Jurnal Pendidikan Geografi

Vol 12 No 2 2025
https://ppjp.ulm.ac.id/journal/index.php/jpg

Fire Risk Level Mapping in Tanah Abang, Central Jakarta Using Geographic Information Systems (GIS)

Siti Nabilah Alzena*, Juhadi, Tjaturahono Budi Sanjoto

Department of Geography, Faculty of Social and Political Sciences,
Semarang State University, Indonesia
*nabilaalzena21@students.unnes.ac.id

Abstract

Rapid urbanisation has increased population density in Tanah Abang District, Jakarta, posing considerable fire dangers. This study uses the Analytical Hierarchy Process (AHP) and Geographic Information System (GIS) to map fire risk levels in seven urban settlements. Three key components were examined: hazard, vulnerability, and capacity. Expert assessments determined the weight of each parameter, which was then spatially analysed using ArcGIS overlay techniques. According to the findings, the majority of locations are classified as moderate risk, particularly dense settlements with restricted road access. Petamburan Village is the most vulnerable due to high poverty rates and a big concentration of vulnerable groups, whereas Gelora Village is the least vulnerable due to lower population density and more organised land usage. Mitigation initiatives have already been implemented, including fire safety education, fire extinguisher training, the formation of volunteer groups, and the installation of hydrants and extinguishers in public buildings. These findings emphasise the need of building local capability and using GIS as a foundation for better fire risk reduction strategy.

Keywords: Urban Fire; Disaster Mitigation; AHP.

DOI: 10.20527/jpg.v12i2.23356
Received: 22 July 2025**; Accepted:** 25 September 2025**; Published:** 28 September 2025
How to cite: Alzena, S. N., Juhadi, Sanjoto, T. B. (2025). Fire Risk Level Mapping in Tanah Abang, Central Jakarta Using Geographic Information Systems (GIS). *JPG (Jurnal Pendidikan Geografi)*, Vol. 12 No. 2.
http://dx.doi.org/10.20527/jpg.v12i2.23356

**Corresponding Author*

1. Introduction

Urbanisation is the migration of significant numbers of people from rural to urban areas. This happens because there are big differences in development between rural and urban areas (Prayojana et al., 2020). Jakarta is the capital of Indonesia and has a strong economy that draws people from all around the country (Zaera, 2024). Jakarta's Gross

Regional Domestic Product (GRDP) hit IDR 920.33 trillion in the third quarter of 2024, which shows how bad things are (Badan Pusat Statistik, 2024). The link between GRDP and population growth shows that economic growth is a major factor in population expansion (Indriani, 2023).

The population of Jakarta has increased from 10,562,088 in 2020 to 10,684,946 in 2024, reflecting a growth rate of 0.31 percent (Badan Pusat Statistik Provinsi DKI Jakarta, 2024a). This growth in the population has made the city exceedingly dense, with 16,165 people living in every square kilometre in 2024 (Badan Pusat Statistik, 2024). Central Jakarta had the highest population density, with 21,955 persons per square kilometre, because it was the centre of urban activity (Badan Pusat Statistik, 2024).

Tanah Abang District is one of the most densely populated places in Central Jakarta, with 18,089 people living there per square kilometre in 2024 (Badan Pusat Statistik, 2024). The district is only 9.31 square kilometres big and has sub-districts including Gelora, Kampung Bali, and Kebon Kacang. These locations have big shopping centres including Senayan City, Plaza Senayan, and fX Sudirman, as well as large business centres such Tanah Abang Market and Thamrin City.

The expanding population and unregulated housing expansion have resulted in environmental deterioration and heightened disaster risk, especially concerning fire threats. Fire is an uncontrolled and destructive conflagration (Santosa et al., 2021 in Fattahanisa et al., 2022). It often happens in locations with a lot of people and business activity (Muzani, 2020). A lot of people and buildings in one area, together with a lot of businesses in one area, make it more vulnerable and need to be watched closely (Firman et al., 2023).

Hazards including short circuits in electrical systems and using gas stoves can start fires in cities. The risk is even higher since residential buildings are so close together that they make it hard for emergency services to get to them (Trifianingsih et al., 2022). Jakarta had 2,286 fires in 2023, according to the Badan Pusat Statistik (2024). In response, the Jakarta Provincial Government has put all administrative municipalities in the middle of the risk zone for structural and residential fires (Januandari et al., 2017).

Given the circumstances, Tanah Abang's status as a social and economic hub in Jakarta necessitates a thorough assessment of fire hazard risk. Sulistyaningtyas et al. (2024) conducted recent studies that primarily evaluate fire risk by integrating hazard, vulnerability, and capacity using GIS and the Analytical Hierarchy Process (AHP) in West and Central Semarang Districts. The studies frequently define capacity in terms of formal infrastructure and administrative support, without explicitly including indicators of community-based capacity.

