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Indonesia Disaster Knowledge Update - May 2023



Research Publication about Disaster-related Indigenous and Local Knowledge in Indonesia

The Sendai Framework for Disaster Risk Reduction recognizes the pivotal role of culture in disaster risk reduction. To identify, preserve, and promote indigenous knowledge in disaster risk reduction across the globe, UNDRR is partnering with The International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) in establishing the guidelines for Using Traditional and Indigenous Knowledge for Disaster Risk Reduction.

Indonesia is well known for its rich cultural heritage and ethnicities. Across its 16,771 islands resided 1,340 ethnicities with each local language and tradition. The country is also prone to experience devastating disasters due to its geological complexities and tropical settings. Along with these physical challenges, Indonesia's indigenous people have developed broad knowledge to mitigate, adapt, and respond to potential hazards. This knowledge has proven its critical role in preserving local communities' risk perception, as seen in Simeulue people who were saved from the impact of the Indian Ocean tsunami in 2004 by the Nandong Smong.

In Indonesia, indigenous knowledge utilisation in disaster risk reduction remains limited and very localized. Alarmingly, there is still limited access even to traditional languages of hazards, impeding the potential for widespread adoption of local wisdom. In an effort to recognize and promote transformative practices of Indonesian indigenous knowledge in disaster risk reduction, the current edition of IDKU delves into a comprehensive review of published research regarding indigenous and local knowledge in disaster risk reduction across Indonesia.

Traditional knowledge represents the wisdom, practices, and way of life passed down through generations among indigenous and local communities worldwide. It takes shape in the form of songs, stories, folklore, and cultural values, serving serves as a practical guide deeply rooted in specific local contexts. In areas prone to hazards, communities have honed their traditional knowledge, adapting it to geography, climate, available resources, and even the latest research. This valuable knowledge is skillfully employed to mitigate disasters and foster resilience. Remarkably, long before the advent of modern disaster management systems, indigenous peoples and local communities relied on their ancestral wisdom to prepare for and respond to hazards.

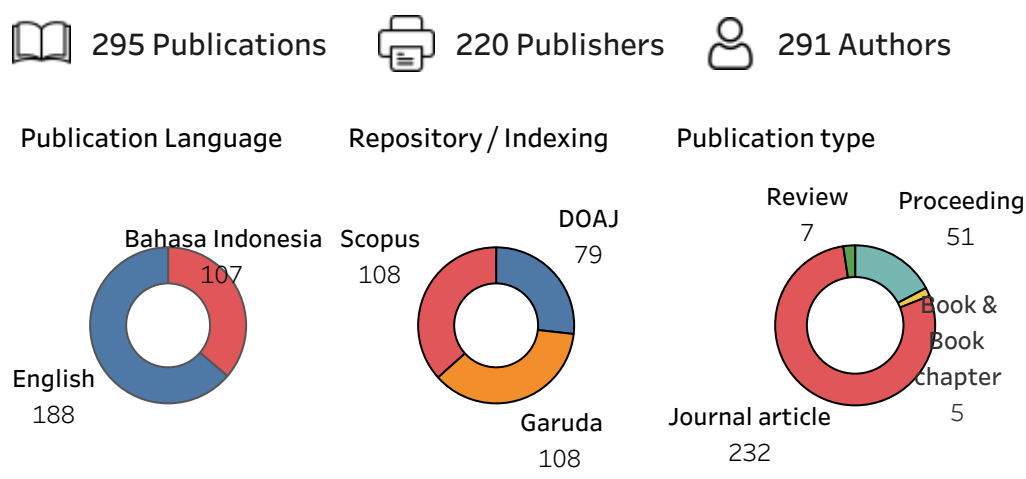
However, as scientific advancements and technology have taken centre stage, a disconnection has emerged between scientific and traditional knowledge. It is essential to recognize that traditional knowledge is ever-evolving and must keep pace with changing social, economic, and environmental landscapes to remain effective and relevant in our modern world.

Indigenous knowledge is characterized by their integration into cultural complexes and encompassing language, classification, resource use, social interactions, values, rituals, and spirituality, which are developed and adapted over generations, demonstrating underlying similarities in their approach to the interconnectedness of individuals within their communities, as seen in practices such as using celestial and terrestrial observations for weather prediction.

Local knowledge is specific to non-indigenous communities and continuously generated collective, inter-generational, and place-based knowledge shaped by personal and collective experiences influenced by historical and social processes, which can inform decision-making and may or may not be tied to a single culture or embedded in broader systems.

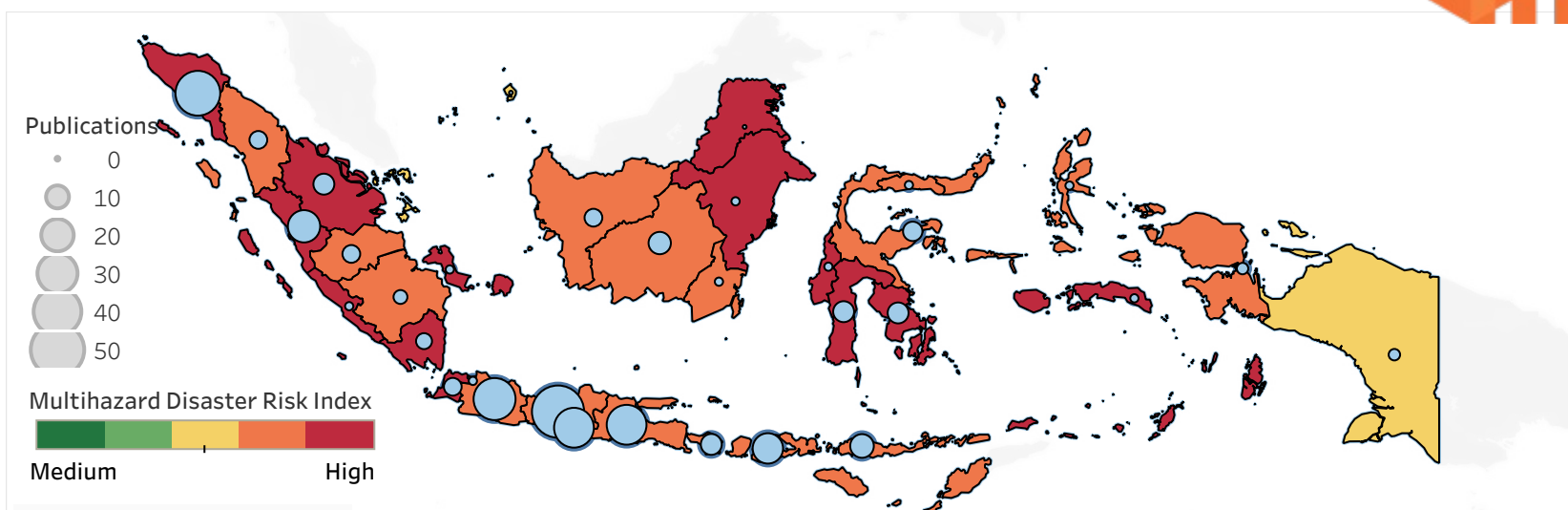
References:
[UNDRR. 2022. Words into Action: Using Traditional and Indigenous Knowledge for Disaster Risk Reduction. UNDRR](#)

