL	ThinkHazard (GFDRR)	ThinkHazard hazard level classification for extreme heat	Ordinal category	Screening-level; does not incorporate health vulnerability directly
Heatwave	Scale	EM-DAT.MAGNITUDE_MEAN_2000_2024	EM-DAT (CRED)	Mean recorded magnitude (2000–2024) where available	Hazard-dependent	Magnitude often missing and hazard-specific
Riverine Flooding	Future relevance	INFORMCC.CHG_HAZEX.FLOOD.2050.pessimistic	INFORM Climate Change	Projected change in flood hazard & exposure by ~2050 under “pessimistic” scenario	Index / model output	Scenario- and model-dependent; does not capture local protection explicitly
Riverine Flooding	Impact	DESINVENTAR.AFFECTED_PER100K_2000_2024	DesInventar Sendai	Total affected (2000–2024) per 100,000 population	People per 100k	Country-managed; flood sub-type coding may vary
Riverine Flooding	Impact	DESINVENTAR.DEATHS_PER100K_2000_2024	DesInventar Sendai	Total deaths (2000–2024) per 100,000 population	Deaths per 100k	Completeness and attribution vary
Riverine Flooding	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) per 100,000 population	People per 100k	Smaller/local floods may be missing; impacts often incomplete
Riverine Flooding	Impact	IDMC.DISPLACEMENTS_PER100K_2000_2024_POPREF	IDMC	Disaster-related internal displacements (2000–2024) per 100,000 population	Displacements per 100k	Impact proxy; flood attribution may be broad (not always riverine-specific)
Riverine Flooding	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT flood events averaged per year (2000–2024)	Events/year	Event capture uneven by country; inclusion criteria apply
Riverine Flooding	Prevalence	TH.FL_LEVEL	ThinkHazard (GFDRR)	ThinkHazard hazard level classification for floods	Ordinal category	Screening-level; spatial variability and defenses not fully represented

Riverine Flooding	Scale	DESINVENTAR.MAGNITUDE_MEAN_2000_2024	DesInventar Sendai	Mean “magnitude” value (2000–2024) where available	Varies by country/ hazard	Magnitude scale not standardized across countries
Riverine Flooding	Scale	EM-DAT.MAGNITUDE_MEAN_2000_2024	EM-DAT (CRED)	Mean recorded magnitude (2000–2024) where available	Hazard-dependent	Magnitude meaning varies and is often missing
Storm Surge	Future relevance	INFORMCC.CHG_HAZEX.COASTAL_FLOOD.2050.pessimistic	INFORM Climate Change	Projected change in coastal flood hazard & exposure by ~2050 under “pessimistic” scenario	Index / model output	Scenario/model dependent; coarse resolution vs local coastal processes
Storm Surge	Impact	DESINVENTAR.AFFECTED_PER100K_2000_2024	DesInventar Sendai	Total affected (2000–2024) per 100,000 population	People per 100k	Coastal flood/surge coding differs by country
Storm Surge	Impact	DESINVENTAR.DEATHS_PER100K_2000_2024	DesInventar Sendai	Total deaths (2000–2024) per 100,000 population	Deaths per 100k	Completeness varies
Storm Surge	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) per 100,000 population	People per 100k	Often recorded as “coastal flood”; surge-specific separation may be inconsistent
Storm Surge	Impact	IDMC.DISPLACEMENTS_PER100K_2000_2024_POPREF	IDMC	Disaster-related internal displacements (2000–2024) per 100,000 population	Displacements per 100k	Impact proxy; hazard attribution may be broad (storm/coastal flooding)
Storm Surge	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT coastal flood/storm events averaged per year (2000–2024)	Events/year	Attribution to surge may not be explicit; underreporting possible
Storm Surge	Prevalence	TH.CF_LEVEL	ThinkHazard (GFDRR)	ThinkHazard hazard level classification for coastal floods	Ordinal category	Screening-level; highly local processes/defenses not captured fully
Storm Surge	Scale	EM-DAT.MAGNITUDE_MEAN_2000_2024	EM-DAT (CRED)	Mean recorded magnitude (2000–2024) where available	Hazard-dependent	Often missing; meaning varies
Storm Surge	Scale	INFORM.HAZEX.COASTAL_FLOOD	INFORM Risk	Coastal flood hazard & exposure component used as relative exposure signal	Index component	Composite; screening-level; depends on underlying hazard modelling
Thunderstorm	Impact	DESINVENTAR.AFFECTED_PER100K_2000_2024	DesInventar Sendai	Total affected (2000–2024) per 100,000 population	People per 100k	Localized events often inconsistently recorded; taxonomy varies