This study introduces a new methodology by incorporating community-level indicators into the capacity variable, including the presence of community hydrants installed by residents and community fire response volunteers. Furthermore, the parameter weighting process is predicated on AHP questionnaires that are distributed exclusively to operational-level stakeholders from the Tanah Abang sub-district fire department, thereby guaranteeing contextual relevance and a grounded assessment. This investigation is designed to assess the fire risk level in Tanah Abang based on vulnerability, capacity, and hazard, and to identify the mitigation efforts that have been

carried out through both community initiatives and supporting facilities.

2. Method

This study employed descriptive quantitative research and was conducted in all seven sub-district in Tanah Abang District (see Fig. 1), Jakarta, from May to June 2025. The sample was chosen using a stratified random sampling technique based on Tanah Abang District's seven sub-districts, with each serving as a sampling category. Samples were chosen proportionally based on population size, and the total sample size was calculated using Slovin's formula.

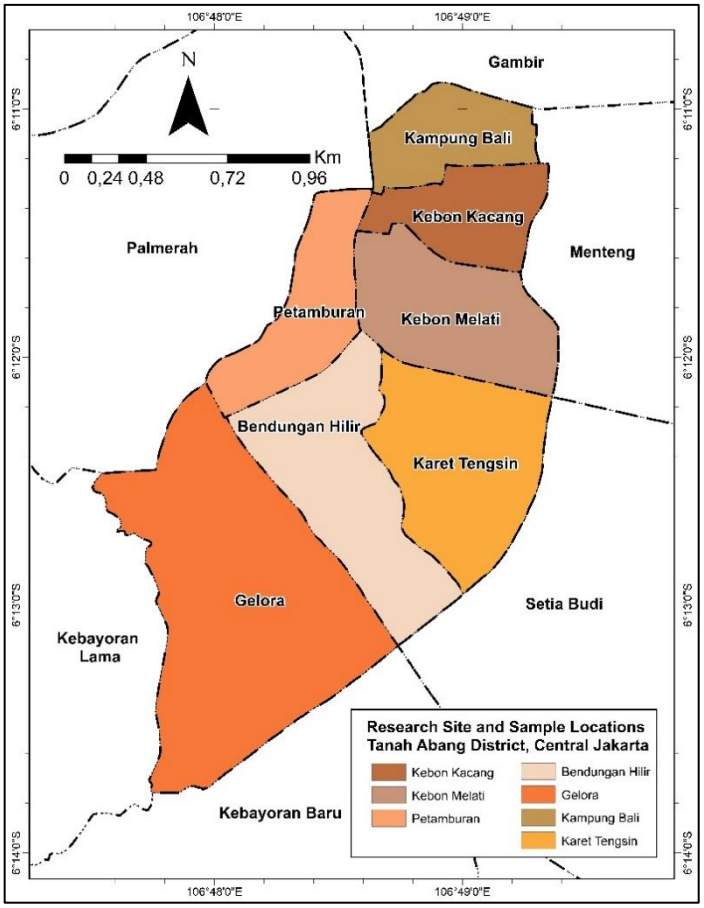

Figure 1. Research Site and Sample Locations Map

The data was compiled using structural and descriptive analysis, followed by a pairwise comparison of parameters using the Analytical Hierarchy Process (AHP) method. The comparison was made between the parameters within the three main variables: hazard, vulnerability, and capacity, to find out which ones were more important. Data that is collected is subsequently processed using the Expert Choice to generate parameter priority lists and determine the Consistency Ratio (CR), with the result considered valid if the CR is less than 0.01.

The variables are made up of several parameters chosen based on their relevance to the current conditions in the Tanah Abang region. Afterward, the parameters are classified by research domain, scaled (1-3), and evaluated using AHP results.

Table1 1. Hazard Parameter Score Classification

Parameter	Low (1)	Moderate (2)	High (3)
Urban Density	1.132 – 6.941 population/km²	6.942 – 12.750 population/km²	12.751 – 15.560 population/km²
Settlement Density	154 – 1.764 unit/km²	1.765 – 3.374 unit/km²	3.375 – 4.984 unit/km²
Building Quality	>75% permanent building	40-75% permanent building	<40% permanent building
Road Classification	>75% collector road	40-75% collector road	<40% collector road

Source : Sulistyaningtyas et al., 2024

Table 2. Vulnerability Parameter Score Classification

Parameter	Low (1)	Moderate (2)	High (3)
Age Group Ratio	< 0,372	0,372 – 0,400	> 0,400
Disability Population Ratio	< 0,00129	0,00129 – 0,00176	> 0,00176
Sex Ratio	< 0,989	0,989 – 1,031	> 1,031
Poverty Ratio	< 0,134	0,134 – 0,248	> 0,248

Source : Sulistyaningtyas et al., 2024

Table 3. Capacity Parameter Score Classification

Parameter	Low (1)	Moderate (2)	High (3)
Distance to Fire Station	≥ 2.500 meter	1.500 – 2.500 meter	< 1.500 meter
Distance to Hydrant	< 700 meter	350 – 700 meter	> 350 meter
Training and Socialization	None	-	Present

Source : Sulistyaningtyas et al., 2024

The overlay technique was used to perform spatial analysis with ArcGIS software, which involved combining thematic maps of the three primary variables. According to the formula from the Head of BNPB Regulation Number 02 of 2012, the fire risk mapping is as follows:

$$R \approx H \times \frac{V}{C}$$

where:
R : *Risk*
H : *Hazard*
V : *Vulnerability*
C : *Capacity*

Once the risk level has been calculated using the formula, the values are displayed on a map showing fire risk levels. This map illustrates the spatial distribution of fire risk

throughout the study area and enables the identification of high, moderate, and low risk zones.

