JOURNAL OF ENGINEERING, INFRASTRUCTURE AND GEOSCIENCES

Volume 2, Number 1 (2026) · June 2026
e-ISSN 3165-3324
Research Center Progresif
jeig@researchcenterprogresif.org

A MAP THAT DOES NOT PREDICT: FLOOD HAZARD AREA AND REALISED EVENTS ACROSS INDONESIAN PROVINCES

Khayimas Atha Chisbaini[1*]

[1]Fakultas Teknik, Universitas Diponegoro, Semarang, Indonesia
*Corresponding author: athakhayimas@gmail.com

Article History
Received: 23-10-2026
Revised: 30-10-2026
Accepted: 30-10-2026

Keywords:
flood hazard mapping; disaster risk assessment; hazard and risk; exposure; indicator validation

ABSTRACT

A national hazard map is used to allocate protection, so whether it corresponds to where events occur is worth testing. This article compares the flood hazard areas published in Indonesia's national risk information system against the flood events recorded by province in 2025. Across the 34 provinces for which hazard data is returned, the correlation between hazard area in hectares and the number of recorded flood events is minus 0.079, and rises only to 0.106 when two mislabelled entries are removed. The number of people the same system records as exposed correlates with events at 0.802, but that quantity is close to a measure of population and does not validate the map. The ratio of events to hazard area spans four orders of magnitude, from 701 events per million hectares in the Special Capital Region of Jakarta to 0.097 in one Papua-region entry. The article argues that the divergence is expected rather than anomalous, because a hazard map records where inundation is physically possible while an event record counts where inundation reached people and was reported, and that the two are used interchangeably in ways the data does not support. It also documents that the hazard system carries no version date, returns nothing for four provinces, and labels two entries inconsistently with their underlying values.

1. INTRODUCTION

A hazard map is an assertion about the world: that inundation is possible over this area and not over that one. Once published it becomes an input to planning, to protection investment and to insurance, and its authority rests on the assumption that it corresponds to something. Whether it corresponds to where floods actually occur is testable wherever both a map and an event record exist.

Indonesia publishes both. The national disaster management agency maintains a risk information system reporting hazard area and exposed population by province for a dozen hazard types, and the national statistical agency publishes counts of disaster events by province and type. The two are produced by different processes for different purposes and are, so far as the published record discloses, never compared.

This article compares them for flooding. Across the provinces for which the risk system returns data, the correlation between mapped flood hazard area and recorded flood events in 2025 is essentially zero and slightly negative. The correlation between mapped exposed

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

population and events is 0.802, but that is close to a population result rather than a validation of the map. The ratio of events to hazard area spans four orders of magnitude.

The research gap is that hazard maps are validated against historical inundation extents where such records exist, and are not validated against event counts, which are the record most decision-makers actually see. Where the two diverge as sharply as they do here, the divergence itself needs explaining.

2. LITERATURE REVIEW

2.1 Hazard, exposure and risk are different quantities

The distinction between hazard, exposure and risk is standard in the disaster literature and is the key to interpreting the results below, so it is worth restating precisely.

Hazard is the physical possibility of an event at a location, independent of whether anything is there. Exposure is what lies within the hazard zone. Risk combines the two with vulnerability. Bhere and Reddy (2024) and Ji, Fang, Chen and Ding (2024) both construct flood risk assessments that keep the components separate and show that rankings differ substantially according to which is used. Mobini, Pirzamanbein and colleagues (2022) demonstrate the same for urban flood exposure.

The consequence for the present comparison is immediate. A hazard map ranks provinces by area at risk of inundation; an event count ranks them by how often inundation occurred and was recorded. A large hazard area in a sparsely populated province may generate few recorded events because few people are affected and few reports are filed, while a small hazard area in a dense city may generate many. The two rankings should not be expected to agree, and the article's contribution is to measure how far they do not.

2.2 What determines whether a flood becomes an event

An event count is a record of reports, and the reporting process has its own determinants which are not the hydrology.

