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Indonesia Disaster Knowledge Update - October 2023

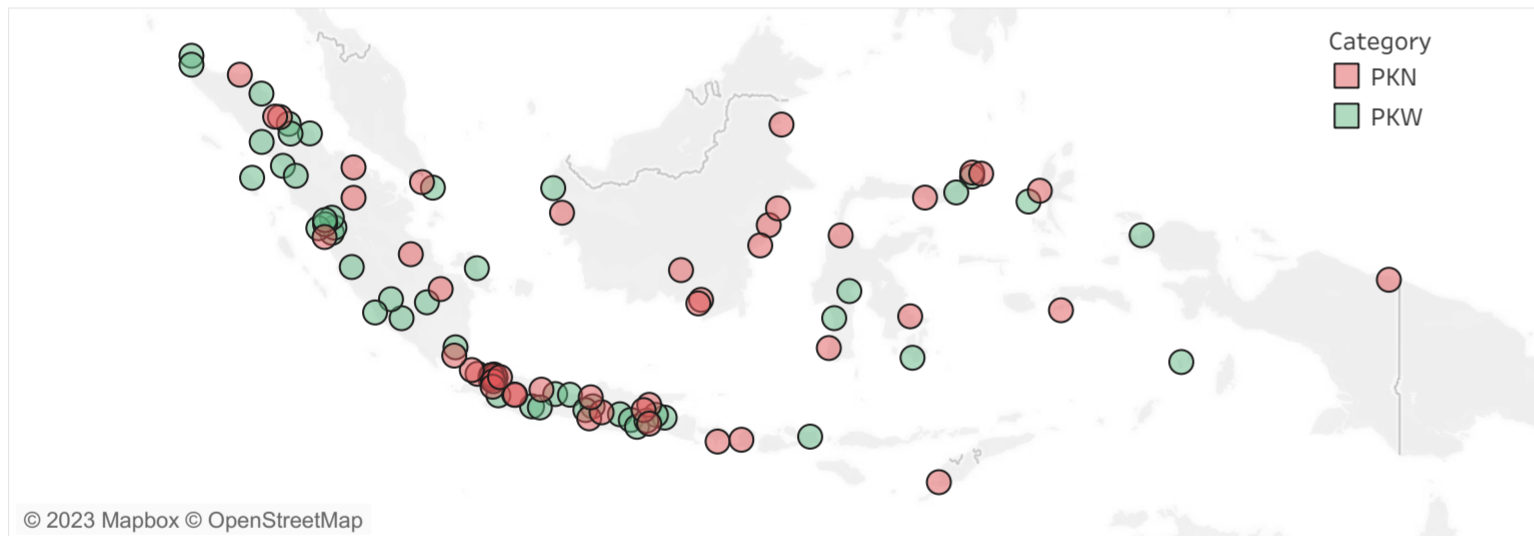


Urban, Hydrometeorology, and Climate Disaster-related Research Publication in Indonesia

