

Assistance for Inventory of Public Asset Vulnerabilities Based on Build Back Better in Simpang Kuta Buluh Village

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ABSTRACT

This community service programme aimed to strengthen village apparatus capacity in inventorying and assessing flood-related vulnerability of public assets through a risk-based asset management approach grounded in the build back better, safer, and sustainable principle. The activity applied a community-based participatory method comprising socialisation, field inventory of public assets, GPS coordinate survey, spatial data processing, and risk classification based on three parameters, namely exposure, vulnerability, and impact, each scored on a scale of one to three so that every asset could be classified into low, moderate, or high-risk categories. Results show that the village apparatus gained a shared understanding of risk-based asset management, obtained a structured instrument for identifying and classifying critical assets, and formulated a preliminary priority list to be integrated into the Village Medium-Term Development Plan and Village Government Work Plan.

INTRODUCTION

The flash floods and landslides that hit North Sumatra, West Sumatra, and Aceh at the end of November 2025 are one of the worst hydrometeorological events ever recorded on the island of Sumatra in the last two decades. The extreme rains that lasted for days caused rivers to overflow, dikes to collapse, and thousands of houses and public facilities were damaged, while hundreds of thousands of residents were forced to evacuate (National Disaster Management Agency, 2025). This incident confirms that hydrometeorological disasters are no longer incidental events, but rather a recurring pattern that is increasingly intense due to a combination of extreme weather, climate change, and degradation of watershed ecosystems.

Langkat Regency, which is hydrologically located in the downstream area of the Batang Serangan River watershed, is an area with high vulnerability to river overflows and prolonged inundation. Simpang Kuta Buluh Village, as one of the downstream villages of the watershed, experienced the impact of real flooding in late November to early December 2025: educational facilities were submerged, the main access road was flooded to exceed the height of adults for several days, and the embankments around the river channel broke at some points so that the volume of water entering the settlements was even greater. This condition paralyzed basic services just when the community needed them most.

The root of the problem lies in the pattern of determining the location of public assets which has been more in line with the availability of land and ease of access, rather than based on a clear flood risk map. As a result, a number of strategic village assets stand at low elevations and are close to the river channel, so they are repeatedly affected every time floods come. This pattern causes recurring losses, wastes limited village development budgets, and prolongs the recovery period of basic services for residents (Kennedy et al., 2008).

Watershed risk-based public asset management is crucial in the preparedness phase because it allows villages to know which assets are the most vulnerable and most critical before a disaster strikes, rather than simply reacting after the damage has occurred. Without risk-based asset mapping, villages tend to deal with damage reactively, while a data-driven approach allows for more targeted contingency planning, including the establishment of evacuation points and the securing of vital assets that support public services. This approach is in line with the principle of build back better, safer, and sustainable, which is the rebuilding and structuring of public assets carried out in a safer, better, and sustainable manner so that the pattern of recurrent flood damage can be broken (Kennedy, Ashmore, Babister, & Kelman, 2008; Ophiyandri, Amaratunga, Pathirage, & Keraminiyage, 2013).

Strengthening risk-based public asset management is also in line with strengthening the Building Village Index (IDM), especially in the dimensions of environmental/ecological resilience and social resilience, because IDM requires good and sustainable management of natural resources as well as protection of basic services for residents (Ministry of Villages, Development of Disadvantaged Regions, and Transmigration, 2015). Without assistance intervention from universities, villages have the potential to continue to replicate asset development patterns that are not sensitive to disaster risks. Therefore, this service activity aims to assist the Simpang Kuta Buluh Village apparatus in inventorying and assessing the vulnerability of public assets to watershed flood risks, as well as fostering village commitment to apply the principles of build back better, safer, and sustainable in planning for future asset development.

IMPLEMENTATION AND METHODS

This service activity uses a community-based participatory approach which involves direct and continuous interaction between the implementation team and the apparatus of Simpang Kuta Buluh Village, Lalat Regency, public asset managers, community leaders, and managers of education, health, and houses of worship facilities affected by the flood at the end of November 2025. The Participatory Rural Appraisal (PRA) approach was chosen because it places the local knowledge of the apparatus and villagers as the main data source in identifying the condition and history of asset vulnerability (Chambers, 1994).