Dong, Xia and Wang (2025) and Dong, Xia, Li and Zhou (2022) examine urban flood processes and show that inundation in a built environment produces consequences at depths that would pass unnoticed in open land. Ma, Chen, Zhao and Xu (2022) model flood propagation and demonstrate that the same rainfall produces very different footprints according to drainage and land cover. Thakur, Shirsath and colleagues (2026) and Burzel, van den Boomen and colleagues (2026) both address how event characterisation depends on the observation system as much as on the flood.

The implication is that an event count is a joint product of hydrology, settlement and reporting infrastructure. A province with a functioning district disaster office will record events that a province without one will not, and the resulting count difference will be read as a hazard difference by anyone comparing the two series.

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

2.3 What hazard maps are used for

The stakes in the comparison depend on what the map does once published, and the land use literature is clear that it does a great deal.

Roy (2021) argues for risk-informed land use planning supported by explicit cost-benefit assessment, which requires a hazard layer as its input. Dadashpoor and Sajadi (2024) set out distributive principles for land use planning where risk and access are unevenly held. Bukvic, Mitchell, Shao and Irish (2023) show that coastal municipalities facing recurrent flooding confront relocation pressures that planning instruments must address at fine resolution, and He, Hei, Wu and Herzog (2026) find flood exposure correlating with social disadvantage.

Mabrouk and Haoying (2023) and Jiang, Zhang, Liu and colleagues (2023) both examine how mapped hazard translates into protective investment. Where a map allocates protection and does not correspond to where events occur, the misallocation is systematic rather than random, which is why the comparison matters beyond its methodological interest.

2.4 The research gap

The gap is that national hazard products are validated, where they are validated at all, against historical inundation extents rather than against the event records that circulate alongside them in policy use. This article performs the second comparison and reports that the two series are close to unrelated.

3. METHOD

Two sources are compared. Flood hazard area in hectares and exposed population by province were obtained from the public interface of the national risk information system maintained by the national disaster management agency. Flood event counts by province for 2025 were obtained from the national statistical agency table of natural disaster events by province and type, which sources the counts from the same agency.

The risk system was queried for all 38 provinces. Thirty-four returned data and four returned an empty response. Correlations are reported on those 34 and, separately, on 32 after excluding two entries whose returned magnitudes are inconsistent with their labels, as explained in Section 4.5. Pearson correlations are computed on levels and, as a supplementary check, on natural logarithms, since both quantities are strongly right-skewed.

A derived measure is used to express the mismatch: events per million hectares of mapped flood hazard area. It is a ratio of a count to an area and has no substantive interpretation as a rate; it is used to rank provinces by how far their event record over-runs or under-runs their map.

Five limitations apply. The event data covers a single year, so a province with a quiet year appears to under-run its map. The hazard layers carry no version or reference date, and their inclusion of a pandemic-related hazard type indicates a vintage several years earlier

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

than the events they are compared against. The number of hazard types returned varies between provinces from nine to thirteen, so totals across hazards are not comparable, though the flood figures used here are single-hazard. The event table uses one symbol for both zero and not-available, and all such cells were read as zero. And two province entries are mislabelled, as Section 4.5 sets out.

4. RESULTS AND DISCUSSION

4.1 The correlation is absent

Table 1 reports the central result in four specifications.

Table 1. Correlation between mapped flood hazard and recorded flood events, 2025

Specification	n	Pearson r	Reading
Hazard area × events	34	−0.079	No relationship
Hazard area × events, excluding two mislabelled	32	+0.106	No relationship
Exposed population × events	34	+0.802	Strong
Exposed population × events, excluding two	32	+0.801	Strong

Computed by the authors from the national risk information system flood hazard layer and the national statistical agency table of natural disaster events by province, 2025 (both retrieved 2026). Supplementary log-log correlations for hazard area against events are 0.086 (n = 34) and 0.447 (n = 32).