Introduction

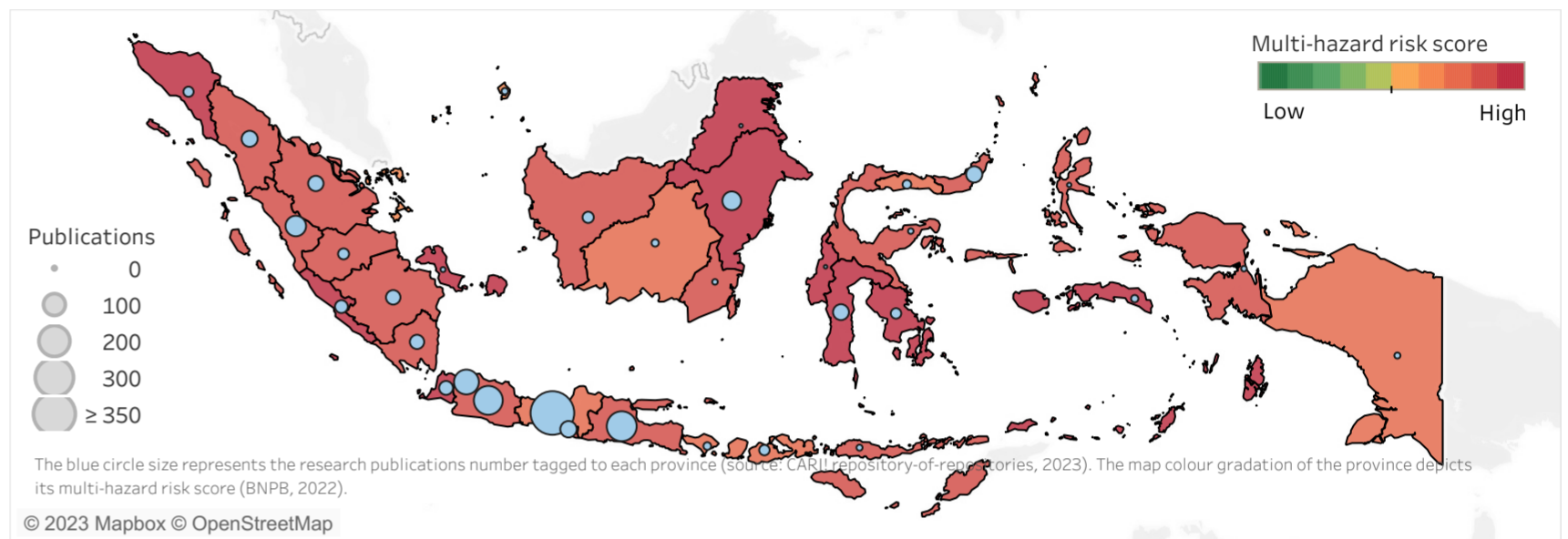
Indonesia Disaster Knowledge Update (IDKU) October 2023 is prepared to celebrate World Cities Day and the Urban Forum held in October. This IDKU will explore urban spatial planning in Indonesia based on disaster management and sustainable development. The analysis will look at the distribution of urban or city-themed publications in Indonesia for all 98 cities listed in the Central Bureau of Statistics and Ministry of Home Affairs data. The basic reference for data processing is summarized in Government Regulation Number 26 of 2008 concerning the National Spatial Plan (RTRWN). The plan states that cities are classified into 5 types, namely megapolitans (≥ 10 million people, generally consisting of two or more metropolitan cities), metropolitan cities (≥ 1 million people), large cities (500,001 - 999,999 people), medium cities (100,001 - 500,000 people), small cities (50,001 - 100,000 people). Population data as of June 30 2023 used in this IDKU for city classification is sourced from the Dukcapil WebGIS. In this IDKU, the research publications were also categorized by spatial elements: structure and pattern. The spatial structure includes an urban center system, transportation network system, energy network system, telecommunication network system, and water resources network system. Spatial pattern includes protected areas and cultivation areas including mainstay areas with leading sectors that are prospectively developed and national strategic areas. Additionally, Indonesia divides cities into three activity centers in urban planning based on the function and scale of activities, namely *Pusat Kegiatan Nasional* (PKN), *Pusat Kegiatan Wilayah* (PKW), and *Pusat Kegiatan Lokal* (PKL). The PKN are urban areas that function to serve international, national, or several provincial-scale activities. Meanwhile, the PKW are urban areas that serve provincial-scale activities or several districts/cities. There are 51 cities categorized as PKN and 47 cities categorized as PKW.

Distribution of the cities reviewed and its economic development functions



The number of studies is more spreaded in West Indonesia Region, specifically in Java Island

Research article distribution map



Volume of publication by city



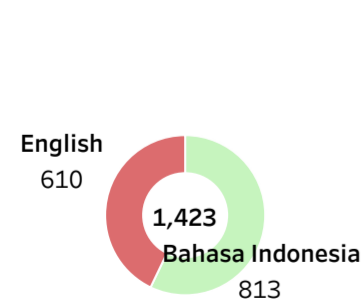
This map shows that the number of studies is more skewed toward the western Indonesia region, especially on Java Island. It is not surprising given conditions that the majority of urban areas are located in Java. Notably, Central Java, East Java, and West Java provinces have a prominent number of studies compared to other provinces in the western Indonesia region.

The word cloud shows every city that becomes the research location, the bigger the label, the more studies are found. Semarang City is strikingly the most studied city with 292 publications, which contributed to a higher number of studies in Central Java province. Other cities that have a reasonably high number of studies (>40 studies) are Surabaya, Bandung, Padang, and other province's capital cities. The growing economy and population in urban areas across Indonesia needed more distributed studies toward the eastern Indonesia region as well.

