

Displaced into Marginality: Climate Mobility, Precarious Urban Incorporation and Social Exclusion in Coastal Semarang

Muhammad Ashabul Kahfi¹

¹ Universitas Islam Negeri Palopo, Indonesia

Correspondence: muhammad.ashabul.kahfi@uinpalopo.ac.id

Article Info

Article History:

Received Aug 15th, 2026

Revised Aug 21th, 2026

Accepted Aug 30th, 2026

Keyword:

Climate mobility; Coastal adaptation; Semarang; Social exclusion; Urban marginality.

ABSTRACT

Coastal mobility was often treated as an adaptive response to climate risk, although relocation did not necessarily resolve the insecurities that shape urban marginality. This study examined how climate-related mobility and adaptation were associated with precarious urban incorporation in coastal Semarang. A structured qualitative secondary analysis was conducted using eight peer-reviewed empirical studies published between 2008 and 2025, with one additional study used as contextual support. Evidence was coded across economic, housing, service or institutional, and social domains. The synthesis showed the strongest convergence around housing insecurity, followed by social dependence or disruption, while economic and institutional constraints appeared less consistently but remained substantively important. Existing studies also showed strong reasons for staying, incremental household adaptation, and relocation outcomes that could reduce hazard exposure without guaranteeing secure urban incorporation. The findings suggested that climate-related vulnerability could become socially durable through unequal access to secure housing, livelihoods, services, and social attachment. The article advanced precarious urban incorporation as an interpretive framework and vulnerability-to-marginality conversion as a cautious theoretical proposition rather than a tested causal pathway.



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INTRODUCTION

Climate-related mobility rarely follows a clean sequence from hazard exposure to relocation. Flooding, land subsidence, coastal erosion and declining livelihood security interact with household resources, social ties and local institutions. Some households move. Others remain in exposed places because work, family and housing are difficult to reproduce elsewhere. Mobility can therefore be adaptive for one household and unavailable to another. This unevenness is well established in climate migration research, which has moved away from simple environmental determinism toward multi-causal and selective accounts of movement (Black et al., 2011; Cattaneo et al., 2019; Hoffmann et al., 2020).

Urban arrival does not settle the question of adaptation. A move can reduce exposure to a coastal hazard while leaving employment unstable or housing insecure. Access to health care, documentation and neighbourhood support may also weaken during relocation. The same household may gain safety in one domain and lose security in another. Work on migration as adaptation has increasingly recognised these trade-offs, especially where low-income households enter cities through informal labour and low-cost housing (McLeman & Smit, 2006; Gemenne & Blocher, 2017; Vinke et al., 2020; Szaboova et al., 2023).

Coastal cities in the Global South make this tension visible because informality often performs an ambivalent function. It lowers the threshold for entry into work and housing, yet it also limits protection. A family can find a room without obtaining secure tenure. Informal employment can

produce income without predictable earnings or social insurance. Community networks may compensate for thin formal support, but those networks do not remove exposure to recurrent hazards. Informality is therefore neither simple exclusion nor successful incorporation. It is often a practical route into the city under weak conditions of security (Satterthwaite et al., 2020).

Precarious urban incorporation is used here to describe that position. The concept does not treat marginal households as being outside urban institutions. They are inside labour markets, rental arrangements, service systems and neighbourhood networks, although their claims within those systems are fragile. This distinction matters because marginality can be reproduced through participation itself. A person may work continuously and remain economically insecure. A household may occupy housing for years and still face recurrent damage or weak tenure. The analytical problem is thus not only access. It concerns the terms on which access is secured and maintained.

Vulnerability and marginality are also kept separate. Vulnerability concerns exposure to harm and limited capacity to anticipate, cope with or recover from it (Adger, 2006). Marginality is more durable and relational. It emerges when disadvantage becomes embedded across everyday institutions and narrows the practical choices available to households. Social exclusion research has long treated exclusion as multidimensional rather than equivalent to poverty alone (Bhalla & Lapeyre, 1997; van Bergen et al., 2014; Laparra et al., 2021). That distinction is useful for climate mobility because relocation may change exposure without resolving the institutional conditions that organise disadvantage.

