



SENSE OF PLACE IMPACT ON MIGRATION PATTERN OF BUMI SEMERU DAMAI RESETTLEMENT SURVIVOR, INDONESIA

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Abstract

The completion of building facilities and economic empowerment activities in Bumi Semeru Damai (BSD), a settlement developed to accommodate survivors of the 2021 Mount Semeru eruption, failed to curb the return of former Semeru residents to their original dwelling site in the high-risk zone. By 2024, many of the houses in BSD were left uninhabited, as the owners had abandoned them, and returned to their native land. According to the findings from previous studies, the effectiveness of a relocation exercise is determined by the affected population's sense of place (SP). As such, this investigation delves into the influence of SP, on the decision-making process of Mount Semeru eruption survivors, in terms of remaining in BSD, or migrating. Hermeneutic phenomenology research methods involve the gathering of data through census and semi-structured interviews, with four key figures. According to the results derived, in the context of the migration pattern (MP), 326 households were involved in either a short-term-domestic migration (after two days, a week, or a month, from BSD to their land of origin), or a long-term- external migration (after about a year, from BSD to another urban location). The factors influencing the MP of these households include their risk perception (RP), their socio-economic capital (SEC), the socio-ecological system (SES) of BSD, their place identity (PI), their place dependence (PD), their societal bonds (SBs), and their place attachment (PA). The findings derived through this undertaking, can be harnessed, for resettlement efforts that support the sustainable livelihood of the affected population.

Keywords: Bumi Semeru Damai, Indonesia, migration pattern, sense of place, The Semeru eruption 2021

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INTRODUCTION

Relocation is considered upon the destruction of a residential area, brought about by a major disaster. In Indonesia, among the post-disaster settlement relocation processes deemed successful, in terms of development pace and inclusiveness of supporting infrastructure, is the Bumi Semeru Damai (BSD) permanent residence, a relocation area for residents affected by the 2021 eruption of Mount Semeru in Lumajang, East Java. The difficulties frequently encountered, by disaster survivors in relocation areas, include livelihood issues, the inability to adapt to a new environment, and a variety of socio-economic as well as demographic problems (Setyonugroho & Maki, 2024). Additionally, the development of the supporting physical infrastructure, needs to take the environmental, social, cultural, economic and sustainability aspects into consideration (Sina et al., 2019), while bridging the social gap between the migrant villagers and the resident villagers, at the relocation site (Daly et al., 2023).

Swapan and Sadeque (2021) opined, that the sense of place (SP) influences the migration patterns (MPs), of those in disaster areas. SP can be separated into two categories: place-based attachment, and psychologically-based attachment. Those experiencing the occurrence of sudden and frequent natural disasters, endure recurring economic losses, a situation which renders migration more acceptable. From a psychological standpoint, an individual would welcome the security and safety offered by a new environment, in place of the risks and uncertainties, posed by his/her natural disaster-prone area of origin (AOO) (Swapan & Sadeque, 2021). The research conducted by Depari and Lindell (2023), focusing on volcanology, revealed that while people are not against moving from their AOO to a new and safer location, they would prefer that the new location be close to their AOO.

Our initial surveillance of BSD revealed a substantial number of unoccupied residences. According to residents in the area, among the reasons for the departure of the house-owners, is their yearning to return to their homes in their AOO. In view of this situation, this study investigates the issues associated with the migrated residents of BSD, based on the following research questions. (1) How well did the BSD migrated residents cope, with life in a new environment? (2) How does PA influence the MP of BSD residents? And (3), why do the majority of migrated BSD residents eventually return to their AOO?

The mount Semeru eruption tragedy prompted the development of the BSD resettlement scheme, which is aimed at providing the affected residents with a safe and sustainable way of life.

LITERATURE REVIEW

Bumi Semeru Damai (BSD) as a Resettlement Area for the 2021 Mount Semeru Eruption's Survivors