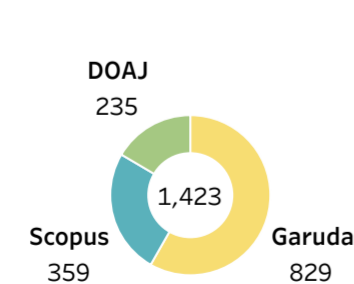
Research Articles Statistics

1423 Publications 823 Publishers 1371 Authors

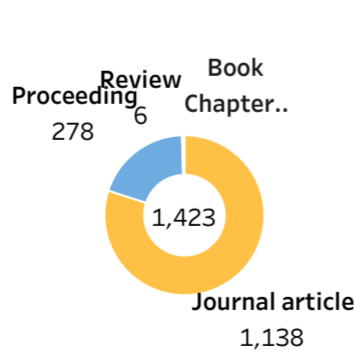
Publications by language



Publications by repository/indexing



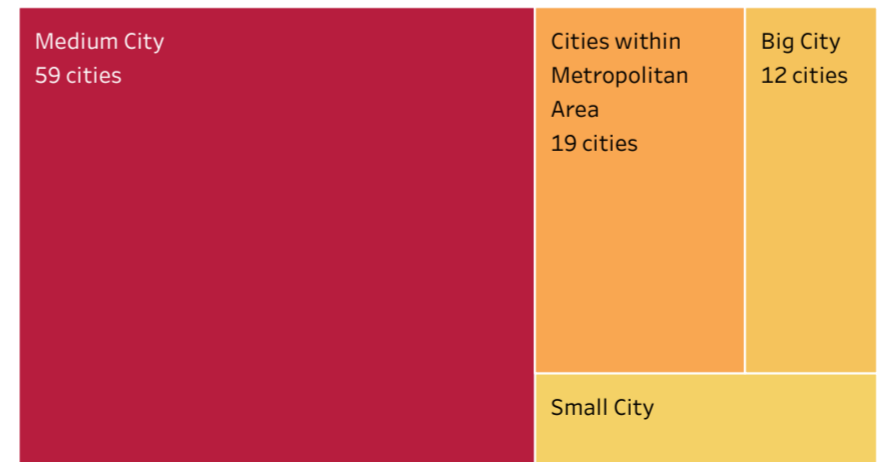
Publications by type



For analytical purposes, we examined research articles related to the urban, hydrometeorological disaster and climate change impact. The scientific articles were obtained from CARI! Knowledge Engine sourced from Scopus, DOAJ, and Portal Garuda repositories. All journal articles, proceedings, book chapters, and reviews were included in this analysis. Also, only articles written in English and Bahasa Indonesia were included. In total, we selected **1423 publications** to be reviewed in the subsequent analysis.

The majority of cities in Indonesia are classified as Medium

Number of city based on city classification



This graph shows the distribution of cities in Indonesia based on the classification of cities based on the National Spatial Plan. There are 59 cities classified as Medium City (100,001 - 500,000 people), such as Banda Aceh, Palu, Manado, Palangkaraya, etc. There are 19 cities classified as Cities within the Metropolitan Area (≥ 1 million people), such as Jakarta cities, Tangerang, Bandung, Surabaya, Medan, etc. There are 12 cities classified as Big City (500,001 - 999,999 people), such as Padang, Samarinda, Denpasar, etc. Lastly, there are 8 cities classified as Small City (50,001 - 100,000 people), such as Payakumbuh, Sabang, Solok, etc.

