JURNAL GEOGRAFI
Geografi dan Pengajarannya
ISSN : 1412 - 6982
e-ISSN : 2443-3977
Volume XIX Nomor 2 Desember 2021

# SiMBa (DISASTER MITIGATION INFORMATION SYSTEM) APPLICATION DEVELOPMENT AS A DISASTER PRONE INFORMATION SERVICE MEDIA IN GUNUNGKIDUL REGENCY, INDONESIA

**Nur Samsu**
Regional Development Planning Agency of Gunungkidul Regency, Special Region of Yogyakarta, Indonesia

*Abstrak:* Pengembangan SiMBa bertujuan untuk membangun sistem pendukung mitigasi bencana berbasis *Geographic Information System* dengan platform *open source* dalam pengolahan, pembuatan, dan penyebarluasan peta kebencanaan (peta risiko, bahaya, dan kerentanan) serta pencatatan kejadian bencana di Kabupaten Gunungkidul. Metodologi yang digunakan dalam pengembangan ini adalah *Feature Driven Development* (FDD) agar pengembangan dapat dilakukan dengan rentang waktu singkat dan sederhana. Implementasi SiMBa sebagai solusi efektif dan efisien dalam mitigasi bencana serta menjadi salah satu alat bantu dalam perumusan dan penetapan kebijakan penanggulangan bencana. Kesimpulan dari pengembangan SiMBa adalah penggunaan platform *open source* QGIS dan Lizmap yang dikembangkan mampu sebagai salah satu platform dalam penerapan standar teknis pada pelayanan Informasi Rawan Bencana dalam Pemenuhan SPM Sub-Urusan Bencana Kabupaten Gunungkidul. SiMBa diharapkan mendukung penilaian Indeks Ketahanan Daerah (IKD) dan Indeks Risiko Bencana Indonesia (IRBI) yang secara khusus menyasar strategi pada prioritas 2, 3, 4, dan 6 dalam strategi peningkatan indeks kapasitas di Kabupaten Gunungkidul, Indonesia
*Kata kunci: Sistem Informasi Mitigasi Bencana, Media Pelayanan Informasi Rawan, Gunungkidul*

*Abstract:* The development of *SiMBa* aims to build a disaster mitigation support system based on a Geographic Information System with an open-source platform in processing, creating, and disseminating disaster maps (maps of risk, hazard, and vulnerability) as well as recording disaster events in Gunungkidul Regency. The methodology used in this development is Feature Driven Development (FDD) so that progress can be carried out in a simple and short period. The development of *SiMBa* concludes that the use of the open-source platforms that were developed can be used as a platform for the application of technical standards in disaster-prone information services in fulfilling Minimum Service Standards (SPM) in Sub-Disaster Affairs. *SiMBa* is expected to support the assessment of the Regional Resilience Index *(IKD)* and the Indonesian Disaster Risk Index *(IRBI)* which specifically target strategies on priorities 2, 3, 4, and 6 in the capacity index improvement strategy in Gunungkidul Regency, Indonesia.
*Keywords: Disaster Mitigation Information System, Vulnerable Information Service Media, Gunungkidul*

## A. INTRODUCTION

The One Map Policy *(KSP)* is one of the priority programs in the implementation of *Nawa Cita*. Indonesian President Joko Widodo has officially launched the One Map Policy Geoportal which aims to provide an accurate and accountable map. Development planning, infrastructure provision, issuance of permits, and land

Corespondency address :
E-mail : nursamsu.gk@gmail.com

rights, as well as various national policies, can refer to accurate spatial data with the One Map Policy. The One Map Policy Acceleration Program has been regulated since 2016 through the issuance of Economic Policy Package VIII and Presidential Regulation Number 9 in 2016 and updated with Presidential Regulation Number 23 in 2021 concerning Amendments to Presidential Regulation Number 9 in 2016 concerning acceleration of One Map Policy implementation at the accuracy level 1:50,000 scale map.

The Gunungkidul Regency Government responded to the one map policy by developing the Gunungkidul Geoportal as one of the nodes of the geospatial information network. Geospatial data and information are provided in the Gunungkidul Geoportal in the form of Geographic Information System (GIS) web services and can be traced to the existence of the data. This shows that the Government of Gunungkidul Regency supports the One Map Policy towards Indonesia Connected. In addition to the Gunungkidul Geoportal, several applications display geospatial information. Based on website visits on the smart city portal, here are some of these applications.

**Table 1. Distribution of geospatial applications in Gunungkidul Regency in 2021**

| Name of Application | Manager |
|---|---|
| SmartCity | Office of Communication and Information Technology (Smartcity Team) |
| PPDB Online | Education Office |
| SIPBM | Education Office |
| Sijaka | Regional Development Planning Agency |
| Siwasmanru | Land and Spatial Planning Office |
| Gunungkidul Geoportal | Land and Spatial Planning Office |

Source : Gunungkidul SmartCity Portal, 2021

Based on the number of geospatial applications or applications that present spatial features in Gunungkidul Regency in Table 1. above, developers see the need to develop geospatial applications with different characteristics. The developer sees that there is no geospatial application that is integrated with various platforms in presenting, processing, and obtaining spatial data and its implementation in disaster sub-affairs in Gunungkidul Regency. The format of the disaster map in Gunungkidul Regency is still in the form of soft files with SHP and pdf extensions, as in table 2 below are some datasets of the disaster maps in Gunungkidul Regency.

