The manuscript titled “Creation and analysis of a multi-hazard database: Tenerife (Canary Islands) as a case study” presents a timely and commendable effort to enhance our understanding of historical natural hazards in island environments. By compiling and analyzing over five centuries of hazard events—including volcanic eruptions, earthquakes, landslides, floods, and tsunamis—the authors contribute to the historical evidence base necessary for improving disaster risk reduction (DRR) planning in volcanic and coastal regions.

The creation of this multi-hazard database represents a meaningful step toward integrated risk assessment, particularly in contexts such as Tenerife, where geographic isolation, complex geomorphology, and socio-economic exposure shape distinct patterns of vulnerability. The dataset, provided as supplementary material, offers valuable insights into hazard frequency, spatial distribution, and early forms of risk management. These insights could support scenario planning and inform both retrospective and prospective DRR strategies.

The authors’ core contribution lies in proposing a systematic methodology for compiling historical hazard records and analyzing their temporal and spatial dynamics. They suggest that the dataset can help identify patterns of vulnerability and response, offering a foundation for improved resilience and even applications in risk modelling and machine learning. The goal is to create a reference dataset capable of bridging the gap between past hazard knowledge and future-oriented, systemic risk governance frameworks. While this objective is both relevant and promising, several aspects of the methodology, conceptual framing, and practical applicability merit further scrutiny. In particular, the lack of standardized classification criteria, limited integration of hazard interdependencies, and insufficient engagement with dynamic, multi-risk frameworks constrain the potential of the dataset to fulfill its broader claims.

The analysis described in the paper often falls short of the rich information provided by the dataset. Indeed, an effort to provide a deeper understanding of frequency, seasonality or spatial distribution could be undertaken. Note, for example, that Figure 2 counts the number of multi-hazard events considered in the dataset with simple frequency, comparing low frequency-high damaging events, such as volcanic eruptions, with more common and less damaging events such as landslides-rockslides. In this respect, it is suggested that the figure is substantially improved to provide a deeper understanding of the event set.

The authors describe the dataset as a systematic collection of “types of events.” However, the current structure contributes to some ambiguity, particularly in how events, hazards, and impacts are classified. Although the event typology appears closely linked to available sources and official reporting, the lack of alignment with standard classification systems—such as the EM-DAT disaster typology (Guha-Sapir et al., 2017)—and the absence of clear definitions or categorization logic undermine the dataset’s potential usability. These limitations reduce its applicability for comparative analyses, probabilistic risk modelling, or integration with early warning systems and DRR strategies, as envisioned in the manuscript’s introduction. While future iterations of the database may focus on harmonization and interoperability, the current version would benefit from a clear justification of the classification choices made, an acknowledgment of their limitations, and a discussion on how they might be refined or aligned with existing standards in the future.

The dataset accounts mainly for geological events such as earthquakes, volcanic eruptions, landslides and seisms, but authors integrate flooding as a geological event without further justification. Flooding is systematically considered an hydrological hazard, not a geological one. Moreover, the list of natural risks for Tenerife in Table 3, classifies Floods within hydrological risks. Therefore, a proper definition of flood throughout the text, particularly with respect to additional terms such as torrential floods and flash floods used to characterize the type of flooding occurring in steep islands in the Macaronesian region, and justification to include it as a geological hazard in the dataset is suggested.

While the authors suggest that the event set can support the understanding of multi-hazard dynamic risk, the analytical narrative could improve to contribute to this objective. Specifically, the terms multi-hazard, event type, and impact are not clearly defined or consistently used throughout the text. As a result, it remains difficult to assess the extent to which the database captures interrelations between hazards or contributes to a systemic understanding of risk dynamics in the context of hazards combinations. In its current form, the paper makes a valuable empirical contribution, and the dataset can certainly support future research on multi-hazard risk and system-level vulnerability. However, to fully realize this potential, the authors could better clarify the terminology used (hazard, event, impact) and outline possible future steps to categorize hazard relationships more precisely, linking their approach more explicitly to existing multi-hazard or risk governance frameworks in subsequent work.

Section 2: Geological context and natural hazards

Section 2 offers a useful geological overview of the Canary Islands, focusing on the formation and volcanic history of Tenerife. While this helps set the stage for understanding the island's hazard profile, the section feels somewhat insular in scope. It is striking that the geological narrative does not reference other significant volcanic events in the archipelago—most notably, the 2021 Tajogaite eruption in La Palma, which stands as the most damaging natural disaster in the Canary Islands' recorded history.