Semarang offers an unusually useful case for examining this problem with secondary evidence. Research on its northern coast has documented recurrent tidal flooding, household adaptation, migration intentions, place attachment, low-income settlement vulnerability and relocation disputes over a long period. These studies were not designed around a single marginality framework, which is precisely why a secondary synthesis is useful. Their findings can be read together to ask whether mobility and adaptation repeatedly intersect with economic insecurity, weak residential security, institutional difficulty and social dependence (Marfai et al., 2008; Harwitasari & van Ast, 2011; Buchori et al., 2018).

The gap is not a lack of evidence that coastal households are vulnerable. The gap lies in how that evidence is organised. Much of the Semarang literature examines flood adaptation, willingness to move, hazard perception or community resilience as separate questions. Less attention has been given to whether these findings point toward a common process in which environmental vulnerability becomes a more durable urban position. The present study therefore asks how existing empirical research on coastal Semarang describes the movement, staying and relocation of climate-exposed households, and what those findings imply for economic, housing, service and social exclusion.

A structured qualitative secondary analysis is used rather than a new household survey. This choice keeps the claims close to the available evidence and avoids treating published studies as if they formed a pooled dataset. The study does not estimate the causal effect of displacement and does not compare individual migrants with non-migrants. It identifies recurring empirical patterns across studies and examines whether those patterns are consistent with precarious urban incorporation. The proposed novelty, vulnerability-to-marginality conversion, is therefore an interpretive proposition. It names a process suggested by convergent evidence rather than a causal pathway demonstrated by longitudinal data.

RESEARCH METHODS

The study uses structured qualitative secondary analysis of peer-reviewed empirical research on coastal Semarang and its immediate metropolitan edge. The unit of analysis is the published study, not the household respondent. Inclusion required a clear empirical focus on tidal flooding, coastal inundation, climate-related adaptation, migration, immobility, relocation or low-income vulnerability in Semarang. Studies also had to report original observations, interviews, surveys, spatial analysis or documented relocation evidence. Conceptual papers without Semarang data were used only in the Introduction and Discussion and were not coded as empirical evidence.

Eight studies formed the core evidence corpus. They span 2008 to 2025 and cover household vulnerability, low-income adaptation, livelihood adjustment, migration preferences, spatial adaptive capacity, household accommodation strategies and relocation. One additional study on migration hold factors in coastal Semarang was used to interpret immobility but was not included in the domain count

because the accessible report did not permit the same level of coding across all four domains (Amin et al., 2021). The core corpus was deliberately small. The aim was transparent within-case synthesis rather than a broad systematic review with thin local evidence.

Evidence was extracted into four domains that had been defined before reading the studies. Economic exclusion covered unstable livelihoods, constrained household resources and adaptation costs. Housing exclusion covered recurrent residential damage, weak tenure, forced relocation and the need for repeated physical modification of dwellings. Service or institutional exclusion captured weak formal support, procedural problems and uneven access to public infrastructure. Social exclusion covered place attachment, dependence on local networks, disruption of social relations and the social costs attached to moving. A study could contribute to more than one domain.

Coding remained conservative. A domain was marked only when the study reported an explicit empirical observation that fit the definition. General statements about vulnerability were not automatically converted into evidence for every domain. This rule matters because the source studies used different methods and concepts. Some relied on household surveys and GIS, while others used interviews, case study material or legal and documentary analysis. Their results were therefore synthesised qualitatively. Counts are used only to show where evidence converges across the corpus. They are not treated as effect sizes, prevalence estimates or measures of causal importance.

The analysis proceeded through repeated comparison of extracted findings. First, each study was read for evidence on movement, staying, adaptation and relocation. Second, those findings were coded to the four exclusion domains. Third, patterns were compared across studies to identify tensions that could not be captured by a simple vulnerability label. Particular attention was given to situations in which an apparently adaptive response preserved another form of insecurity. The resulting themes were then read through precarious urban incorporation and the vulnerability-to-marginality conversion framework. Interpretation was bounded by the design. Secondary evidence can support convergence and conceptual inference, but it cannot reconstruct individual trajectories that the original studies did not follow.

