# Preparedness of geotourism facilities in disaster mitigation based on the Global South viewpoint: case study of East Java, Indonesia


## Abstract

**Purpose:** This paper assesses the preparedness of tourism destinations to mitigate the potential risks of unforeseen calamities. A comprehensive assessment of the degree to which destinations ensure the protection of visitors is examined.

**Study design:** A qualitative methodology was applied by implementing on-site assessment using a tourism destination readiness form that had been developed in advance. The aim was to examine the preparedness for potential disasters and the existing facilities managed by destination managers in Indonesia's geotourism sector. A dataset was gathered on potential hazards and the preparedness of all (n24) geotourism facilities within the Gunung Sewu UNESCO Global Geopark region. To support the data, a group discussion was held to accommodate the stakeholders' perspectives.

**Findings:** Although complete mitigation management is difficult to achieve, preparedness activities can reduce the high impact of natural hazards that may occur unexpectedly. Potential catastrophes in the geotourism sector range in severity from minor to major and necessitate responses of varying scale. This research demonstrates that tourism destinations in the Global South are not as yet prepared for the challenges at hand. As such, structural and non-structural approaches to mitigation management must be taken seriously.

**Originality:** The study provides insights into the preparedness and commitment of geotourism stakeholders in pre-disaster contexts in the Global South, as well as the impact of the facilities on geotourism activities.


**Keywords:** Disaster management, Global South tourism activities, geotourism, risk mitigation, disaster preparedness

## 1. Introduction

Tourism has the potential to impact regional development positively. Of late, geotourism has been gaining interest among tourists, particularly those engaged in natural, cultural, and educational activities. Although not always related to geotourism, geoparks hold the potential to improve community well-being through geoconservation, geoeducation, and geotourism, which are long-established geosite strategies. Concurrently, geotourism utilises local geosites as an income source by promoting the development of geoheritage sites, coastal beaches,

vertical and horizontal caves, and natural hot springs. These outdoor activities are offered in geotourism destinations.

While multiple studies highlight the advantages of geotourism development, such as the national income earned from the geotourist tax expenditure (Ruban, 2021), social sustainability through environmental protection and economic growth (Matshusa *et al.*, 2021b), and geoeducational opportunity for the scientific community (AbdelMaksoud *et al.*, 2021), geotourism has potential threats from geomorphological activities contributing to natural disasters. The geo-site disaster that occurred in the Izu-Oshima Island in the last century illustrates the importance of pre-disaster management. Despite a 12-meter tsunami accompanying the Great Kanto Earthquake, the fatalities and building damage were insignificant, with only seven deaths and 117 structures destroyed (Nishitani *et al.*, 2021). In contrast, the 2006 Yogyakarta Earthquake in the Gunung Sewu UNESCO Global Geopark (UGGp) Indonesia recorded 4,715 deaths and 109,100 buildings completely destroyed (Murakami *et al.*, 2008). Global income inequality between developed and developing countries in tourism has influenced infrastructure development to support tourism activities, particularly in the Global South (Chi, 2020).

The potential hazards in geotourism activities are exacerbated by inadequate pre-disaster management, encompassing both structural and non-structural development. Pre-disaster management in geotourism and enhanced managerial professionalism are imperative to ensure the safety of visitors during their geo-activities which primarily consist of outdoor activities characterised by moderate to prominent levels of risk. The capability of managers to provide safety assurances at tourist attractions can reduce fatalities. However, this capability is influenced by internal restrictions and external over-regulation (Jiang *et al.*, 2023). Internal and external structures in the tourism business should be coordinated, particularly in disaster management. Misalignment can impede disaster planning. This can be overcome by balancing internal capability and external support for tourism-related preparedness programmes.