Research Articles Statistics



We conducted an examination of published research articles focusing on indigenous and local knowledge related to disasters in Indonesia. The scientific articles were sourced from various repositories, including Scopus, DOAJ, and Portal Garuda, through the CARI! Knowledge Engine. Our analysis encompassed journal articles, proceedings, reviews, and books, with a specific inclusion criterion of articles written in English and Bahasa Indonesia. In total, we carefully selected 295 research articles from 220 journal publishers for further review in our analysis.

Central Java and Aceh stand out with the largest number of published research articles

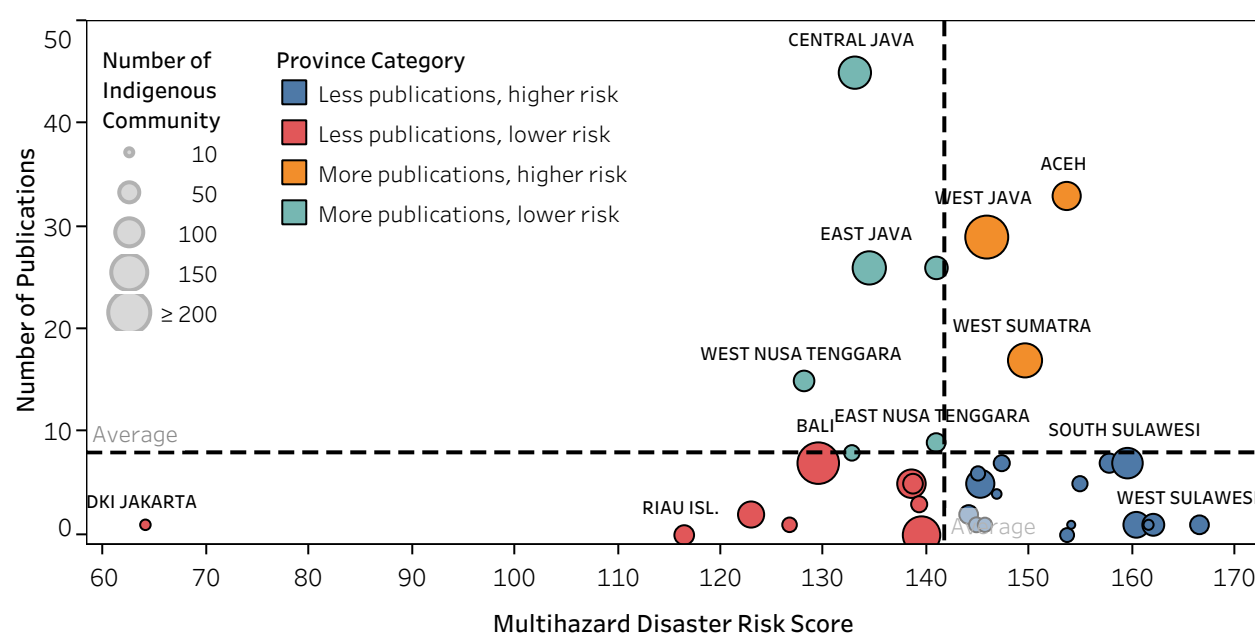


The blue circle size represents the research articles number tagged to each province (source: CARI! repository-of-repositories, 2023). The map colour gradation of the province depicts its multihazard disaster risk class (BNPB, 2021).

- BOMBANA
- KOTA PARIAMAN
- BANDUNG BARAT
- ACEH JAYA
- SLEMAN
- KOTA JAMBI
- KOTA PADANG
- KOTA BANDA ACEH
- PANGANDARAN
- KOTA YOGYAKARTA
- KARANGANYAR
- ACEH BESAR
- PESISIR SELATAN
- KOTA SEMARANG
- KOTA MALANGINDRAMAYU
- KOTA BANDUNG
- KOTA PALANGKA RAYA
- PIDIE AGAM
- PIDIE JAYAMALANG
- KOTA TASIKMALAYA
- SUMEDANG
- GUNUNGKIDUL
- PADANG PARIAMAN
- KOTA MATARAM
- REMBANG
- KOTA SUKABUMI
- MERAUKE
- KOTA PALU
- SIMEULUE
- BOYOLALI
- OGAN KOMERING ULU SELATAN
- TEBAKOTA
- MAKASSAR
- KALUR

The map indicates a disparity in the number of research articles, with higher concentrations observed in the Java and Sumatera regions, while fewer articles are found in other areas. Notably, Central Java and Aceh provinces exhibit the highest research output, with 45 and 33 publications respectively, while the remaining provinces have less than 30 articles each. Despite the comparable high risk in some provinces in Sumatra, Kalimantan, and South Sulawesi, research efforts in those regions remain minimal. At the city/regency level, Aceh Besar and Simeulue stand out with 9 and 8 publications respectively. This concentration of research articles in specific provinces may be attributed to the presence of prominent higher education and research institutions primarily situated on Java Island. As well as the increased local wisdom popularity on recent major disasters such as smong in Simeulue.