The people of Lumajang Regency, in the East Java province of Indonesia, live under the constant threat of volcanic eruptions. Located in the vicinity of their homes, at 3676 meters above sea level, is Mount Semeru, the highest and most active type of stratovolcano on the island of Java (Solikhin et al., 2012). Its eruption on the 4th of December, 2021, resulted in 51 deaths, and the displacement of residents across 410 evacuation centres in Pasirian District (n=1746), Candipuro District (n=4645) and Pronojiwo District (n=1077). The rapid flow of hot clouds (containing a combination heated lava chunks, pumice, ash and volcanic gas), down the southeast slope, extended as far as 20 kilometres, sweeping away 2 square kilometres of settlements and agricultural land in Besuk Kobokan (Realita et al., 2022). The heavy rainfall at the top of Mount Semeru, shortly after the eruption, exacerbated the situation, by triggering a devastating flood of lava flow (Gomez et al., 2018). According to Bachri (2023), scenario modelling for the next ten years, ending 2032, suggests that the development of built land, unaccompanied by responsible land use and regional planning, significantly raises the disaster risk potential (Bachri et al., 2024; Irawan et al., 2024; Sumarmi et al., 2020). The BSD Permanent Residence was developed on 90.98 hectares of land in Sumbermujur Village, Candipuro District, in response to the 2021 Mount Semeru volcanic eruption disaster. The map of the Semeru disaster prone area (KRB), places BSD precisely on the eastern slope of Mount Semeru. In the decree of the Regent of Lumajang Number 1 in 2022, concerning the implementation of temporary housing for the natural disaster victims of the Mount Semeru eruption, it is stated that all victims who had lost their homes are entitled to housing assistance in BSD. Residents located in the Kamar Kajang Hamlet, Kebondeli Utara Hamlet, Kajar Kuning Hamlet in Sumberuwluh Village, Curah Kobokan Hamlet, Summersari Hamlet, and Gumuk Mas Hamlet in Supiturang Village, whose houses remained intact, were also relocated to BDS, as these locations are considered part of the disaster prone red zone.

Correlation between Sense of Place (SP) and Migration Patterns (MP)

Sense of place (SP) refers to human bonds with a location, in terms of experiences associated with family and friends, traditions, and the accumulation of memories over time (Binoy, 2022). The factors influencing SP include PA, place identity (PI), place dependence (PD) (Wartmann and Purves, 2018), societal bonds (SBs), socio-economic capital (SEC), and the socio-ecological system (SES) (Swapan and Sadeque, 2021). PA is associated with affective attitudes, PI is associated with cognitive attitudes, while PD is associated with conative attitudes (Svensson, 2019). According to Scannell and Gifford (2010), PA research involves three main aspects: people, places and processes (Lewicka, 2011).

The findings derived through research focusing on SP, can be harnessed for the development of disaster management strategies (Baldwin et al., 2017). This can be attributed to the influence of SP, on the decision-making process of individuals, enduring the after-effects of a natural disaster. Swapan (2020) separated the relationship between SP and the MP into two categories: communities which migrate easily and communities which migrate with difficulty, with each category influenced by place-based attachment and psychologically-based attachment, respectively. Furthermore, the decision-making process of an individual, with regards to migration, is influenced by his/her risk perception (RP), in terms of the potential dangers existing in an unfamiliar location. An individual's decision-making process, with regards to migration, may be influenced by issues related to security, adverse situations, and apprehension (Peng et al., 2017). Whether the disaster occurs suddenly or gradually, also determines whether it is easier or more difficult for an individual to migrate (Chumky, Basu, Onitsuka, & Hoshino, 2022; Chumky, Basu, Onitsuka, Parvin, et al., 2022).

RESEARCH METHODOLOGY

Study Area

In the map defining the disaster-prone areas of Semeru Southeast Sector, BSD is located in the KRB II zone. This implies that this area is susceptible to hot clouds, lava flows, and incandescent rock avalanches. The occurrence of accelerated lava dome growth, and more intensive eruptions, will prompt the extension of this disaster-prone area, through the establishment of KRB III. KRB II is labelled high risk for settlements and human activities, as the occurrence of natural disasters in this area can lead to casualties, infrastructure damage, and property loss. Figure 1 depicts the location of BSD, with the distribution of buildings in its landscape.

The visual appearance of the houses, dispensed to surviving victims of the Mount Semeru eruption, is portrayed in Figure 2. Of the 1951 housing units constructed, 1920 are currently occupied by migrated residents. The housing unit received by each household is termed a 'healthy, simple, and instant house' (RISHA). The assembly of a RISHA involves the employment of modular construction technology, which is not only trouble-free and quick, but also free of construction residues (Opabola et al., 2023). The RISHA concept represents a swift response to the housing needs of natural disaster victims (Lines et al., 2022). Each RISHA comes with a building area of 36m² (6m by 6m), a land area of 10m by 14m, one living room, two bedrooms, one toilet, a front terrace, a garbage can, electrical installations, clean water supply, and an integrated waste disposal system.



Figure 1. The Studied Area
Source: Author, 2024



Figure 2. An Example of a RISHA in the Studied Area
Source: On-site Observation, 2024

Bumi Semeru Damai (BSD) Home Occupancy Data

A census was conducted in March, 2024, to ascertain the number of residents occupying the units allotted to them. This census is based on data regarding the list of houses constructed and owned by the Lumajang Regency Regional Disaster Management Agency. The 1,951 housing units involved in this undertaking were grouped under three categories: (1) houses inhabited by recipients, (2) houses unoccupied/abandoned by recipients, and (3) houses inhabited by owners who have migrated. The census was carried out by residents, following a brief training session conducted by the researchers.