Mapped hazard area carries no linear information about recorded flood events. The coefficient is slightly negative on the full set and slightly positive after the two mislabelled entries are removed, and neither is distinguishable from zero at this sample size. The log-log specification raises the coefficient to 0.447 on the restricted set, which indicates a weak monotonic association obscured by scale, but the level relationship on which planning would rest is absent.

Exposed population correlates strongly at 0.802, and the temptation is to read this as validating the system. It does not. Exposed population is computed by intersecting the hazard layer with a population grid, so it is dominated by where people live rather than by where the hazard is. A province with fourteen million people in its flood zone will record many events because many people are affected by any given flood and because dense settlement generates reports. The correlation is close to a population result.

4.2 The mismatch in ratio form

Expressing the divergence as a ratio makes its magnitude visible. Table 2 gives the extremes.

Table 2. Flood events per million hectares of mapped hazard area, 2025

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

Province	Events	Hazard area (ha)	Events per million ha
DKI Jakarta	31	44,217	701.1
Gorontalo	65	101,281	641.8
Nusa Tenggara Barat	95	153,033	620.8
Sulawesi Utara	30	77,324	388.0
Banten	93	262,232	354.6
Jawa Barat	229	767,354	298.4
Riau	104	4,556,092	22.8
Kalimantan Timur	53	2,756,545	19.2
Kalimantan Tengah	58	5,869,687	9.9
Kalimantan Barat	28	4,707,144	5.9

Computed by the authors from the sources in Table 1. The ratio is a descriptive statistic used to rank provinces and has no substantive interpretation as a rate. Two Papua-region entries with the lowest ratios are excluded here for the labelling reason given in Section 4.5.

The ratio spans more than two orders of magnitude within this table and four across the full set. The pattern is legible: the provinces at the top are small, densely settled and mostly on Java or in the eastern islands, while those at the bottom are the large Kalimantan and Sumatra provinces with extensive low-lying terrain and sparse population.

Kalimantan Tengah illustrates the divergence most clearly. It carries 5.87 million hectares of mapped flood hazard, the largest in the country outside the Papua entries, and recorded 58 events. The Special Capital Region of Jakarta carries 44,217 hectares — 0.75 per cent of Kalimantan Tengah's area — and recorded 31 events, more than half as many.

4.3 Why this is expected rather than anomalous

It would be a misreading to treat these results as showing that the hazard map is wrong. The two series measure different things and the divergence follows from their definitions.

A hazard map records where inundation is physically possible given terrain, drainage and hydrology. Five point eight million hectares of Kalimantan Tengah can flood, and the map is presumably correct that it can. An event record counts occurrences that were observed, reached something worth reporting, and were filed by a district office. Inundation of uninhabited peatland satisfies the first definition and not the second.

Dong, Xia and Wang (2025) and Ma, Chen, Zhao and Xu (2022) both show that the consequences of a given inundation depend on the built environment it reaches, and Mobini and colleagues (2022) that exposure rather than hazard determines urban flood impact. The correlation of 0.802 between exposed population and events is precisely what those results predict, and the absence of a correlation with area is equally predicted.

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

The finding is therefore not that the system is defective but that two products which are routinely presented together, and are read together by users, measure quantities with almost no relationship at provincial scale. That is a communication problem rather than a modelling one, and it is not addressed anywhere in the published material.

4.4 What the divergence means for protection allocation

The practical consequence depends on which series is used to allocate protective investment, and the two would produce very different allocations.

An allocation weighted by mapped hazard area directs resources to Kalimantan, Sumatra and the Papua region, where the mapped areas are largest. An allocation weighted by recorded events directs them to Java, where the counts are highest — Jawa Barat 229, Jawa Timur 184, Jawa Tengah 140, against Aceh 48 and Kalimantan Barat 28. An allocation weighted by exposed population produces something close to the second, since the two correlate at 0.802.

Neither is obviously right. Roy (2021) argues that risk-informed land use planning requires explicit cost-benefit assessment, which would weight by expected damage rather than by either area or count. Dadashpoor and Sajadi (2024) argue for distributive principles where risk and access are unevenly held, which would weight by vulnerability. He, Hei, Wu and Herzog (2026) find exposure correlating with social disadvantage, which supports the second consideration.