3. Result and Discussion

A. Analytical Hierachy Process (AHP)

Data was processed using the Analytical Hierarchy Process (AHP) based on feedback from five expert informants from the Fire and Rescue Department (Gulkarmat). These experts made judgements based on pairwise comparisons of parameters within each main variable: hazard, vulnerability, and capacity for fire risk. The results of this analysis yielded priority weights for each parameter, as shown in the table below.

Table 4. Results of the Analytical Hierarchy Process (AHP) for Hazard Parameters

Parameter	Final Weight
Urban Density	0.491
Settlement Density	0.145
Building Quality	0.301
Road Classification	0.063
Total	**1.000**

Source: Processed Data, 2025

Table 5. Results of the Analytical Hierarchy Process (AHP) for Vulnerability Parameters

Parameter	Final Weight
Age Group Ratio (Vulnerable)	0.362
Poverty Ratio	0.273
Gender Ratio	0.092
Disability Ratio	0.273
Total	**1.000**

Source: Processed Data, 2025

Table 6. Results of the Analytical Hierarchy Process (AHP) for Capacity Parameters

Parameter	Final Weight
Distance to Fire Station	0.301
Distance to Hydrant	0.068
Training and Socialization	0.631
Total	**1.000**

Source: Processed Data, 2025

B. Hazard Level Mapping in Tanah Abang District

The fire hazard map in Tanah Abang District was created through an overlay process that involved the integration of multiple datasets, such as population density, habitation density, building quality, and road classification. Out of the seven urban villages, only Gelora is classified as having a low fire hazard level, according to the analysis. With a population of 3,657, this village covers an area of 2.59 km², resulting in

a substantially lower population density than other regions. Moreover, the majority of Gelora is composed of non-residential zones, including office complexes and verdant open spaces in the Gelora Bung Karno area, which naturally mitigate the potential fire risk.

On the other hand, urban villages with a high density of buildings tend to have higher levels of fire hazard. In such regions, the presence of flammable construction materials can significantly impede firefighting efforts, as well as the limited road access and confined spacing between buildings (Sumadi et al., 2022). In numerous densely populated areas of Tanah Abang, the constricted local streets are challenging for large vehicles to navigate. The mobilisation of fire trucks during emergencies is significantly impeded by the absence of broad main roads. These access constraints can delay both evacuation and extinguishing efforts during a fire, thereby increasing the potential for losses.

The hazard level is further exacerbated when there is a lack of adequate spatial planning with a high population density. Increased fire risk and impact are substantially influenced by factors such as building size regulation, spacing between structures, construction quality, and road width (Herlambang & Purnomo, 2017). High-hazard zones are defined as regions that exhibit a combination of low building quality, inadequate road infrastructure, and dense settlements. Particularly in enclosed and confined neighbourhoods, the potential for fire spread is much greater and more challenging to manage under these circumstances. This results in a highly vulnerable environment to large-scale conflagration and reduces the time available for emergency response and evacuation (see Fig. 2).