Selection of Key Informants for Semi-Structured Interviews

The technique of selecting key informants in semi-structured interviews with a quota sampling strategy was carried out by considering the role, organization, experience, and AOO. To fulfill these eligibilities, the author found four BSD residents (Table 1) as key informants, who have information about the migration phenomenon carried out by some BSD residents.

Table 1. The Characteristics of the Key Informants

Initial	Age	Sex	AOO	Role in the Community	Occupation
T	39	Female	Kebondeli Utara	Women Religious Organisation	Self-employed
L	64	Male	Kamar Kajang	Security	Private Sector
S	29	Female	Sumbersari	Citizen	Housewife
N	47	Male	Curah Kobokan	Resettlement Coordinator	Food Trader

Source: Author, 2024

Hermeneutic Phenomenology with Van Manen Analysis

For this study, we employed the hermeneutic phenomenology method to examine the experiences and emotions of the migrated residents of BSD, and the Van Manen's technique for the analysis of our findings. Interview transcripts were categorised thematically rather than chronologically, to place emphasis on the fundamental themes of the migration phenomena (Depari & Lindell, 2023).

Table 2. The Questions in the Semi-Structured Interview That Were Based on the Conceptual Framework of the Correlation between SP-MP

Domains		Questions	Source
Risk Perception (RP)	RP1	Do you know which disaster-prone zone BSD is located in?	(Bachri et al., 2015, 2023, 2024; Peng et al., 2017)
	RP2	Is BSD safer than your AOO?	
	RP3	In the next 10 years, could another Mount Semeru eruption affect BSD?	
	RP4	Would the impact of another Mount Semeru eruption be greater on BSD or your AOO?	
	RP5	Were you scared when Mount Semeru erupted?	
	RP6	Are you afraid that another Mount Semeru eruption and lava floods could affect BSD?	
Socio-economic Capital (SEC)	SEC1	Do you still have economic assets in your AOO after the 2021 Mount Semeru eruption?	(Islam & Walkerden, 2014)
	SEC2	Do you have residential assets in another area?	
	SEC3	Do you have family that can provide you with long-term accommodation in another area?	
Socio-Ecological System (SES) of BSD	SES1	Does the BSD have agricultural infrastructure to support residents who were originally farmers?	(Mallick, 2019)
	SES2	Does the BSD have livestock infrastructure to support residents who were originally farmers?	
	SES3	Does the BSD have related infrastructure to support residents who were originally sand miners?	
Place Identity (PI)	PI1	Is BSD located in a more strategic location than your AOO?	(Roosli et al., 2022)
	PI2	Is BSD easier to access than your AOO?	
	PI3	Is BSD more comfortable than your AOO?	
	PI4	Are the facilities in BSD more complete than in your AOO?	
	PI5	Is BSD equipped with safer facilities than your AOO?	
Place Dependence (PD)	PD1	Does BSD provide a better life than your AOO?	(Zheng et al., 2019)
	PD2	Is BSD more suitable for Mount Semeru survivors?	
	PD3	Are you satisfied with life in BSD?	
Societal Bonds (SB)	SB1	Was it easy to leave your AOO?	(Peng et al., 2017)
	SB2	Do you want to be separated from your AOO and its local residents?	
	SB3	What does your AOO have that BSD does not have?	
Place Attachment (PA)	PA1	Do you feel proud to live in your AOO?	(Peng et al., 2017)
	PA2	Is your love for your AOO greater than your love for BSD?	

Source: Author, 2024

Van Manen's analysis was performed in four stages: (1) the phenomena listed in the transcripts of each interview was categorised under a specific theme, (2) the common themes in the experiences of the respondents were identified, (3) phenomenological texts were developed based on the themes identified through the literature reviews, and (4) the significance of the identified themes was interpreted (Lindseth & Norberg, 2004).

ANALYSIS AND DISCUSSION

Home Occupancy Rate in Bumi Semeru Damai (BSD)

According to the census findings, more than half of the houses in BSD are occupied by the Mount Semeru disaster survivors. Of the 1951 homes, 1920, or 59% (n=1122) had been handed over to the natural disaster survivors, with 42% (n=799) occupied permanently, and 17% (n=326) inhabited by homeowners who periodically migrated. The remaining 41% of the units (n=795) are either unoccupied, or left abandoned by their homeowners.