Significant research has examined internal and external collaboration in disaster management within geotourism, focusing on public and private collaboration in improving disaster risk awareness (Kausar *et al.*, 2023), collaborative participation and hierarchical intergovernmental interactions post-disaster.(Wu *et al.*, 2021). However, internal and external governance research needs to be further explored (Qiu *et al.*, 2024). A critical element of exploring destination preparedness, particularly in health infrastructure, is fatal risks to tourists engaged in geotourism (Wirawan *et al.*, 2020). Consequently, enhancing tourist safety required an investigation into the extent to which tourism destinations in the Global South, particularly

in Indonesia, are prepared to establish support infrastructure for geotourism. Hence this study required these specific research questions to be answered:

RQ1: To what extent are the internal capacity and external support related to health and safety infrastructures of geopark destinations equipped to cope with unforeseen disasters?

RQ2: What is the role of the destination and supporting stakeholders in ensuring disaster preparedness of the health infrastructure of geopark destinations?

## 2. Literature review

### *2.1 Trends and challenges of geological sites in tourism*

Of late, geotourism has garnered the attention of many tourists as an alternative activity to be experienced. Geotourism has provided an opportunity to develop destinations offering wellness tourism activities. Examples are Sophia's Springs (Zečević *et al.*, 2022) and healing forest bathing in the Batur UGGp with the aim of attracting more tourists and increased local participation (Mihardja *et al.*, 2023). Besides local economic benefits, geotourism activities can be a sustainable rural development option by reducing mass tourism in sensitive environmental areas (Xu and Wu, 2022). Hence, geo-destinations can serve as the balance between natural resources and tourist activities in a country.

Nevertheless, the development of geotourism in the Global South has encountered problems that must be addressed. Sumanapala *et al.* (2021) evaluated two of Sri Lanka's geotourism sites and found that they operated without any best-practice concept development, including the lack of capable human resources. In the case of Iran, the absence of government investment and expert geo-tour guides became a critical issue which has led to the economic stagnation of this sector (Salamzadeh *et al.*, 2021).

Apart from economic development, Global South geo-destinations face a lack of safety infrastructure. Matshusa *et al.* (2021a) revealed that the South Africa National Parks have improper safety infrastructure resulting in wild animal attacks. Establishing protocols for managing geotourism sites is essential. Therefore, research is needed to evaluate destination vulnerability and mitigation strategies in the Global South so as to enhance destination image and attract more tourists.

### *2.2 Importance of geotourism safety*

As geosites are vulnerable to natural and human disasters, community partnerships are needed at the earliest stages of the geopark co-design for the integration of spatial and environmental

planning policies (Fepuleai *et al.*, 2021). Four parameters should be monitored at an identified geosite: (i) weather conditions, (ii) visitor characteristics, (iii) geosite conditions, and (iv) geological heritage characteristics. This identification can be a baseline for policymakers and stakeholders to provide the necessary support facilities.

Risk assessment classification based on geosite conditions allows for hosts and tourists to know current conditions. For example, if a geosite is experiencing degradation (Morante-Carballo *et al.*, 2023), the potential risks include microseismical activities which require daily hazard level indicators from green to red (Al-Halbouni *et al.*, 2022), and rockfall processes which determine carrying capacity and the need for the host to integrate tourism management and conservation plans into development designs (Carrión-Mero *et al.*, 2024). Thus, identifying geosite conditions is crucial to ensure sustainable development through comprehensive management strategies.

Another critical aspect of risk assessment is to evaluate the potential hazards that have a high possibility of occurrence. Since geotourism activities are outdoor activities, natural hazards dominate this activity, highlighting the necessity for health service support. Though these services can improve tourist satisfaction and loyalty to the destination, Tourism Public Health Services Quality (TPHSQ) remains limited (Han *et al.*, 2021). Addressing these issues through improved health services and comprehensive risk assessment methods is critical for both safety of tourists and the long-term viability of geotourism sites.

## 3. Methodology

This research was conducted in 2023, using on-site assessment in East Java Gunung Sewu UNESCO Global Geopark, Indonesia. After the great earthquake in 2006, this geosite experienced many positive changes, one of which was its designation as a Karst National Tourism Strategic Area (KSPN) by the central government. Yet, disasters at the geosite remain a constant concern. Therefore, it is essential to understand the extent of the health service infrastructure currently available for geotourists to mitigate the hazards. A descriptive qualitative method was employed to evaluate the facilities at the destination through three stages (Figure 1).