**Table 2. Disaster map in Gunungkidul Regency**

| Document | Manager | Extensions |
|---|---|---|
| **Regional Regulation of Gunungkidul Regency Number 6 in 2011 concerning Regional Spatial Planning of Gunungkidul Regency of 2010-2030** | • Map of Hazardous Areas, with the legend:<br>- Earthquakes prone,<br>- Water scarcity prone,<br>- Landslide prone,<br>- Flood prone, and<br>- Tsunami prone. | SHP and pdf |
| **Disaster Management Plan (RPB) Document 2019-2023** | • Tidal Wave and Tsunami Disaster Map<br>• Drought Disaster Map<br>• Earthquake Disaster Map<br>• Flood Disaster Map<br>• Fire Disaster Map<br>• Landslide Disaster Map<br>• Strong Wind Disaster Map | pdf |

Source : Regulatory and policy documents, 2021

Table 2. above shows that Gunungkidul Regency requires a medium for delivering disaster-prone information with an internet media format or platform, such as web-based and mobile so that the method of disseminating disaster-prone information is not limited to the slide presentation method in the presentation.

Based on the Government Agency Performance Report *(LKj IP)* of the Regional Disaster Management Agency of Gunungkidul Regency in 2020 (BPBD Kabupaten Gunungkidul, 2021), there are problems with internal factors: (1) inadequate quality and quantity of human resources and no disaster experts; (2) inadequate operational budget, so that the implementation of *BPBD*'s duties and functions is less than optimal; (3) not yet optimal integration in disaster management in the regions. Following the Regional Regulation of Gunungkidul Regency, Number 22 in 2011 concerning the Establishment, Organizational Structure, Position, and Duties of the Regional Disaster Management Agency, several tasks of *BPBD* related to disaster mitigation are: (1) establishing guidelines and directions under the policies of the regional government and the National Disaster Management Agency *(BNPB)*. Towards disaster management efforts which include disaster prevention, emergency management, rehabilitation, and reconstruction fairly and equitably; and (2) compiling, establishing, and informing disaster-prone maps (Bupati Gunungkidul, 2008).

Based on the condition that there are no geospatial applications or

applications that provide spatial features in disaster sub-affairs and internal factor problems at *BPBD*, developers propose solutions by innovating and being creative by developing the *SiMBa* (Disaster Mitigation Information System) application in terms of processing, manufacturing, and dissemination of disaster maps (maps of risk, hazard, and vulnerability) and recording of disaster events in Gunungkidul Regency. In addition, the developer also looks at the opportunities for utilizing spatial data in disaster mitigation in the capacity index improvement strategy in Gunungkidul Regency. Specifically, the development will focus on the use of GIS-based open-source platforms and source code in developing the application in disaster sub-projects. Utilization of open-source platform and source code that is not only minimal in development costs but is also not inferior in function to paid GIS platforms.

The purpose of developing the *SiMBa* application for the Regional Disaster Management Agency of Gunungkidul Regency is to (1) develop an information system in the processing, manufacture, and dissemination of disaster maps (maps of risk, hazard, and vulnerability) and recording of disaster events to support disaster mitigation in Gunungkidul Regency and (2) describe the conceptual relationship between the development of the *SiMBa* application and the capacity index in supporting the assessment of the Regional Resilience Index *(IKD)* and the Indonesian Disaster Risk Index *(IRBI)* in Gunungkidul Regency. The benefits expected from the development of the *SiMBa* application are (1) *SiMBa* as one of the implementations of technical standards in disaster prone information services in fulfilling Minimum Service Standards *(SPM)* in Sub-Disaster Affairs of Gunungkidul Regency, (2) *SiMBa* as a tool in carrying out the main tasks of *BPBD* in compiling, determining, and informing disaster-prone maps and collecting disaster data, (3) *SiMBa* as a tool in formulating and determining policies for disaster management and handling refugees by acting quickly and precisely, effectively and efficiently, and (4) *SiMBa* as a strategy to increase the capacity index to support the assessment of the Regional Resilience Index *(IKD)* and the Indonesian Disaster Risk Index *(IRBI)* in Gunungkidul Regency.

The development of disaster mitigation applications that had previously been developed at the *BPBD* Kuningan Regency is useful for the community to find out the latest disaster information and get early warning information so that people can know and be more alert in dealing with natural disasters (Lukmanudin et al., 2017). With a record of disaster events, one of which

is a flood disaster, a digital map can be developed to produce a map of flood-prone locations by Agus Ilyas, Tri Agus Setiawan, and Sattriadi Wahyu Binabar for *BPBD* Pekalongan Regency on the website as education and mitigation. flood disaster for the people of Pekalongan (Ilyas et al., 2020). The use of an open-source in the development of web-based GIS for disaster-prone areas can be done in Nagekeo Regency by Dedy Kurnia Sunaryo by concluding that the use of open-source applications does not cost money to get the program code, but requires sufficient knowledge in its development (Sunaryo, 2013). Application development with an open-source gives developers the freedom to redistribute and adapt to their own needs and access program code (Rakhmawati, 2006). In detail, the development of the *SiMBa* application refers to the development of disaster mitigation applications that have been carried out previously and have fundamental differences in their development according to the following table.