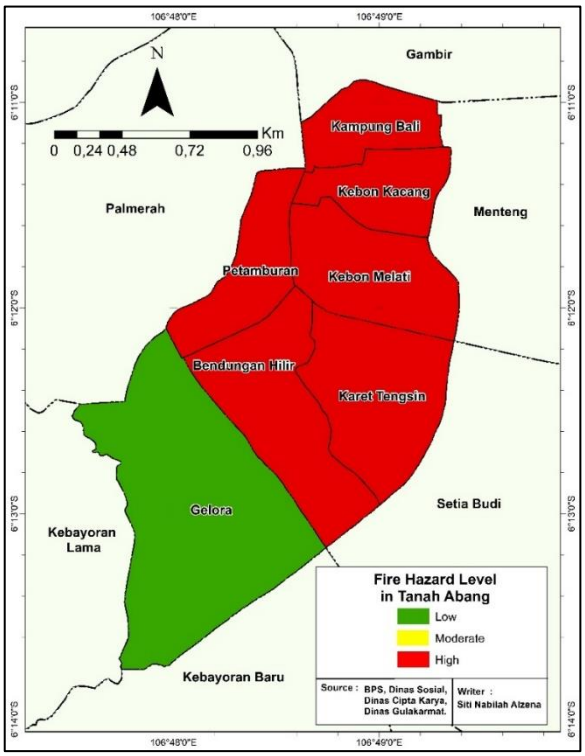

Figure 2. Fire Hazard Level Map of Tanah Abang
Source: Processed Data, 2025

C. Vulnerability Level Mapping in Tanah Abang District

Using four essential indicators gender ratio, vulnerable age groups, poverty level, and persons with disabilities the mapping of social vulnerability to fire in Tanah Abang District was conducted (see Fig. 3). It is generally more challenging for these groups to evacuate without assistance due to their limited mobility and response capabilities during disasters (Pahleviannur et al., 2023; Puspitotanti & Karmilah, 2022). The analysis demonstrates that Petamburan Village is the most vulnerable due to a combination of a high number of impoverished residents, an imbalanced gender ratio, and a substantial proportion of individuals with disabilities. Conversely, Gelora and Bendungan Hilir Villages demonstrate low levels of vulnerability due to their relatively low poverty rates and more equitable gender composition. In contrast, the elderly and infants are generally evenly distributed throughout all villages.

Regardless of population density, the primary determinants of social vulnerability in nearly all urban villages of Tanah Abang are high rates of poverty and disability. This vulnerability is primarily influenced by the following factors: limited access to information, difficulty in evacuation mobility, and feeble economic resilience. Those with disabilities, particularly those with hearing or visual impairments, encounter difficulties in self-evacuation and receiving early warnings (Hapsoro & Buchori, 2015) Simultaneously, low-income communities are inclined to reside in high-risk environments and possess restricted access to recovery and protection services (Hallegatte et al., 2020). These circumstances indicate that poverty not only exacerbates the effects of disasters but also impedes the capacity to recover in a timely and sustainable manner.

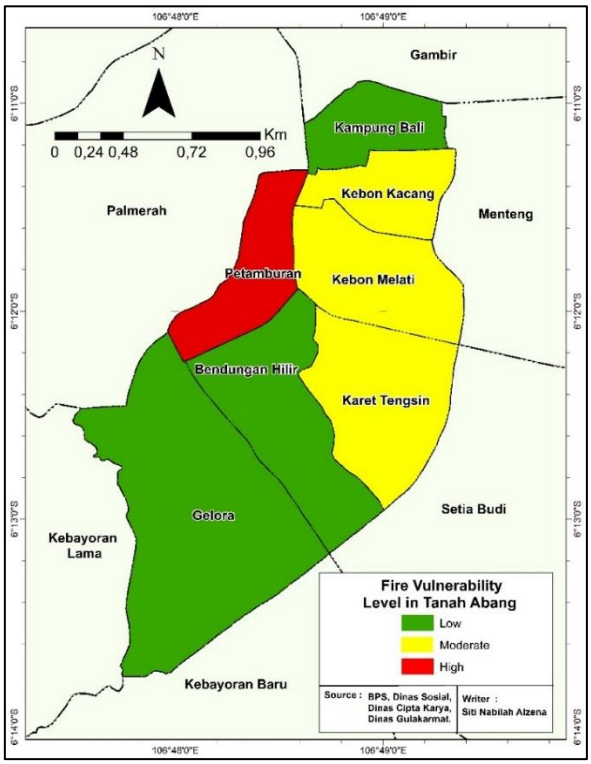

Figure 3. Map of Fire Vulnerability Levels in Tanah Abang District

Source: Processed Data, 2025

D. Capacity Level Mapping in Tanah Abang District

The mapping of fire response capacity in Tanah Abang District was based on three key parameters: distance to hydrants, distance to fire stations, and the level of community training and outreach. The district has 40 city hydrants, 2 community hydrants, and 6 fire station (see Fig. 4), which improves the overall fire response infrastructure. The investigation shows that high-capacity areas encompass 10.76 km², while low-capacity areas account for only 0.72 km². One of the most important considerations is the distance from the nearest fire station. Areas more than 2.5 km from a fire station typically have slower response times, increasing the overall risk and effect of fire events (Evalianto et al., 2024). High capacity indicates a strong resilience to fire threats, especially in communities that have undergone basic training and awareness education. This understanding enables residents to quickly manage small fires before they turn into major ones. Furthermore, proximity to a fire station provides the benefit of faster emergency response. An effective protective system not only speeds up response efforts, but also reduces the impact of fires on human safety, the environment, and infrastructure (Saraswati & Cahyono, 2017).

Meanwhile, the existence of hydrants does not directly improve community fire response capacity because their use is often limited to professional firefighters. Although hydrants are technically crucial in assisting extinguishing operations, homeowners continue to rely on firefighting teams' ability to operate them successfully. As a result, proximity to a fire station is more strategically valuable because it has a direct impact on response time. In addition, training and outreach are critical components in developing internal community resilience. Residents who are trained with the abilities to identify and respond to early-stage fires on their own can reduce the chance of the fire spreading to larger regions.

In numerous regions, greater public awareness of fire safety has sparked community-led projects to construct self-funded hydrants. Despite their limited extent, these independent hydrants constitute a tangible step towards improving early response capability. These hydrants are typically located near densely populated settlements that are at high danger of fire, allowing them to be accessed faster before professional assistance comes. Such initiatives demonstrate an increasing level of community involvement in local fire risk mitigation activities.