**Figure 1.** Gunung Sewu UGGp research flow

First, all 24 geotourism sites were observed to evaluate the data needed, which included geosite area review, discussion with destination manager and stakeholders, and geological data information. This activity generated the list of geotourism destinations to be evaluated. The

following research step was readiness assessment using the destination preparedness form. Three main variables were assessed: interest value assessment, potential risk assessment, and capability assessment. Before conducting the readiness assessment, the form was discussed and validated with the local disaster agency. This process was completed in one month by team members who visited all 24 destinations one by one. The last stage was conducted as a focus group by inviting several stakeholders related to geotourism activities, including regional government, local disaster agencies, destination managers, local communities, private and village-owned businesses, and academia. The participants were chosen after conducting a comprehensive assessment of the role of each stakeholder that involved direct interaction with visitors. The focus group session addressed each role in tourism preparedness for disasters, focusing on their respective activities.

**Figure 2.** Gunung Sewu UNESCO Global Geopark Area

A census sampling technique was applied in this research where the total population (n=24) was evaluated to determine the general nature of tourist attractions in East Java Region's Gunung Sewu UGGp. Bryman *et al.* (2022) described the census technique as an effort to gather data from every single member of the population. From an administrative standpoint, as illustrated in Figure 2, Gunung Sewu UGGp spans three provinces: East Java, Central Java, and the Special Region of Yogyakarta. This study focussed explicitly on East Java because, according to the statistical data released by the Tourism Ministry, it is the primary gateway for international tourists. The data underwent manual processing and analysis in Microsoft Excel, involving several steps of PivotTable analytical data processing. These steps included grouping, sorting, filtering, summarizing, and analysing the data trends. To determine the mapping of each destination, the authors provided a narrative description of the process following the identification stage.

## 4. Findings and Discussion

### *4.1 The present condition of the East Java Region's Gunung Sewu UGGp*

**Figure 3. East Java Region's Gunung Sewu UGGs site distribution map**

The twenty-four geosites are distributed in nine districts of Pacitan, East Java (Figure 3). Pringkuku has the most number of tourism destinations, followed by Donorojo. Although these two districts dominate in the number of geosites, other regions also have geotourism destinations thus ensuring an equitable distribution of tourists. Tourism activities that are spread out over several geosites ensure economic equality in the community.

The dominant characteristics of the natural, cultural, and man-made destinations are shown in Table I.

**Table I.** Type of East Java Region's Gunung Sewu UNESCO Global Geoparks

Table I shows that more than 75% of the destinations are nature-based and managed by governmental and community groups, apart from one operated by the private sector. The government oversees more than half of the destinations. Government ownership can have a positive impact since a definitive source of funding is available. Multi-ownership destinations shows stagnation in development as any development must accommodate all parties, yet most are limited by budget. Norrish *et al.* (2014) found that geotourism development in Western Australia experienced land ownership issues, which created a problem in maintaining and upgrading facilities.

In spite of government ownership of geotourism, private investments are needed for the fulfilment of support facilities. Adoption of several strategies can increase investor confidence. Evaluation of potential risks within the tourism sector can increase investor confidence by providing an assessment of the risks tourists will encounter. Evaluated potential hazards can be seen in Table 2.

**Table II.** Index of potential hazards at East Java Region's Gunung Sewu UNESCO Global Geoparks

Following Kim and Yoon (2018), hazards were categorised on a scale of Low, Medium, and High based on risk, frequency, and severity. Currently, all destinations fall into the medium category with one district in the high category The government can use these findings to attract investors and tourists. Safety travel campaigns and disaster risk reports can increase tourism. Investor trust is crucial for growth. Stakeholders can take measures to reduce hazards, as no district currently falls into the low-hazard category. These findings are consistent with

Parlindungan and Manurung (2023) that tourism destinations must provide secure locations from health and safety hazards to attract international investors.