Several provinces with a high disaster risk is still understudied, despite the presence of numerous indigenous communities



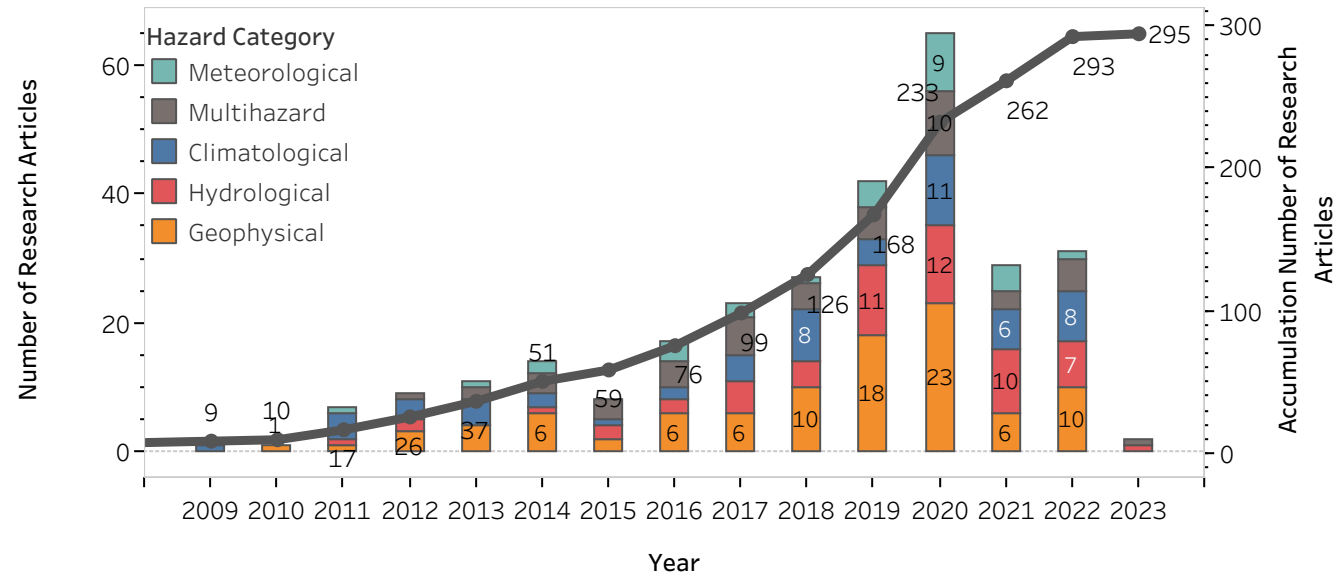
The quadrant plot shows the province's category (marked by different colours) based on the number of research articles (CARI!, 2023) and drought risk score (BNPB, 2021). The circle's size depicts the number of indigenous community (Kemendesa, 2022).

According to our data, every province in the country has at least one article, except for North Kalimantan, North Sulawesi, and Riau Islands. Nine provinces surpass the national average in terms of publications, with a minimum of 8 articles. This includes six provinces in the green category and three provinces in the blue category, located in Java, Sumatra, and Nusa Tenggara. Regrettably, provinces with a significant number of indigenous communities, e.g. Papua and North Sulawesi, lack sufficient research on indigenous knowledge related to disasters.

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Increasing Trend of Articles Addressing the Issue



The left axis of the stacked bar chart displays the annual count of research articles published, while the right axis of the line chart represents the cumulative number of research articles. The colour coding in the stacked bar chart indicates the specific hazard category under study.

The earliest record of published disaster-related indigenous knowledge dates back to 1996, followed by a gap until 2004, 2007 (not shown), and subsequent continuous publication every year since 2009. There has been an overall positive trend leading up to recent times, with a minimum of 40 articles published each year since 2013. The highest number of published articles focuses on hydrological and geophysical hazards, as these hazards are more localized in nature compared to meteorological and climatological factors, which can vary significantly over time, particularly with the influence of climate change.

Research Production Dominated by Major Universities

- Ritsumeikan University
- MAN Insan Cendekia OKI
- Universitas Malikussaleh
- Universitas Nusa Cendana
- Universitas Bengkulu
- Universitas PGRI Palembang
- Politeknik Negeri Kupang
- Universitas Ahmad Dahlan
- Universitas Hindu Indonesia
- Universitas PGRI Yogyakarta
- Universitas Tanjungpura
- UIN Maulana Malik Ibrahim
- Universitas Bakrie
- Badan Informasi Geospasial
- STKIP Yayasan Abdi Pendidikan
- Universitas Katolik Parahyangan
- Universitas Abdurachman Saleh
- UIN Sunan Gunung Djati
- Institut Seni Budaya Indonesia Aceh
- Balai Penelitian Kehutanan Banjarbaru
- Masyarakat Pernekahan Nusantara
- Lembaga Administrasi Negara
- Institut Pertanian Bogor
- Indonesian Center for Environmental Law
- Universitas Indonesia
- Gifu University
- Balai Pelestarian Nilai Budaya
- Universitas Janabadra
- Politeknik Negeri Bali
- Balai Penelitian Kehutanan Makassar
- Universitas Katolik Soegijapranata Semarang
- Universitas 17 Agustus 1945 Jakarta
- Universitas Negeri Makassar
- Universitas Islam Raden Rahmat Malang
- Institut Teknologi Bandung
- Lembaga Pengkajian Agama dan Masyarakat
- Universitas Muhammadiyah Jakarta
- Perpustakaan Nasional Republik Indonesia
- Universitas Pembangunan Nasional Veteran Yogyakarta
- IAIN Antasari
- Badan Nasional Penanggulangan Bencana
- Universitas Tadulisan
- Balai Penelitian Kehutanan Kupang
- Universitas Diponegoro
- UIN Syarif Kasim Riau
- Universitas Palangka Raya
- Universitas Negeri Semarang
- Universitas Atma Jaya
- Universitas Negeri Padang
- Center for Research and Development on Social, Economy, Policy and Climate Change
- Charles Darwin University
- Universitas Negeri Yogyakarta
- Universitas Pendidikan Indonesia
- GBKP Pekanbaru
- Universitas Gadjah Mada
- Universitas Al Aizhar Indonesia
- Indonesian Centre for Agricultural Socio Economic and Policy Studies
- Universitas Ibn Khaldun
- Universitas Airlangga
- Commonwealth Scientific and Industrial Research Organisation
- Badan Riset dan Inovasi Nasional
- Universitas Syiah Kuala
- Universitas Brawijaya
- Indonesian Agroclimate and Hydrology Research Institute
- Pusat Vulkanologi dan Mitigasi Bencana Geologi
- Assessment Institute for Agricultural Technology
- STKIP PGRI
- Jogja Heritage Society
- Universitas Negeri Surabaya
- Universitas Padjadjaran
- Griffith University
- Lembaga Ilmu Pengetahuan Indonesia
- Universitas Muhammadiyah Yogyakarta
- Universitas Muhammadiyah Bengkulu
- Universitas Sebelas Maret
- Sekolah Tinggi Teknologi Mineral Indonesia
- Universitas Muhammadiyah Mataram
- Universitas Muhammadiyah Malang
- IAIN Kudus
- Universitas Muhammadiyah Purwokerto
- Universitas Muhammadiyah Malang
- IAIN Kudus
- Balai Arkeologi Daerah Istimewa Yogyakarta
- Universitas Muhammadiyah Purwokerto
- Universitas Muhammadiyah Malang
- IAIN Kudus
- Australian National University
- Ehime University
- Politeknik Elektronika Negeri Surabaya
- Universitas Muhammadiyah Surakarta
- Universitas Lambung Mangkurat
- Kementerian PUPK
- STKIP PGRI Pontianak
- Universitas Merdeka Malang
- Balai Penelitian Pertanian Lahan Rawa
- Universitas Kristen Satya Wacana
- Universitas Teknologi Sumbawa
- Universitas Florissant
- Universitas Negeri Malang
- Universitas Muslim Indonesia
- SMP Negeri 2 Kedungbanteng
- Seminar Alkitab Asia Tenggara
- Universitas Negeri Medan
- UIN Sultan Syarif Kasim
- Universitas Sumatera Utara
- Universitas Hasanuddin
- Universitas Negeri Gorontalo
- UIN Sayyid Ali Rahmatullah
- Universitas Riau
- Universitas Bina Nusantara
- Universitas Pertahanan

