

PERANCANGAN APLIKASI DASBOR PRA-BENCANA TSUNAMI DI GUGUS MITIGASI LEBAK SELATAN

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Pelatihan Data-Driven Kesiapsiagaan Bencana dan Resiliensi Pasca Bencana:
Analisis dan Visualisasi Data

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1. Pendahuluan

Tsunami telah meninggalkan sejarah kelam di Indonesia, salah satunya tsunami Selat Sunda. Tsunami Selat Sunda memakan 200 korban jiwa, 1000 luka-luka, dan merusak fasilitas umum di Lampung dan Banten [1]. Untuk mengurangi dampak tersebut, diperlukan mitigasi bencana. Namun, faktor kritis yang menghambat mitigasi tsunami Selat Sunda adalah kurangnya sinergi antara peringatan dini tsunami milik Badan Meteorologi, Klimatologi, dan Geofisika (BMKG) dengan pelaporan erupsi Anak Krakatau dari Pusat Vulkanologi dan Mitigasi Bencana Geologi (PVMBG) [2]. Dalam rangka menguatkan mitigasi bencana di Indonesia, Gugus Mitigasi Lebak Selatan (GMLS), sebagai komunitas kesiapsiagaan bencana yang berpusat di Lebak, Banten, menginisiasi *pilot project* bersama Universitas Multimedia Nusantara (UMN) untuk mengembangkan sistem informasi yang dapat memperkuat sinergi antarpihak yang berkepentingan dalam pengurangan risiko bencana (PRB) [3]. Hal tersebut didukung oleh beberapa penelitian terdahulu, di mana dibuat dasbor untuk mempresentasikan ketahananbencana di Camerino, Italia, salah satu kawasan rawan bencana (KRB) gempa bumi dengan fokus untuk meningkatkan kolaborasi antar- *stakeholders* [4]. Demikian pula di China, dibuat dasbor untuk memetakan risiko bencana di pesisir pantai agar dapat membantu pengambilan keputusan *stakeholders* dalam perencanaan tata kota maupun mitigasi bencana [5]. Oleh karena itu, dibutuhkan rancangan sistem informasi berbentuk dasbor untuk membantu GMLS memaksimalkan mitigasi bencana di Panggarangan, Lebak.

2. Metodologi

GMLS merupakan komunitas masyarakat Lebak Selatan yang bergerak dalam mitigasi, kesiapsiagaan, tanggap darurat, dan pemulihan bencana. GMLS memiliki visi dan misi untuk mengembangkan *database* kebencanaan,

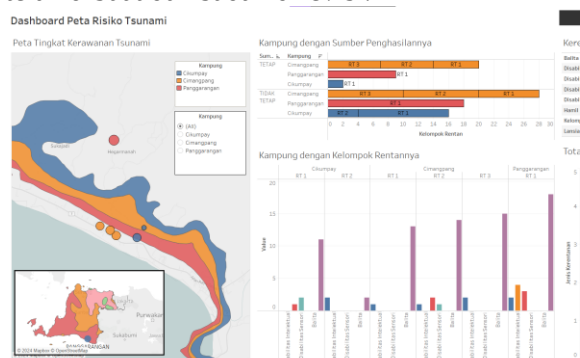
melakukan edukasi bencana, mewujudkan kesiapsiagaan, dan menciptakan komunitas yang responsif terhadap peristiwa bencana. Selain itu, GMLS diketuai oleh Anis Faisal Reza, yang berperan sebagai perantara antara GMLS dengan berbagai institusi, organisasi masyarakat, bisnis, akademisi, media, dan badan-badan kebencanaan seperti Badan Nasional Penanggulangan Bencana dan BMKG [6]. Alur kerja penelitian dilakukan sesuai dengan metode *Prototype*. Metode *Prototype* adalah pendekatan pengembangan perangkat lunak yang berfokus pada pembuatan representasi awal ("prototype") dari produk akhir. Prototype ini digunakan untuk menguji konsep, mengumpulkan umpan balik dari pengguna, dan menyempurnakan desain produk sebelum pengembangan penuh dimulai, untuk alurnya adalah dari menentukan tujuan, membuat prototype, menilai prototype, memperbaiki prototype, *repeat* [7]. Sementara itu, penelitian dibantu dengan *business intelligence tool* bernama Tableau. Dalam kasus ini, penelitian dimulai dengan identifikasi masalah di Lebak dengan survei lapangan dan wawancara yang dilakukan pada 1 Maret sampai dengan 7 Maret 2024, di mana masalahnya adalah ancaman tsunami dan dampaknya, sehingga dibutuhkan dasbor pra-bencana. Kemudian, dilakukan analisis kebutuhan sistem yang diperoleh dari wawancara bersama subjek penelitian, yaitu GMLS. Lalu, dilakukan perancangan dasbor dengan mengolah data yang sudah terkumpul dan terformat di Tableau. Setelah itu, dilakukan pengujian dan dikumpulkan *feedback* dari GMLS. Dari hasil *feedback*, dilakukan revisi sesuai kebutuhan. Setelah sesuai, maka dasbor dapat digunakan, dan ditarik simpulan penelitian.