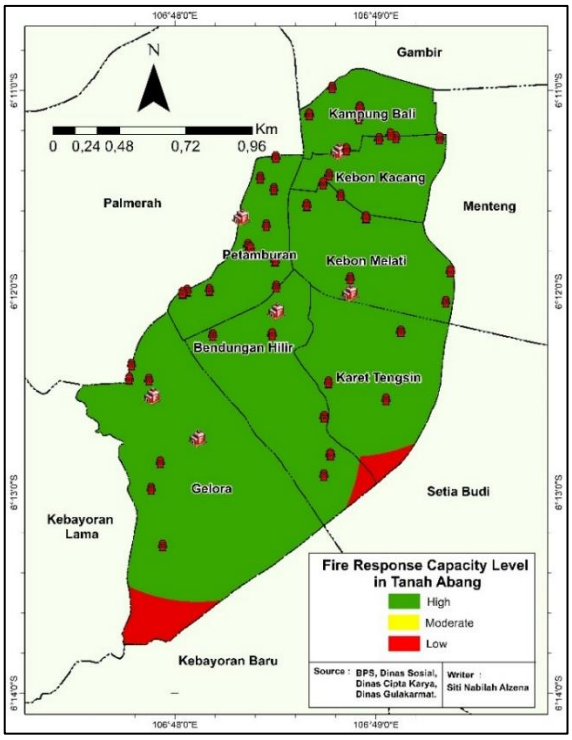

Figure 4. Fire Capacity Map of Tanah Abang District
Source: Data Processing, 2025

E. Fire Risk Level Mapping in Tanah Abang District

The Indonesian National Disaster Management Agency's (BNPB) risk analysis methodology, which has three main parts: hazard, vulnerability, and capacity, was used to make the fire risk map of Tanah Abang District. This method gives a whole picture of how often fires are to happen in a certain area and what their effects might be, as well as how well the area can respond to and lower those risks. The study finds that a large part of the district, about 6.92 km² or 68.38 percent of the entire area, is at intermediate risk. Almost all of the urban villages are in this zone, including Bendungan Hilir, Karet Tengsin, Kebon Melati, Petamburan, Kebon Kacang, Kampung Bali, and a tiny part of Gelora (see Fig. 5). This condition shows that there is a balance between the level of fire risk and the ability to respond. These moderate-risk locations don't fall into the high-risk category, but they still need close attention through initiatives to improve firefighting infrastructure and make communities more prepared.

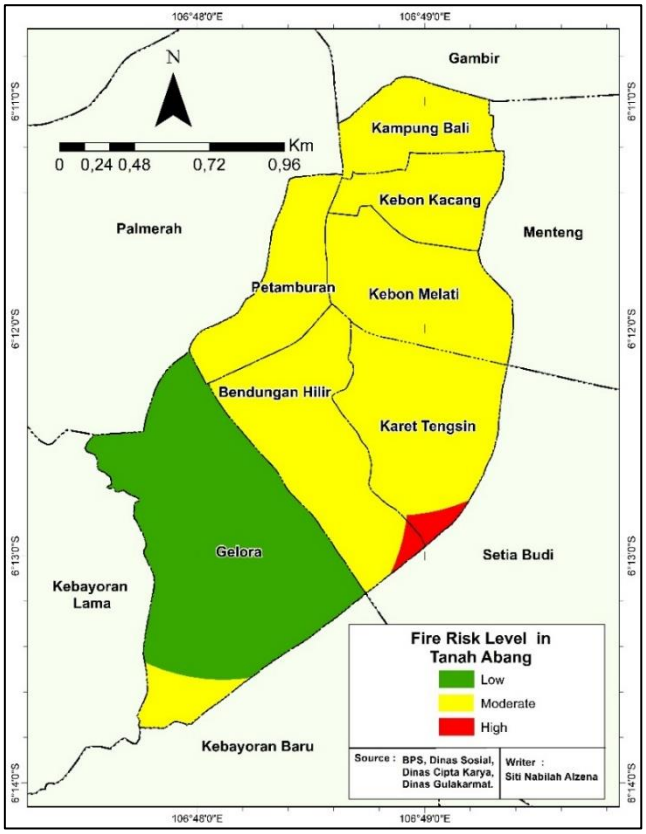

Figure 5. Fire Risk Map of Tanah Abang District
Source: Data Processing, 2025

These urban settlements are classed as moderate-risk regions because to their relatively high levels of hazard and susceptibility, which are not currently supported by adequate fire response capabilities. Only one urban village—Gelora—has a low-risk designation, accounting for around 3.08 km² (30.44% of the total area). This community has more stable environmental conditions, greater infrastructure, and lesser vulnerability than other locations. These variables make Gelora the only place with a minimal likelihood and impact of fire events.