Because the study analyses published material, no new human participants were recruited and no identifiable personal data were processed. Ethical risk is correspondingly limited, although interpretive responsibility remains important. Findings were not lifted out of their original context to imply stronger claims than the source design allowed. A survey result was not rewritten as an ethnographic account, and evidence about willingness to move was not treated as observed migration. Where a study addressed intention, adaptation or relocation rather than post-move outcomes, the discussion preserves that distinction.

Table 1 Secondary Evidence Corpus

Study	Site or focus	Primary method	Secondary analytical use
Marfai et al. 2008	Semarang coast	Household survey and field evidence	Household vulnerability, housing adaptation and government response
Harwitasari and van Ast 2011	Semarang tidal flood areas	Household research	Adaptation, risk perception and intention to remain
Wijayanti and Pratomo 2016	Mangunharjo	Case-based socioeconomic analysis	Livelihood and social adjustment
Mussadun et al. 2016	Tambak Lorok	Qualitative case study	Low-income adaptation and economic constraint
Buchori et al. 2018	Northern Semarang	GIS, questionnaires and interviews	Migration preference, adaptation and social attachment
Suhelmi and Triwibowo 2018	Semarang coastal area	Spatial vulnerability and capacity analysis	Adaptive capacity and public facility context
Buchori et al. 2019	Semarang Bay	Household survey and focus groups	Accommodation, informal finance and self-organisation
Suwandi and Novrikar 2025	East Flood Canal relocation	Legal and documentary case analysis	Relocation, housing rights and procedural protection

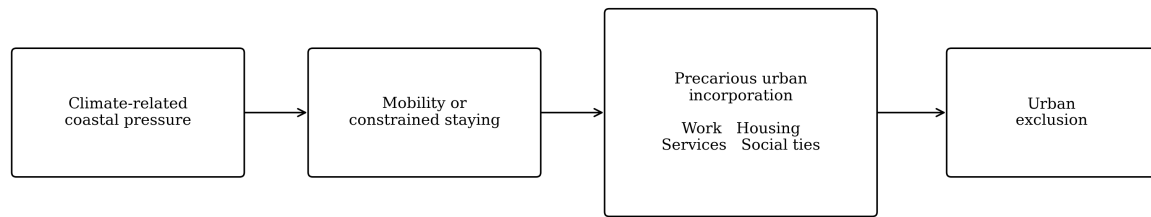


Figure 1 Vulnerability-to-Marginality Conversion Framework

Table 2 Explicit Evidence by Urban Exclusion Domain

Study	Economic	Housing	Service or institutional	Social
Marfai et al. 2008	No	Yes	Yes	No
Harwitasari and van Ast 2011	No	Yes	No	Yes
Wijayanti and Pratomo 2016	Yes	No	No	Yes
Mussadun et al. 2016	Yes	Yes	No	Yes
Buchori et al. 2018	No	Yes	No	Yes
Suhelmi and Triwibowo 2018	No	Yes	Yes	No
Buchori et al. 2019	Yes	Yes	No	Yes
Suwandi and Novrikar 2025	No	Yes	Yes	No