**Table 3. Mitigation application development and utilization of previous disaster GIS applications**

| Previous Developer | Category | Source Code | Platforms |
|---|---|---|---|
| Liestyasari et al., 2013 | *Sistem Informasi Geografis Untuk Penanggulangan Risiko Bencana Erupsi Gunung Merapi* | MapServer (open-source) | Android (mobile) |
| Muhammad et al., 2018 | *Sistem Informasi Panduan Mitigasi Bencana Alam Berbasis Android* | PHP framework Codeigniter (open-source) | Android (mobile) |
| Setiadi, 2013 | *Sistem Informasi Geografis Pemetaan Daerah Rawan Tanah Longsor, Mitigasi dan Manajemen Bencana* | ArcView and Power Designer 15 (paid) | Web-based |
| Cahyo et al., 2014 | *Geographical* Information System of Disaster Victims Location Using Web-Based and Mobile Application | PHP and MySQL (open-source) | Web-based and Android (mobile) |
| Lukmanudin et al., 2017 | *Sistem Informasi Mitigasi Bencana BPBD Berbasis Android* | Java and MySQL (open-source) | Android (mobile) |
| Ilyas et al., 2020 | *Sistem Informasi Geografis Edukasi Dan Mitigasi Bencana Banjir Untuk Siaga Bencana* | Google Earth/Map and MySQL (open-source) | Web-based |
| Sunaryo, 2013 | *Sistem informasi Geografis Berbasis Web untuk Kawasan Rawan Bencana* | ArcGIS (paid) and MySQL (open-source) | Web-based |
| Septianto et al., 2019 | *Sistem Informasi Spasial untuk Mitigasi Bencana Gunung Berapi* | ArcGIS (paid), PHP, and Java (open-source) | Web-based and Android (mobile) |

Source : garuda.ristekbrin.go.id, 2021.

Based on the application development and the use of GIS in multi-platform disasters, it appears that the use of open-source can be an alternative for developing disaster information systems. The development of the *SiMBa* application using open-source can be done with the free software package

QGIS and the open-source Lizmap source code as integration between GIS spatial software that can provide support in decision making in planning and processing, making, and disseminating disaster maps (maps of risk, hazards, and vulnerability) and recording of disaster events in Gunungkidul Regency.

The development of the *SiMBa* application refers to various regulations and policies related to maps and disaster mitigation as a synergy between the central and local governments through regulations and policies according to the following table.

**Table 4. Regulations and policies related to maps and disaster mitigation supporting the development of the SiMBa application**

| Document | Manager |
|---|---|
| *Undang-Undang Nomor 24 Tahun 2007* (Presiden Republik Indonesia, 2007) | ○ Article 44: The implementation of disaster management in situations there is a potential for disaster as referred to in Article 34 letter b includes; (a) readiness, (b) early warning, and (c) disaster mitigation.<br>○ Article 47 paragraph (1): Mitigation, as referred to in Article 44 letter c, shall be carried out to reduce the risk of disaster for communities in disaster-prone areas. |
| *Peraturan Pemerintah Nomor 21 Tahun 2008* (Presiden Republik Indonesia, 2008) | ○ Article 15: Implementation of disaster management in situations where there is a potential for a disaster to occur as referred to in Article 4 letter b includes; (a) readiness, (b) early warning, and (c) disaster mitigation.<br>○ Article 20 paragraph (1): Disaster mitigation as referred to in Article 15 letter c is carried out to reduce the risks and impacts caused by disasters to communities living in disaster-prone areas. |
| *Peraturan Presiden Nomor 23 Tahun 2021 dan Lampiran* (Presiden Republik Indonesia, 2016; *Lampiran Peraturan Presiden Nomor 23 Tahun 2021*, 2021) | That to encourage the use of geospatial information resulting from the acceleration and to expand the scope of the acceleration of the implementation of the one map policy, especially the economic field map, maritime sector map, disaster field map, and other maps as well as to accommodate changes in the tasks and functions of the ministry and agency organizations, it is necessary to implement a policy one map and changes in the structure of changes to the scope of activities and institutional action plans, one map policy acceleration team and one map policy implementation team. |
| *Peraturan Mendagri Nomor 101 Tahun 2018* (Kemendagri, 2018) | ○ Article 3: basic services sub-type of disaster affairs of regencies/cities include; (a) disaster-prone information services, (b) disaster prevention and preparedness services, and (c) rescue and evacuation services for disaster victims.<br>○ Article 7: The procedure for the application of Minimum Service Standards (SPM) in Sub-Disaster Affairs of regencies/cities conducted in stages; (a) data collection, (b) calculation of needs to fulfill basic service needs, (c) preparation of plans for the fulfillment of basic services, and (d) implementation of basic service fulfillment. |
| Indonesia Disaster Risk Index (IRBI) 2018 (BNPB, 2018a) | Based on the 2015-2018 Disaster Risk Index table, Gunungkidul Regency has a risk class with the "high" category with no changes every year due to the tendency of constant capacity values. |

Source : Regulatory and policy documents, 2021

Based on table 4, disaster mitigation is one of the efforts to implement disaster management in situations where there is a potential for a disaster to occur, in accelerating the one map policy, especially in the disaster sector. It is necessary to involve regencies/cities in updating the Thematic Geospatial Information *(IGT)* for disasters following the attachment of Presidential Regulation Number 23 in 2021. It is also following the Regulation of the Minister of Home Affairs Number 101 in 2018. The regulation is about disaster-prone information services and data collection are types of basic services and procedures for implementing Minimum Service Standards that must be met by regencies/cities. In addition, the district needs to implement a strategy to reduce the Disaster Risk Index through a strategic policy of increasing the Regional Capacity Index in the Gunungkidul district.

Referring to various regulations and policies related to disaster maps and mitigation as well as the conditions of the Disaster Risk Index, the development of the *SiMBa* application is (1) one of the implementations of fulfillment of Minimum Service Standards *(SPM)* in Sub-Disaster Affairs in Gunungkidul Regency, (2) a tool in carrying out the main tasks of *BPBD* in compiling, establish, and inform disaster-prone maps as well as disaster data collection, (3) aids in the formulation and stipulation of policies for disaster management and handling of refugees by acting quickly and precisely, effectively and efficiently, and one strategy to increase the capacity index to support the assessment of the Regional Resilience Index *(IKD)* and the Indonesian Disaster Risk Index *(IRBI)* in Gunungkidul Regency.