Table 7. Area Distribution of Fire Risk in Tanah Abang District

Sub-district	Total Area		
	Low	Moderate	High
Gelora	3,08 km².	0,254781 km²	-
Bendungan Hilir	-	1,58 km²	0,045268 km²
Karet Tengsin	-	1,529214 km²	0,074381 km²
Kebon Melati	-	1,250592 km	-
Petamburan	-	0,88 km²	-
Kebon Kacang	-	0,734466 km²	-
Kampung Bali	-	0,689465 km²	-

Source: Data Processing, 2025

High risk areas are located in Bendungan Hilir and Karet Tengsin, accounting for only 0.12 km² or 1.18% of the district's total size. Despite their small size, these zones show a high level of hazard and susceptibility that is not offset by adequate mitigation capability. As a result, these findings underscore the significance of enhancing mitigation methods, particularly in the district's moderate-risk zones, while also focussing on smaller high-risk areas.

F. Mitigation Efforts That Have Been Implemented

Fire mitigation efforts in Tanah Abang District are implemented through technical, social, and policy-based approaches aimed at preventing and minimizing impacts before incidents occur (Ngabito et al., 2024). One of the most effective approaches is strengthening community capacity, as residents are the first to face disasters. With adequate knowledge and preparedness, communities can respond to emergency situations swiftly and appropriately (Argarini, 2020)

Public outreach and training also play a crucial role in enhancing community readiness (Mulyadi et al., 2023). The Fire and Rescue Department (Gulkarmat), in collaboration with the Regional Disaster Management Agency (BPBD), regularly conducts awareness campaigns, fire extinguisher (APAR) training, and fire drills targeting various community groups—from neighborhood associations (RT/RW) and kindergarten children to users of public facilities. Through hands-on education such as training and simulations, participants gain direct experience that improves preparedness and capacity while fostering a culture of safety and building resilient communities (Juhadi et al., 2017). Such experiential learning also contributes to the development of care and empathy—key components of disaster responsiveness (Cahyani & Suharini, 2021).

Figure 6. Awareness Campaign, Training on Fire Extinguisher (APAR) Use, and Fire Suppression Simulation.
Source: Dinas Gulkarmat. 2024

These educational efforts are not only delivered through in-person neighborhood meetings but are also expanded via digital platforms, including social media and online videos, and reinforced through visual information such as warning stickers displayed in public facilities. This multifaceted approach increases the likelihood that mitigation messages are widely received and understood across various segments of the population, thereby fostering a more risk-aware and collectively prepared environment.

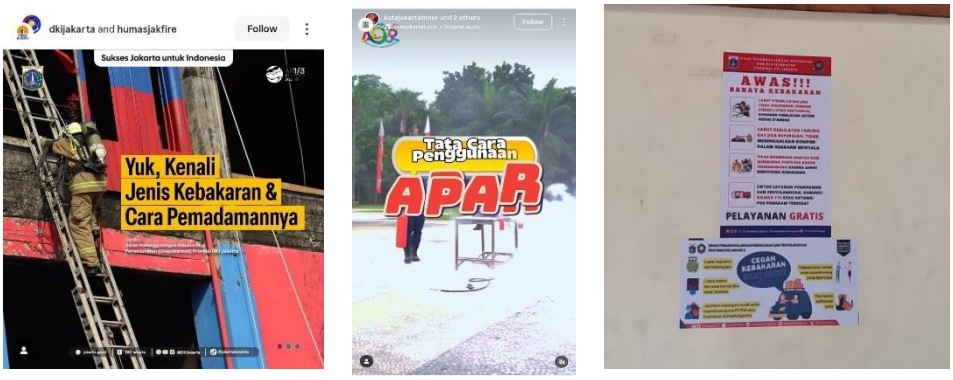

Figure 7. Approaches to Fire Safety Education Using Social and Visual Media
Source: Dinas Gulkarmat. 2024

Furthermore, the establishment and training of Community Fire Volunteers (Relawan Kebakaran or Redkar) in each urban village are essential components of fire mitigation efforts. These volunteers are instrumental in the initial response to fire incidents and are tasked with the direct provision of informal fire safety education to residents. Additionally, they receive instruction in technical skills, including the utilisation of fire extinguishers, evacuation protocols, and fire incident reporting protocols. Redkar functions as an effective intermediary between the local population and professional firefighters due to their direct engagement at the community level.

Figure 8. Development of Community Fire Volunteers (RedKar)
Source: Dinas Gulkarmat. 2024

From an infrastructural standpoint, the government additionally advocates for community engagement via the "GEMPAR" program (Gerakan Masyarakat Punya APAR, or Community Movement for Fire Extinguisher Ownership) (see Fig. 9). This program seeks to guarantee that each household and public facility possesses a portable fire extinguisher (APAR) for use in emergencies. The allocation of APARs is executed by cross-sector collaboration, incorporating input from the business sector. Alongside fire extinguishers, the installation of independent hydrants in densely populated regions addresses the challenge of restricted access for fire trucks. These hydrants are outfitted with water storage tanks and an extensive network of pipelines within the neighbourhood, guaranteeing a reliable water supply even when firefighting trucks are unable to access the fire site.