Based on the main author's affiliation, Universitas Gadjah Mada emerged as the leading contributor among universities, with 13 articles focusing on disaster-related indigenous knowledge. Universitas Syiah Kuala and Universitas Pendidikan Indonesia closely followed with 10 articles each. Other notable universities with a substantial number of articles include Universitas Negeri Padang, Universitas Diponegoro, and Universitas Padjadjaran. In total, our review encompassed 161 different affiliations, representing diverse research fields and faculties, including several foreign affiliations.

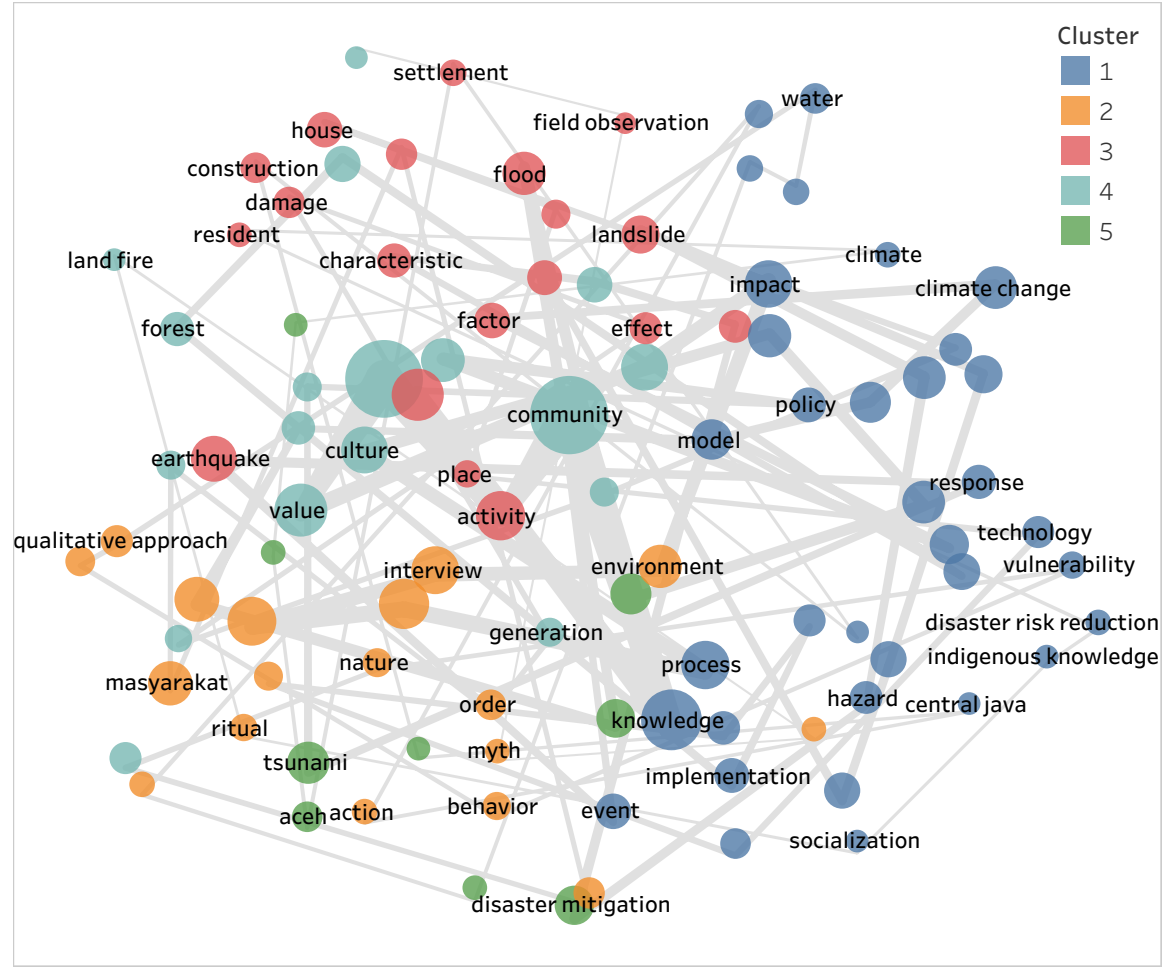
Top Research Articles

- National systems for managing the risks from climate extremes and disasters**
Lal, P.N., T. Mitchell, P. Aldunce, H. Auld, R. Mechler, A. Miyan, L.E. Romano, and S. Zakaria | Managing the Risks of Extreme Events and Disasters to Advance Resilient and Fair Development | Published on 2012-01-01 | Cited by 58 articles
- Reinterpretations of mystical traditions: Explanations of a volcanic eruption in Java**
Schlehe J. | Anthropos | Published on 1996-01-01 | Cited by 33 articles
- Volcanoes in human history: The far-reaching effects of major eruptions**
de Boer, J.Z., Sanders, D.T., and Ballard, R.D. | Volcanoes in Human History: The Far-Reaching Effects of Major Eruptions | Published on 2012-01-02 | Cited by 33 articles
- A systematic review of Community Engagement (CE) in Disaster Early Warning Systems (EWSs)**
Sufri, S., Dwirahmadi, F., Phung, D., Rutherford, S. | Progress in Disaster Science | Published on 2020-01-01 | Cited by 18 articles
- Character of community response to volcanic crises at Sinabung and Kelud volcanoes**
Andreastuti, S.; Paripurno, E.; Gunawan, H.; Budianto, A.; Syahbana, D.; Pallister, J. | Journal of Volcanology and Geothermal Research | Published on 2019-09-15 | Cited by 18 articles

The list above is the five most highly cited research articles on disaster-related traditional knowledge, as recorded by Scopus as of May 2023. These highly-cited articles on disaster-related traditional knowledge, which covers indigenous-local knowledge and community response and perception, highlight the importance of integrating scientific and cultural perspectives for effective disaster management.