The initial socialization activity was carried out on July 20, 2026 in Simpang Kuta Buluh Village by conveying the concept of watershed risk-based public asset management and the basic framework of disaster risk as well as the importance of mapping critical village assets. This socialization is a stage of equalizing perceptions before village officials are accompanied to conduct an independent asset inventory.

The technical stages of inventory assistance are carried out as follows. First, identification and recording of village public assets (schools, village offices, village halls, roads, bridges, health facilities, houses of worship, and embankments) including the names of assets, functions, physical conditions, years of development, level of community utilization, and history of floods that have been experienced. Second, field coordinate surveys use GPS on smartphones to record the location points of each asset and documentation of their physical conditions. Third, spatial data processing uses GIS software (QGIS) to compile village map layers, public asset layers, and flood-prone zone layers. Fourth, the analysis and classification of the risk of each asset is based on three parameters, namely exposure, vulnerability, and impact, each of which is assessed on a scale of 1 to 3, so that the total score of each asset ranges from 3 to 9 and is grouped into low, medium, or high risk categories.

Data collection is carried out through field observation of the physical condition of assets, semi-structured interviews with apparatus and asset managers, as well as secondary data in the form of maps of village areas and history of flood events. Validation of the results of the inventory and risk classification is carried out through targeted group discussions (FGD) with village officials to ensure that the mapping results reflect the real conditions on the ground, before being integrated into village planning documents in the form of Village Medium-Term Development Plans (RPJMDes) and Village Government Work Plans (RKPDDes)

RESULTS AND DISCUSSION

Improving the Understanding of Village Apparatus

The socialization on July 20, 2026 succeeded in equalizing the perception of the Simpang Kuta Buluh Village apparatus regarding the root of the problem of public asset vulnerability, namely that the determination of building locations has been more based on the availability of land and ease of access, not a flood risk map.



Figure 1. Presentation of Material to Village Apparatus by the Implementation Team

Source: Personal Documentation, 2026

Village officials understand that public asset management is the systematic process of planning, building, maintaining, and evaluating publicly-owned assets to remain in optimal functioning throughout their life cycle, including during disasters, and that a watershed risk-based approach integrates flood risk analysis into every stage of asset management, from location determination to securing vital assets in the event of a disaster.

Asset Risk Inventory and Assessment Instruments

The assistance produces a risk assessment instrument that integrates three parameters, namely exposure, vulnerability, and impact, as presented in Table 1. The three parameters are assessed on a scale of 1 to 3 by the village apparatus and the accompanying team for each asset that has been inventoried, so that a more objective risk profile is obtained than the intuitive assessment alone.

Table 1. Parameters and Scales of Public Asset Risk Assessment

Parameters	Operational Definition	Rating Scale (1-3)
(Exposure)	The extent to which the location of the assets is within the range of the flood-prone zone and inundation of the Batang Serangan River.	Far (1) → Near (3)
(Vulnerability)	The physical and functional condition of the asset in the face of water pressure, flooding, and inundation.	Strong (1) → Fragile (3)
(Impact)	The extent of the impact on the continuity of public services if an asset fails to operate.	Low (1) → Critical (3)

Source: PMKI Assistance Materials for Simpang Kuta Buluh Village, 2026

The integration of the three parameters resulted in a total score of 3 to 9 which was grouped into three risk categories, as presented in Table 2. Assets with a score of 7-9 are categorized as high risk because they have high exposure to river overflows, vulnerable physical conditions, and a major impact on basic services if they fail to operate, making them a top priority to be integrated into the RPJMDes. Assets with a score of 5-6 require physical reinforcement and preventive protection plans, while assets with a score of 3-4 are sufficiently monitored periodically because they are located relatively far from the river channel with good physical condition.

Table 2. Asset Risk Level Classification and Follow-up Recommendations

Score	Category Risk	Characteristics	Follow-up Recommendations
3-4	Low	The assets are located far from the river channel, the physical condition is good, the impact of disturbances is limited.	Periodic monitoring.
5-6	Medium	Assets are in a fairly vulnerable zone and require physical reinforcement.	Regular maintenance and preventive protection plans.
7-9	Hight	High exposure, vulnerable conditions, and major impacts on basic services.	The main priority in the RPJMDes/RKPDe s.

