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Urban Toponymy as Flood Memory: Analyzing Water-Related Place Names in Jakarta, Indonesia

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ABSTRACT

Jakarta, Indonesia's flood-prone capital, bears a hydrological legacy embedded in its place names (toponyms). This study examines how urban village toponyms reflect historical water-related landscapes and their implications for contemporary flood risk. This study examines the relationship between Jakarta's toponyms and its flooding patterns through qualitative descriptive analysis of 104 urban village names identified in flood-prone zones by Jakarta's Bureau of Regional Disaster Management (BPBD Jakarta). We identified 14 toponyms explicitly referencing rivers, 27 tied to water-associated vegetation, and 7 denoting wetlands, revealing a strong correlation between toponyms and ancestral ecological knowledge. Toponymic data collected from the Indonesia Statistics Agency (BPS) and the Dutch East-Indies Topographic Maps reveals diverse linguistic origins including Malay-Betawi, Javanese, Sundanese, Chinese, Portuguese, and Dutch. From 1940 to 2019, landscape transformation analysis demonstrates that today's flood-vulnerable neighborhoods are primarily built on former wetlands, lakes, and agricultural fields, often erasing original toponyms. Historically, toponyms like Danau Sunter or Rawabadak served as implicit flood hazard indicators, yet modern development has disregarded these warnings. We argue that toponym conservation, supported by historical maps and legal frameworks, can preserve indigenous knowledge for disaster mitigation. Water-related names underscore how toponyms

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ARTICLE INFO
Received:19 April 2025; Revised:9 June 2025; Accepted: 20 June 2025; Published Online: 16 July 2025
DOI: https://doi.org/10.30564/fls.v7i7.9604

CITATION
Mulyadi, A., Dede, M., Widiawaty, M.A., et al., 2025. Urban Toponymy as Flood Memory: Analyzing Water-Related Place Names in Jakarta, Indonesia. Forum for Linguistic Studies. 7(7): 719–729. DOI: https://doi.org/10.30564/fls.v7i7.9604

encode landscape vulnerabilities now obscured by urbanization. This study highlights the urgency of integrating toponymic wisdom into spatial planning to reinforce flood resilience in rapidly transforming cities, where cultural memory and environmental risk intersect.

Keywords: Disaster; Java Island; Names Conservation; Urban Area

1. Introduction

The study of place names or toponyms is currently being promoted by various educational and research institutions in Indonesia, because toponym has a hidden meaning behind the naming processes [1,2]. Toponyms can record many events, natural resources, landscape processes, and tell the human figures who greatly contributed to the community [3]. With these various purposes, the purpose of giving place names by humans is the connecting link between the past and the present as a form of local wisdom that must be maintained by the community. The toponym peculiarities in Indonesia based on aquatic phenomena, as shown in the place names beginning with *ci*, *rawa*, *situ*, *kali*, *kuala*, and *ranca* [4].

Recognizing the meaning contained in each toponym, people are capable of analyzing all the potential in a region, including its disaster aspect. As a means of identifying the history of the landscape, toponyms can be used as a reference in identifying potential geological, social, and hydrometeorological disasters [5]. This study is very important, especially for regions with rapid development and is the center of socio-economic activities on a national scale with very high disaster potential, where the process of landscapes changes is sometimes accompanied by a change in the original name of the region through the establishment of new administrations at the district and village levels [6]. This phenomenon can be found in the Capital Region (DKI) of Jakarta, especially in the mainland region, which has been known as a flood-prone area.

Jakarta floods have occurred since the 5th century AD, when the Tarumanegara Kingdom recorded them through the Tugu inscription. These events continued until the era of the Pajajaran Kingdom and the Dutch colonial era. Floods with heights of more than one meter had hit Jakarta in 1621, and floods also occurred in 1699 due to the overflow of the Ciliwung river after the eruption of Mount Salak. Floods were also recorded in 1714, 1854, 1918, 1942, 1996, 2002, and 2007, which became the worst peak of Jakarta floods in the last 3 centuries [7]. Floods in Jakarta tend to increase every year, resulting in extensive inundation. This condition is inseparable from the history of Jakarta's landscape, formed by the sedimentation of upland areas such as Bogor and Cianjur, which have soft soil texture and are downstream for many watersheds [8]. In addition, the presence of rivers such as Ciliwung and Cisadane makes this region vulnerable to overflowing water from rivers when rain intensifies [9]. Apart from its natural conditions, flooding in Jakarta is also caused by human activities. Since 1998, the mainland of Jakarta has indicated urban sprawl. Potential flooding has increased, which is exacerbated by land subsidence; thus, the flood hazard does not only originate from river overflows but also from tidal activity [10,11].