Each stakeholder's contribution and participation significantly affect destination development, especially in decreasing the potential hazards through structural and non-structural programs. Table 3 illustrates the programs in the Gunung Sewu UGGp. Non-structural programs refer to activities related to education and interpretation of potential disasters through disaster literacy in support of risk reduction.

**Table III.** Structural and non-structural evaluation of destination preparedness

Structural developments are essential for preparedness and require multiple stakeholders and these efforts must be led by the local government. The public health centre (PUSKESMAS) provides essential health services to the community and visitors. Over 50% of health services are at a medium distance (5 to 15 km) from destinations, and 8% are far away. Therefore, the government should increase health services in these areas. Accessible health services are crucial in hazard-prone areas.

The preparation of an evacuation route is mandatory to provide hazard standardisation since it plays a vital role in mitigating potential catastrophes. Although one destination has no evacuation route, 83% of sites have a range of routes in optimal, acceptable, and unsatisfactory conditions. In terms of infrastructure readiness to mitigate a hazard at the destination, it was favourable with 50% in optimal condition and the remaining 50% in acceptable (25.00) or unsatisfactory (25.00) condition. Although it is the destination manager's responsibility to ensure that the necessary infrastructure is in place, the government should proactively improve it through the implementation of policies and financial assistance.

Two additional structural enhancements that were evaluated are operator-supplied assembly points and emergency response tools. When a disaster occurs, assembly locations become open spaces that local people and visitors can utilise. Additionally, emergency response tools can enhance the quality of care that may be required prior to advanced medical aid. The government can facilitate the collaboration between destinations and corporations through the provision of relevant instruments. The allocation of funds for Corporate Social Responsibility (CSR) can enable the destination to enhance its preparedness.

Based on the observations and interviews with the destination operators about non-structural activities, all communities play an active role in every destination, not only in those operated by the community but also in government and private destinations where they

participate actively. The government has held several programs to scale up the community's awareness of disaster management. Socialisation, working program alignment, and simulations are essential for the development of human resources skills. Simulation programs may be coordinated by the destination manager in collaboration with the local government.

Aside from structural and non-structural development, support instruments need to be evaluated to ensure that the destination is ready for disasters. Three instruments have been assessed by researchers, as detailed in Table 4.

**Table IV.** Evaluation of preparedness of support equipment at destination

Seventy-five per cent of destinations have an operational procedure in place to mitigate potential hazards (Table 4). The remaining destinations require encouragement to establish such procedures. Standard Operating Procedures (SOPs) are indispensable instruments for addressing emergencies involving natural and human-made hazards (Kato *et al.*, 2022). For nature-based tourism, support facilities are crucial to the destination. Provision of the facilities is contingent on the capacity of each destination and the contribution of other stakeholders.

Aside from operational transportation, destinations also provide facilities, including isolation areas, ambulances, breathing apparatus, and other support facilities, especially in the context of emergency operations. To enhance the facilities, the hosts should collaborate with the private sector to provide the facilities through mutually advantageous schemes. Additionally, the authors found that most hosts had first-aid kits at the location, allowing visitors to administer initial medical care in the event of an incident. Figure 3 illustrates the health services coverage map of the destinations.

Short-range coverage is present in the green area which involves three destinations (Figure 4). However, most of the destinations are located in the medium (16) to long-range coverage area (5), which affects the timeframe when the health service can be of assistance.

**Figure 4.** Main health service coverage map

Tourism stakeholders should implement mitigation and conduct adequate planning to ensure visitors are satisfied with the location, particularly when engaging in nature-based tourism activities that present various risks. Appropriate health infrastructure located near the destination is required. To ensure that tourists feel safe during travel, good health infrastructure and services should be provided (Seetanah *et al.*, 2022). Therefore, private general hospitals

may be established in tandem with regional public hospitals to ensure that visitors have access to healthcare services. The government can propose operating hours for general practitioners near the destination so that visitors can seek care when needed. Providing adequate facilities to general practitioners who participate in the program will be necessary for the success of this initiative.