3. Hasil dan Pembahasan

Berdasarkan hasil wawancara, diketahui *user* dan *system requirements* dalam dasbor pra-bencana, di antaranya dapat memvisualisasikan demografi desa, memvisualisasikan kejadian bencana terutama

gempa dan tsunami, memvisualisasikan titik kumpul dan kesiapsiagaan desa, serta memvisualisasikan risiko tsunami di KRB. Sementara itu, data-data yang diperoleh dari GMLS untuk dianalisis meliputi data *assessment* demografi penduduk desa Panggarangan, peta jalur evakuasi dan lokasi rambu evakuasi atau titik kumpul (TES/ tempat evakuasi sementara dan TEA/ tempat evakuasi akhir), serta kegiatan kesiapsiagaan seperti seminar atau acara edukasi bencana yang dilengkapi dari media sosial, yaitu

Instagram. Tak hanya itu, data visualisasi diperkaya dengan batas administrasi, baik berbentuk koordinat bujur/ lintang dari <https://github.com/coll-j/indonesia-locations-data> maupun berbentuk *multipolygon* dari <https://data.humdata.org/dataset/cod-ab-idn>, serta peta KRB tsunami dan gempa bumi dari <https://vsi.esdm.go.id/portalmgb/>. Kemudian untuk data kejadian gempa bumi dan tsunami, diperoleh dari <https://earthquake.usgs.gov/earthquakes/>. Gambar 1 merupakan rancangan dasbor yang telah dibuat dan sudah direvisi.



Gambar 1. Dasbor Pra-Bencana Risiko GMLS.

Dasbor pada Gambar 1 juga dapat diakses pada https://public.tableau.com/views/dashboard_pra_bencana/DashboardPra-BencanaGMLS. Sementara itu, Tabel 1 merupakan *feedback* GMLS.

Tabel 1. Penilaian Dasbor.

Skor SUS	Pernyataan (1-10)									
Sebelum	5	2	4	3	5	2	4	2	4	4
Sesudah	4	3	3	2	4	3	3	3	3	1
Total	72.5									

Berdasarkan *feedback* GMLS yang diukur dengan *System Usability Scale* (SUS), diperoleh nilai 72.5 yang berada dalam kategori *good*. Dalam kasus ini, rancangan sudah sesuai kebutuhan dan dapat diterima, namun belum melebihi ekspektasi. Faktor kritis dari penilaian terdapat pada pernyataan dengan respon paling setuju, yaitu: “Saya perlu membiasakan diri terlebih dahulu sebelum menggunakan sistem ini.” Dengan demikian, dasbor dan elemen yang didesain belum cukup intuitif. Namun, GMLS menyatakan sangat setuju untuk menggunakan dasbor lagi dan merasa fiturnya sudah fungsional.