Jakarta's landscape conditions are recorded in toponyms. Currently, the emergency response effort – aid distribution option – is by an international NGO also based on toponyms [12]. The relationship between toponyms and disaster has previously been reviewed by several researchers. Dall'Ò provided advice on aspects of planning that helped to shape the formation of several toponyms in the Aosta Valley as a disaster-prone area [13]. Other studies also conducted by Ati et al. revealed that the toponymy of inviting water also signifies the potential for hydrometeorological disasters in Cirebon [4]. In contrast to previous studies, this study combines toponym and flood disaster assessments with databases from the past to reveal the naming of areas without Jakarta's development reforms. Therefore, this study has a single research question: Are the toponyms related to flood disasters in DKI Jakarta, specifically in the mainland region?

2. Literature Review

2.1. Toponyms

Toponyms are a term that is known not only in linguistics for analyzing names or naming, but also in other

fields [14]. Toponyms are closely related to semantics that explore the meaning of language, including the meaning units such as words, phrases, clauses, and speeches [15]. Toponymy is part of the onomastics branch that studies place names [16]. Onomastics is the study of the origin, form, and meaning of proper names, especially names of people and places [17,18]. Despite toponymy, there is another branch of onomastics, which is anthroponymy, the study of personal names [19]. Toponymy involves examining their etymology, structure, and socio-cultural context, with etymological and structural analysis focusing on their origins, meanings, and word-formation through historical and linguistic methods [20,21], while regional and pattern analysis investigates their distribution within specific areas to reveal settlement history and cultural influences [22].

Toponyms carry information about the history, culture, and characteristics of a region, and they are considered both linguistic elements and cultural heritage, reflecting the collective memory and identity of communities [23,24]. Although synonyms are often associated with geography, toponyms mainly discuss scientific names and the origin, as well as the meaning of places (areas) on the earth's surface, both natural and man-made [25,26]. Toponyms function as unique markers of a place, making it easier for experts to research, write documents, and map the area [27]. Toponyms encode universal and local meanings, serving as cultural markers and historical records [28–30]. Land use or policy changes can erase traditional toponyms, reflecting power dynamics. Toponyms represent linguistic treasures integral to national heritage and collective consciousness. Toponyms are vital cultural artifacts encapsulating community history and worldview, revealing settlement patterns and human-environment relationships.

2.2. Flood Disaster

Flooding is a condition of a river where the flow of water exceeds the capacity of the existing riverbed, resulting in a discharge greater than it can bear [31]. Floods can cause property damage and even loss of life. This situation occurs when the water overflows the bank because the canal bed is not capable of receiving a large water flow [32]. Upstream, floods tend to have rapid flows and significant erosion, but are short-lived [33]. During this time downstream, the flow is slower due to the gentler flow, but the flooding time is longer [34]. In general, floods can be caused by two causes, which are natural causes and human actions [35]. In addition, the problem of flooding in urban areas stems from very rapid population growth, but it is not offset by the provision of adequate urban infrastructure and amenities [36,37]. As a result, urban land use becomes irregular and messy, which further complicates the problem of urban drainage [38]. Low public awareness and a lack of awareness of the importance of fixing the city's problems may also be a factor behind this flooding problem [39,40].

3. Materials and Methods

The research location is in the mainland of DKI Jakarta, which is Indonesia's capital city. The mainland of Jakarta is a relatively flat region with an average height of 7 meters above sea level and bordered by the Java Sea, Banten Province, and Java Province. Some watersheds found in DKI Jakarta include Ciliwung, Cisadane, Kali Sunter, Kali Grogol, Kali Krukut, and Cipinang. Ciliwung is the largest watershed with a total area of 347 km^2 and the length of the main river is 117 km [41]. Jakarta has 2000 mm of rainfall per year with the highest rainfall occurring in January [42]. This study takes toponyms on the urban village level in the mainland of Jakarta. Toponymy data includes 104 toponyms of urban villages (*kelurahan*) in the flood-prone area according to the Jakarta's Bureau of Regional Disaster Management (BPBD Jakarta) (**Figure 1**). The toponym data is compiled based on the Indonesia Statistics Agency (BPS) and the Dutch East-Indies Topographic Maps or AMS (**Figure 2**).