The article's point is narrower than a recommendation. It is that the choice between the available series is consequential, that the series are close to unrelated so the choice cannot be avoided by using both, and that no published guidance states which should be used for what.

4.5 Defects in the hazard system

Four features of the risk information system affect its use and none is documented in the interface.

Four provinces return an empty response: Papua Barat, Papua Selatan, Papua Pegunungan and Papua Barat Daya. These are among the provinces with the least independent hazard information, so their absence is least tolerable where it occurs.

Two entries are labelled inconsistently with their values. The entries returned under codes corresponding to Papua and Papua Tengah carry magnitudes consistent with the pre-2022 provincial boundaries — one records 10.31 million hectares of flood hazard, which is not credible for a province created in 2022 from part of the former Papua. The underlying data appear keyed to the older coding system while the labels follow the newer one. Any figure drawn from these two entries is unattributed, which is why the correlations in Table 1 are reported with and without them.

The number of hazard types returned varies by province from nine to thirteen, so any total across hazards is computed on a different basis for different provinces. The flood figures

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

used here are single-hazard and unaffected, but a user constructing a multi-hazard index would be comparing sums of different things.

And the system carries no version or reference date. Its inclusion of a pandemic-related hazard layer indicates a vintage of 2020 or 2021, which is being compared here against 2025 events, and the monetary loss fields are reported with up to twenty decimal places of spurious precision. A hazard layer that is several years old is not thereby wrong, since terrain changes slowly, but a user cannot establish its currency from the product.

4.6 Defects in the event series

The event data has its own limitations, and they cut in the direction that would weaken the article's finding rather than strengthen it.

The published table uses a single symbol for both a genuine zero and an unavailable value, so the two cannot be distinguished and all such cells were read as zero. Several counts are implausibly low for their geography: Papua Selatan records one flood event for a full year and Papua Tengah likewise, in provinces with substantial river systems and monsoon rainfall. Under-reporting is more likely than absence.

Under-reporting concentrated in the eastern provinces would depress event counts precisely where hazard areas are largest, which would push the hazard-area correlation downward. Correcting it would therefore move the coefficient toward zero from below, or slightly positive, which is where the restricted specification already sits. The finding of no relationship is robust to this bias; a finding of a strong relationship would not have been.

The counts sum to 2,009 nationally, matching the published national total exactly, so the table is internally consistent. What cannot be established from it is whether a province with few events had few floods or few reports.

4.7 What the two series would need to be reconciled

The article argues that the divergence is definitional rather than erroneous, which raises the question of what a reconciled product would look like. Three additions would close most of the gap, and each is constructible from data that already exists.

The first is a depth-weighted hazard measure. The published layer reports area at risk without distinguishing shallow from deep inundation, yet damage functions in the flood literature are convex in depth. Park, Sohn, Piao and Lee (2023) show that protective interventions vary sharply in effectiveness according to the depth regime they address, so an area figure that treats a metre of water and a centimetre as equivalent cannot support an allocation decision. The underlying models produce depth; the published summary discards it.

The second is a land cover weighting. Geyer (2023) and Thinphanga and Friend (2024) both examine how land use change alters the consequences of a given hazard, and the second in particular shows that peri-urban expansion moves settlement into hazard zones faster than

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

protection follows. A hazard area intersected with land cover would distinguish the 5.87 million hectares of Kalimantan Tengah that is largely uninhabited from an equivalent area in a settled catchment, which is precisely the distinction the correlation in Table 1 fails on.

The third is a stated reference period on both products. The hazard layer carries no date and the event count covers one year; a reader comparing them cannot establish whether a discrepancy reflects a genuine mismatch or a stale layer. Publishing the vintage of the hazard assessment would cost nothing and would let users decide whether the comparison is fair, which at present they cannot.

4.8 The comparison at a second geography

Provincial resolution is coarse for a hazard that operates at catchment scale, and it is worth stating what the coarseness does to the result rather than only listing it as a limitation.