## B. METHOD

SiMBa application development uses the Agile Software Development method, which is characterized by development by prioritizing the application running early and developing it from time to time. The Agile development method is like going on a small evolution by breaking the giant architecture of a large project into smaller pieces that can be built and tested incrementally (Cockburn, 2001).

Specifically, the type of Agile *method* used in developing the SiMBa application is Feature-Driven Development (FDD) which consists of five processes according to Figure 1. by presenting the design of work/features repeatedly as needed measurably within a certain period so that clients/stakeholders are easy to understand (Palmer & Felsing, 2002).

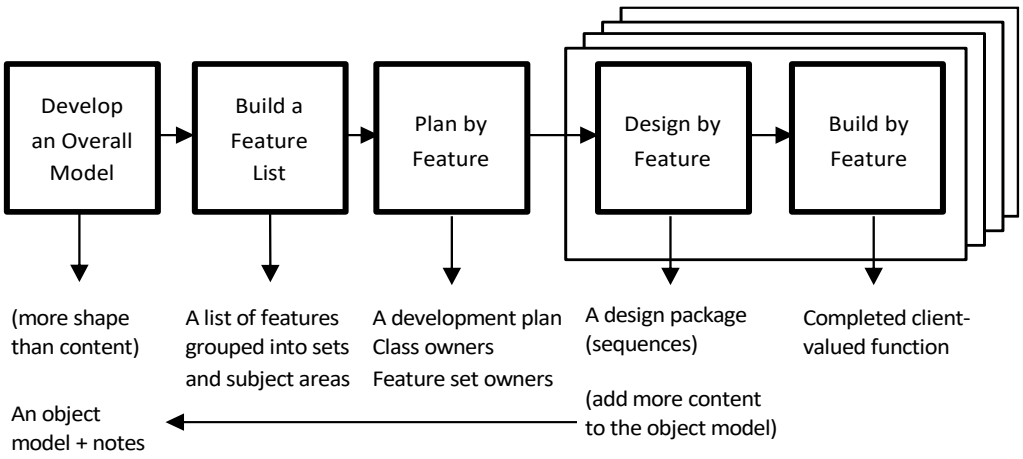


**Figure 1. The pattern of iterative development**

Based on Figure 1. shows a pattern of iterative development until the creation of conformity of work results/features expected by clients/stakeholders. Some application development using FDD can be concluded that application development can be developed systematically, quickly, and effectively in completing application development projects (Santosa & Setiaji, 2020). FDD is applied in the development of multi-user web-based applications that enable development by performing feature list creation, project planning, supporting collaboration among feature team members, and tracking project progress in an illustrative manner (Rychlý & Tichá, 2008). Likewise, according to Hariono et al. development with FDD does not focus on how to design a system which is considered to be costly and time-consuming. However, FDD prioritizes how to execute a project with a faster and more efficient time (Hariono et al., 2014). In addition, FDD is used to facilitate tracing if an error occurs in testing a program and making functions in the next project (Shabrina, Fildzah; Widodo; Adhi, 2020).

Before the initial stages of development, the client/stakeholder (in this case *BPBD*) is presented with an initial model in the form of an initial application for customized features according to *BPBD* needs, after *BPBD* gets an overview and agrees on the features to be developed, the developer goes through the following stages.

1. Develop an Overall Model

At this stage, the developer already knows the process in the Agile Software Development method by designing an interface design as review material for clients/stakeholders. Together with determining the main users of the application to be developed, this is known as the Use Case Diagram. Use

case which is a user and group admin as actors in the *SiMBa* application. At this stage, the developer begins to divide the work plan into sub-sections, namely the front-end and back-end.

2. Build a Features List

At this stage, the developer offers several features that can be applied and following the type of application to be developed to the client/stakeholder. In developing the *SiMBa* application, the must-have features are (1) map content comes from the *BNPB* inaRISK Geo Service, (2) the ability to display map overlays, (3) have analytical tools, such as: measuring tools, drawing and buffering, (4) printing menus based on scale, (5) the ability to be exported to GIS applications, (6) multi-platform based (web and mobile), and (7) can be used as a mobile-based disaster event recorder.

3. Plan by Feature

After the features are approved, the next stage is for the developer to adjust the development time using a Gantt Chart accompanied by a timetable for the distribution of the feature completion grace period. In developing the *SiMBa* application, the FDD method is very useful because it is developed independently, so feature development is carried out per feature, and verification of work results is carried out per feature and iteratively. By using Gantt Chart and Timetable, development was facilitated by setting grace periods according to features.

4. Design by Feature

Developers at this stage carry out application work according to the features according to a predetermined grace period and implement these features into the design. Developers perform visual design and feature implementation on the front-end. The interface of the Home Page accessed by actors in the User Case by implementing one of the *SiMBa* application download features on Android (mobile) devices. In this development process, it has not been officially launched by *BPBD*, so users are limited to accessing Android (mobile) features.

5. Build by Feature

At this stage of development, implement all the features of the *SiMBa* application according to the feature list with the Lizmap plugin as the back-end of the *SiMBa* application. After the back-end has been prepared along with the features, then the front-end and back-end are combined as a single application and localhost running and handling tests are carried out if problems are found while the application is running. When testing has been carried out, all features that are running well are deployed to a webserver and start filling in map content from InaRISK *BNPB* and a base map from the Land and Spatial Planning Office of

Gunungkidul Regency with a map accuracy level of 1:50,000.