## 5. Summary

Assessing the level of geotourism disaster preparedness in the context of the Global South is critical. To assess this readiness, Indonesia was selected as the case study, with particular emphasis on regions that had experienced devastating geophysical disasters in the previous two decades. Apart from experiencing significant growth, the sites have the potential for hazards such as tsunami, earthquakes, floods, landslides, and volcanic eruptions. Both structural and non-structural initiatives in these destinations need further development. Stakeholders have supported risk reduction processes, including social involvement and infrastructure development. The government should be more active in attracting private businesses to invest in disaster facilities. The community should be encouraged to be involved, particularly in non-structural development.

This research contributes to understanding the preparedness and mitigation stage of the disaster management cycle. However, the limitation of this research is that it only focuses on structural and non-structural development, particularly in health service infrastructure. Early Warning Systems (EWS), both technological and institutional, must be further researched to support the preparedness process in disaster management activities. The analysis of EWS is essential in the context of risk management to improve the risk reduction process and enhance the preparedness of geotourism destinations.

Ultimately, the study findings suggest three essential points to note for health services in these destinations. First, there is a need to increase, upgrade, and improve healthcare facilities. Second, the government should partner with other stakeholders, such as general practitioners, to address the problem of coverage in these areas. Third, financial difficulties should be addressed through the optimisation of partnerships between the public and private sectors to support the destination financially, i.e., CSR development.

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**Table I Type of East Java Region's Gunung Sewu UNESCO Global Geoparks**

| No | Type of Geotourism | Activity | Potential Disaster | Total | Managed by | | | % |
|---|---|---|---|---|---|---|---|---|
| | | | | | Govt | Comm | Private | |
| 1 | Natural Destination | Cave tours, Cave instrument performances, Sightseeing, Surfing, Camping, Fishing, Turtle Conservation, Springwater, Paddling, Rappelling | Earthquakes, Tsunamis, High tidal waves, Sea breezes, Floods, Storms, Abrasion, Cliff landslides | 19 | 9 | 9 | 1 | 79.17 |
| 2 | Cultural Destination | Periodic Air Force shows, Club camping, Outbound tours, Cultural festivals, Edu-cultural tours | Earthquakes, Landslides | 2 | 2 | n/a | n/a | 8.33 |
| 3 | Man-made Destination | Swimming, Recreation, Sightseeing, Edu-tour | Earthquakes, Floods, Landslides, Fallen trees | 3 | 2 | n/a | 1 | 12.50 |
| | | | | 24 | 13 | 9 | 2 | 100.00 |

*Govt = Government
Comm = Community

**Table II The Index of Potential Hazards at East Java Region's Gunung Sewu UNESCO Global Geoparks**

| District | Total Destination | Risk | | | Frequency | | | Severity | | | Index** | Scale |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | M | H | L | M | H | L | M | H | | |
| Arjosari | 1 | ✓ | | | ✓ | | | | ✓ | | 0.44 | Medium Scale |
| Donorojo | 5 | ✓✓ | ✓✓ | ✓ | ✓✓✓✓ | | ✓ | ✓✓✓ | ✓ | ✓ | 0.53 | Medium Scale |
| Kebonagung | 1 | | ✓ | | ✓ | | | | ✓ | | 0.56 | Medium Scale |
| Nawangan | 1 | ✓ | | | ✓ | | | | ✓ | | 0.44 | Medium Scale |
| Ngadirojo | 2 | | ✓✓ | | ✓ | | ✓ | | ✓✓ | | 0.67 | Medium Scale |
| Pacitan | 3 | ✓ | ✓✓ | | ✓✓ | ✓ | | ✓✓✓ | | | 0.44 | Medium Scale |
| Pringkuku | 6 | ✓ | ✓✓✓ | ✓✓ | ✓ | ✓✓✓ | ✓✓ | ✓ | ✓✓✓✓ | ✓ | 0.70 | High Scale |
| Punung | 3 | ✓✓ | ✓ | | ✓✓ | ✓ | | ✓✓ | ✓ | | 0.44 | Medium Scale |
| Tulakan | 2 | ✓ | ✓ | | | ✓✓ | | ✓ | ✓ | | 0.56 | Medium Scale |
| Total | 24 | 9 | 12 | 3 | 13 | 7 | 4 | 10 | 12 | 2 | | |