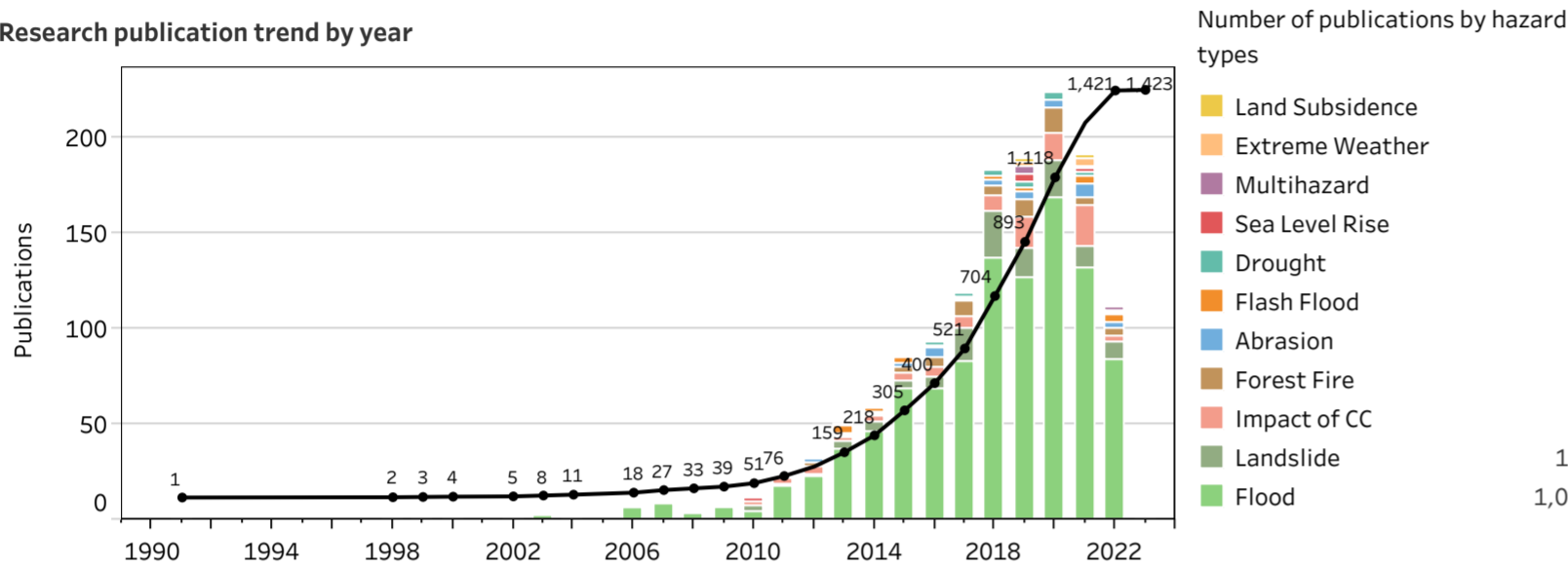
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Research Growth & Descriptive Analysis

Flood hazard is always the most examined by urban and climate research every year

Research publication trend by year



The growth of hydrometeorological and climate disaster research in urban areas continues to increase. Studies continuously published every year since 2006, and substantial growth in publications was observed after 2017. In 2020, there were more than 1000 research publications were published. The flood, followed by landslide hazard, is always the most widely discussed every year, which is correlated with complex water management in urban areas. Studies focused on the impact of climate change have started gaining attention from researchers in recent years.

Top Research Articles

Estimation of river flood damages in Jakarta, Indonesia

Wijayanti, P., Zhu, X., Hellegers, P. et al. | Natural Hazards
8 published on 2017 | cited by 28 articles

A tale of two cities: comparing alternative approaches to reducing the vulnerability of riverbank communities in two Indonesian cities

Taylor J. | Environment and Urbanization
11 published on 2015 | cited by 25 articles

Coastal adaptation laws and the social justice of policies to address sea level rise: An Indonesian insight

Nurhidayah, L., & McIlgorm, A. | Ocean and Coastal Management
23 published on 2019 | cited by 25 articles

Key factors influencing wider adoption of blue-green infrastructure in developing cities

Drosou N, Soetanto R, Hermawan F, Chmutina K, Boshier L, Hatmoko JUD. | Water (Switzerland)
124 published on 2019 | cited by 22 articles