By omitting this broader perspective, the section inadvertently conveys a sense of volcanic risk as unique to Tenerife. This weakens the opportunity to contextualize the region's multi-hazard dynamics, and the systemic nature of volcanic risk across the region. Including a brief mention of past and recent eruptions beyond Tenerife (La Palma at least) would help frame the database as part of a regional risk landscape and contribute to a more integrated understanding of hazard interconnections.

In addition, the section could be strengthened by reflecting more directly on the types of geological interactions captured in the dataset. Even a preliminary discussion of how different hazard types (e.g., seismicity, landslides, eruptions) may have interacted historically would provide a useful bridge between the physical setting and the subsequent data analysis. Although the database covers events up to 2020, it may be worth briefly acknowledging the recent uptick in seismic activity, which reinforces the contemporary relevance of the database and suggests avenues for its future update and use.

Section 3. Natural hazards, risk management and risk regulation

Section 3 presents several disconnected elements that would benefit from clearer purpose and structure. The first part of the section is devoted to replicating the methodology used by the Cabildo de Tenerife's PEIN (2020) to assess natural risk levels through an index based on hazard probability (0–5) and risk severity (0, 1, 2, 5, 10). The combination of these scores generates an overall risk score from 0 to 50 and classifies severity from Low to Very High, later applied to a list of hazards.

While this description may be useful in explaining how risk is formally assessed at the local level, it appears tangential to the core research aims of the paper. The authors do not justify the relevance of including this methodology, nor do they provide scientific references or a critical discussion of its assumptions or limitations. A more concise explanation, alongside Table 3, would likely suffice. In its current form, this section adds a layer of institutional detail without showing how this risk classification contributes to the construction or interpretation of the historical hazard database. This disconnection introduces a sense of subjectivity in the selection or weighting of hazard-event relationships.

The second part of the section shifts focus to future climate change scenarios in the Canary Islands—particularly increasing temperature, sea level rise, and changing precipitation patterns. However, the narrative only introduces the current weather regimes of Tenerife toward the end of the section, along with historical precipitation and temperature maps. This order weakens the analytical flow: it would be more logical to first describe the island's present-day meteorological patterns and hydrometeorological risk drivers, and then introduce how climate change is projected to alter these conditions. Such a structure would help readers understand how ongoing and future climate shifts could affect the frequency and severity of extreme events—and why existing risk classifications may require updating.

In light of these observations, the authors could consider restructuring this section by:

- Beginning with the description of Tenerife's climate conditions and weather types;
- Following with climate change scenarios and their implications for hazard patterns;
- And moving the explanation of the PEIN risk index and Table 3 to a dedicated section on disaster risk reduction (DRR) planning, where its institutional role can be better contextualized.

Finally, the section would benefit from a brief overview of the overall risk and emergency coordination structure in the Canary Islands. While the PEIN is a key territorial risk plan for Tenerife, it exists within a broader governance architecture that includes specific emergency response plans for each type of hazard (volcanic, flood, wildfire, etc.). This fragmentation—based on a single-risk planning model—is not acknowledged in the paper, and neither is the lack of integrated multi-hazard emergency coordination or communication frameworks. Addressing this gap, even briefly, would strengthen the authors' position and reinforce the relevance of a historical multi-hazard dataset for improving future DRR strategies.

Section 4. Methodology

The Methodology section outlines the process by which the historical hazard database was compiled. While the authors present a structured workflow, there are two key issues that deserve attention.

As mentioned before, the classification of hazards appears to contain some inconsistencies. Notably, floods are categorized as geological hazards, which contradicts widely accepted definitions used in international and national risk frameworks (e.g., UNDRR, EU Risk Typologies, Spanish Civil Protection legislation). Floods are typically considered hydrometeorological hazards, with geological hazards referring to earth-origin phenomena such as landslides, earthquakes, or volcanic eruptions. This classification should be further justified and suggests a need for greater alignment with standardized hazard typologies, particularly if the dataset is to serve comparative or modeling purposes beyond the regional context.

On the other hand, while the authors refer to a systematic approach to event identification and classification, the methodology lacks references to established multi-hazard or disaster risk frameworks, which would lend robustness and replicability to their approach. For instance, the manuscript does not draw on available taxonomies or concepts distinguishing: primary vs. secondary hazards, triggering relationships (e.g., rainfall-induced landslides), or compound, cascading, and interacting hazard events. The manuscript would benefit from anchoring its methodology in existing risk classification standards and definitions, as provided by international scientific literature and operational frameworks. For example, López-Saavedra and Martí (2023) offer a structured review of conceptual distinctions between hazard, risk, and impact, as well as the types of interactions (e.g., compound, cascading, or interconnected hazards) that are critical in multi-hazard risk assessment.