* L=Low scale; M=Medium scale; H=High Scale
** Index is based on the authors' grading where 1,00 is the highest rate, which means high risk, high frequency, and high severity

**Table III Structural and Non-Structural Evaluation of Destination Preparedness**

| No | Structural Development | | | Non-Structural Development | | |
|---|---|---|---|---|---|---|
| | Description | Destination | % | Description | Destination | % |
| 1 | Health Service Distance | | | Community Participation | | |
| | - Near Distance | 8 | 33.33 | - Active Participating | 24 | 100.00 |
| | - Medium Distance | 14 | 58.33 | - Inactive Participating | 0 | 0.00 |
| | - Long Distance | 2 | 8.33 | | | |
| 2 | Evacuation Route | | | Human Resources Hazard Understanding | | |
| | - Available | 20 | 83.33 | - Understand | 23 | 95.83 |
| | ✓ Optimal | 13 | 65.00 | ✓ Skilled | 16 | 69.57 |
| | ✓ Acceptable | 5 | 25.00 | ✓ Unskilled | 7 | 30.43 |
| | ✓ Unsatisfactory | 2 | 10.00 | | | |
| | - Non-Available | 4 | 16.68 | - None understand | 1 | 4.17 |
| 3 | The readiness of destination in Hazards | | | | | |
| | - Optimal | 12 | 50.00 | | | |
| | - Acceptable | 6 | 25.00 | | | |
| | - Unsatisfactory | 6 | 25.00 | | | |
| 4 | Assembly Point | | | | | |
| | - Available | 19 | 79.17 | | | |
| | - Non-Available | 5 | 20.83 | | | |
| 5 | Emergency Response Tools | | | | | |
| | - Available | 17 | 70.83 | | | |
| | - Non-Available | 7 | 29.17 | | | |

**Table IV Supporting Equipment Evaluation of Destination Preparedness**

| No | Description | No of Destination | % |
|---|---|---|---|
| 1 | SOP of Hazard Mitigation | | |
| | - Available | 18 | 75.00 |
| | - Non-Available | 6 | 25.00 |
| 2 | Supporting Facilities | | |
| | - Available | 16 | 66.67 |
| | ✓ Optimal Condition | 9 | 56.25 |
| | ✓ Acceptable Condition | 5 | 31.25 |
| | ✓ Unsatisfactory Condition | 2 | 12.50 |
| | - Non-Available | 8 | 33.33 |
| 3 | First Aid Kit Availability | | |
| | - Available | 22 | 91.67 |
| | - Non-Available | 2 | 8.33 |