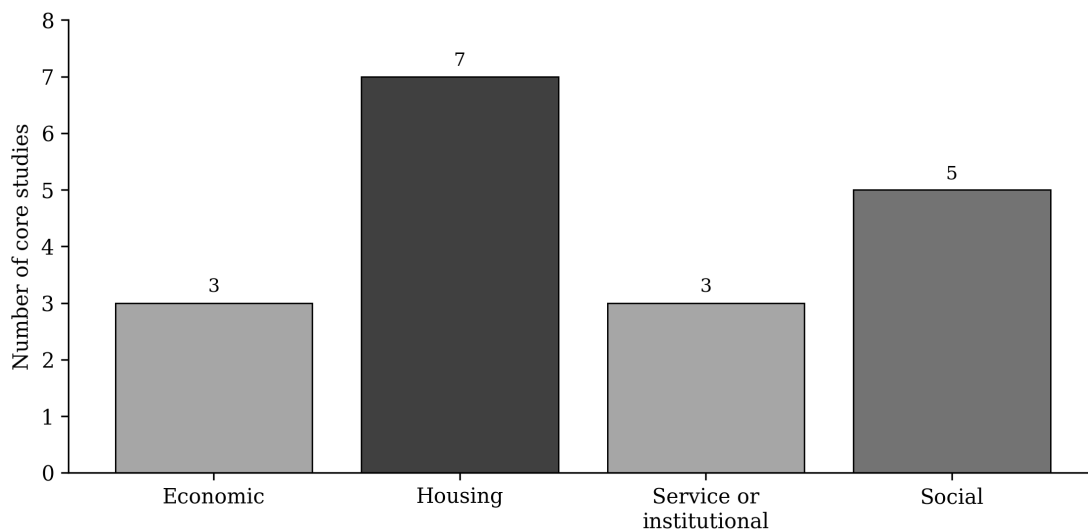


Figure 2 Evidence Convergence across Urban Exclusion Domains

Table 3 Cross-Study Analytical Patterns

Analytical pattern	Evidence base	Interpretive implication
Constrained staying and selective mobility	Harwitasari and van Ast 2011, Buchori et al. 2018, Amin et al. 2021	Mobility decisions reflect attachment, livelihoods and unequal exit capacity
Incremental adaptation under economic limits	Wijayanti and Pratomo 2016, Mussadun et al. 2016, Buchori et al. 2019	Household agency can preserve insecurity when adaptation remains resource constrained
Housing as the dominant interface	Seven of eight core studies	Urban security is repeatedly negotiated through dwelling modification, continued exposure and relocation
Institutional protection becomes visible during planning and relocation	Marfai et al. 2008, Suhelmi and Triwibowo 2018, Suwandi and Novrikar 2025	Marginality is partly organised by the quality of public support and procedural protection
Social ties protect and constrain	Five core studies	Networks support adaptation while increasing the social cost of exit

Table 4 Evidence and Claim Alignment

Claim type	Supported formulation	Avoided formulation
Mobility	Existing studies show selective movement and strong reasons for staying	Climate change causes households to migrate
Exclusion	Evidence converges on housing, social, economic and institutional insecurity	Displaced households are statistically more excluded than non-displaced households
Mechanism	Patterns are consistent with precarious urban incorporation	Precarious urban incorporation mediates the effect of displacement
Novelty	Vulnerability-to-marginality conversion is an interpretive proposition	The study proves a causal conversion pathway
Policy	Relocation outcomes depend on housing and procedural conditions	Relocation necessarily reduces vulnerability

RESULTS AND DISCUSSION

The secondary evidence does not support a simple story in which climate exposure pushes households out of coastal Semarang and into a uniform condition of urban exclusion. Movement is selective, and staying is often deliberate even under persistent flood conditions. Harwitasari and van Ast (2011) found that many residents did not intend to leave despite recurrent tidal flooding. Buchori et al. (2018) likewise reported a preference for staying and adapting, with social comfort and community relationships shaping the decision. Climate mobility in this setting is therefore inseparable from constrained immobility and the value attached to existing social and livelihood ties.

This pattern complicates the usual assumption that relocation is the obvious adaptive response. Staying can protect access to work, neighbours and familiar services while preserving exposure to flooding. Moving may reduce hazard exposure but weaken those same resources. The decision is not simply between safety and danger. It is often a choice between different bundles of insecurity. Amin et al. (2021) reaches a similar conclusion through the study of migration hold factors, showing why attachment and locally embedded resources can restrain movement even in climate hazard-prone areas. Selective mobility is thus already structured by inequality before relocation occurs.

Economic insecurity appears explicitly in three of the eight core studies. Research in Mangunharjo found that coastal households modified livelihoods, income strategies and social relations in response to environmental pressure (Wijayanti & Pratomo, 2016). Work in Tambak Lorok shows the same constraint from another angle. Low household income limited adaptation, leaving many responses partial and incremental rather than transformative (Mussadun et al., 2016). Buchori et al. (2019) also identified informal loans and community self-organisation as practical ways to maintain livelihoods under repeated coastal hazards. These responses keep households functioning, but they do not necessarily create economic security.