While the methodology is clearly structured and reflects a commendable effort to organize diverse historical records, it would benefit from greater alignment with existing frameworks in the field of multi-hazard risk analysis. At present, the paper does not reference widely used classification systems or conceptual approaches developed by organizations such as the UNDRR, or key academic contributions (e.g., Gill & Malamud, 2016; Kappes et al., 2012; de Ruiter & van Loon, 2022). Integrating—or at least situating—the proposed classification in relation to such frameworks could enhance both the transparency and transferability of the work. Given the authors' stated aim to contribute to understanding dynamic, multi-hazard risk, a brief explanation of the rationale behind their categorization choices, and how these align with or diverge from established standards, would help clarify the dataset's scope and improve its broader analytical and policy relevance. Such reflection could also open the door to future development of the database toward greater interoperability and utility across different risk governance contexts and regions.

Section 5. Results

Section 4 presents the results of the event compilation and hazard analysis, but would benefit from greater internal consistency, clearer references, and stronger integration with earlier sections of the paper.

To begin with, there appear to be figure reference inconsistencies that should be corrected for clarity. For example:

- Line 296 refers to Figure 6 while describing volcanic eruptions; it seems the correct figure might be Figure 2.
- Line 303 again cites Figure 6 for seismic activity, when this likely corresponds to Figure 7.

In Line 303, the authors also claim that seismic activity is the most frequent hazard in Tenerife if earthquakes below 3.5 mbLg are considered. This statement could be strengthened by referencing a reliable data source—such as the Instituto Geográfico Nacional (IGN)—to support the frequency threshold used.

As previously mentioned, Figure 7 presents a useful summary of seismic activity, but it could benefit from the richness of the dataset. The authors could enhance its value by incorporating additional dimensions in the analysis, such as a timeline distribution of events, seasonality, or disaggregation by magnitude and location. Separate figures by hazard type could also allow for better visualization of trends and interactions.

In Line 310, the authors note that landslides and rockfalls occur mainly on roadsides and are associated with human activities. However, this framing risks underestimating unreported or undocumented events in uninhabited or infrastructure-free areas. In contexts where no direct damage is recorded, such events may remain absent from historical datasets. This illustrates a broader issue in the paper, where hazard and risk concepts are sometimes used interchangeably. In this case, the authors might take the opportunity to qualify their statements more carefully and acknowledge the limitations of the dataset in fully capturing the dynamics of hazard occurrence and impact.

Relatedly, in Line 320, the authors report a total of 18 fatalities in beaches and ravines associated with landslides and rockfalls. They then state that such events do not result in significant economic losses or require population evacuation, and that recovery is typically straightforward. These conclusions may be overly confident given the likely limitations of available records. For example, some of these events may have caused prolonged closures of beaches or trekking areas, with economic and reputational effects on tourism-dependent municipalities. In some cases, victims were tourists, which raises questions about impacts on risk perception, insurance, and emergency response capacity. Without documented evidence on compensation, loss of income, or indirect effects, it would be advisable to present these conclusions with greater caution.

In Line 317, the phrase “However, most do not result in subsequent hazards…” is somewhat unclear. Since the paper does not previously discuss hazard interconnections or cascading effects, this sentence may be confusing to readers. The authors could consider introducing relevant definitions of hazard interactions earlier in the text—possibly drawing on sources such as López-Saavedra & Martí (2023) or the Handbook on Multi-Hazard, Multi-Risk Definitions and Concepts (Ward et al., 2022). This would provide a useful conceptual basis for interpreting their findings.

In Lines 329–332, the manuscript refers to storm patterns linked to flooding events, but this link is not clearly developed in earlier sections. For instance, the role of tropical-like storms and Atlantic squalls is mentioned in Section 3 but not sufficiently explained. Revisiting this earlier description and clarifying how such meteorological systems relate to compound hazards, especially floods, may enhance both the internal coherence of the manuscript and its contribution to understanding multi-hazard dynamics in the region.

The reference to “precedent events” in Line 332 could benefit from greater clarity, especially if the authors intend to describe causal or sequential hazard relationships. In most cases, floods in the Canary Islands are the result of meteorological triggers such as heavy rainfall or storm surges, and are thus typically classified as primary hydrometeorological hazards. However, the authors may wish to clarify whether they refer to purely meteorological drivers or also consider flood events that arise from compound or cascading processes (e.g., landslide dam failures or volcanic triggers). Making these distinctions clearer would help improve the conceptual consistency of the hazard classifications used in the paper.