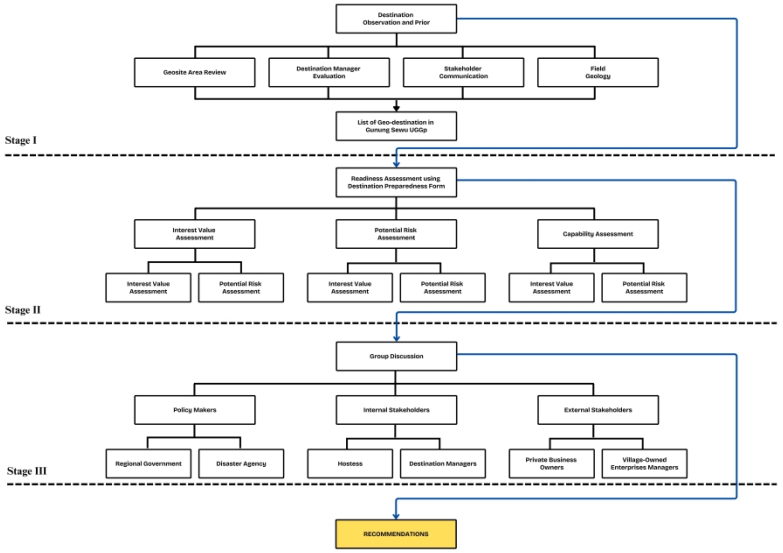


Figure 1 Gunung Sewu UGGp Research Flow

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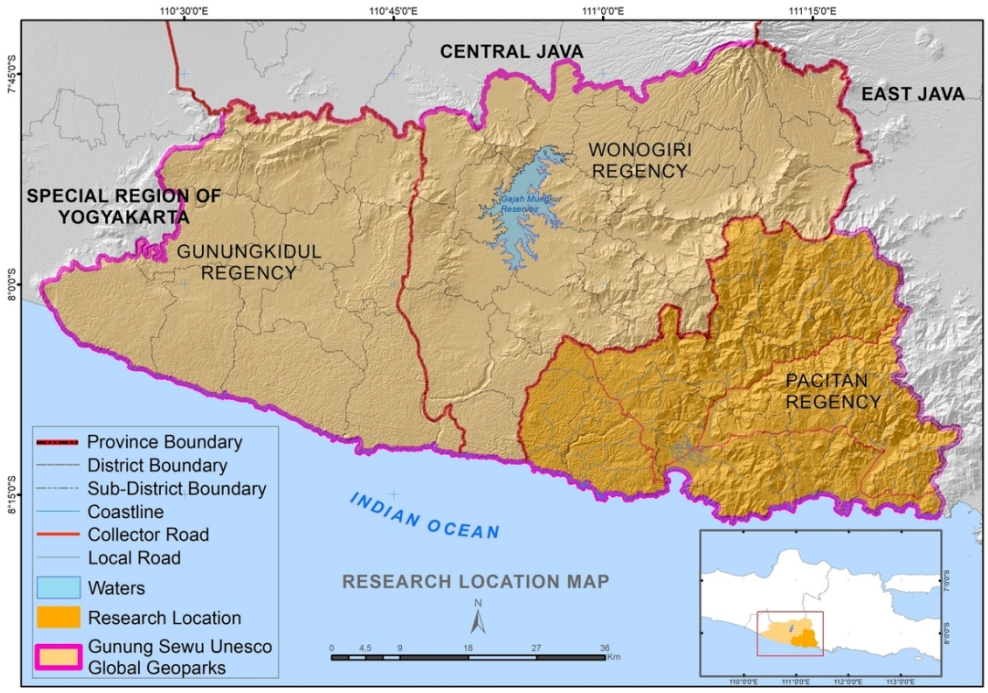


Figure 2 Gunung Sewu UNESCO Global Geopark Area
Resource: Authors, 2024

209x147mm (150 x 150 DPI)