The distinction between coping capacity and secure incorporation is important here. Informal credit, livelihood switching and household-level adaptation can prevent immediate collapse. They may still reproduce dependence on unstable income or community resources. Migration as adaptation research has warned against judging success by movement alone because gains in one area can coexist with losses elsewhere (Gemenne & Blocher, 2017; Szaboova et al., 2023). Semarang fits that caution. The evidence suggests that households are active and adaptive, yet their agency often operates within narrow material limits. Resilience language can obscure those limits when persistence is mistaken for improved security.

Housing is the strongest point of convergence in the corpus. Seven of eight studies contain explicit evidence related to residential insecurity or the physical burden of maintaining habitation under recurrent flooding. Marfai et al. (2008) documented repeated household measures such as raising floors, building small barriers and elevating surrounding areas. Harwitasari and van Ast (2011) similarly described everyday adaptation to tidal flooding, while Mussadun et al. (2016) found that low-income residents commonly raised their houses. Such measures are rational responses to recurrent hazards. Their repetition, however, shows that remaining housed often requires continuing private expenditure and physical modification.

Repeated adaptation should not be read as proof of failed agency. It may be the most workable response available. The problem is that housing security is being maintained through continuous household effort rather than through durable reduction of exposure. Buchori et al. (2019) describe accommodation as a substantial and often overlooked response mode, distinct from both short-term coping and long-term retreat. That insight fits precarious incorporation well. Households remain

incorporated in place, but the material basis of that incorporation is unstable. Housing exists, yet maintaining it consumes resources and does not end recurrent hazard pressure.

Relocation evidence reveals a different form of housing insecurity. Suwandi and Novrikar (2025) document the displacement of 97 families during the East Flood Canal normalisation process and identify problems involving replacement housing and procedural justice. That case should not be treated as equivalent to household climate migration. It is state-led displacement linked to flood-control infrastructure. Even so, it shows why movement away from risk cannot automatically be coded as successful adaptation. The conditions of relocation matter. A household can leave a hazardous location and still face insecurity when housing rights, timing and procedural protections remain unsettled.

Service and institutional exclusion appears less frequently than housing but remains visible in three core studies. Marfai et al. (2008) examined government response alongside household vulnerability. Suhelmi and Triwibowo (2018) linked coastal adaptive capacity to spatial planning and the distribution of facilities, while Suwandi and Novrikar (2025) exposed procedural weaknesses in relocation. The smaller number of studies does not establish that institutional problems are less important. It shows instead that much of the local literature has measured household adaptation more consistently than institutional access. This is an evidence gap inside the case rather than evidence of institutional adequacy.

The asymmetry is analytically useful. If the literature repeatedly observes households raising floors, changing livelihoods and using local credit while giving thinner attention to service access or administrative protection, adaptation may be over-individualised in the evidence base. Responsibility becomes visible at household level because household action is easier to observe. Institutional arrangements remain in the background. Climate vulnerability can then appear as a technical problem of coping rather than a distributive problem involving infrastructure, planning and enforceable claims. Social exclusion research helps correct this bias by asking whether people can use institutions on secure and equal terms.

Social ties are reported in five of the eight core studies and often work in two directions. They support adaptation, yet they can also make exit costly. Harwitasari and van Ast (2011) show strong attachment to dwellings and local settings. Buchori et al. (2018) found that comfort with community relations contributed to preferences for staying. Buchori et al. (2019) emphasised participatory capacity and self-organisation. Mangunharjo research likewise describes changes in social relationships as part of livelihood adaptation (Wijayanti & Pratomo, 2016). Social embeddedness is therefore a resource, but it can also bind households to locations where hazard exposure remains high.

This double role of social relations is lost when social capital is treated only as a protective asset. Networks can provide credit, information and practical help. They also create replacement costs when migration requires leaving trusted neighbours, nearby relatives or locally embedded livelihoods. A household that stays because social support is valuable is not simply immobile through ignorance or risk denial. The choice may reflect a rational assessment of what would be lost through movement. Climate mobility research increasingly treats such selectivity as central rather than exceptional (Boas et al., 2019; Garip & Reed, 2025). Semarang gives that argument a concrete urban form.