Thunderstorm	Impact	DESINVENTAR.DEATHS_PER100K_2000_2024	DesInventar Sendai	Total deaths (2000–2024) per 100,000 population	Deaths per 100k	Attribution and completeness vary
Thunderstorm	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) per 100,000 population	People per 100k	Local convective storms underreported; impact fields incomplete
Thunderstorm	Impact	IDMC.DISPLACEMENTS_PER100K_2000_2024_POPREF	IDMC	Disaster-related internal displacements (2000–2024) per 100,000 population	Displacements per 100k	Impact proxy; hazard attribution may be limited/aggregated
Thunderstorm	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT lightning/thunderstorm events averaged per year (2000–2024)	Events/year	Underreporting likely for localized events
Thunderstorm	Scale	EM-DAT.MAGNITUDE_MEAN_2000_2024	EM-DAT (CRED)	Mean recorded magnitude (2000–2024) where available	Hazard-dependent	Often missing; meaning varies
Wildfires	Impact	DESINVENTAR.AFFECTED_PER100K_2000_2024	DesInventar Sendai	Total affected (2000–2024) per 100,000 population	People per 100k	Recording varies by country; attribution may be inconsistent
Wildfires	Impact	DESINVENTAR.DEATHS_PER100K_2000_2024	DesInventar Sendai	Total deaths (2000–2024) per 100,000 population	Deaths per 100k	Underreporting possible; attribution differences
Wildfires	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) per 100,000 population	People per 100k	Smaller fires often missing; impacts incomplete
Wildfires	Impact	IDMC.DISPLACEMENTS_PER100K_2000_2024_POPREF	IDMC	Disaster-related internal displacements (2000–2024) per 100,000 population	Displacements per 100k	Impact proxy; displacement depends on exposure/vulnerability/response
Wildfires	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT wildfire/forest fire events averaged per year (2000–2024)	Events/year	Underreporting likely for smaller fires
Wildfires	Prevalence	TH.WF_LEVEL	ThinkHazard (GFDRR)	ThinkHazard hazard level classification for wildfire	Ordinal category	Screening-level; ignition/land management drivers not fully represented
Wildfires	Scale	EM-DAT.MAGNITUDE_MEAN_2000_2024	EM-DAT (CRED)	Mean recorded magnitude (2000–2024) where available	Hazard-dependent	Often missing; meaning varies

Tropical cyclone	Impact	DESINVENTAR.AFFECTED_PER100K_2000_2024	DesInventar Sendai	Total affected (2000–2024) per 100,000 population	People per 100k	Wind event coding differs across countries (cyclone vs storm vs windstorm)
Tropical cyclone	Impact	DESINVENTAR.DEATHS_PER100K_2000_2024	DesInventar Sendai	Total deaths (2000–2024) per 100,000 population	Deaths per 100k	Completeness varies
Tropical cyclone	Impact	EM-DAT.AFFECTED_PER100K_2000_2024	EM-DAT (CRED)	Total people affected (2000–2024) per 100,000 population	People per 100k	Often captured under tropical cyclone/tornado categories; wind-only events may be missing
Tropical cyclone	Impact	IDMC.DISPLACEMENTS_PER100K_2000_2024_POPREF	IDMC	Disaster-related internal displacements (2000–2024) per 100,000 population	Displacements per 100k	Impact proxy; displacement reflects vulnerability/response as well as hazard
Tropical cyclone	Prevalence	EM-DAT.EVENTS_PER_YEAR_2000_2024	EM-DAT (CRED)	EM-DAT wind-related disasters averaged per year (2000–2024)	Events/year	Wind hazards not consistently separated; inclusion criteria apply
Tropical cyclone	Prevalence	TH.CY_LEVEL	ThinkHazard (GFDRR)	ThinkHazard hazard level classification for cyclones (wind proxy)	Ordinal category	Screening-level; cyclone-centric
Tropical cyclone	Prevalence	TH.TS_LEVEL	ThinkHazard (GFDRR)	ThinkHazard hazard level for tropical storm/severe storms (wind/convective proxy)	Ordinal category	Proxy; convective storms hard to represent consistently
Tropical cyclone	Scale	DESINVENTAR.MAGNITUDE_MEAN_2000_2024	DesInventar Sendai	Mean “magnitude” value (2000–2024) where available	Varies by country/ hazard	Magnitude scale not standardized
Tropical cyclone	Scale	EM-DAT.MAGNITUDE_MEAN_2000_2024	EM-DAT (CRED)	Mean recorded magnitude (2000–2024) where available	Hazard-dependent	Often missing; meaning varies
Tropical cyclone	Scale	INFORM.HAZEX.TROPICAL_CYCLONE	INFORM Risk	Tropical cyclone hazard & exposure component used as relative exposure signal	Index component	Cyclone-focused; screening-level