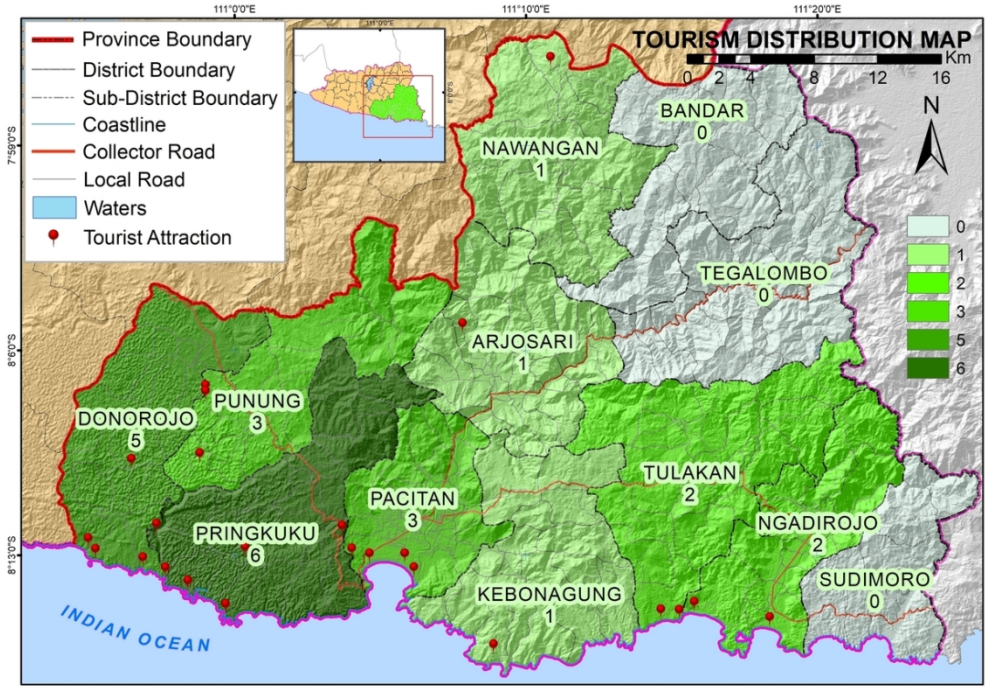


Figure 3 East Java Region's Gunung Sewu UGGs Site Distribution Map
Resource: Authors, 2024

209x147mm (150 x 150 DPI)

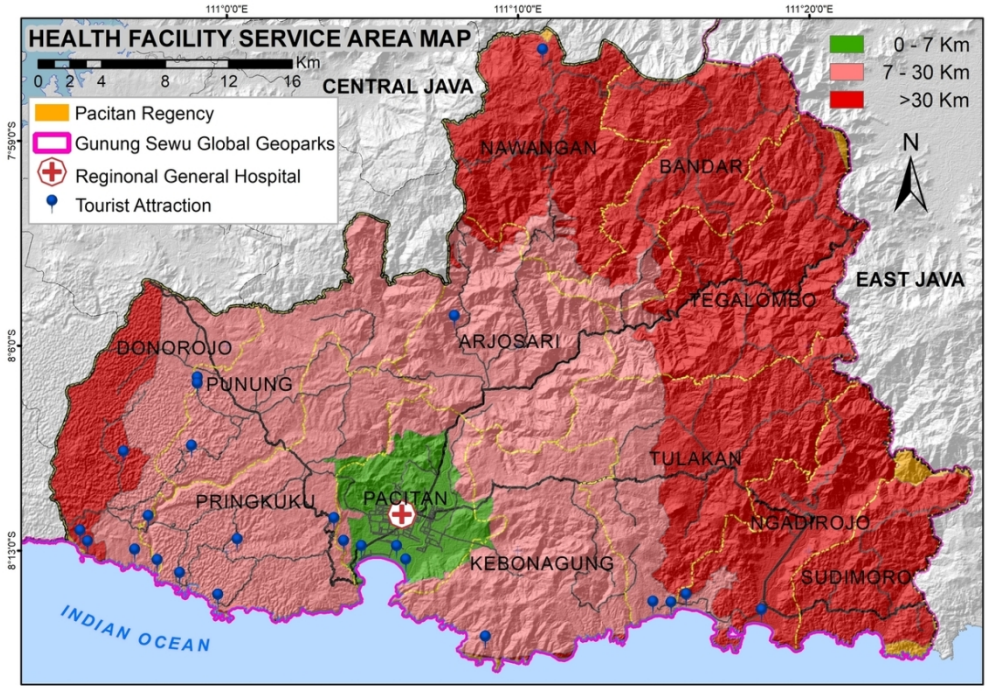


Figure 4 Main Health Service Coverage Map
Resource: Authors, 2024

209x147mm (150 x 150 DPI)