The cross-study pattern is uneven rather than symmetrical. Housing insecurity appears in seven studies, social dependence or disruption in five, and explicit economic and institutional evidence in three each. These counts are not measures of prevalence. They describe the attention and empirical convergence within the corpus. Housing emerges as the most consistent interface through which coastal pressure is managed. Social relations often explain why adaptation remains local. Economic constraints limit the range of feasible responses, while institutional conditions appear most clearly when planning or relocation becomes contested. Taken together, these domains produce a more differentiated account than a single index of vulnerability would allow.

Precarious urban incorporation offers one way to connect those findings without forcing them into a causal sequence. Coastal households remain part of the city through work, residence, local organisations and public systems. Their incorporation is nevertheless conditional. Housing requires repeated defence. Income can depend on informal adjustment. Social networks substitute for formal protection, and relocation can expose procedural weakness. The evidence therefore points less toward exclusion as absence and more toward unequal inclusion. This distinction is important because it explains why households can be deeply embedded in urban life while still occupying a marginal position within it.

Vulnerability-to-marginality conversion names the interpretive move from temporary or hazard-specific insecurity toward a durable social position. The Semarang evidence does not observe that conversion at individual level over time, so the concept should not be presented as a demonstrated mechanism. It is better understood as a proposition generated by evidence convergence. Recurrent environmental pressure can become socially durable when the responses available to households preserve insecure housing, unstable livelihoods or dependence on thin institutional support. Mobility may interrupt that process for some households, but relocation can also reproduce it when the terms of urban incorporation remain weak.

The secondary design changes what can be claimed about climate displacement. No pooled comparison shows that displaced households have higher exclusion than non-displaced households. There is also no basis for estimating an adjusted effect of climate mobility. What the evidence can show is that the practical choices around moving and staying are shaped by resources that are already unequally distributed. It also shows that adaptation outcomes cannot be judged from hazard exposure alone. Housing, livelihood, institutional support and social ties repeatedly condition what movement means and what staying costs. Those are narrower claims, but they are better supported.

The findings also qualify policy narratives that equate relocation with risk reduction. Safer geography matters, yet a move is not socially successful if replacement housing is insecure or if work and social support become harder to sustain. Conversely, supporting households to remain cannot mean normalising endless private adaptation to recurrent flooding. Policy needs to distinguish voluntary staying from constrained staying and planned relocation from displacement without adequate protection. The evidence does not identify one universally preferable response. It shows why the quality of incorporation after either movement or immobility deserves as much attention as the physical location of the household.

Several limitations remain. The included studies vary in method, neighbourhood and period, and most were not designed to measure social exclusion directly. The evidence corpus is therefore interpretive rather than statistically integrated. Publication patterns also shape what can be seen. Housing adaptation is documented more often than administrative access, while post-relocation trajectories remain thin. These weaknesses restrict generalisation beyond coastal Semarang. They also point toward the next empirical step, which would be a comparative household study that follows movers and stayers over time and measures whether security changes across the four domains rather than assuming that relocation itself is an outcome.

CONCLUSION

Coastal Semarang does not present a simple sequence from climate hazard to migration and then to social exclusion. Existing studies show repeated adaptation, strong reasons for staying and selective movement toward safer locations. They also show that the ability to adapt is materially uneven. Low-income households modify homes and livelihoods, rely on community resources and absorb recurrent costs. Relocation can reduce one form of exposure while creating new housing or procedural insecurity. Social ties remain protective, although they also increase the cost of leaving. Marginality is therefore better understood through the terms of incorporation than through movement alone. Precarious urban incorporation captures this pattern without treating climate-exposed households as socially detached from the city. They are economically and socially embedded, but the security of that embeddedness is weak. Vulnerability-to-marginality conversion extends the argument by identifying a possible route through which repeated hazard pressure becomes a more durable urban disadvantage. The present secondary analysis cannot prove that process causally. Its contribution is to show that separate studies of housing adaptation, livelihood adjustment, social attachment and relocation converge around the same institutional problem. Climate mobility matters because movement and staying redistribute insecurity across domains rather than simply removing it.