Source: PMKI Assistance Materials for Simpang Kuta Buluh Village, 2026

In addition to score-based classification, the assistance also introduces four qualitative criteria to determine village critical assets, namely: (1) vital functions, including assets that support emergency services such as health facilities, village offices, and evacuation points; (2) high utilization rates by daily communities; (3) being in high-risk zones with high exposure and vulnerability to flooding; and (4) difficult or expensive to replace if damaged. This criterion complements the quantitative score so that the prioritization of critical assets does not only rely on numbers, but also considers the strategic role of assets for the sustainability of basic village services.

Application of the Build Back Better, Safer, and Sustainable Principles

The results of the risk inventory and classification are directed to be the basis for the application of the principle of build back better, safer, and sustainable, namely the reconstruction and arrangement of village public assets carried out in a safer, better, and sustainable manner, in order to break the pattern of repeated asset damage due to flooding (Kennedy et al., 2008). In the context of Simpang Kuta Buluh Village, the application of this principle means that assets identified as high-risk are not only rehabilitated at the same location and design, but are considered to be relocated to a safer elevation, structurally strengthened to withstand inundation, or equipped with alternative evacuation routes. The experience of post-disaster recovery in various regions shows that an approach that is centered on the needs of residents and involves active community participation is a determining factor in the success of the implementation of build back better, including in community-based reconstruction projects in Indonesia (Ophiyandri, Amaratunga, Pathirage, & Keraminiyage, 2013).

The role of village officials in this framework is positioned as a pioneer in the continuous updating of public asset data, a driver of community participation in asset mapping and validation, as well as a link between mapping results and formal village planning documents. The active participation of residents is the key to success, because the most accurate maps and asset data are born from local knowledge that is only owned by residents and village officials themselves.

Benefits for Villages

This assistance in the inventory of public asset vulnerability provides a number of direct benefits for Simpang Kuta Buluh Village. First, increasing the understanding and capacity of village officials in managing flood-risk-based assets. Second, the availability of frameworks and instruments to compile priority lists of critical assets that need to be protected and strengthened. Third, the opening of opportunities to integrate the results of the inventory into village planning documents (RPJMDes and RKPDes) so that the allocation of the village development budget can be more targeted and measurable. Fourth, this activity also supports the strengthening of the Building Village Index (IDM) in the dimension of environmental and social resilience, because the protection of public assets such as schools, health facilities, and village offices ensures the sustainability of basic community services during disasters (Ministry of Villages, Development of Disadvantaged Regions, and Transmigration, 2015). These findings are in line with a number of participatory risk mapping-based service

activities in other villages, which also reported an increase in community understanding and positive responses to data-driven disaster mitigation efforts (Darmawan, Della, Avelia, & Haq, 2020; Darwis, Resnawaty, & Nuriyah, 2020).

CONCLUSIONS AND RECOMMENDATIONS

The assistance in the inventory of public asset vulnerability in Simpang Kuta Buluh Village, Langkat Regency succeeded in building a common understanding among village officials about the importance of watershed risk-based public asset management and produced a risk assessment instrument that integrates three parameters, namely exposure, vulnerability, and impact, so that each asset can be grouped into low, medium, or high risk categories in a measurable manner. This instrument is equipped with criteria for determining critical assets that consider vital functions, utilization levels, risk zones, and the level of difficulty of asset replacement. The results of this assistance are the basis for the application of the principle of build back better, safer, and sustainable, where high-risk public assets are directed to be relocated, strengthened, or rearranged, rather than rebuilt in similarly vulnerable locations and designs. Thus, villages obtain an operational policy foundation to shift from a reactive approach to proactive preparedness, while strengthening the environmental and social resilience dimension in the Building Village Index. The sustainability of the results of this activity is highly dependent on the village government's commitment to regularly update asset data and integrate the inventory results into the RPJMDes and RKPDes.

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