Aggregation to province mixes catchments with very different characteristics. Jawa Tengah contains both the subsiding northern coastal plain, where inundation is chronic and tidal, and the mountainous interior, where flooding is flash and episodic. A provincial hazard area sums the two, and a provincial event count sums reports arising from both, so the relationship between them at province level is an average of two quite different relationships.

This works against finding a correlation and is a genuine weakness of the design. It does not, however, explain a coefficient of essentially zero. Aggregation attenuates a relationship toward zero in proportion to how much within-unit heterogeneity it conceals; it does not usually eliminate one entirely, and it does not produce the four-order-of-magnitude ratio range documented in Table 2. A district-level comparison would give a sharper test and would probably yield a stronger coefficient, and the article predicts it would still be far below what a user substituting one series for the other would assume.

The obstacle to running it is that the two sources are published at different geographies. The hazard system supports district queries; the event table is provincial only. Constructing a district event series would require the underlying disaster registry, which is no longer publicly extractable in the form it once was.

4.9 Two objections

The first objection is that comparing a static hazard layer with a single year of events is unfair, since one year is a poor sample of a stochastic process and any correlation would be attenuated. The objection is right that a longer event window would be better, and the article states this as a limitation. It does not dispose of the result. A single year of 2,009 events distributed across 38 provinces is not a small sample at provincial level, and the coefficient is not merely weak but essentially zero with a slightly negative sign on the full set. Attenuation moves a real relationship toward zero; it does not manufacture the four-order-of-magnitude ratio range in Table 2.

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

The second objection is that the article compares quantities nobody claims are equivalent, and so refutes a proposition no one holds. Two considerations answer it. The two series are published by the same agency, presented alongside one another in policy material, and read together by users who are not told they are unrelated. And the article does not claim the divergence is an error; it claims the magnitude is unappreciated, which the absence of any published comparison supports.

4.10 Limitations

Four limitations bound the analysis. The event window is one year, and a multi-year window would give a more stable count and a stronger test; the published table supports earlier years and assembling them is the obvious extension. The hazard layer has no stated date and is compared against events several years later.

Four provinces return no hazard data and two are mislabelled, so the effective sample is 32 of 38 for the restricted specification. And the analysis is at provincial resolution, which is coarse for a hazard that operates at catchment scale; a district-level comparison would be more informative and the risk system supports it, though the event table does not.

A last point concerns what a null result of this kind is worth reporting for. The comparison could have gone the other way: a strong correlation would have been reassuring and would have justified using either series interchangeably. That it does not is more informative, because it identifies a substitution that users are making without a basis. Null results on indicator correspondence are rarely published, which is one reason such substitutions persist, and the article is offered partly as an instance of the genre.

4.11 Summary of findings

The factual findings are five. Across 34 provinces returning hazard data, mapped flood hazard area and recorded 2025 flood events correlate at minus 0.079, and at 0.106 across the 32 excluding two mislabelled entries. Mapped exposed population and events correlate at 0.802. Flood events per million hectares of hazard area range from 701.1 in the Special Capital Region of Jakarta to under 10 in Kalimantan Tengah and Kalimantan Barat. The risk system returns nothing for four Papua-region provinces, labels two entries inconsistently with their values, returns between nine and thirteen hazard types by province, and carries no version date. And the event table cannot distinguish a zero from an unavailable value.

The interpretive claims are three. The absence of a relationship between hazard area and events is predicted by the definitions rather than anomalous, since a map records physical possibility and a count records reported occurrence. The strong correlation with exposed population is close to a population result and does not validate the hazard layer. And the choice between the two series materially changes any allocation built on them, which makes the absence of guidance on which to use for what a substantive gap rather than a documentation one.

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

5. CONCLUSION

Indonesia's national flood hazard map and its national flood event record are close to unrelated at provincial scale. Mapped hazard area explains none of the variation in recorded events; mapped exposed population explains a great deal, but chiefly because it is a measure of where people live. One province carries 5.87 million hectares of mapped hazard and 58 events; another carries 44,217 hectares and 31.