## C. RESULT AND DISCUSSION

### C.1. RESULT

The development of the *SiMBa* application using open-source can be done in the development of a disaster mitigation information system on the *SiMBa* application. The development of this application uses the free QGIS software package.

**Table 5. Limited test results**

| Document | Manager | Extensions |
|---|---|---|
| The map content comes from the inaRISK *BNPB* Geo Service. | The map content can be displayed properly. | OK |
| Ability to display map overlays. | Map content can be displayed properly in an overlay. | OK |
| Have analytical tools, such as measuring tools, drawing, and buffering. | The features have been completed and run properly. | OK |
| Printing menu based on user-defined scale. | The features have been completed and run properly. | OK |
| Ability to export maps to GIS applications. | The features have been completed and run properly. | OK |
| Multi-platform-based (web and mobile). | Displays a map according to the size of PC and mobile devices. | OK |
| The application can be used as a mobile-based disaster event recorder. | The application can tag events at the disaster site. | Need further development |

Source : Deployment results, 2021

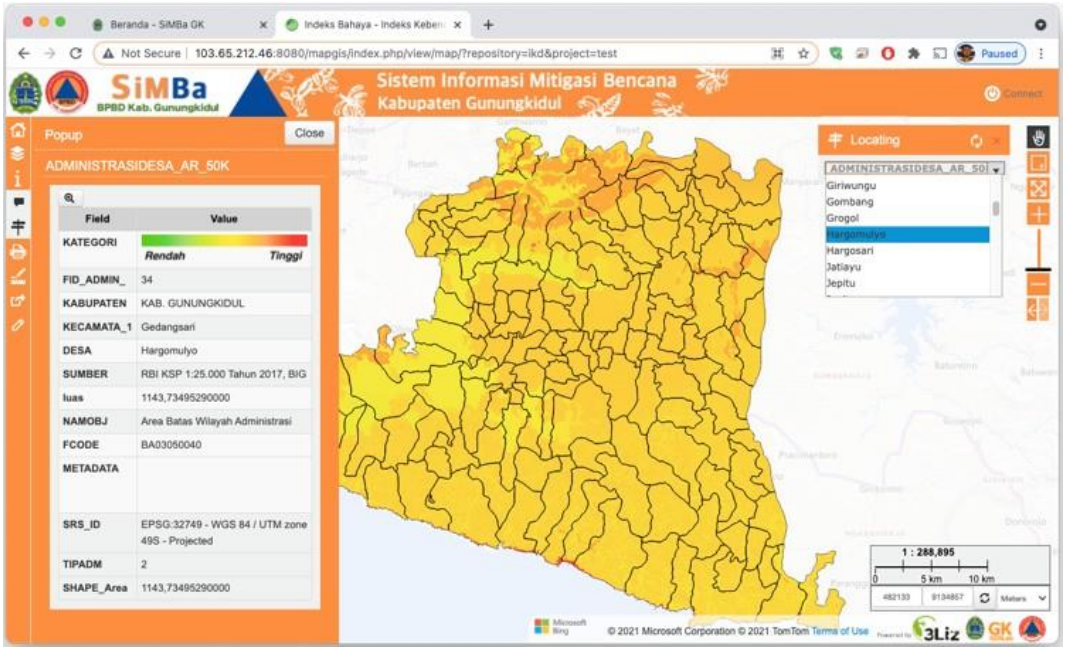


**Figure 2. The interface of the SiMBa application displas maps from inaRISK BNPB**

The open-source Lizmap source code was applied in decision making with analysis features in processing, creating, and disseminating disaster maps (risk,

hazard, and vulnerability maps) and recording disaster in Gunungkidul Regency. The results of the appropriate feature testing are provided in the table 5.

**Table 6. Comparison of map datasets in the 2019-2023 *RPB* Document and the results of InaRisk map processing on *SiMBa***

| ***RPB* Document** | ***SiMBa*** |
|---|---|
| 1. Tidal Wave and Tsunami Disaster Map | 1. Disaster Event Map |
| 2. Drought Disaster Map | 2. Flash Flood Hazard Index Map |
| 3. Earthquake Disaster Map | 3. Flood Hazard Index Map |
| 4. Flood Disaster Map | 4. Extreme Weather Hazard Index Map |
| 5. Fire Disaster Map | 5. Extreme Wave and Abrasion Hazard Index Map |
| 6. Landslide Disaster Map | 6. Earthquake Hazard Index Map |
| 7. Strong Wind Disaster Map | 7. Forest and land fire hazard index map |
| | 8. Drought Hazard Index Map |
| | 9. Landslide Hazard Index Map |
| | 10 Tsunami Hazard Index Map |
| | 11 Multi-Hazard Index Map |
| | 12 Flash Flood Vulnerability Index Map |
| | 13 Flood Vulnerability Index Map |
| | 14 Extreme Weather Vulnerability Index Map |
| | 15 Extreme Wave and Abrasion Susceptibility Index Map |
| | 16 Earthquake Susceptibility Index Map |
| | 17 Forest and land fire vulnerability index map |
| | 18 Drought Vulnerability Index Map |
| | 19 Landslide Susceptibility Index Map |
| | 20 Tsunami Vulnerability Index Map |
| | 21 Multi-Hazard Vulnerability Index Map |
| | 22 Flash Flood Risk Index Map |
| | 23 Flood Risk Index Map |
| | 24 Extreme Weather Risk Index Map |
| | 25 Extreme Wave and Abrasion Risk Index Map |
| | 26 Earthquake Risk Index Map |
| | 27 Forest and land Fire Risk Index Map |
| | 28 Drought Risk Index Map |
| | 29 Landslide Risk Index Map |
| | 30 Tsunami Risk Index Map |
| | 31 Multi-Hazard Risk Index Map |

Source : Results of SiMBa application development, 2021

The results of limited testing show that 85% percent of the features are ready for use and there is still one feature that cannot be tested because it still requires further development. From these achievements, the application can be used in general by typical users, stakeholders, and group admins to enrich map content.