A stronger empirical test would require longitudinal comparison of movers and stayers, especially before and after relocation. Until such data exist, policy claims should remain modest. Risk reduction should not be inferred from physical movement alone, and resilience should not be inferred from the capacity to remain. More useful questions concern whether households can secure housing without recurrent private repair, earn income without chronic instability, access services without procedural disadvantage and preserve social support without being trapped by place. Those conditions

provide a clearer basis for judging whether climate adaptation reduces vulnerability or merely reorganises it.

REFERENCES

- Adger, W. N. (2006). Vulnerability. *Global Environmental Change*, 16(3), 268-281. <https://doi.org/10.1016/j.gloenvcha.2006.02.006>
- Amin, C., Sukamdi, S., & Rijanta, R. (2021). Exploring migration hold factors in climate change hazard-prone area using grounded theory study. Evidence from coastal Semarang, Indonesia. *Sustainability*, 13(8), 4335. <https://doi.org/10.3390/su13084335>
- Bhalla, A., & Lapeyre, F. (1997). Social exclusion: Towards an analytical and operational framework. *Development and Change*, 28(3), 413-433. <https://doi.org/10.1111/1467-7660.00049>
- Black, R., Bennett, S. R. G., Thomas, S. M., & Beddington, J. R. (2011). Climate change: Migration as adaptation. *Nature*, 478(7370), 447-449. <https://doi.org/10.1038/478477a>
- Boas, I., Farbotko, C., Adams, H., Sterly, H., Bush, S., van der Geest, K., Wiegel, H., Ashraf, H., Baldwin, A., Bettini, G., Blondin, S., de Bruijn, M., Durand-Delacre, D., Fröhlich, C., Gioli, G., Guaita, L., Hut, E., Jarawura, F. X., Lamers, M., & Black, R. (2019). Climate migration myths. *Nature Climate Change*, 9, 901-903. <https://doi.org/10.1038/s41558-019-0633-3>
- Buchori, I., Pramitasari, A., Sugiri, A., Maryono, M., Basuki, Y., & Sejati, A. W. (2018). Adaptation to coastal flooding and inundation: Mitigations and migration pattern in Semarang City, Indonesia. *Ocean and Coastal Management*, 163, 445-455. <https://doi.org/10.1016/j.ocecoaman.2018.07.017>
- Buchori, I., Sugiri, A., Mussadun, M., Wadley, D., Liu, Y., Pramitasari, A., & Pamungkas, I. T. D. (2019). How do households respond to coastal hazards: A framework for accommodating strategies using the example of Semarang Bay, Indonesia. *International Journal of Disaster Risk Reduction*, 37, 101177. <https://doi.org/10.1016/j.ijdr.2019.101177>
- Cattaneo, C., Beine, M., Fröhlich, C. J., Kniveton, D., Martinez-Zarzoso, I., Mastrorillo, M., Millock, K., Piguet, E., & Schraven, B. (2019). Human migration in the era of climate change. *Review of Environmental Economics and Policy*, 13(2), 189-206. <https://doi.org/10.1093/reep/rez008>
- Chung, J. H., Buswala, B., Keith, M., & Schwanen, T. (2022). Climate mobilities into cities: A systematic review of literature from 2011 to 2020. *Urban Climate*, 45, 101252. <https://doi.org/10.1016/j.uclim.2022.101252>
- Daoust, G., & Selby, J. (2024). Climate change and migration: A review and new framework for analysis. *WIREs Climate Change*, 15(4), e886. <https://doi.org/10.1002/wcc.886>
- Few, R., Ramírez, V., Armijos, M. T., Zambrano Hernández, L. A., & Marsh, H. (2021). Moving with risk: Forced displacement and vulnerability to hazards in Colombia. *World Development*, 144, 105482. <https://doi.org/10.1016/j.worlddev.2021.105482>
- Fussell, E., Hunter, L. M., & Gray, C. L. (2014). Measuring the environmental dimensions of human migration: The demographer's toolkit. *Global Environmental Change*, 28, 182-191. <https://doi.org/10.1016/j.gloenvcha.2014.07.001>
- Garip, F., & Reed, C. A. (2025). Climate change and human mobility: Considering context, mechanisms, and selectivity. *Population and Development Review*, 51(1), 449-489. <https://doi.org/10.1111/padr.12716>
- Gemenne, F., & Blocher, J. (2017). How can migration serve adaptation to climate change: Challenges to fleshing out a policy ideal. *The Geographical Journal*, 183(4), 336-347. <https://doi.org/10.1111/geoj.12205>
- Harwitasari, D., & van Ast, J. A. (2011). Climate change adaptation in practice: People's responses to tidal flooding in Semarang, Indonesia. *Journal of Flood Risk Management*, 4(3), 216-233. <https://doi.org/10.1111/j.1753-318X.2011.01104.x>
- Hoffmann, R., Dimitrova, A., Mutarak, R., Crespo Cuaresma, J., & Peisker, J. (2020). A meta-analysis of country-level studies on environmental change and migration. *Nature Climate Change*, 10, 904-912. <https://doi.org/10.1038/s41558-020-0898-6>
- Laparra, M., Zugasti Mutilva, N., & García Lautre, I. (2021). The multidimensional conception of social exclusion and the aggregation dilemma: A solution proposal based on multiple correspondence analysis. *Social Indicators Research*, 158(2), 637-666. <https://doi.org/10.1007/s11205-021-02707-6>