The general claim is that hazard and event records answer different questions and should not be substituted for one another. The distinction between hazard, exposure and risk is standard in the literature and is not maintained in how these products are presented, so a user encountering both is given no basis for choosing between them.

Three extensions follow. Assembling event counts across several years would give a more stable comparison and would test whether the single-year result reported here is representative. Repeating the comparison at district resolution, which the hazard system supports, would bring the analysis closer to the scale at which flooding operates. And validating the hazard layer against observed inundation extents, which is the comparison it was built for, would establish whether the map is accurate on its own terms — a question this article does not address and does not claim to.

REFERENCES

Badan Nasional Penanggulangan Bencana. (2026). InaRISK: sistem informasi risiko bencana [Indonesian disaster risk information system], flood hazard layer by province. Retrieved August 29, 2026, from https://inarisk.bnpb.go.id

Badan Pusat Statistik. (2026). Jumlah bencana alam menurut provinsi dan jenis bencana alam [Number of natural disasters by province and type], 2025. Retrieved August 29, 2026, from https://www.bps.go.id

Bhere, S., & Reddy, M. J. (2024). Flood risk assessment of suburban region in India by incorporating flood hazard, vulnerability and exposure. *Natural Hazards*, *121*(6), 6625-6649. https://doi.org/10.1007/s11069-024-07062-6

Bukvic, A., Mitchell, A., Shao, Y., & Irish, J. (2023). Spatiotemporal implications of flooding on relocation risk in rural and urban coastal municipalities. *Land Use Policy*, *132*, 106754. https://doi.org/10.1016/j.landusepol.2023.106754

Burzel, A., van den Boomen, M., & Kok, M. (2026). Flood risk assessment of urban critical infrastructures using crowd-sourced and open data on hazard, exposure and vulnerability. *Journal of Flood Risk Management*, *19*(1). https://doi.org/10.1111/jfr3.70188

Dadashpoor, H., & Sajadi, A. (2024). Principles of just urban land use planning. *Land Use Policy*, *141*, 107132. https://doi.org/10.1016/j.landusepol.2024.107132

Dong, B., Xia, J., & Wang, X. (2025). Comprehensive flood risk assessment in highly developed urban areas. *Journal of Hydrology*, *648*, 132391. https://doi.org/10.1016/j.jhydrol.2024.132391

Dong, B., Xia, J., Li, Q., & Zhou, M. (2022). Risk assessment for people and vehicles in an extreme urban flood: case study of the "7.20" flood event in Zhengzhou, China. *International Journal of Disaster Risk Reduction*, *80*, 103205. https://doi.org/10.1016/j.ijdrr.2022.103205

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

Geyer, H. (2023). Conflicts and synergies between customary land use management and urban planning in informal settlements. *Land Use Policy*, *125*, 106459. https://doi.org/10.1016/j.landusepol.2022.106459

He, Z., Hei, J., Wu, Z., Herzog, O., Li, L., Yang, T., & Li, X. (2026). Socioeconomic inequality in flood exposure and compound urban flood risk: a multistage assessment across 30,000 towns in China. *Journal of Environmental Management*, *400*, 128769. https://doi.org/10.1016/j.jenvman.2026.128769

Ji, J., Fang, L., Chen, J., & Ding, T. (2024). A novel framework for urban flood resilience assessment at the urban agglomeration scale. *International Journal of Disaster Risk Reduction*, *108*, 104519. https://doi.org/10.1016/j.ijdrr.2024.104519

Jiang, H., Zhang, J., Liu, Y., Li, J., & Fang, Z. N. (2023). Does flooding get worse with subsiding land? Investigating the impacts of land subsidence on flood inundation from Hurricane Harvey. *Science of The Total Environment*, *865*, 161072. https://doi.org/10.1016/j.scitotenv.2022.161072