Diverse Research on Disaster-related Indigenous and Local Knowledge

The nodes sizes symbolize the frequency of keywords occurrences, while the nodes that are closer together indicate a higher occurrence of the keywords appearing together, and the thickness of the tie connecting them shows the significance of the co-occurrence. The nodes colour denotes the attributed cluster of knowledge.



Knowledge network analysis utilizes keywords extracted from publication titles and abstracts to classify study clusters, showcasing information diversity in the field by identifying keyword variations. This analysis has generated keyword nodes and their associated ties within disaster-related indigenous knowledge. The main nodes include local wisdom, community, and knowledge. Five clusters have been mapped, revealing the goals, methodologies, subjects, and objects across the article corpus:

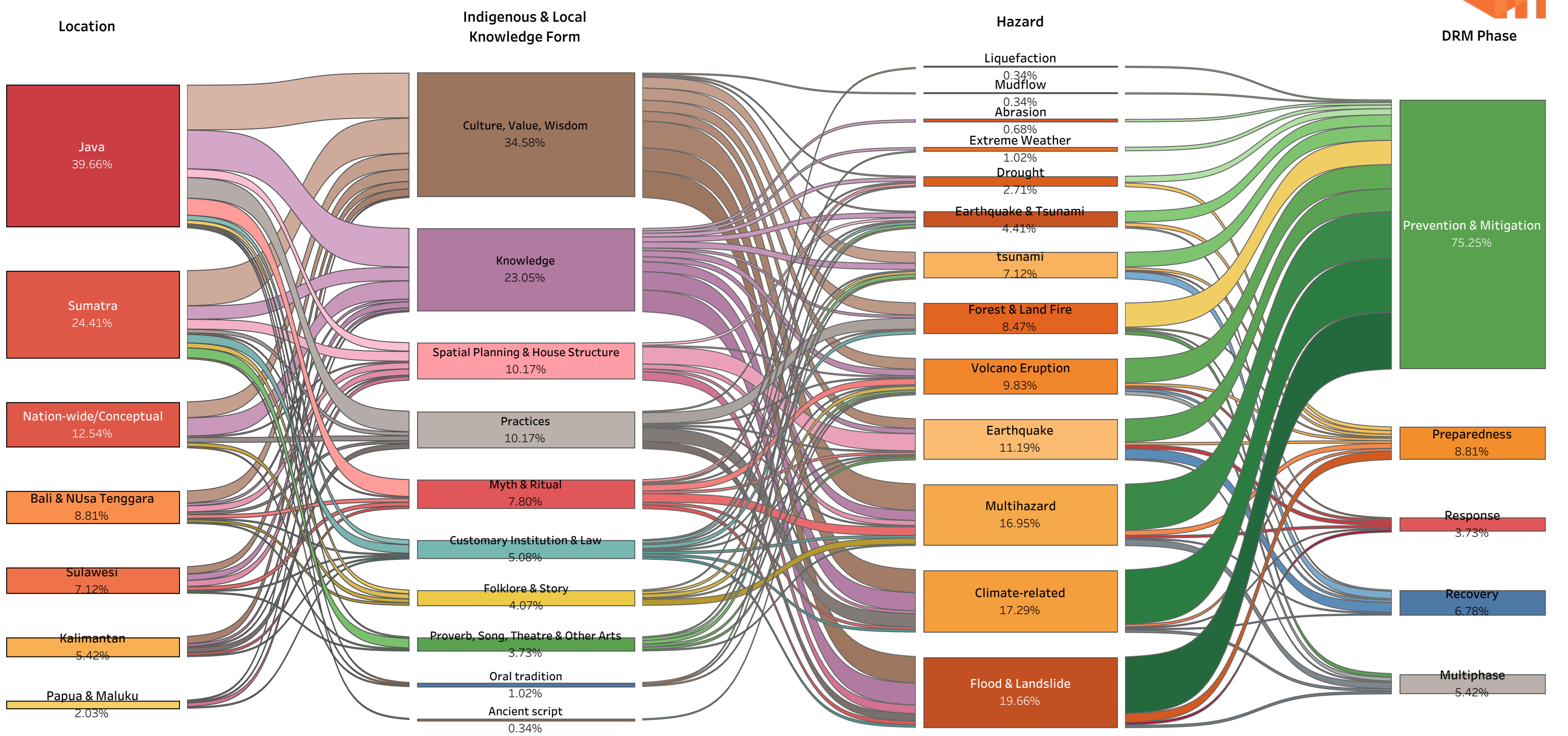
- Cluster Blue:** predominantly focuses on IK & LK research related to climate-related hazards and disaster risk management
- Cluster Orange:** consists of surveys conducted on indigenous and local populations
- Cluster Red:** predominantly examines structural building and spatial planning
- Cluster Cyan:** emphasizes community vulnerability to forest and land forest
- Cluster Green:** focuses on Aceh and Tsunami-related research

Not surprisingly, the majority of attention has been focused on comprehending the knowledge and practices surrounding this subject. This includes examining their application in Disaster Risk Reduction (DRR) and exploring their potential for further enhancement. In summary, knowledge network analysis using keyword-based clustering provides insights into the diverse aspects of disaster-related indigenous knowledge, highlighting key research areas and their respective focuses.

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Sankey Diagram of Publications: Research Location to Indigenous & Local Knowledge Form to Hazard Type to Disaster Risk Management Phase



The Sankey diagram is visualized proportionally to the number of publications. The larger size of the box and the wider lines indicate a greater number of publications accounted for them. The Sankey diagram illustrates the distribution of research articles and their relations across studied locations, indigenous and local knowledge forms, hazard types, and disaster management phases.