The processed map is the result of a Geo Service connection on the InaRisk *BNPB* portal then clipping the map with a base map obtained from the Land and Spatial Planning Office of Gunungkidul Regency with a scale of 50K (1:50,000). Based on the results of processing the InaRisk map, the following table compares the map datasets in the 2019-2023 Disaster Management Plan *(RPB)* Document with *SiMBa* in the Table 6.

The entire maps processed by InaRisk above and several map datasets are packaged in *SiMBa* as a supporting tool for disaster-prone information service media in the Disaster Sub-Agency in Gunungkidul Regency. In addition, the *SiMBa* application can be used as a recording of disaster events in Gunungkidul Regency.

Recording of disaster events directly at the scene of the *SiMBa* application is still under feature development, so that field officers still use social communication media and enter disaster data into the application system.

**C.2. DISCUSSION**

The *SiMBa* application as a support system in disaster mitigation still requires improvements and additional features so that the FDD method is suitable to be applied in this development. Even though as a support system in disaster mitigation, according to Wahyuni and Saka, there are four important things in supporting disaster mitigation: (1) information and maps of disaster-prone areas are available for each type of disaster, (2) socialization for people who live in disaster areas. to increase public understanding and awareness in dealing with disasters, (3) knowing what needs to be done and avoided, as well as knowing how to save themselves if a disaster occurs, and (4) regulating and structuring disaster-prone areas to reduce the threat of disasters (Wahyuni & Saka, 2018).

In the delivery of disaster-prone information, it can be delivered more innovatively and creatively, so it is necessary to design disaster communication messages with the segmentation of productive age groups, especially teenagers as communicators as well as communicants of disaster message information (Retnowati et al., 2014). This is in line with the intention of

developing *SiMBa* so that it can be easily accessed by anyone and anywhere. In addition, the developer hopes that the use of this application can be integrated with the *Sistem Informasi Desa (SID)* which runs as a menu and additional features on the village website. Because people who are connected to the *SID* network can find out periodically updated population data as well as know disaster information (Sari et al., 2018).

Public understanding of disaster-prone information can be done through the implementation of local and village government policies. The form of capacity building is through the Disaster Risk Reduction Forum *(PRB)* and the Community Disaster Preparedness Team *(TSBM)* (Koem et al., 2019). In addition to improving the community in DRR forums, it is necessary to increase capacity in making maps and analyzing threats independently, and being able to make thematic disaster maps at the village level. This is an effort to reduce disaster risk to minimize the impact caused by encouraging the collection, management, and access to risk information using a location-based database (Sulistyani et al., 2016).

Gunungkidul Regency has a southern coastline that extends and makes Gunungkidul a beach tourism destination. Access to risk information using a location-based database for villages along the coast is important. Awareness of disaster risk along tourist routes in coastal areas needs mitigation that is applied to minimize the consequences of disasters (Pahleviannur et al., 2020) so that disaster-resilient tourism can be realized. The southern coastal area consists of several residential areas and also several ports that have a vulnerability to tsunami hazards, so disaster preparedness is needed by improving disaster management organization and written procedures as a reference for implementation when a disaster occurs (Nucifera, Fitria; Riasasi, Widiyana; Putro, Sutanto Trijuni; Marfai, 2019).

Based on the results and discussion of the results of previous research as well as the development of *SiMBa* if it is associated with the assessment of the Technical Guidelines for the Regional Resilience Index Assessment Tool with 71 Indicators (BNPB, 2018b), it is hoped that the existence of *SiMBa* as a strategy to increase the capacity index in supporting Regional Resilience Index *(IKD)* and the Indonesian Disaster Risk Index (IRBI) and the potential for *SiMBa* to support priorities 2 and 3 directly and priorities 4 and 6 indirectly. The distribution of potential *SiMBa* support for the Regional Resilience Index Priority *(IKD)* and the Indonesian Disaster Risk Index *(IRBI)* in Gunungkidul Regency.

**Table 7. Comparison of map datasets in the 2019-2023 *RPB* Document and the results of InaRisk map processing on *SiMBa***

| Priority 2<br>RISK ASSESSMENT AND INTEGRATED PLANNING | Priority 3<br>DEVELOPMENT OF INFORMATION SYSTEMS, TRAINING, AND LOGISTICS | Priority 4<br>THEMATIC MANAGEMENT OF DISASTER-PROVEN AREAS | Priority 6<br>STRENGTHENING DISASTER PREPAREDNESS AND MANAGEMENT |
|---|---|---|---|
| 10. Hazard Map and Study for All Hazards in the Area | 14. Means of delivering disaster information that directly reaches the community | 27. PRB-based spatial planning | 44. Earthquake Contingency Plan |
| 11. Vulnerability Map and Assessment for All Hazards in the Area | 15. Dissemination of disaster prevention and preparedness in each sub-district in its area | 28. Spatial planning information that is easily accessible to the public | 45. Tsunami Contingency Plan |
| 12. Capacity Map and Study | 18. Disaster data collection system connected to the national disaster data collection system | 30. Disaster Resilient Village *(Destana)* | 47. Tsunami Evacuation Plan |
| 13. Disaster Management Plan | | | 48. Flood Contingency Plan |
| | | | 50. Landslide Contingency Plan |
| | | | 52. Land and Forest Fire Contingency Plan |
| | | | 54. Volcanic Eruption Contingency Plan |