This research is a qualitative study with a descriptive approach to finding out the meaning of toponyms and floods. Qualitative methods are able to explore various meanings in toponymy (semantics) and can be combined with ethno-linguistic analysis methods [43–45]. To find out the meaning of the toponym, data validation uses literature studies by utilizing previous studies and spatial data, especially from the maps and satellite imagery. This process used an overlay analysis between the dataset [46]. Therefore, this study revealed the relationship between the meaning of places named and flood occurrences. Floods are events that have a return period from several years to decades [47,48]. The research process to analyze toponyms and flood events in Jakarta is shown in **Figure 3**.

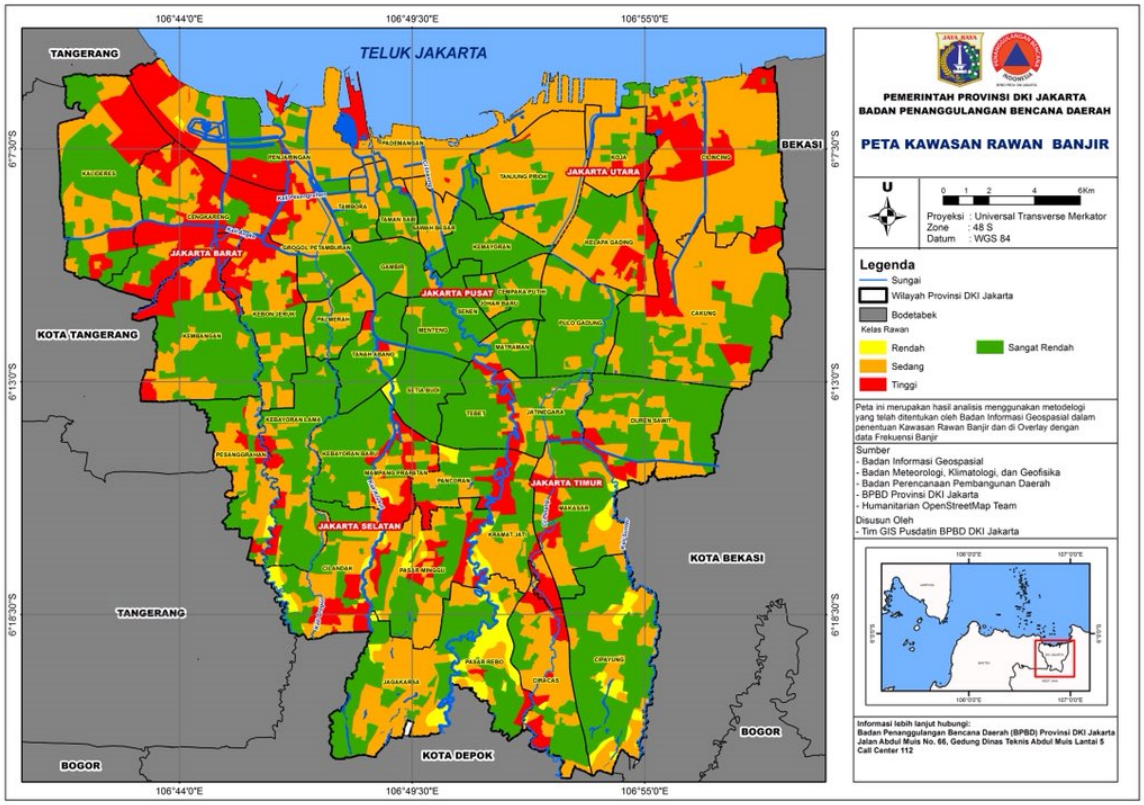

Figure 1. Flood-Prone Area in the Jakarta.