Data derived through the census reveals that BSD is inhabited by survivors from 17 hamlets, in seven villages, located in the districts of Pronojiwo and Candipuro. The sole village in the Pronojiwo district is Supiturang Village, which accommodates the hamlets Curah Kobokan, Gumukmas, Supiturang and Sumbersari. The villages and hamlets in the Candipuro District are: (1) Sumberwuluh Village, which accommodates the hamlets Kamar Kajang, Kajar Kuning, Kebondeli Utara, Kebondeli Selatan, Sumberwuluh, Kebonagung, and Kampung Baru, (2) Jugosari Village, which accommodates the hamlets Karang Wage and Sumber Kajar, (3) Krajan Village, which accommodates the hamlet Krajan, (4) Sumber Rejo Village, which accommodates the hamlet Sumber Rejo, (5) Sumbermujur Village, which accommodates the hamlet Sumbermujur, and (6) Penanggal Village, which accommodates the hamlet Wonosari. The majority of BSD residents originate from the Curah Kobokan hamlet, as this hamlet is closest to the peak of Mount Semeru, rendering it worst affected by the 2021 Mount Semeru volcanic eruption. This is in agreement with the findings from previous studies, which report that the location of a dwelling in relation to the disaster source, influences an individual's decision-making process with regards to migration (Mallick, 2019).

The data derived through the census also revealed that the unoccupied housing units belong to homeowners who: (1) had returned to their AOO, (2) have residential assets elsewhere, (3) had passed away, (4) are elderly individuals who had moved to live with their children in other locations, and (5) are orphaned teenagers who had moved to live with siblings in other locations. It is assumed that the increasing number of family cards (KK) being issued, is attributed to the deliberate breaking up of households, for the purpose of spreading out the claims for housing assistance.

N: "The housing assistance given to each family [in BSD] eventually led to many household splits. Prior to the eruption, more than one KK could live in one house, but after the housing assistance, each KK got a house."

Respondents *N* and *T* described the gathering of data from housing assistance recipients as a chaotic process. According to *T*, the data of relocated survivors is deemed unverified, until all stages of the house handover process are fulfilled. As this delay hampered the implementation of the block arrangement, the separation from previous neighbours and familiar faces, made it difficult for the migrated residents to adapt to life in the BSD. In view of this circumstance, the relocation process should include the creation of a housing assistance recipient database, aimed at supporting and retaining the essence of community life (Khusna et al., 2023).

Impact of Sense of Place (SP) on Migration Patterns (MP): To Remain in the Area of Origin (AOO) or to Move to an Area That is Not Truly Safe?

The review of relevant literature indicates that following a disaster, a victim's MP is influenced by his/her SP (Swapan & Sadeque, 2021). A migration behaviour, whether the move from the AOO to another region, or the move from another region back to the AOO, can be influenced by place-based and/or psychologically-based attachments. In the context of the settlement relocation following the 2021 eruption, survivors from 17 hamlets were relocated to BSD. It should be noted that BSD was initially deemed a risky area, due to its location in the KRB II zone, a region affected by the Mount Semeru eruption.

The community's decision, to move from their AOO to BSD, was based on several considerations. For *N* and his neighbours, almost all their houses were severely damaged by hot clouds, and their valuables buried in sand. While *N* is aware that BSD is located in the KRB II zone, he is not overly concerned about another eruption, as his understanding of volcanic morphology places BSD on a safer, though not entirely safe slope of Mount Semeru, and away from the risk of a lava flood landslide. Consequently, based on the premise that BSD is a safer option, *N*'s community group was among the four, that made the decision to embark on the permanent move, from their AOO to BSD. *N* and the other three census participants share the same RP. All four are of the opinion that although BSD is not entirely risk-free, in comparison to their AOO, BSD is less likely to be affected by another eruption. Thus, a positive RP promotes the SB of the community to the place. Slightly different from *N* (who originates from the hamlet closest to the danger source), *S* (who originates from a hamlet farther from the danger source) is of the opinion that the decision of his community group, to permanently move from their AOO to BSD, is based on the assumption that in comparison to their AOO, BSD has a better PI.

S: "In my opinion, life in BSD is more comfortable. The houses are neatly arranged, the roads are good, and the distance to the centre of the sub-district is closer. It is also has an integrated health centre, schools, and other public facilities".

Place identity (PI) is defined as the correlation between humans and the surrounding environment (Tourneau, 2022; Zhao, 2023). Although the survivors of the Mount Semeru eruption migrated to BSD only two years ago, they are impressed by the amiable, safe and comfortable environment the housing area offers. The positive PI demonstrated by BSD, promotes the migration tendency of the disaster victims to this resettlement location (Swapan & Sadeque, 2021).