Source : Technical Guidelines for Regional Resilience Index Assessment Tools (BNPB, 2018)

Based on the table 7, there are still several policies that must be made in implementing strategies to increase the capacity index to support the assessment of the Regional Resilience Index *(IKD)* and the Indonesian Disaster Risk Index *(IRBI)* in Gunungkidul Regency. The pattern of improvement strategies on priority 6 is indirectly supported by the existence of *SiMBa*, so it needs the support of the Gunungkidul Regency Government and the *Kalurahan* Government in its implementation.

## D. CONCLUSION

The conclusion obtained from the development of *SiMBa* is that the use of the QGIS open-source platform and the Lizmap plug-in that was developed can provide benefits (1) *SiMBa* as one of the implementations of technical standards in improving Disaster Prone Information services in fulfilling Minimum Service Standards *(SPM)* in Sub-Disaster Affairs of Gunungkidul Regency, (2) *SiMBa* as a tool in carrying out the main tasks of *BPBD* in compiling, determining, and informing disaster-prone maps and data collection of disaster events, (3) *SiMBa*

as a tool in formulating and determining policies for disaster management and handling refugees by acting quickly and precisely, effectively and efficiently, and (4) the use of *SiMBa* as a strategy to increase the capacity index in supporting the assessment of the Regional Resilience Index *(IKD)* and the Indonesian Disaster Risk Index *(IRBI)* in Gunungkidul Regency.

**BIBLIOGRAPHY**


BNPB. (2018a). Indeks Risiko Bencana Indonesia (IRBI) 2018. In *Badan Nasional Penanggulangan Bencana*.

BNPB. (2018b). *Petunjuk Teknis Perangkat Penilaian Indeks Ketahanan Daerah (71 Indikator)*.

BPBD Kabupaten Gunungkidul. (2021). *Laporan Kinerja Instansi Pemeritah (LKj IP) Badan Penanggulangan Bencana Daerah Kabupaten Gunungkidul Tahun 2020*.

Bupati Gunungkidul. (2008). *Peraturan Daerah Kabupaten Gunungkidul Nomor 22 Tahun 2011 tentang Pembentukan, Susunan Organisasi, Kedudukan, dan Tugas Badan Penanggulangan Bencana Daerah* (Issue 6).

Cahyo, P. W., Asyhab, N., Yazid, A. S., & Nuruzzaman, M. T. (2014). *Geographical Information System of Disaster Victims Location Using Web-Based and Mobile Application*. *3*(2).

Cockburn, A. (2001). The Agile Software Development Series. *International Conference on Software Engineering 2000*, 220.

Gunadi, B., Nugraha, A., & Suprayogi, A. (2015). Aplikasi Pemetaan Multi Risiko Bencana di Kabupaten Banyumas Menggunakan Open Source Software GIS. *Jurnal Geodesi Undip*, *4*(4), 287–296.

Hariono, M. F., Albert, A., Vinsensius, A., & Kusnadi, A. (2014). Developing Review Websites Using Feature Driven Development (FDD). *Jurnal ULTIMATICS*, *6*(2), 100–104. https://doi.org/10.31937/ti.v6i2.338

Ilyas, A., Setiawan, T. A., & Binabar, S. W. (2020). Sistem Informasi Geografis Edukasi Dan Mitigasi Bencana Banjir Untuk Siaga Bencana di Kota Pekalongan. *JURNAL LITBANG KOTA PEKALONGAN*, *19*, 55–63.

Jayantara, I. G. N. Y. (2020). Implementasi QGIS untuk Mengestimasi Kerugian Ekonomi Akibat Banjir di Kabupaten Bandung. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *18*(2), 231–242.

Kemendagri. (2018). *Peraturan Mendagri Nomor 101 Tahun 2018*

*tentang Standar Teknis Pelayanan Minimal Sub-Urusan Bencana Daerah Kabupaten/Kota*.

Koem, S., Akase, N., & Muis, I. (2019). Peningkatan Kapasitas Masyarakat Dalam Mengurangi Risiko Bencana Di Desa Bandung Rejo Kabupaten Gorontalo. *Aksiologiya: Jurnal Pengabdian Kepada Masyarakat*, *3*(2), 176. https://doi.org/10.30651/aks.v3i2.1815

Liestyasari, S., Noranita, B., & Bahtiar, N. (2013). Sistem Informasi Geografis Untuk Penanggulangan Risiko Bencana Erupsi Gunung Merapi. *Journal of Informatics and Technology*, *2*(3), 13–20.

Lukmanudin, D., Yusuf, F., & Lesmana, I. (2017). Sistem Informasi Mitigasi Bencana BPBD Kabupaten Kuningan Berbasis Android. *Jurnal Nuansa Informatika*, *11*(2), 11–17.

Muhammad, F., Hadi, A., & Irfan, D. (2018). Pengembangan Sistem Informasi Panduan Mitigasi Bencana Alam Provinsi Sumatera Barat Berbasis Android. *Jurnal Teknologi Informasi Dan Pendidikan*, *11*(1), 27–42. https://doi.org/10.24036/tip.v11i1.93

Muryani, C., Nugraha, S., Soegiyanto, H., & City, B. (2016). *Developing Learning Multimedia Based on Geographical Information System To Improve Students' Spatial Ability in Flood-Disaster Mitigation*. *1*, 345–349.