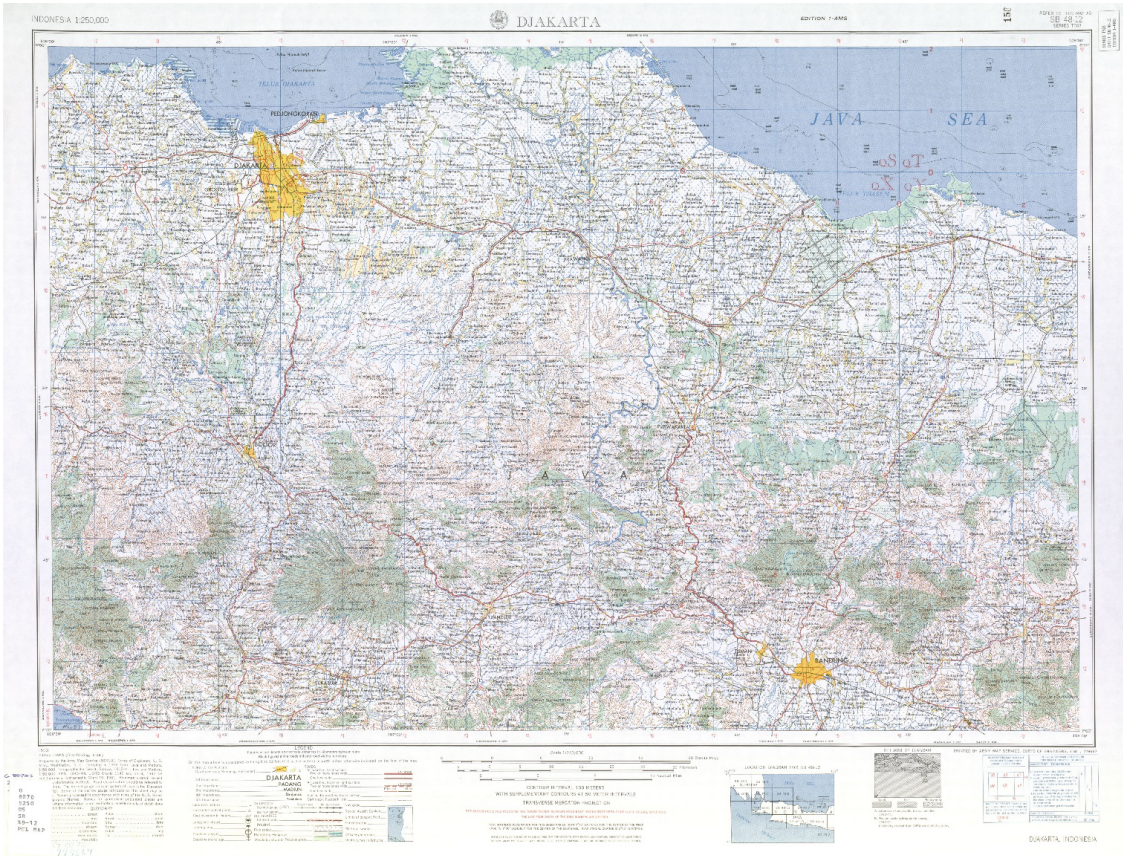

Figure 2. Dataset Sources from the Historical Maps.

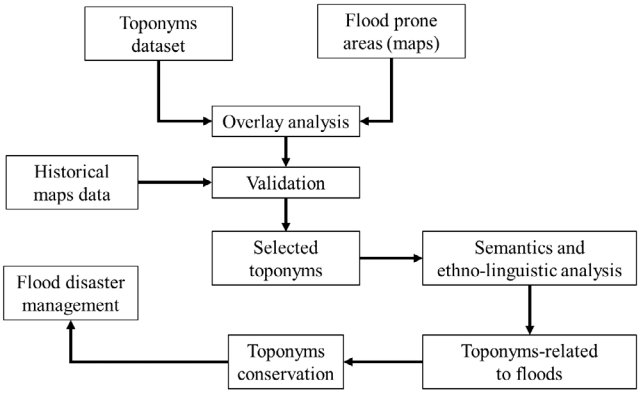

Figure 3. Research Framework.