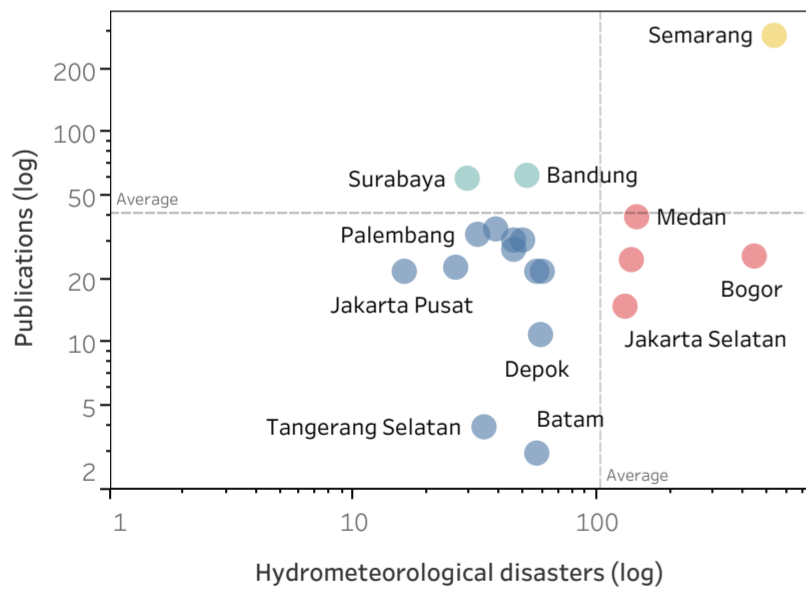
Two-dimensional model of ciliwung river flood in DKI Jakarta for development of the regional flood index map

Formánek, Adam, et al. | Journal of Engineering and Technological Sciences
published on 2013 | cited by 19 articles

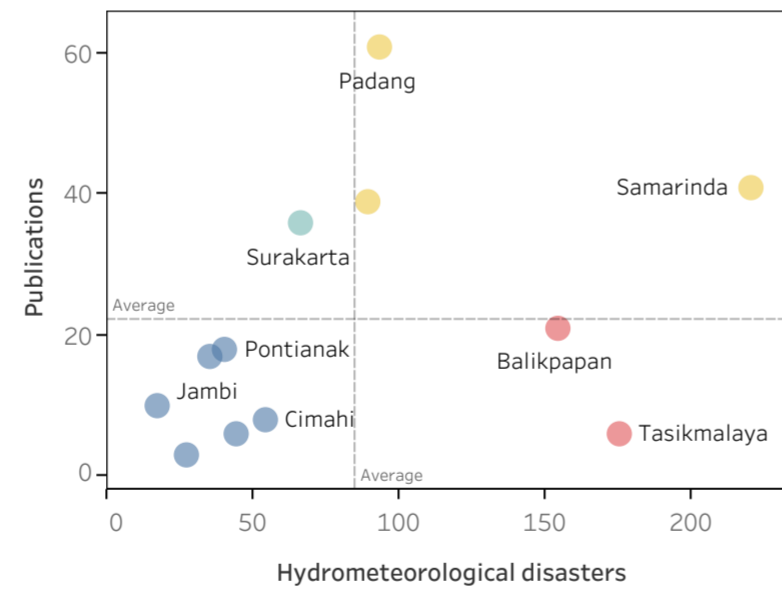
The list above is each of the top five publications on the topic of urban hydrometeorological disaster and climate impact, ranked by citation number recorded by Scopus in September 2023.

Bigger cities have more vulnerability and exposure, and tend to have higher disaster risks and recorded more disaster events. Hence, leads to more disaster-related research