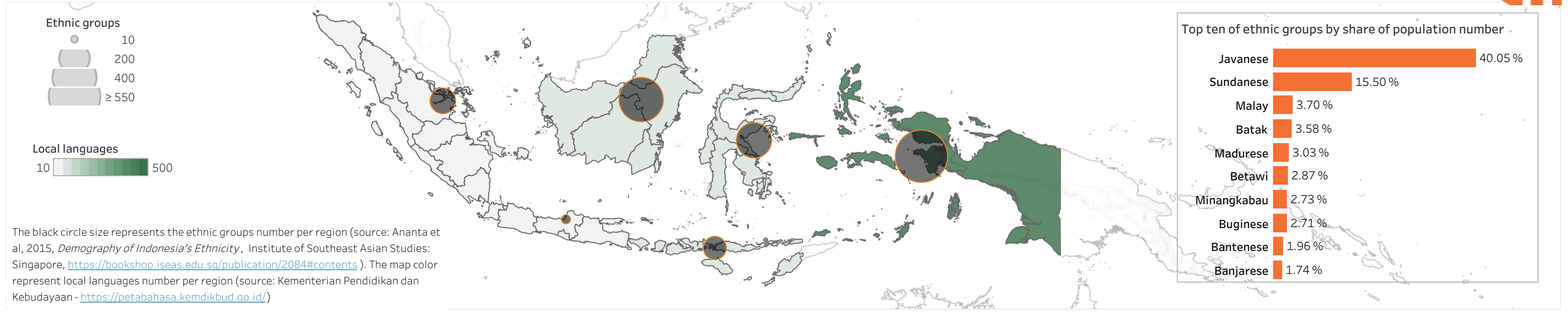
The Sankey diagram above is utilized to determine the co-analysis relationship among the research location by region, indigenous knowledge form, the type of hazard studied, and the disaster risk management phase investigated in each research article. Research on **local disaster knowledge** in Indonesia has primarily **focused on Java and Sumatra**, exploring various aspects of local culture, values, wisdom, and broader knowledge. **Sumatra** has been the **main area** of study for **local spatial planning and building structures**, while **Java** has been more extensively researched for **local practices, myths, rituals, and customary law**. However, regions such as **Bali & Nusa Tenggara, Sulawesi, Kalimantan, and Maluku** have received **little attention** in terms of understanding **local knowledge**, including folklore, sayings, and oral traditions. **Floods, landslides, and climate-related hazards** have been the **main areas of focus**, accounting for **19.66%** of the overall research. **Spatial planning and building structures** are closely associated with **earthquake hazards**, while **local practices** are connected to **flood and landslide hazards**. The research has **predominantly emphasized the prevention and mitigation phase (75%)**, followed by preparedness, recovery, and multiphase associated with different hazards. Unfortunately, the **emergency response phase has been largely overlooked** in studies on **local disaster knowledge** in Indonesia. Future studies should strive to broaden the geographic scope by exploring local disaster knowledge in regions such as Bali & Nusa Tenggara, Sulawesi, Kalimantan, and Maluku, and should also pay greater attention to the emergency response phase, thus providing a more comprehensive understanding of local knowledge across various hazards in Indonesia.

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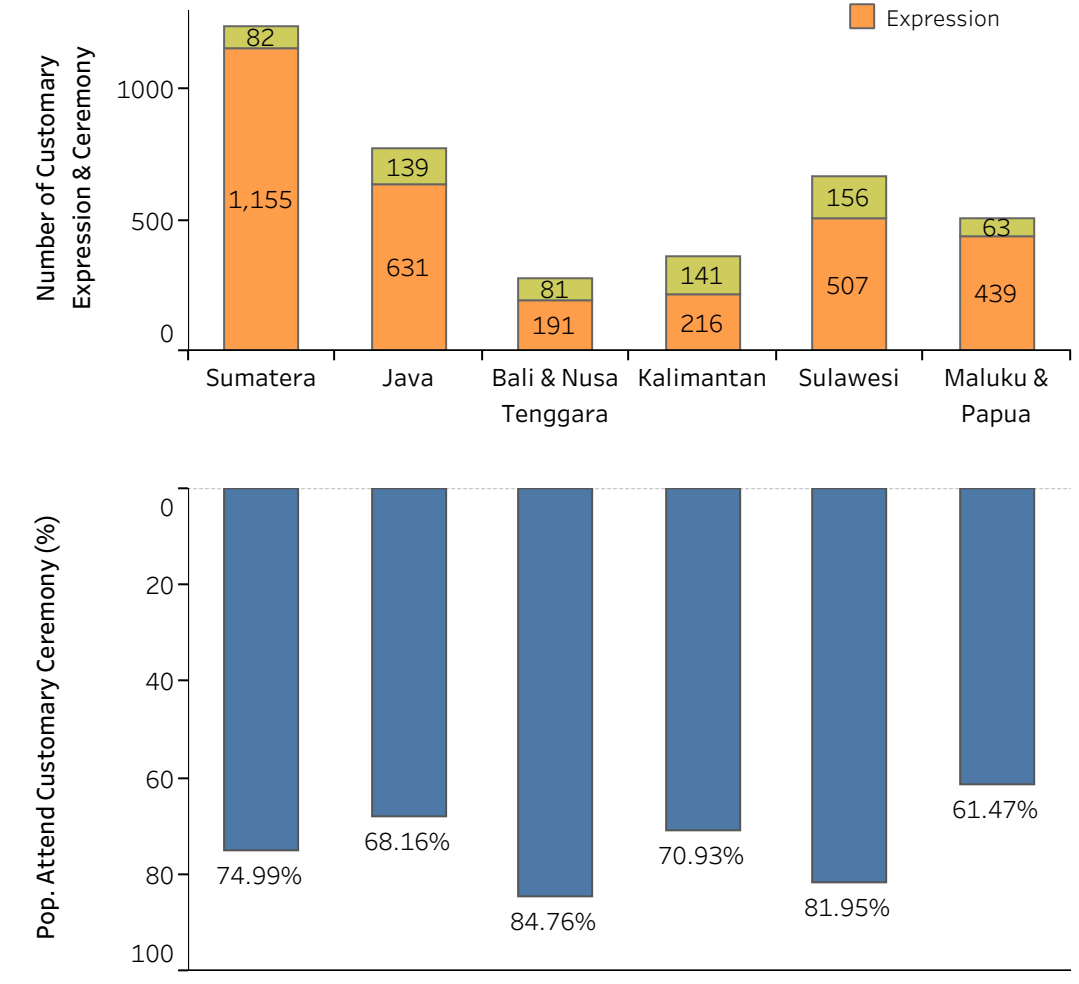