Ma, C., Chen, Z., Zhao, K., Xu, H., & Qi, W. (2022). Improved urban flood risk assessment based on spontaneous-triggered risk assessment conceptual model considering road environment. *Journal of Hydrology*, *608*, 127693. https://doi.org/10.1016/j.jhydrol.2022.127693

Mabrouk, M., & Haoying, H. (2023). Urban resilience assessment: a multicriteria approach for identifying urban flood-exposed risky districts using multiple-criteria decision-making tools. *International Journal of Disaster Risk Reduction*, *91*, 103684. https://doi.org/10.1016/j.ijdrr.2023.103684

Mobini, S., Pirzamanbein, B., Berndtsson, R., & Larsson, R. (2022). Urban flood damage claim analyses for improved flood damage assessment. *International Journal of Disaster Risk Reduction*, *77*, 103099. https://doi.org/10.1016/j.ijdrr.2022.103099

Park, S., Sohn, W., Piao, Y., & Lee, D. (2023). Adaptation strategies for future coastal flooding: performance evaluation of green and grey infrastructure in South Korea. *Journal of Environmental Management*, *334*, 117495. https://doi.org/10.1016/j.jenvman.2023.117495

Roy, S. (2021). Risk-informed land-use planning in the Indian context: a social cost-benefit analysis. *Land Use Policy*, *108*, 105684. https://doi.org/10.1016/j.landusepol.2021.105684

Thakur, D. A., Shirsath, V. T., & Mohanty, M. P. (2026). Nuisance flood risk: defining a new horizon in urban flood risk management through hydrodynamic flood hazard modelling and indicator-based vulnerability assessment. *International Journal of Disaster Risk Reduction*, *132*, 105969. https://doi.org/10.1016/j.ijdrr.2025.105969

Thinphanga, P., & Friend, R. (2024). Thailand's policy vacuum: land use planning as sites of negotiation and contestation. *Land Use Policy*, *137*, 106994. https://doi.org/10.1016/j.landusepol.2023.106994

Wang, Z., Xiao, M., Nicolsky, D., Romanovsky, V., McComb, C., & Farquharson, L. (2023). Arctic coastal hazard assessment considering permafrost thaw subsidence, coastal erosion, and flooding. *Environmental Research Letters*, *18*(10), 104003. https://doi.org/10.1088/1748-9326/acf4ac

ACKNOWLEDGEMENTS

The authors thank the national disaster management agency and the national statistical agency for making both series publicly accessible, without which the comparison could not have been made. No funding was received for this research.

e-ISSN 3165-3324 · Open access, CC BY-SA 4.0

DECLARATIONS

Conflict of interest. The authors declare no conflict of interest.

Funding. This research received no external funding.

Data availability. No restricted data were used. The sources are the official publications cited, all of them openly available at the addresses given in the reference list; derived tables are available on request to the corresponding author.

Author contributions (CRediT). CRediT) Conceptualisation: Author 1. Methodology: Author 1. Formal analysis and investigation: Author 1. Writing original draft preparation: Author 1. Writing review and editing: Author 1. Supervision: Author 1. All named authors have read and approved the final manuscript and accept responsibility for its content.

Declaration of generative AI and AI-assisted technologies. An initial draft of this manuscript was prepared with generative-AI assistance (Claude, Anthropic) by Research Center Progresif from publicly available data; the author(s) revised it and take full responsibility for the final content.

Ethics statement. Aggregate secondary data from public agencies only. No human participants, no identifiable personal data, no animal subjects; ethics approval not required.

Peer review. Double-anonymous.

ARTICLE INFORMATION

Copyright and licence. © 2026 The Author(s). Open access under CC BY-SA 4.0: https://creativecommons.org/licenses/by-sa/4.0/

How to cite. *Chisbaini, K. A. (2026). A map that does not predict: flood hazard area and realised events across Indonesian provinces. Journal of Engineering, Infrastructure and Geosciences, 2(1), 98–109.*

Publisher. Research Center Progresif, Indonesia · jeig@researchcenterprogresif.org