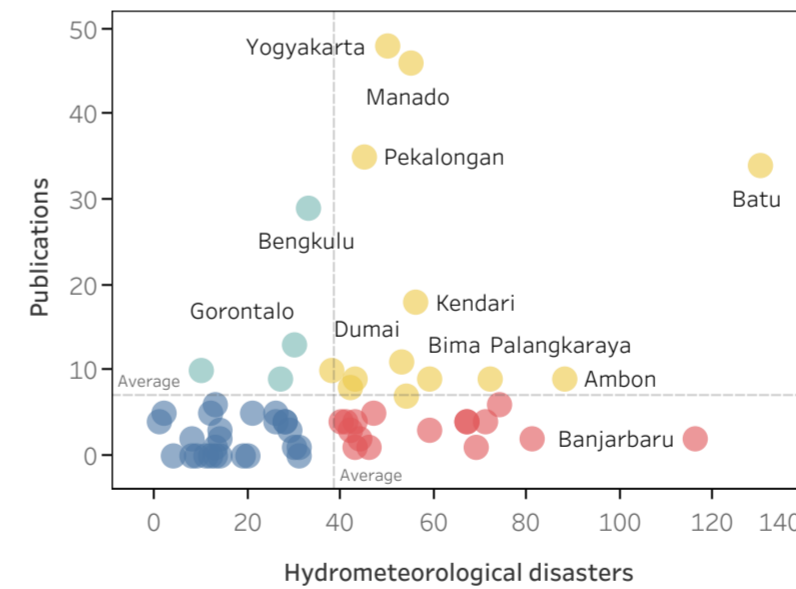
Cities within Metropolitan Area



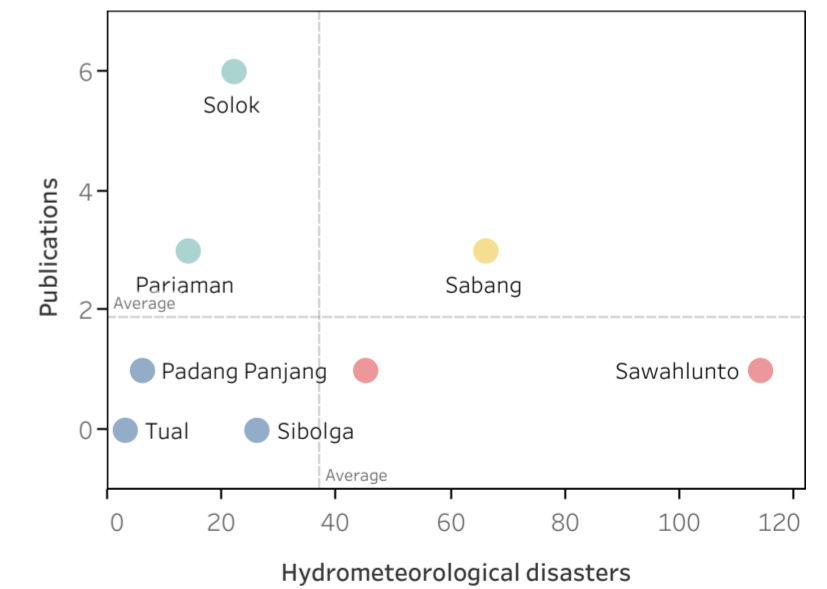
Big Cities



Medium Cities



Small Cities



Legend: ■ Less studies, fewer disasters; ■ Less studies, more disasters; ■ More studies, fewer disasters; ■ More studies, more disasters

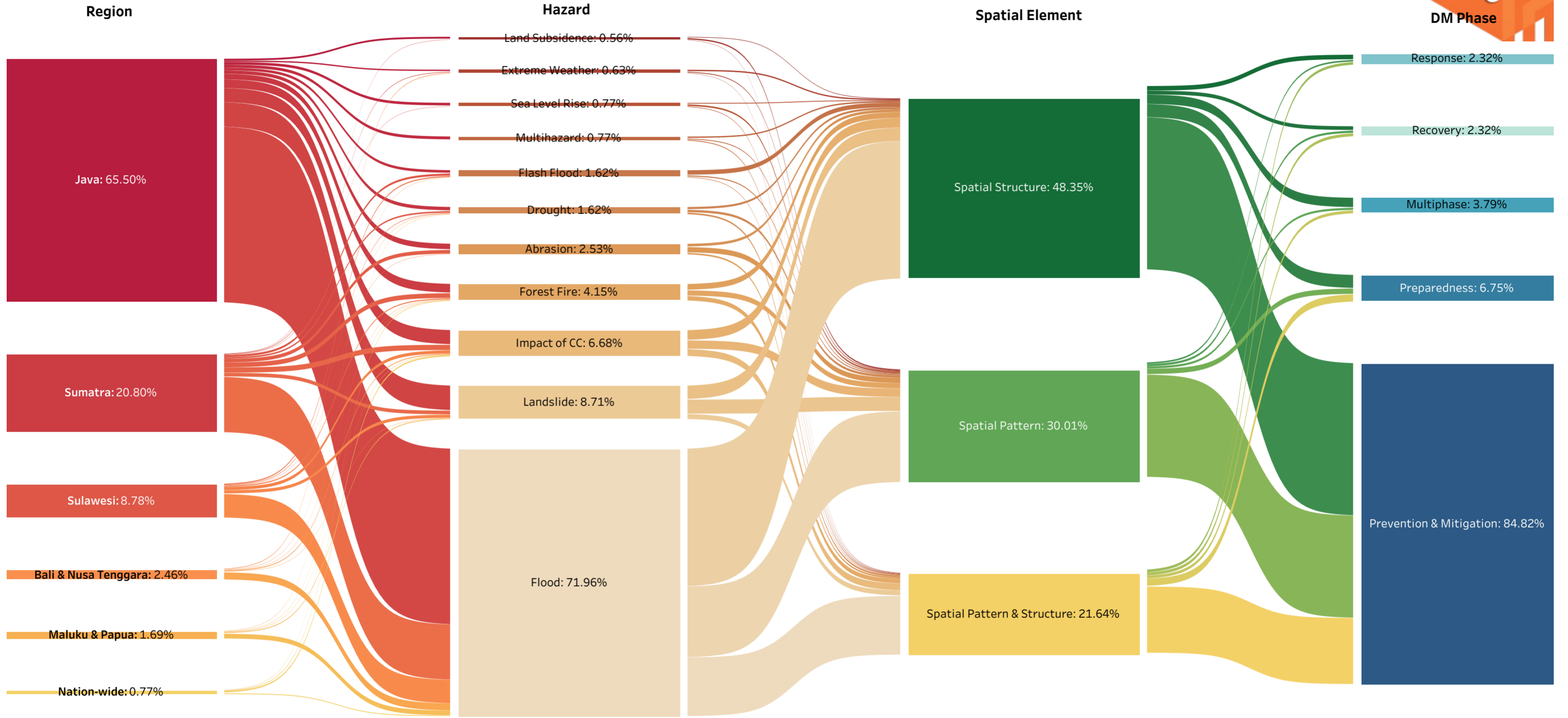
We divided cities into four groups based on the average number of publications and hydrometeorological disasters. The plot shows four categories, namely more studies & more disasters (yellow), more studies & fewer disasters (green), less studies & more disasters (red), and less studies & fewer disasters (blue).