Deep dive into The Wealth Indigenous and Local Knowledge Landscape in Indonesia

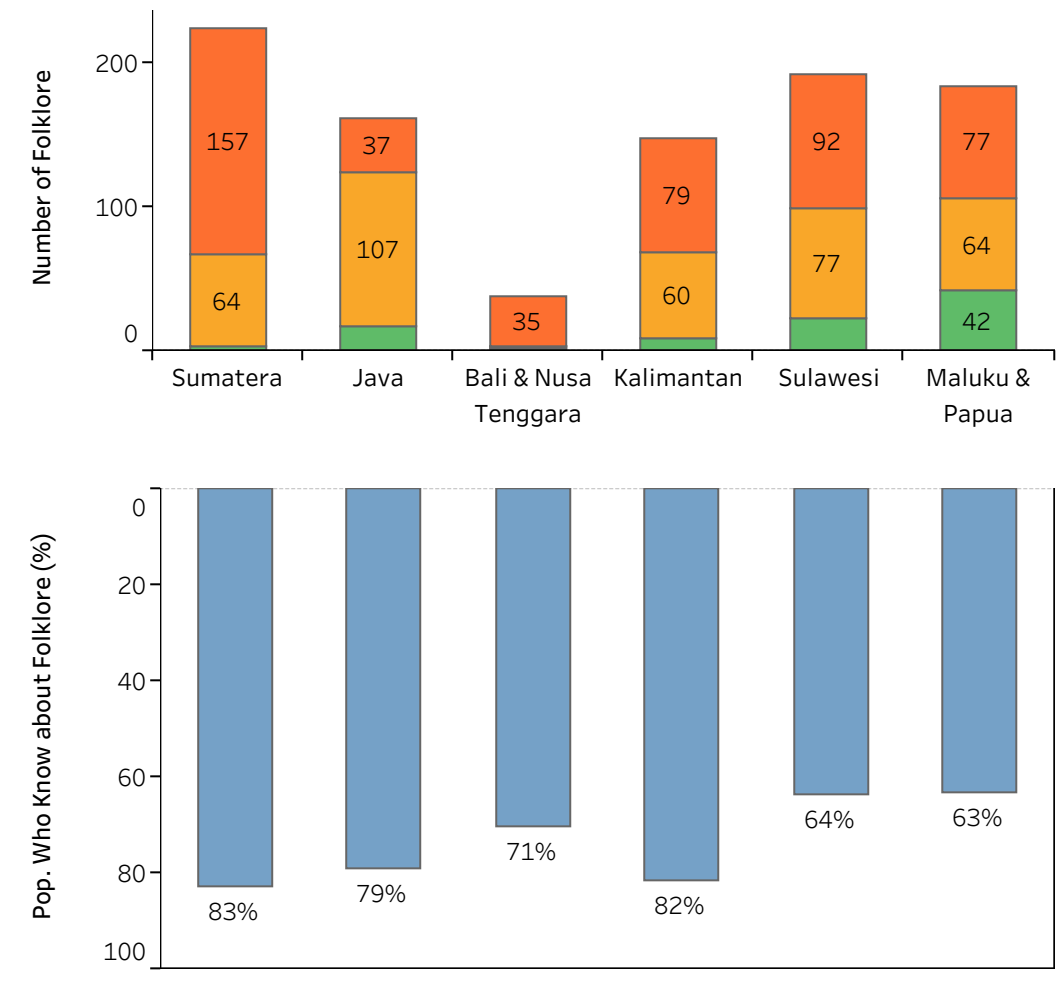
Local Language and Ethnic Group



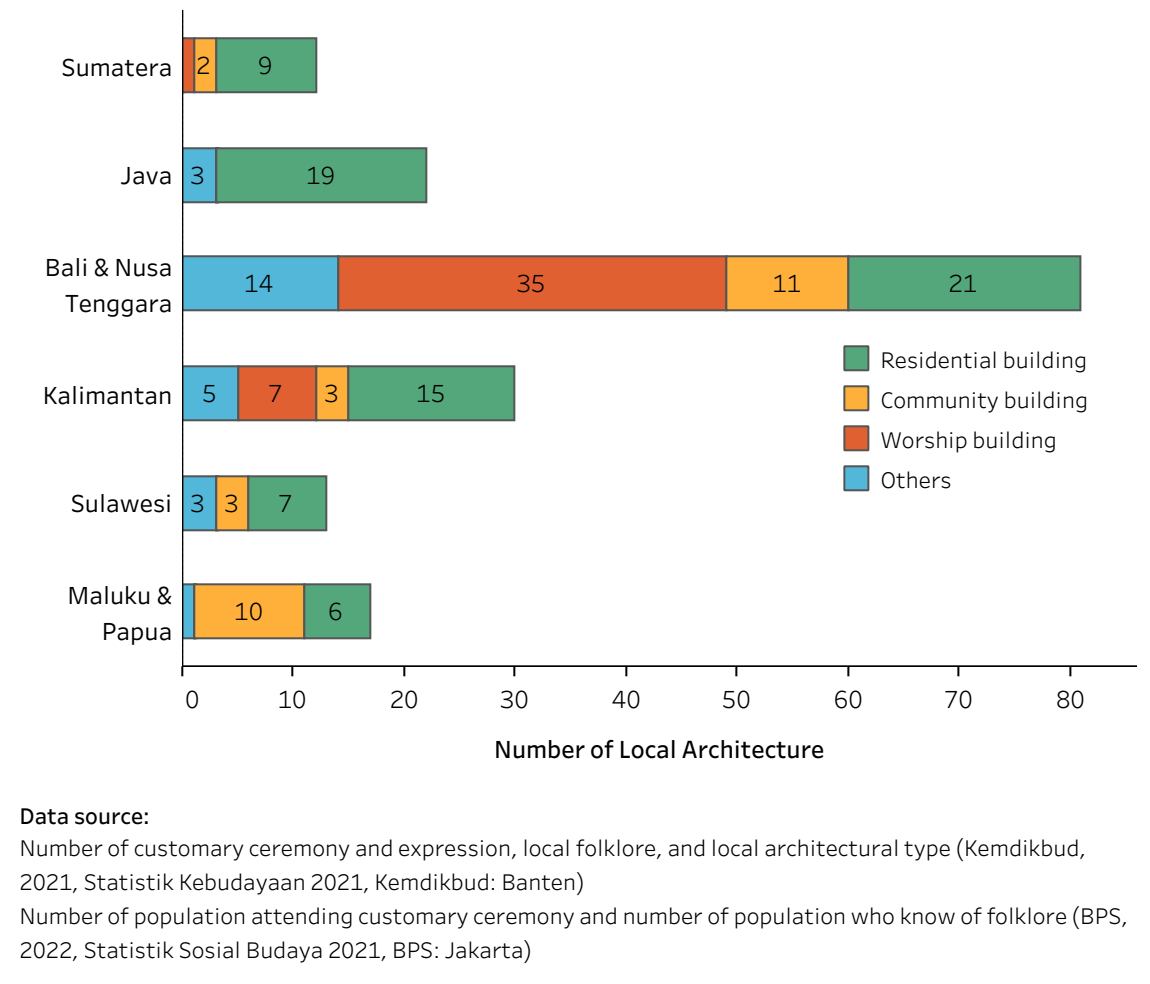
Customary Ceremony and Expression



Folklore



Local Architecture



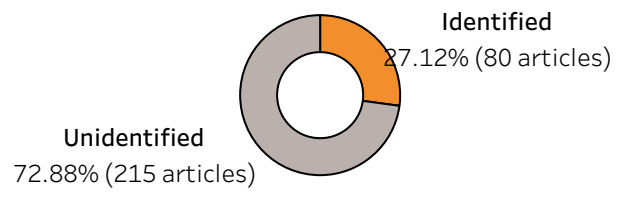
Indonesia boasts 718 local languages and over 600 different ethnic groups spread across its islands. The largest concentration is found in Papua and Maluku, home to 509 languages and 563 ethnicities. Sulawesi and Nusa Tenggara have a significant number of local languages, while Kalimantan and Sulawesi have the most diverse ethnic groups. Java and Sumatra, although fewer in number, stand out for their rich expressions and traditional ceremonies. Bali & Nusa Tenggara, with fewer expressions and ceremonies, excels in community participation. Sumatra has the most folktales, and its people are well acquainted with them. Bali & Nusa Tenggara showcase diverse architectural styles with 81 variations. With this wealth of local knowledge, further research is crucial to identify its role in reducing disaster risks.

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Identified Indigenous and Local Knowledge Forms

Articles that identified IK & LK forms



Identified Wisdom, Culture, and Values

Merun, Muhun, Smong, Smong Palelindon, Air Turun Naik, Nyabuk Gunung, basandi syarak, Rumoh Aceh, Patchouli, Jamblang, Nandong, Smong, Pranata mangsa, Kul-kul, Tolak bala, Bale beleq, Dina Renteng Ilmu Titen, Gotong royong Pesakitan, tabuik, Pranata mangsa

Identified Hazard Local Name

Identified Customary Institution, Law, and Ritual

nalodo, gampo, galodo, smong, air turun naik, ie tuara, gedeb ombak gedeb angin, rob

Lembu Suro, Sedekah Gunung, Mappaoli Banua Bulan Suro, Upacara Ngalokat, Tumik Singgalang, Cemme Passili, Labuhan, Laku Topo Bisu, Sedekah Gunung, Maarak Kitab Bukhari, Jenang Kutei, Niniak Mamak, Cingcowong, Tolak bala, Sasi, Syarak Basandi

Identified Practices, Structural Building and Spatial Planning

Slash & Burn, Paseduluran, Pengataa, Lende Ura Lumbang, Joglo, Bugis, Rumoh Aceh, Ruwatan Pondasi Ark'a, Lamban Langgahk, Pranata Mangsa, Slash & Burn, Sonor Sedekah Bumi, Gugur Gunung, Tamarjan, Waring, Ammu Hawu Meru, Nyabuk Gunung, Slash & Burn, Surjan Sopo, Ngalaksa, mamar, titir, Imah Panggung, Stengah Leger, Fala Kanci

Identified Folklore, Story, Oral Tradition, Myth, and Other Art

Telaga Lindur Prabu Boko, Martandu Dragon; Taro, Lampung Karam, Nandong, nafinafi, Goenoeng Keloet Rapa'l Dabo'ih, Timun Mas, Rawapening, Nyi roro kidul, Sangkan Paraning Dumadi, Candi Tawangalun, Emas Ketimun, Saedah Saenih, Sundanese game, Sesonggan Smong, Smong, Under The Volcano

The research corpus on local knowledge about disasters in Indonesia has generally overlooked identifying the specific types and names of local knowledge. Only 80 articles, which make up 27% of the corpus, have mentioned the name of the local knowledge. The diverse range of local knowledge related to disasters includes general local wisdom, knowledge, local practices, building structures, and traditional rituals. However, literary-type knowledge, such as folklore, songs, and myths, has received