The results, derived through the semi-structured interviews, also revealed, that the survivors' inclination to accept life in BSD, is attributable to their PD. According to L, the majority of BSD residents are family members or neighbours from the same AOO. As such, although the house block arrangement is not according to their AOO, the residents easily adapted to the new social environment, realising that as survivors of the Mount Semeru disaster, they share the same fate. Thus, an individual's PD, in relation to both family members and neighbours, influences his/her migration decision-making process (Peng et al., 2017).

All four census participants are in agreement that a positive RP of BSD, directly or indirectly influences aspects of SP (SB, PI, PD and PA). This finding is in line with the results derived through a previous study conducted by Peng Li (2017), who reported that SP influences the migration decisions of disaster survivors.

Temporal-Spatial Migration: A Path of Survivorship from Homelessness and an Age of Economic Distress

According to our census data, 326 families living in BSD had migrated. In this context, migration is defined as the act of moving from their BSD home to another area periodically, but eventually returning to their main residence in BSD. This form of migration was exhibited by residents living in three villages (Supiturang Village, Sumberwuluh Village, and Jugosari Village), and two sub-districts (Pronojiwo District and Candipuro District).

As shown in Table 2, the MPs of BSD residents come in spatial and temporal dimensions. In terms of the temporal dimension, the MP performed by the BSD residents can be separated into 11 categories: (a) once every two days, (b) once a week, (c) once every two weeks, (d) once every three weeks, (e) once every month, (f) once every two months, (g) once every three months, (h) once every four months, (i) once every five months, (j) once every six months, and (k) once a year. These 11 MPs can be further separated into two types: short-term migrations (days, weeks or months), and long-term migrations (annual) (Fussel

et al., 2014). As for the spatial dimension, the most frequent MP demonstrated by the BSD residents is the domestic migration, which is from one village to another. External migration was performed annually by 326 families, with the migration destination area located beyond Lumajang City, but within one province of East Java. A total of 22 families migrated to the cities of Surabaya and Madura, returning to BSD once a year during the holiday period. The MP also includes short-term domestic migration, which is explained as migration from BSD to the AOO, then back to BSD, within two days, one week, three weeks, one month, two months, three months, and six months.

Table 3. The MP According to Time and AOO

Village	AOO	Migration Type Based on Time											Σ
		a	b	c	d	e	f	g	h	i	j	k	
Supiturang	Curah Kobokan	0	8	2	0	6	4	0	1	1	1	14	37
	Gumukmas	1	0	0	0	7	0	0	0	0	0	1	9
	Sumbersari	2	6	14	0	17	11	5	1	2	0	2	60
Sumberwuluh	Kamar Kajang	0	18	8	1	18	7	7	5	2	2	3	71
	Kajar Kuning	0	6	1	1	3	0	0	0	0	0	1	12
	Kebondeli Utara	3	24	19	2	38	10	4	1	4	0	1	106
	Kebondeli Selatan	0	16	1	0	5	1	2	1	1	0	0	27
	Kebonagung	0	1	0	0	0	0	0	0	0	0	0	1
Jugosari	Karang Wage	0	1	0	0	0	0	0	0	0	0	0	1
	Sumber Kajar	0	1	0	0	1	0	0	0	0	0	0	2
Total Migration		6	81	45	4	95	33	18	9	10	3	22	326

Sense of place (SP) correlates with the community MP in disaster areas. According to Chumky (2022), the MP triggered by the occurrence of a rapid onset disaster, comes in the form of a hasty migration from village to city. Migrations prompted by slow onset disasters are mainly associated with negative economic conditions (including debts, unemployment and low income), and adverse agricultural situations (such as loss of crop seeds, and cultivation land degradation). It is notable that migration stemming from sudden, unforeseen disasters, is frequently associated with physical issues such as damage to houses, public infrastructures, and public institutions (Chumky, Basu, Onitsuka, Parvin, et al., 2022; Daly et al., 2023; Mbaye, 2017; Mukherjee & Fransen, 2024). The type of migration associated with the BSD residents, can be deemed unique, in comparison to those covered through previous studies. In terms of the temporal dimension, the Mount Semeru eruption can be considered a high intensity rapid onset disaster. Interestingly, however, in addition to the adverse effects of the Mount Semeru eruption, the residents who relocated to BSD are also faced with the slow onset disaster threat of floods. This combination of rapid and slow onset

disaster hazards, has given rise to adaptive migration behaviours, based on economic, physical and institutional infrastructures.

The theme 'Temporal-Spatial Migration: A Path of Survivorship from Homelessness and an Age of Economic Distress' is intended as a survival strategy for homelessness and economic hardship. This theme was derived from the synthesis incorporating a literature review, census data analysis, and semi-structured interview results analysis. The literature review implies that the SEC of migrants, and the SES of BSD, affect the decisions of residents with regards to the issue of migration (Islam & Walkerden, 2014; Mallick, 2019).