The plot illustrates that the larger the city size, the greater the number of hydrometeorological disasters and therefore the more research related to them. For cities within the metropolitan area, only Semarang city has above-average publications in the yellow color category, there are 4 metropolitan cities categorized in red, namely Medan, Bogor, East Jakarta, and South Jakarta. This indicates that these four cities are highly exposed to disasters but their disaster knowledge base is below average. In the Big Cities section, there are 3 cities classified in yellow, namely Padang, Malang, and Samarinda. However, Tasikmalaya and Balikpapan are classified in red color, especially since the number of disaster events is quite large. In contrast to the previous findings that many Medium Cities are classified in red, such as Tarakan, Banjarbaru, Kupang, Sukabumi, etc. This needs to be a special concern because Medium Cities are common cities in Indonesia. Lastly, there are 2 Small Cities categorized as red, namely Sawahlunto, and Subulussalam.

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Sankey Diagram of Publications: Research Location to Hazard Type to Spatial Elements to the Disaster Management Phase



The Sankey diagram is proportionally visualizing the number of publications. The larger size of the box and the wider lines indicate a greater number of publications accounted for them. The diagram illustrates the distribution of research articles and their relations across studied locations, hazard type, spatial el..

The Sankey diagram is used to determine the co-analysis relationship among the research location, hazard type, spatial elements, and disaster management phase investigated in each research article. The majority of research is distributed in the Java region which accounts for 58.61% or 834 articles, followed by the Sumatra region with 20.80% or 296 articles, the Sulawesi Region with 8.78% or 125 articles, and the Kalimantan region with 6.89% or 98 articles. As in previous findings, the majority of urban areas are located in Java. Notably, Central Java, East Java, and West Java have a prominent number of studies compared to other provinces in the western part of Indonesia, so when natural disasters occur, more disasters will occur in cities with large populations. Regarding the type of hazard, flood hazards are the type of hazard that is most studied across regions with a total of 1,024 articles or 71.96% of the total publications. Objects contained in the spatial structure are the most studied across regions with a total publication of 688 articles or 48.35%. This shows that there are many studies that discuss disaster and urban planning at a more detailed scale, such as mapping hazard susceptibility to road networks, water sources, and so on. As for the regional scale or Spatial Pattern, there are 427 articles or 30.01% of the total publications. These publications discuss in the context of protected areas, cultivation, and development in urban areas related to disaster. For both spatial elements, there are 308 articles, or 21.64% of the total that discuss about it. However, there is a big gap if we look at the phases of disaster management. The Prevention & Mitigation phase is the most studied phase with a total of 1,207 articles or 84.82% of the total publications, while for other phases it is still very minimal. Therefore, there is a need for encouragement for broader research in other disaster management phases, particularly by considering the distribution of locations hazard type, and spatial elements.