Figure 9. Community-Based Hydrant Houses and Boxes in Karet Tengsin
Source: Observation, 2025

4. Conclusion

There are different categories of fire danger in the Tanah Abang District. Most locations are at moderate risk because they have significant levels of hazard and susceptibility but not enough resources to deal with them. Gelora Urban Village is the only place that is considered low risk since it has a low population density, a lot of non-residential spaces, and excellent infrastructure. Building density, poor road access, social disparity, and the distance to fire stations are all important factors that affect the risk of fire. Education, community training, the establishment of Redkar volunteer teams, the provision of fire extinguishers (APAR) and independent hydrants, as well as visual and digital public communication have all been used to help with mitigation. But improving the community's ability to respond to fires and building up its infrastructure is still a top concern, especially in places with a lot of people living there. Combining spatial techniques with the AHP method has been useful for finding out where the risks are and helping to plan more focused fire mitigation in cities.

5. Acknowledgment

The author would like to sincerely thank the staff of the Fire and Rescue Sub-Department (Gulkarmat) of Tanah Abang Sector, especially Mr. Feri, for all the help and support they gave during this research. We also want to thank the firemen in Sector 7 Tanah Abang for giving us useful information about how to respond to fires in the field. The author would also like to thank the Jakarta Provincial Sub-Department and the Department of Human Settlements (Dinas Cipta Karya) for their help and assistance in making this research possible.

6. References

Argarini, T. O. (2020). *Strategi Pengurangan Risiko Bencana Kebakaran di Kawasan Permukiman Padat Melalui Peningkatan Kapasitas Masyarakat di Kapas Madya Baru*. https://doi.org/10.12962/j2716179x.v15i2.7509

Badan Pusat Statistik Kota Administrasi Jakarta Pusat. (2024a). *Kecamatan Tanah Abang Dalam Angka 2024*.

Badan Pusat Statistik Kota Administrasi Jakarta Pusat. (2024b). *Kota Jakarta Pusat Dalam Angka 2024*. *40*(November 2021), 2021–2022.

https://jakpuskota.bps.go.id/publikasi.html

Badan Pusat Statistik Provinsi DKI Jakarta. (2024a). *Pertumbuhan Ekonomi DKI Jakarta Triwulan III-2024*.

Badan Pusat Statistik Provinsi DKI Jakarta. (2024b). *Provinsi DKI Jakarta Dalam Angka 2024*.

Cahyani, Y. F., & Suharini, E. (2021). Kesiapsiagaan Masyarakat dalam Menghadapi Bencana Kebakaran di Kampung. *Edu Geography*, *9*(1), 57–65.

Evalianto, A. R., Mataburu, I. B., & Muzani. (2024). Analisis Lokasi Pos Damkar Berdasarkan Peta Kerawanan Kebakaran. *JPIG (Jurnal Pendidikan Dan Ilmu Geografi)*, *9*(2), 160–169. https://doi.org/10.21067/jpig.v9i2.10301

Fattahanisa, A., Ristawati, A., Widiyatni, H., & Purwiyono, T. T. (2022). Peningkatan Keterampilan Warga Cluster Venezia Parung Panjang Terhadap Penanggulangan Kebakaran Di Rumah. *Jurnal Abdi Masyarakat Indonesia (JAMIN)*, *4*(2). https://doi.org/10.25105/jamin.v4i2.14027

Firman, F., Gazalin, J., & Wijaya, A. A. M. (2023). Program Pembelajaran Mitigasi Bencana Kebakaran Sejak Usia Dini Pada Dinas Pemadam Kebakaran Dan Penyelamatan Kota Baubau. *Jurnal Inovasi Penelitian*, *2*(1), 349–365. https://doi.org/10.47492/jip.v4i1.2603

Hallegatte, S., Vogt-Schilb, A., Rozenberg, J., Bangalore, M., & Beaudet, C. (2020). From Poverty to Disaster and Back: a Review of the Literature. *Economics of Disasters and Climate Change*, *4*(1), 223–247. https://doi.org/10.1007/s41885-020-00060-5

Hapsoro, W. A., & Buchori, I. (2015). Kajian Kerentanan Sosial Dan Ekonomi Terhadap Bencana Banjir (Studi Kasus: Wilayah Pesisir Kota Pekalongan) Arsiadi Wisnu Hapsoro[1] dan Imam Buchori[2] 1. *Jurnal Teknik PWK*, *4*, 542–553. https://doi.org/10.14710/tpwk.2015.9814

Herlambang, A. A., & Purnomo, N. H. (2017). Tingkat Kerentanan Pemukiman Terhadap Potensi Bahaya Kebakaran di Wilayah Padat Penduduk di Kelurahan Peneleleh Kecamatan Genteng Kota Surabaya. *Swara Bhumi*, *04*(03), 39–43. https://ejournal.unesa.ac.id

Indriani, S. A. . & N. S. F. (2023). Analisis Pengaruh Produk Domestik Regional Bruto, Investasi, Indeks Pembangunan Manusia, Angka Kelahiran Terhadap Kepadatan Penduduk Di Provinsi Jawa Tengah Tahun 2020-2021. *Prosiding Seminar Nasional & Call for Paper Fakultas Ekonomi* , *2*, 433–443.