- Marfai, M. A., King, L., Sartohadi, J., Sudrajat, S., Budiani, S. R., & Yulianto, F. (2008). The impact of tidal flooding on a coastal community in Semarang, Indonesia. *Environment Systems and Decisions*, 28, 237-248. <https://doi.org/10.1007/s10669-007-9134-4>
- McLeman, R., & Smit, B. (2006). Migration as an adaptation to climate change. *Climatic Change*, 76, 31-53. <https://doi.org/10.1007/s10584-005-9000-7>
- Mussadun, M., Jannata, P. F., & Islamiyah, F. W. P. (2016). Upaya adaptasi masyarakat berpenghasilan rendah dalam menghadapi bencana banjir rob: Studi kasus Kampung Tambak Lorok, Kota Semarang. *Ruang*, 2(4), 331-340. <https://doi.org/10.14710/ruang.2.4.331-340>
- Satterthwaite, D., Archer, D., Colenbrander, S., Dodman, D., Hardoy, J., Mitlin, D., & Patel, S. (2020). Building resilience to climate change in informal settlements. *One Earth*, 2(2), 143-156. <https://doi.org/10.1016/j.oneear.2020.02.002>
- Suhelmi, I. R., & Triwibowo, H. (2018). Coastal inundation adaptive strategy in Semarang coastal area. *Forum Geografi*, 32(2). <https://doi.org/10.23917/forgeo.v32i2.5672>
- Suwandi, D., & Novrikar, A. (2025). Polemik penataan kota: Tinjauan yuridis terhadap pelaksanaan relokasi warga bantaran Sungai Banjir Kanal Kota Semarang dalam proyek normalisasi. *Hukum dan Masyarakat Madani*, 15(1), 63-74. <https://doi.org/10.26623/humani.v15i1.12133>
- Szaboova, L., Adger, W. N., Safra de Campos, R., Maharjan, A., Sakdapolrak, P., Sterly, H., Conway, D., Codjoe, S. N. A., & Abu, M. (2023). Evaluating migration as successful adaptation to climate change: Trade-offs in well-being, equity, and sustainability. *One Earth*, 6(6), 620-631. <https://doi.org/10.1016/j.oneear.2023.05.009>
- van Bergen, A. P. L., Hoff, S. J. M., van Ameijden, E. J. C., & van Hemert, A. M. (2014). Measuring social exclusion in routine public health surveys: Construction of a multidimensional instrument. *PLOS ONE*, 9(5), e98680. <https://doi.org/10.1371/journal.pone.0098680>
- Vinke, K., Bergmann, J., Blocher, J., Upadhyay, H., & Hoffmann, R. (2020). Migration as adaptation. *Migration Studies*, 8(4), 626-634. <https://doi.org/10.1093/migration/mnaa029>
- Wijayanti, W. P., & Pratomo, R. A. (2016). Adaptation of social-economic livelihoods in coastal community: The case of Mangunharjo Sub-District, Semarang City. *Procedia Social and Behavioral Sciences*, 227, 477-484. <https://doi.org/10.1016/j.sbspro.2016.06.103>