4. Results

Jakarta's toponym has actually undergone several changes during the time of the local kingdom known as Sunda Kalapa, which acts as a port because it is naturally an estuary that leads directly to the waters of the bay. This name changed after the successful expulsion of the Portuguese by the Sultanate of Demak, Sunda Kalapa changed to Jayakarta (sometimes pronounced Jakarta), which meant a 'great victory' [49]. Its strategic location caused the Dutch to be interested in making Jayakarta the center of government and trade, then changed its name to Batavia, which commemorates their ancestor in Europe, 'Bataaf', even after independence returned to Jakarta [50].

Out of 104 urban villages in mainland Jakarta, 14 toponyms explicitly reference river names using the prefixes *ci* and *kali*, while one refers to a lake (*danau*). Meanwhile, the toponym of urban village that refers to vegetation shows the naming that refers to lowland plants that are close to water sources, such as the palm family (*kelapa*, *pinang*, and *gebang*), mangrove (*bangka*), *meliaceae* trees (*dukuh* and *kedoya*), vegetation typical of tropical forests (*rotan* and *warakas*), the toponym based on vegetation amounted to 27 urban villages. The existence of water recorded in toponimi, which means swamp begins with the word swamp and thorn with a total of seven villages – prefix *rawa*, *duri,* and *roa*. Not only that, water is also depicted in toponymy based on landforms such as estuaries, headlands, basins, and beaches as well as the daily activities of coastal communities such as boats and preserving fish (semper), in addition to naming based on rice fields and cultivations (**Table 1**).

Table 1. Toponyms Classification in Jakarta.

Aspect	Toponym	Aspect	Toponym
Vegetation	*Koja, Jati Padang, Pondok Pinang, Kebayoran Lama Utara, Pondok Labu, Bintaro, Kebon Manggis, Bidara Cina, Dukuh, Kramat Jati, Pinang Ranti, Kebon Pala, Kelapa Dua Wetan, Rambutan, Mangga Dua Selatan, Jati Pulo, Wijaya Kesuma, Kapuk, Kedoya Selatan, Kedoya Utara, Warakas, Kelapa Gading Timur, Pulo Gebang, Pondok Bambu, Kebon Baru, Rorotan, and Bangka.*	Social events	*Cawang, Tugu Selatan, Pegangsaan Dua, Pejagalan, Pasar Minggu, Petogogan, Manggarai, Kampung Melayu, Makasar, Pekayon, Baru, Bale Kambang, Gunung Sahari Utara, Glodok, Tambora, Pekojan, Joglo, Angke, Kembangan Selatan, Kembangan Utara, Semanan, Grogol, Petamburan, Karet Tengsin, Mampang Prapatan, Petukangan Selatan, Ulujami, Pademangan Barat, Marunda, Pejagalan, Pejaten Timur, Kuningan Barat, Pengadegan, and Suka Pura.*
Swamp	*Rawabadak Utara, Rawajati, Roa Malaka, Rawa Terate, Duri Kosambi, Rawa Buaya, and Duri Kepa,*	Lake	*Danau Sunter*
Rice field (cultivation)	*Tegal Alur, Tegal Parang, and Kebon Bawang.*	Landform	*Lagoa, Tanjung Priuk, Ancol, Kapuk Muara, Kamal Muara, Bukit Duri, and Lebak Bulus.*
Water and fisheries livelihood	*Pluit, Penjaringan, Semper Timur, and Semper Barat.*	River	*Cilincing, Cilandak Timur, Cilandak Barat, Kalibata, Cipinang Besar Selatan, Cipinang Muara, Cipinang Melayu, Cibubur, Kalisari, Kedaung Kali Angke, Cengkareng Timur, Cengkareng Barat, Cililitan, and Cipulir.*

The dominance of toponymy at the urban village level, which shows the meaning of water both explicitly and implicitly, indicates that the flood hazard has actually been perpetuated by the predecessors through the naming of areas in the mainland of Jakarta. Toponyms in flood-prone urban villages in the mainland of Jakarta are at least composed of Malay Betawi, Javanese, Sundanese, Chinese, Dutch, Portuguese, and Sumbawa (**Table 2**). A mixture of languages was also found in toponymy, such as Javanese + Sundanese, Sundanese + Malay, and Javanese + Malay. Uniquely in many toponyms of the urban village level implies dispersed water is implied in each language except Chinese and Sumbawa. From the origin of the urban village toponym, it can also be seen that the mainland of Jakarta used to be a region dominated by Malay Betawi.