Section 6. Discussion

Lines 384–389. The authors conclude that sufficient insights have been extracted from the historical hazard dataset to inform Disaster Risk Reduction (DRR) recommendations, specifically offering seven measures focused on flood risk reduction. However, there appears to be some disconnect between the descriptive findings of the database and the proposed recommendations. First, the discussion could benefit from clearer consideration of multi-hazard and dynamic risk contexts, particularly within complex flood scenarios. For example, how might each of the proposed measures interact with other hazards—either reinforcing or undermining risk reduction goals? A more explicit exploration of synergies and trade-offs would improve the strategic coherence of the proposed actions.

Second, the recommendations could be strengthened by drawing on evidence-based literature or case studies demonstrating the effectiveness of such measures in similar geographic or institutional contexts. In their current form, the proposals read more as general suggestions than conclusions directly derived from the dataset analysis or the local policy landscape.

Third, the discussion omits key elements of existing flood risk planning frameworks in Tenerife. Royal Decree 903/2010 of 9 July, which transposes the EU Floods Directive (2007/60/EC), establishes Spain's formal framework for flood risk management. This includes preliminary risk assessments, flood hazard and risk mapping, and the development of Flood Risk Management Plans (FRMPs). Tenerife has already completed three full planning cycles (2015–2021, 2021–2027, and the ongoing 2027–2033), and many technical and institutional measures might be already embedded in these plans. Therefore, the paper could at least refer to the proposed DRR measures with existing planning instruments, noting areas of alignment or divergence. This would also be an opportunity to examine whether current official planning processes are integrating—or neglecting—multi-hazard scenarios, especially given the multi-risk ambition of the database.

Lines 426–427. There appears to be a referencing inconsistency: Figure 3 is cited, but the correct figure may be Figure 4. Additionally, Line 427 seems to describe Measure 7, though this is not clearly indicated.

Line 450. The final set of five landslide risk reduction measures is presented without supporting evidence or references. Providing links to empirical examples or planning experiences would bolster the credibility of these suggestions. In this context, it might be valuable to acknowledge the role of path-dependent adaptation—that is, how past decisions and institutional learning have shaped current risk management strategies in Tenerife or in the Canary Islands. This could reveal both limitations and opportunities for transformative change.

Lines 467–471. The brief mention of other hazards—such as haze episodes, droughts, and heatwaves—deserves further development. These meteorological conditions are well-known triggers of wildfires, especially when compounded by human activity, and the manuscript would benefit from elaborating on these interactions. For example, the 2007 and 2023 wildfires are compared based on the surface area burned, yet the phrase "the same area affected" could be misinterpreted as affecting the same geographic area: rephrase by "number of hectares affected". Clarifying this distinction is important. Moreover, the potential cascading effects of such hazards—e.g., increased erosion, biodiversity loss (including damage to the laurel forest), and downstream flood risk—could be more thoroughly analyzed, especially given the database's multi-risk potential.

Lines 475–end. The final section suggests that citizen science initiatives may improve the forensic analysis of past hazard events through collaborative platforms and public engagement. This is an important and promising avenue. However, it could be reconciled with the more ambitious expectations set in the Introduction, where the authors claim the dataset could support risk modelling and machine learning applications (such as Classen et al., 2023). In its current state, the dataset lacks sufficient metadata standardization, clear indicators, validation protocols, and methodological documentation to support such advanced uses. These limitations should be acknowledged explicitly, particularly regarding the representativeness, reliability, and interoperability of the dataset. A transparent discussion of these constraints would not only improve the manuscript's credibility but also help future researchers understand the scope and current limitations of this valuable resource.

A final comment on integrating vulnerability and socio-economic dynamics to strengthen risk analysis:

Throughout the manuscript, the authors offer a rich historical overview of hazard events in Tenerife, but the analysis remains largely hazard-centric, with limited attention to the underlying social, economic, or institutional drivers of vulnerability. Over the 400-year period covered, Tenerife island and the region has undergone profound transformations—including population growth, tourism development, land-use change, and infrastructure expansion—all of which deeply shape risk exposure and, ultimately, adaptive capacity. A brief description or a discussion of how these processes have evolved and influenced vulnerability over time, seems like a great opportunity to contextualize the data and offer a more systemic understanding of risk transformation. Acknowledging these socio-economic dynamics would help position the dataset as a more holistic tool for future risk assessments, and align the work more closely with contemporary approaches in disaster risk science that emphasize the co-evolution of hazards, exposure, and vulnerability.

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