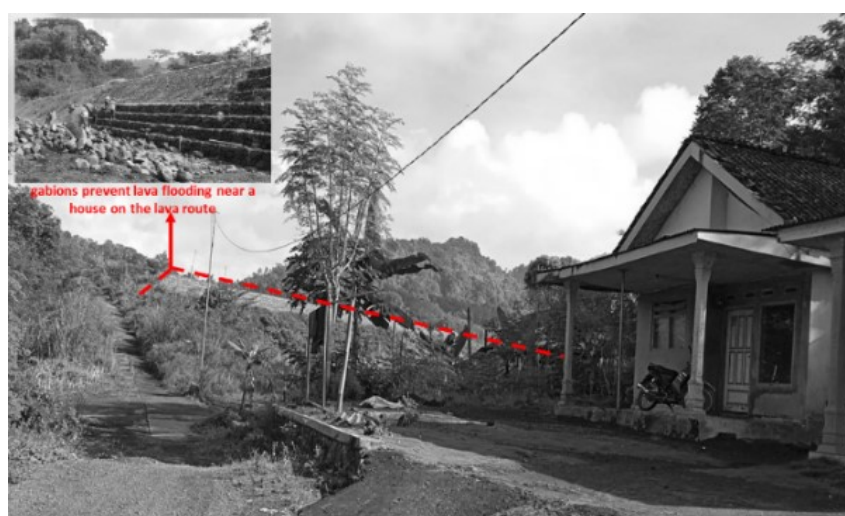


Figure 3. A House in Kebondeli Utara, which is the Destination of the Periodic Migration of BSD Residents

Source: On-site Observation, 2024

In this study, the issue of homelessness is portrayed in two different perspectives: (1) loss of homes and land assets in the AOO, and (2) loss of housing allotment in BSD. Disaster victim migration from the AOO to BSD, is prompted by property damage (severe, moderate or mild), as well as the delineation of red zones through government policies. Thus, inevitably, in order for disaster survivors to receive housing allotments, these government policies need to be adhered to. Residents, whose houses in the AOO were completely damaged, tend to settle in BSD; but for residents whose houses in the AOO remained liveable, whose livelihood assets in the AOO are still manageable, and whose AOO is verified remote from the disaster source; tend to migrate temporally, from BSD to homes in their AOO. For these BSD residents, periodic migrations to their AOO is essential, to maintain the condition of their houses, and its surroundings (Figure 3).

Other than the economic elements in the AOO, other issues, which prompted the migration of residents from BSD, include those associated with the SES. The Decree of the Regent of Lumajang Number 188.45/191/427.12/2022 concerning the Master Plan for Relocation for Victims of the Mount Semeru Eruption Natural Disaster, states that the BSD resettlement scheme is to include plantation areas, integrated cage areas, and trade facilities that support the economic activities of its residents. At the commencement of this research, the completed infrastructures were limited to the integrated cages. The economic assistance efforts were also not in agreement with the occupation of the residents in their AOO. For instance, residents who formerly worked as sand miners, found it difficult to adjust to economic assistance, which required them to perform as farm animal breeders. As such, these residents opted to return to their AOO, and their job, as sand miners. The findings derived through this study, regarding the perception of residents towards the SEC and SES of BSD, are in agreement with the results derived through the study conducted by Mallick (2019), which reported that 'residents who migrate periodically, return to their AOO as a form of survival strategy for homelessness, and to survive economic squeezes'.

CONCLUSION

The findings derived through the three research questions reveal that in BSD, among the 1920 heads of families receiving housing assistance, 42% (n=799) lived in the housing allotments, 41% (n=795) did not live in the housing allotments, and 17% (n=326) lived in the housing allotments, but migrated periodically to their AOO, and some beyond their AOO. The spatial-temporally migration practiced by BSD residents comes in two forms: (1) short-term migrations to their AOO, and (2) long-term migrations to other cities within the province of East Java. While short-term migration is differentiated based on the number of days, weeks or months, long-term migration is differentiated by year. The shortest migration duration is bi-daily, and the longest a year. The decision to migrate, or stay, is significantly influenced by the SP, both in BSD as well as the AOO. In the context of BSD, SP is influenced by SB, PI, PD, PA, SEC, and SES, as well as the direct and indirect RP of the residents. Basically, the driving force, propelling the migration of BSD residents, is the need to deflect the threat of housing loss, and the difficulties stemming from an unfavourable economic situation.