Januandari, U., Rachmawati, T. A. R., & Sufianto, H. (2017). Analisa Risiko Bencana Kebakaran Kawasan Segiempat Tunjungan Surabaya. *Jurnal Pengembangan Kota*, *7062*(November), 1–10. https://doi.org/10.14710/jpk.5.2.

Juhadi, Hidayah, I., Nugraha, S. B., & Banowati, E. (2017). Disaster Education Model for Early Childhood. *Geography and Geography Education*, *1*(2), 89–93. https://doi.org/10.24036/sjdgge.v1i2.91

Mulyadi, R., Putra, N., & Angelin, N. (2023). Sosialisasi Mitigasi Bencana Kebakaran

Menggunakan Alat Deteksi Kebakaran Berbasis IOT Pada Mahasisa Trem Institusi Kesehatan dan Teknologi AL Insyirah. *Jurnal Pengabdian Masyarakat Teknik*, *6*(1), 33. https://doi.org/10.24853/jpmt.6.1.33-42

Muzani. (2020). *Bencana Kebakaran Permukiman*. Deepublish.

Ngabito, O. F., Abid, I., Faqiih, A., Ramadhan, D. N., Analisa, I., Mingkala, M. R., Faradilla, C. D., Putri, J. C., Suryaatmadja, R., & Rezkiyah, Z. (2024). *Strategi Mitigasi Bencana Pada Pemukiman Padat*. *3*(1).

Pahleviannur, M. R., Ayuni, I. K., Widiastuti, A. S., Umaroh, R., Aisyah, H. R., Afiyah, Z., Azzahra, I., Chairani, M. S., Dhafita, N. A., Rohmah, N. L., Sudrajat, S., Mardiatno, D., Rachmawati, R., & Rahardjo, N. (2023). Kerentanan Sosial Ekonomi terhadap Bencana Banjir di Hilir DAS Citanduy Bagian Barat Kabupaten Pangandaran Jawa Barat. *Media Komunikasi Geografi*, *24*(2), 189–205. https://doi.org/10.23887/mkg.v24i2.66370

Prayojana, T. W., Fazri, A. N., & Saputra, B. (2020). Dampak Urbanisasi Terhadap Pemukiman Kumuh (Slum Area)(The Impact of Urbanization on Slum Settlements (Slum Areas). *Jurnal Kependudukan Dan Pembangunan Lingkungan*, *2*(1), 13–22. http://jkpl.ppj.unp.ac.id/index.php/JKPL/article/view/12/7

Puspitotanti, E., & Karmilah, M. (2022). Kajian Kerentanan Sosial Terhadap Bencana Banjir. *Jurnal Kajian Ruang*, *1*(2), 177. https://doi.org/10.30659/jkr.v1i2.20023

Saraswati, D. F., & Cahyono, A. B. (2017). Analisis Daerah Risiko Bencana Kebakaran di Kota Surabaya dengan Menggunakan Sistem Informasi Geografis. *Jurnal Teknik ITS*, *6*(2), 1–4. https://doi.org/10.12962/j23373539.v6i2.24410

Sulistyaningtyas, S. A., Nugraha, A. L., & Hadi, F. (2024). Analisis Risiko Bencana Kebakaran Permukiman Menggunakan Metode Analytical Hierarchy Process (Studi Kasus : Kecamatan Banyumanik Dan Tembalang, Kota Semarang). *Jurnal Goedesi Undip*, *3*(1), 48–57. https://doi.org/10.14710/jgundip.2024.42258

Sumadi, R. L., Kristanti, L., Firdha Khairunnisa, N., & Amanda Putri Asheka, N. (2022). A. Risiko Kebakaran Terhadap Wilayah Permukiman Padat di Kecamatan Penjaringan, J. Utara. *Jurnal Sains …*, *11*, 13220. https://doi.org/10.2210/jsg.vx1ix.xxx

Trifianingsih, D., Agustina, D. M., & Tara, E. (2022). Kesiapsiagaan Masyarakat Dalam Menghadapi Bencana Kebakaran Di Kota Banjarmasin (Community Preparedness To Prevent Fire Disaster In The City Of Banjarmasin). *Jurnal Keperawatan Suaka Insan (Jksi)*, *7*(1), 7–11. https://doi.org/10.51143/jksi.v7i1.301

Zaera, M. R. P. (2024). Faktor dan Dampak dari Peningkatan Urbanisasi di DKI Jakarta pada Tahun 2023. *Jurnal Wahana Bina Pemerintahan*, *6*(1), 38–42. https://doi.org/10.55745/jwbp.v6i1.167