comparatively less attention in research. Throughout the research, hazard names in local languages have been identified, such as "smong" (tsunami) hazards from Simeulue, "ie tuara" (tide flood) from Aceh, "galodo" (flash floods) and "gampo" (earthquake) from West Sumatra, "nalodo" (liquefaction) from Central Sulawesi, "air turun naik" (tsunami) from Maluku, "rob" (tide flood) from Java, and "gedeb ombak gedeb angin" (high waves) from Bali. However, there is no comprehensive glossary of hazard names in local languages compiled from all regions in Indonesia.

Recommendations

While there has been an increasing trend in research publications focusing on the utilization of indigenous and local knowledge in Indonesia, there remains an uneven distribution of research locations throughout the country. Furthermore, integration and utilization of this knowledge are still limited and localized. Therefore, we provide several recommendations to minimise these gaps:

- Develop cooperation across stakeholders** including at national and local levels to explore, document, and mainstream the good practices of traditional knowledge to a broader scale. This could also help to preserve the existing traditional knowledge while supporting the ever-evolving of traditional knowledge in the communities. Relevant stakeholders that could be added to this cooperation include, but not limited to, the Ministry of Education and Culture, the National Disaster Management Agency, the Ministry of Tourism and Creative Economy, the National Statistics Agency, the National Research Agency, the Ministry of Village, Development of Disadvantage Regions, Ministry of Home Affairs, Center for Volcanology and Geological Hazard Mitigation, and Meteorological, Climatological, and Geophysical Agency.
- Refocusing research of traditional knowledge on potential regions** such as Maluku, Papua and other overlooked regions. The existing gaps in published research highlight the limited attention to several areas in Indonesia despite the existing well-developed tribes and cultures in the regions. National-level stakeholders such as the Ministry of Education and Culture and/or the National Research Agency could support through special programs or funds to promote the research through joint research programs with local universities. This step not only will enrich the research of traditional knowledge on overlooked regions but also boost and strengthen the diversity of the research landscape in local universities.
- Launch collaboration with local community organisations**, community movements, or NGOs in identifying and developing a database on the nature and characteristics of indigenous and local knowledge specific to each location. The best source of traditional knowledge is the indigenous people and the local community itself. Therefore, it is critical to involve members of indigenous people and the local community to identify the existing knowledge. Involving indigenous people and local community through local community organisations or NGOs could accelerate the establishment of traditional knowledge database and minimise misunderstanding in the translation and documentation process of traditional knowledge.