Table 2. Jakarta's Toponyms According to the Origin Languages.

Languages	Toponyms
Malay Betawi	*Penjaringan, Kebon Bawang, Koja, Tanjung Priuk, Tugu Selatan, Pegangsaan Dua, Rawabadak Utara, Danau Sunter, Kelapa Gading Timur, Rorotan, Marunda, Kapuk Muara, Pejagalan, Kamal Muara, Pasar Minggu, Jati Padang, Petukangan Selatan, Pondok Pinang, Kebayoran Lama Utara, Bangka, Mampang Prapatan, Kuningan Barat, Kebon Baru, Bukit Duri, Manggarai, Pondok Labu, Rawajati, Bintaro, Kebon Manggis, Pondok Bambu, Bidara Cina, Kampung Melayu, Dukuh, Kramat Jati, Pinang Ranti, Makasar, Kebon Pala, Cibubur, Rambutan, Baru, Rawa Terate, Bale Kambang, Mangga Dua Selatan, Petamburan, Semanan, Kedaung Kali Angke, Roa Malaka, Wijaya Kesuma, Duri Kepa, Kedoya Utara, Angke, Kembangan Utara, Kedoya Selatan, Kembangan Selatan, Duri Kosambi, Rawa Buaya, Kapuk*
Javanese	*Warakas, Ulujami, Tegal Parang, Pengadegan, Pulo Gebang, Kalisari, Joglo,*
Sundanes	*Ancol, Glodok, Grogol*
Chinese	*Cawang, Karet Tengsin*
Dutch	*Semper Timur, Semper Barat, Pluit, Pademangan Barat*
Portuguese	*Lagoa*
Sumbawa	*Tambora*
Javanese + Sundanese	*Lebak Bulus*
Sundanes + Malay	*Cilincing, Cilandak Timur, Cipulir, Cilandak Barat, Cipinang Besar Selatan, Cipinang Muara, Cipinang Melayu, Gunung Sahari Utara, Cengkareng Barat, Cengkareng Timur*
Javanese + Malay	*Suka Pura, Pejaten Timur, Petogogan, Kalibata, Kelapa Dua Wetan, Pekayon, Cililitan, Pekojan, Jati Pulo, Tegal Alur*

The dynamics of the regional development seemed to cause the toponyms in the mainland of Jakarta as if it had no connection with the phenomenon of flooding. Landscape changes analysis in the mainland of Jakarta in 1940–2019 showed an increase in the amount of built-up area that was previously in the form of swamps, lakes, agroforestry, and cultivation. The emergence of the built-up area seemed to ignore the potential aspects of the flood disaster contained in the toponym. This condition is exacerbated when the construction of several new settlements and industrial areas eliminates the original toponyms, which should have been maintained, and their historical aspects are known to the population. Toponym conservation does not mean prohibiting society from giving different names or making replacements for them, but rather retaining the original names, inserted with new components. Meanwhile, people also often forget the meaning of a name as a place or geographical phenomenon; for some ethnicities, this is quite confusing. Toponym conservation requires a legal basis to prevent developers and society from giving place names that are different from their origin. The toponym is a reminder to the community, as well as waiting for experts to study it carefully, because it contains meanings that can be linked to disasters, especially floods.

5. Discussion

Since the colonial era, Jakarta has been built based on urban planning patterns in the Netherlands where the area is prone to flooding due to former swamps and rice fields. A flood control system is designed to build dams and ditches that serve as pathways for the surface run-off and drainage [51]. Thus, water and other associated objects have become familiar words in toponyms at the village level in various languages used by people of Jakarta.

Toponym means that water can indicate the connectivity landscape and socio-cultural phenomena related to potential disaster in a place [52,53]. However, the topology in the mainland of Jakarta is often composed of more than one language due to intercultural meetings.