4. Kesimpulan

GMLS, sebagai komunitas yang berpusat di Panggarangan, Lebak Selatan memiliki tujuan untuk memaksimalkan mitigasi bencana, lalu UMN, salah satu institusi pendidikan yang mendukung GMLS, bekerja sama untuk menginisiasi *pilot project* dalam rangka

mengembangkan sistem informasi pra-bencana. Dengan demikian, dikembangkan sistem informasi berbentuk dasbor, di mana dapat memvisualisasikan demografi desa, kejadian bencana, titik kumpul dan kesiapsiagaan desa, serta potensi risiko di KRB. Meskipun dasbor yang dirancang sudah sesuai kebutuhan dan dapat diterima, namun dasbornya belum cukup intuitif. Harapannya, dasbor dapat memperkuat sinergi antar-*stakeholders*, terutama pihak yang berkepentingan dalam PRB. Untuk pengembangan selanjutnya, dapat dikembangkan aplikasi/ dilakukan *deployment* agar dapat diakses oleh perangkat desa. Tak hanya itu, dapat berkolaborasi dengan pengembang *back-end* untuk memvisualisasikan sekaligus *update* data secara *real-time*, terutama terintegrasi dengan *database* berbasis *cloud* yang terjangkau untuk desa, seperti Google Firebase atau MongoDB. Berikut terlampir presentasi berkelompok yang dapat diakses di YouTube <https://youtu.be/LHafnzzPJwc>.

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CO-DESIGNING DASHBOARDS OF PRE-TSUNAMI APPLICATION IN SOUTH LEBAK MITIGATION GROUP

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Training on Data-Driven Disaster Preparedness and Post-Disaster Resilience:

Data Analysis and Visualization

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1. Introduction

Tsunami has cast a shadow over Indonesia's history, such as the Sunda Strait tsunami on 2018. The Sunda Strait tsunami claimed 200 lives, left 1000 injured, and damaged public facilities in South Lampung and Banten [1]. In order to reduce the damage, mitigation efforts are crucial. However, a critical factor hindering the mitigation in Sunda Strait tsunami is the lack of synergy between tsunami early warning system operated by Meteorological, Climatological, and Geophysical Agency (BMKG) and reporting of Anak Krakatau eruption by Volcanology and Geological Hazard Mitigation Center (PVMBG) [2]. So as to enhance disaster preparedness in Indonesia, South Lebak Mitigation Group (GMLS), a community dedicated to disaster mitigation in the Lebak region of Banten, has initiated a pilot project with Nusantara Multimedia University (UMN) with a goal to develop an information system able to connect relevant stakeholders and maximize disaster risk reduction [3]. This research is also supported by several previous research, where a dashboard was created to present disaster resilience as maps in Camerino, Italy, an earthquake-prone area with a focus to enhance collaboration among stakeholders [4]. Similarly, in China, a dashboard was developed to map disaster risks along the coast with aim to assist decision-makers in urban planning and disaster mitigation [5]. Thus, a dashboard-based information system is needed to help GMLS maximize disaster mitigation in Panggarangan, Lebak.

2. Methodology

GMLS is a community in South Lebak that is active in mitigation, readiness, emergency response, and disaster recovery. GMLS has several visions and missions, i.e. develop a disaster database, conduct disaster education, manifest preparedness for potential disasters, and become a community that is responsive to