Nucifera, Fitria; Riasasi, Widiyana; Putro, Sutanto Trijuni; Marfai, M. A. (2019). Penilaian Kerentanan dan Kesiapsiagaan Bencana Tsunami di Pesisir Sadeng, Gunungkidul. *Jurnal Geografi*, *11*(2), 182–192. https://doi.org/10.24114/jg.v11i2.11475

Pahleviannur, M. R., Wulandari, D. A., Sochiba, S. L., & Santoso, R. R. (2020). Strategi Perencanaan Pengembangan Pariwisata Untuk Mewujudkan Destinasi Tangguh Bencana Di Wilayah Kepesisiran Drini Gunungkidul. *Jurnal Pendidikan Ilmu Sosial*, *29*(2), 116–126. https://doi.org/10.23917/jpis.v29i2.9692

Palmer, S., & Felsing, J. (2002). *A Practical Guide to Feature-Driven Development*. Prentice Hall PTR.

Presiden Republik Indonesia. (2007). *Undang-Undang Nomor 24 Tahun 2007 tentang Penanggulangan Bencana*.

Presiden Republik Indonesia. (2008). *Peraturan Pemerintah Nomor 21 Tahun 2008 tentang Penyelenggaraan Penanggulangan Bencana*.

Presiden Republik Indonesia. (2016). *Peraturan Presiden Nomor 23*

*Tahun 2021 tentang Perubahan Atas Peraturan presiden Nomor 9 Tahun 2016 tentang Percepatan Pelaksanaan Kebijakan Satu Peta pada Tingkat Ketelitian Peta Skala 1:50.000* (Issue 099120, pp. 1–16).

Lampiran Peraturan Presiden Nomor 23 Tahun 2021, (2021).

Rakhmawati, N. A. (2006). Software Open Source, Software Gratis? *JUTI: Jurnal Ilmiah Teknologi Informasi*, *5*(1), 13. https://doi.org/10.12962/j24068535.v5i1.a201

Retnowati, E., Yulianto, M., Naryoso, A., & Rakhmad, W. (2014). Studi Deskriptif Diseminasi Informasi Pesan Kebencanaan di Kelompok Masyarakat Kawasan Rawan Bencana Desa Umbulharjo Kecamatan Cangkringan Kabupaten Sleman Daerah Istimewa Yogyakarta. *Interaksi Online*.

Rychlý, M., & Tichá, P. (2008). A tool for supporting feature-driven development. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *5082 LNCS*, 196–207. https://doi.org/10.1007/978-3-540-85279-7_16

Samsu, N. (2021). *SiMP-PLAN: Sistem Informasi Manajemen dan Perencanaan Perlengkapan Jalan Berbasis GIS sebagai Alternatif Sistem Pendukung Perencanaan*.

Santosa, O. A., & Setiaji, H. (2020). Pengembangan Aplikasi Ecommerce dengan Metode Feature Driven Development. *Automata*, *1*(2).

Sari, K. P., Priyo, P., Oktradiksa, A., & Setiawan, A. (2018). Sistem Informasi Desa Dalam Mitigasi Bencana (Peran Desa Penyangga Dalam Implementasi Sister Village). *Jurnal Pengabdian Kepada Masyarakat MEDITEG*, *3*(1), 1–8. https://doi.org/10.34128/mediteg.v3i1.27

Septianto, D. I., Arham, Z., & Rustamaji, E. (2019). Sistem Informasi Spasial untuk Mitigasi Bencana Gunung Berapi. *Applied Information Systems and Management (AISM)*, *2*(1), 23–27.

Setiabudi, D. H., Widyadana, I. G. A., Harsono, V., & Wongso, R. C. (2018). A new disaster aid information system model for Indonesia Red Cross: A case study in East Java Province. *International Journal of Supply Chain Management*, *7*(3), 9–15.

Setiadi, T. (2013). Perancangan Sistem Informasi Geografis Pemetaan Daerah Rawan Tanah Longsor, Mitigasi Dan Manajemen Bencana Di Kabupaten Banjarnegara. *Jurnal Kesehatan Masyarakat*

*(Journal of Public Health)*, *7*(1). https://doi.org/10.12928/kesmas.v7i1.1050

Shabrina, Fildzah; Widodo; Adhi, B. P. (2020). Model Requirement Traceability Untuk Metode Pengembangan Perangkat Lunak Feature Driven Developmet (FDD). *Seminar Nasional Informatika 2020 (SEMNASIF 2020) UPN Veteran Yogyakarta*, *Semnasif*, 230–240.

Sulistyani, A., Syaifullah, A., & Kusmiarto, M. (2016). Penyajian Informasi Spasial Pertanahan Berbasis Bencana Tanah Longsor di Gedangsari, Gunungkidul. *BHUMI: Jurnal Agraria Dan Pertanahan*, *2*(2), 239. https://doi.org/10.31292/jb.v2i2.74

Sunaryo, D. K. (2013). Sistem informasi Geografis Berbasis Web untuk Kawasan Rawan Bencana. *Industri Inovatif*, *3*(1), 44–48.

Wahyuni, A., & Saka, B. G. M. (2018). Mitigasi Bencana Geologi ( Gempabumi Dan Tanah Longsor Di Kabupaten Toraja Utara Dan Tana Toraja Dalam Mengurangi Risiko Bencana. *Jurnal Pendidikan Fisika Neutrino*, *1*(2), 33–38.