The findings derived through this undertaking, provide empirical verification of the SP-migration-disaster correlation. It is our recommendation, that the Lumajang regency government authorities take these findings into consideration, to better manage the relocation of the Mount Semeru eruption survivors, as well as to retain and improve the community assistance programme, for their quick and progressive economic recovery. The main shortcoming, in terms of the census conducted through this study, is the dearth of investigations

into the experiences of the periodic migrating residents of BSD themselves. As for future studies in this area, we propose more explorations into the motives driving the migration of BSD residents and the precise identification of their economic and social recovery requirements.

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DISCLOSURE STATEMENT

The authors declare that this research is free from any conflicts of interest. All data and research findings presented in this paper are solely for academic and scientific purposes.

REFERENCES

- Bachri, S., Fathoni, M. N., Sumarmi, Masruroh, H., Wibowo, N. A., Khusna, N., Billah, E. N., & Yudha, L. (2023). Geomorphological mapping and landform characterization of Semeru volcano after the eruption in 2021. *IOP Conference Series: Earth and Environmental Science*, 1180(1). <https://doi.org/10.1088/1755-1315/1180/1/012004>
- Bachri, S., Shrestha, R. P., Sumarmi, Irawan, L. Y., Masruroh, H., Prastiwi, M. R. H., Billah, E. N., Putri, N. R. C., Hakiki, A. R. R., & Hidiyah, T. M. (2024). Land use change simulation model using a land change modeler in anticipation of the impact of the Semeru volcano eruption disaster in Indonesia. *Environmental Challenges*, 14(December 2023), 100862. <https://doi.org/10.1016/j.envc.2024.100862>
- Bachri, S., Stötter, J., Monreal, M., & Sartohadi, J. (2015). The calamity of eruptions, or an eruption of benefits? Mt. Bromo human–volcano system a case study of an open-risk perception. *Natural Hazards and Earth System Sciences*, 15(2), 277–290. <https://doi.org/10.5194/nhess-15-277-2015>
- Chumky, T., Basu, M., Onitsuka, K., & Hoshino, S. (2022). The current research landscape of disaster-induced migration: A systematic review and bibliometric analysis. *International Journal of Disaster Risk Reduction*, 74, 102931. <https://doi.org/https://doi.org/10.1016/j.ijdr.2022.102931>
- Chumky, T., Basu, M., Onitsuka, K., Parvin, G. A., & Hoshino, S. (2022). Disaster-induced migration types and patterns, drivers, and impact: A union-level study in Bangladesh. *World Development Sustainability*, 1(May), 100013. <https://doi.org/10.1016/j.wds.2022.100013>
- Daly, P., Mahdi, S., Mundir, I., McCaughey, J., Amalia, C. S., Jannah, R., & Horton, B. (2023). Social capital and community integration in post-disaster relocation settlements after the 2004 Indian Ocean Tsunami in Indonesia. *International Journal of Disaster Risk Reduction*, 95(November 2022), 103861. <https://doi.org/10.1016/j.ijdr.2023.103861>
- Depari, C. D. A., & Lindell, M. K. (2023). “Moving or not?”: Factors affecting