disaster events. Furthermore, presides over GMLS is Anis Faizal Reza, serving as an intermediary between the community with various entities, such as government institutions, community organizations, businesses, academics, press, and disaster agencies like the National Agency for Disaster Countermeasure and BMKG [6]. The research workflow is conducted according to the Prototype method. The Prototype method is a software development approach that focuses on creating an early representation ("prototype") of the final product. The prototype is used to test concepts, gather feedback from users, and refine the product design before full development begins, for the flow is from defining goals, creating a prototype, assessing the prototype, improving the prototype, repeat the prototype, and refining the prototype[7]. Meanwhile, the research is assisted by a businessintelligence tool named Tableau. In this case, theresearch began with the identification of problems in Lebak through field surveys and interviews conducted from March 1 to March 7, 2024, where the issue is the threat of tsunamis and their impact, thus requiring a pre-disaster dashboard. Then, a system requirements analysis was conducted, obtained from interviews with the research subjects, namely GMLS. Next, the dashboard design was carried out by processing the data that had been collected and formatted in Tableau. After that, testing was conducted and feedback was collected from GMLS. Based on the feedback, revisions were made as needed. Once appropriate, the dashboard can be used, and then conclusions are drawn.

3. Results and Discussion

Based on the interview results, it is found that the user and system requirements in the pre-disaster dashboard include the following: visualizing village demographics, visualizing disaster events (especially earthquakes and tsunamis), visualizing assembly point and village preparedness, as well as the tsunami risk in disaster-prone areas. Meanwhile, the data obtained from GMLS for analysis include

demographic assessment of Panggarangan village population, the map of evacuation routes, as well as the location of evacuation signs or assembly points (TES/temporary evacuation sites and TEA/evacuation posts), and preparedness activities data such as seminars/ events about

disaster education from social media, specifically Instagram. Additionally, the visualization data is enriched with administrative boundaries data, both in the form of latitude/longitude coordinates obtained from <https://github.com/coll-j/indonesia-locations-data> and multipolygon data obtained from <https://data.humdata.org/dataset/cod-ab-idn>, as well as maps of tsunami and earthquake-prone areas from <https://vsi.esdm.go.id/portalmgb/>. Furthermore, earthquake and tsunami disaster data are obtained from <https://earthquake.usgs.gov/earthquakes/>. Figure 1 shows the dashboards' design that has been created.



GMLS Risk Pre-Disaster Dashboard.

The dashboards in Figure 1 can be accessed on https://public.tableau.com/views/dashboard_pra_bencana/DashboardPra-BencanaGMLS. Meanwhile, Table 1 shows the feedback result.

Table 1. Dashboards' Score.

SUS Score	Statements (1-10)									
Before	5	2	4	3	5	2	4	2	4	4
After	4	3	3	2	4	3	3	3	3	1
Total	72.5									

Based on feedback in Table 2 measured using the System Usability Scale, the design received a score of 72.5 with category of good. In this case, the design meets the requirements and can be accepted, but the dashboards cannot exceed the expectation of GMLS. A critical factor in the design evaluation lies in the statement with a highest agreement response: "I think there are lot of things to learn before I can start using this system." Thus, the dashboards and its elements are not yet intuitive enough. However, GMLS expresses agreement to like to use the dashboards frequently and find that the dashboards are functioning smoothly and are well-integrated.

4. Conclusion

GMLS, as a community centered in Panggarangan, South Lebak, is dedicated to maximize disaster mitigation in collaboration with UMN, an educational institution that

supports GMLS, have initiated a pilot project for developing pre-disaster information systems. Thus, dashboards information system was designed, capable of visualizing village demographics, disaster events, assembly points, village preparedness, and potential risks in disaster-prone zones. Although the feedback confirms that the designed dashboards meet the requirements and can be accepted, the dashboards are not yet intuitive enough. The hope is that the outcomes will foster greater synergy among stakeholders, especially those actively engaged in disaster risk reduction. For future development, an application can be created/ deployed to make the dashboard accessible to village personnel. Moreover, collaboration with back-end developers becomes pivotal to provide data visualization with real-time updates, especially when integrated with cloud-based databases that are affordable for villages, for example Google Firebase or MongoDB. Herewith attached a group presentation that is accessible on YouTube <https://youtu.be/LHafnzzPJwc>.

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