The change in the Jakarta landscape which, along with the continuous acculturation of the Malay Betawi community with other ethnic groups, has led to an agrarian-coastal pattern that fades and causes livelihood diversification, especially as urbanization continues to push it forward [54,55]. Though the landscape changes rapidly, it is characterized by shifts in land use for settlements, infrastructure, and industries, which have the potential to lower the environment's carrying capacity [56–58]. Urban sprawl and the reduction of vegetated areas that occur in all directions ultimately increase the flood risk [59,60]. At present, it is difficult to find urban villages that retain their toponym character in the form of biophysical evidence or livelihood; thus the names are only past phenomena that have nothing to do with current events [61,62].

In Sundanese, Indonesian people did not realize that Ciamis (place) and *Ci Amis* (river) have different meanings. Toponym conservation can refer to historical maps or other artifacts [63]. In Indonesia, this is reflected in the writing of toponyms on maps published by the Dutch East Indies, which are now archived at Leiden University [64]. In another case, ancient manuscripts could be a basis to reveal their meanings [65,66]. Toponym conservation is an effort to reveal the local wisdom, a community always records past events to become a place name, hence current and future generations will continue to remember that phenomenon [67]. Many places in Indonesia have toponyms seemingly unrelated to current phenomena. This disconnect occurs due to dynamic geological processes and ancestral historical legacies that are difficult to trace because of historical sources, technology limitations, and sometimes deliberate efforts to obscure past memories. As we know, many landforms have been buried by sedimentation, volcanic ash, or damaged by erosion from water, wind, or the sea. Additionally, we must understand that numerous Indonesian historical sources are currently stored abroad, particularly in the Netherlands and other countries. Even newly discovered historical sources face challenges from smuggling and are targeted by both local and international collectors due to minimal oversight, public awareness and participation, and unclear punishment-reward systems.

Tracing toponyms becomes increasingly difficult when related to darker historical phenomena, leading communities to propose name changes to create better impressions. The trend of adopting modern names from foreign languages makes understanding toponyms even more challenging for younger generations. Toponyms connected to plants and animals often confuse today's generation because these species have become rare or extinct. Toponyms should be valued as cultural heritage and part of national identity [68]. Toponym conservation must be given a legal basis and supervision from the national to the local levels [69,70]. Toponyms can be a preliminary assessment in disaster mitigation, especially determining hazards and vulnerable areas either descriptive or associative [71–73].

6. Conclusions

Jakarta is a lowland area at the upstream of several watersheds. Interaction of the population with water recorded in toponymy at the urban village level. The 104 toponyms in flood-prone locations show a link between name and water as an element of hydrometeorological disasters, both explicitly and implicitly composed of Betawi Malay, Javanese, Sundanese, Portuguese, and Dutch as many as 61 urban villages. In locations that have close meaning to water, the landscape has changed, thus biophysical and livelihood characteristics are no longer visible. Especially when it began to appear with the regional development trends, toponym naming was ignored. Therefore, toponym conservation is an important effort to mitigate flood potential disasters by giving names to the urban anthropogenic landscapes such as settlements, industrial areas, and commercial areas. Toponym conservation should be a shared awareness among all parties, not merely an obligation for archaeological and historical institutions. Other stakeholders, such as government agencies in development and planning, environmental management, and even tourism, must become agents that encourage communities to be more conscious of the toponyms around them. The loss of toponyms and their meanings represents a concrete example of the erosion of national culture.

Author Contributions

Conceptualization, A.M. and M.D.; methodology, A.M., M.D., M.A.W. and B.I.A.; validation, S.N., H.S., B.I.A. and A.I.; formal analysis, B.I.A.; investigation, B.I.A.; writing—original draft preparation, A.M., M.D. and M.A.W.; writing—review and editing, S.N., H.S. and A.I.; visualization, M.D.; supervision, M.A.W.; funding acquisition, A.M. All authors have read and agreed to the published version of the manuscript.

Funding

This work was supported by Faculty of Social Sciences Education (FPIPS), Universitas Pendidikan Indonesia, through 'Bantuan Publikasi Internasional Bereputasi' grant number [2020–2021].

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Datasets are available from the corresponding author upon reasonable request.

Acknowledgments

This research was supported by the Faculty of Social Sciences Education (FPIPS), Universitas Pendidikan Indonesia, through 'Bantuan Publikasi Internasional Bereputasi'. The authors are grateful to thank the journal's editorial team and reviewers who have provided valuable input for manuscript improvement.

Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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