- community responses to environmental disruption. *International Journal of Disaster Risk Reduction*, 95(July), 103898. <https://doi.org/10.1016/j.ijdrr.2023.103898>
- Gomez, C., Lavigne, F., Sri Hadmoko, D., & Wassmer, P. (2018). Insights into lahar deposition processes in the Curah Lengkong (Semeru Volcano, Indonesia) using photogrammetry-based geospatial analysis, near-surface geophysics and CFD modelling. *Journal of Volcanology and Geothermal Research*, 353, 102–113. <https://doi.org/10.1016/j.jvolgeores.2018.01.021>
- Irawan, L. Y., Farihah, S. N., Prasetyo, W. E., Azizah, V., Hartono, R., Masrurroh, H., & Mapa, M. T. (2024). The effectivity of community-based early warning system on reducing Semeru eruption impact post-eruption 2021. *IOP Conference Series: Earth and Environmental Science*, 1314(1). <https://doi.org/10.1088/1755-1315/1314/1/012037>
- Islam, R., & Walkerden, G. (2014). How bonding and bridging networks contribute to disaster resilience and recovery on the Bangladeshi coast. *International Journal of Disaster Risk Reduction*, 10(PA), 281–291. <https://doi.org/10.1016/j.ijdrr.2014.09.016>
- Khusna, N. I., Sumarmi, Bachri, S., Astina, I. K., Susilo, S., & Idris. (2023). Social resilience and disaster resilience: A strategy in disaster management efforts based on big data analysis in Indonesian's twitter users. *Heliyon*, 9(9), e19669. <https://doi.org/10.1016/j.heliyon.2023.e19669>
- Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology*, 31(3), 207–230. <https://doi.org/10.1016/J.JENVP.2010.10.001>
- Lindseth, A., & Norberg, A. (2004). A phenomenological hermeneutical method for researching lived experience. *Scandinavian Journal of Caring Sciences*, 18(2), 145–153. <https://doi.org/10.1111/j.1471-6712.2004.00258.x>
- Mallick, B. (2019). The nexus between socio-ecological system, livelihood resilience, and migration decisions: Empirical evidence from Bangladesh. *Sustainability (Switzerland)*, 11(12). <https://doi.org/10.3390/su11123332>
- Mbaye, L. (2017). Climate change, natural disasters, and migration. *IZA World of Labor, March*, 1–10. <https://doi.org/10.15185/izawol.346>
- Mukherjee, M., & Fransen, S. (2024). Exploring migration decision-making and agricultural adaptation in the context of climate change: A systematic review. *World Development*, 179, 106600. <https://doi.org/https://doi.org/10.1016/j.worlddev.2024.106600>
- Peng, L., Lin, L., Liu, S., & Xu, D. De. (2017). Interaction between risk perception and sense of place in disaster-prone mountain areas: a case study in China's Three Gorges Reservoir Area. *Natural Hazards*, 85(2), 777–792. <https://doi.org/10.1007/s11069-016-2604-6>
- Realita, A., Fahmi, M. N., Prastowo, T., & Madlazim, M. (2022). Detection of Lahar Flow Direction from Semeru Eruption on 4 December 2021 using Gravity Method. *JPSE (Journal of Physical Science and Engineering)*, 7(2), 75–85. <https://doi.org/10.17977/um024v7i22022p075>
- Roosli, R., Isa, M. I., Mohamad, D., & Othman, A. G. (2022). Criteria and Attributes for the 20-Minute City Concept (Kp20M) in Balik Pulau, Pulau Pinang. *Planning*

- Malaysia*, 20(4), 235–247. <https://doi.org/10.21837/pm.v20i24.1200>
- Setyonugroho, G. A., & Maki, N. (2024). Policy implementation model review of the post-disaster housing reconstruction in Indonesia case study: Aceh, Yogyakarta, and Lombok. *International Journal of Disaster Risk Reduction*, 100(December 2022), 104181. <https://doi.org/10.1016/j.ijdrr.2023.104181>
- Sina, D., Chang-Richards, A. Y., Wilkinson, S., & Potangaroa, R. (2019). A conceptual framework for measuring livelihood resilience: Relocation experience from Aceh, Indonesia. *World Development*, 117, 253–265. <https://doi.org/10.1016/j.worlddev.2019.01.003>
- Solikhin, A., Thouret, J. C., Gupta, A., Harris, A. J. L., & Liew, S. C. (2012). Geology, tectonics, and the 2002-2003 eruption of the Semeru volcano, Indonesia: Interpreted from high-spatial resolution satellite imagery. *Geomorphology*, 138(1), 364–379. <https://doi.org/10.1016/j.geomorph.2011.10.001>
- Sumarmi, Bachri, S., Irawan, L. Y., Putra, D. B. P., Risnani, & Aliman, M. (2020). The effect of experiential learning models on high school students learning scores and disaster countermeasures education abilities. *Journal for the Education of Gifted Young Scientists*, 8(1), 61–85. <https://doi.org/10.17478/jegys.635632>
- Svensson, D. P. H. (2019). *The Patterns of Sense of Place A Post-Structural Human Geography Case Study in HafenCity, Hamburg*.
- Swapan, M. S. H., & Sadeque, S. (2021). Place attachment in natural hazard-prone areas and decision to relocate: Research review and agenda for developing countries. *International Journal of Disaster Risk Reduction*, 52(October), 101937. <https://doi.org/10.1016/j.ijdrr.2020.101937>
- Tourneau, F. M. Le. (2022). “It’s Not for Everybody”: Life in Arizona’s Sparsely Populated Areas. *Annals of the American Association of Geographers*, 112(6), 1794–1811. <https://doi.org/10.1080/24694452.2022.2035208>
- Zhao, H. (2023). Understanding Shiminhua in Chinese Greater Bay Area: Internalizing urban identity and negotiating place attachment. *Regional Science Policy & Practice*, 15(9), 1956–1979. <https://doi.org/https://doi.org/10.1111/rsp3.12730>
- Zheng, C., Zhang, J., Guo, Y., Zhang, Y., & Qian, L. (2019). Disruption and reestablishment of place attachment after large-scale disasters: The role of perceived risk, negative emotions, and coping. *International Journal of Disaster Risk Reduction*, 40(July), 101273. <https://doi.org/10.1016/j.ijdrr.2019.101273>

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