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license**BRIDGING SPATIAL INEQUALITY THROUGH
INFRASTRUCTURE: A SOCIOLOGICAL STUDY ON
SUSTAINABLE DEVELOPMENT OF SMALL ISLAND
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45, Surabaya 60118, Indonesia*Correspondence E-Mail: ony@untag-sby.ac.idDOI: <https://doi.org/10.30598/baileofisipvol3iss2pp390-406>**ABSTRACT**

Spatial inequality between central regions and small islands in Eastern Indonesia shows that infrastructure development remains uneven and socially unjust. This study aims to analyze the role of infrastructure in reducing spatial and social inequality in small island regions, identify sociocultural dynamics influencing infrastructure acceptance and sustainability, and formulate a community-based model of sustainable development. Using a qualitative sociological approach, the study employs SWOT and Participatory Planning Analyses to examine strengths, weaknesses, opportunities, and threats from a local-social perspective, combined with Participatory Rural Appraisal (PRA) through in-depth interviews, field observations, and focus group discussions in Metimiarang Island. Findings indicate that infrastructure serves as a social integrator that enhances access to basic services, economic opportunities, and social cohesion in peripheral areas. Yet, weak governance, fragmented stakeholder coordination, and low community participation hinder effectiveness. Sustainable programs are those integrating local wisdom and social institutions, notably community-based 3R (reduce, reuse, recycle) systems. The study's novelty lies in introducing a socio-infrastructure bridging framework, positioning infrastructure as a social bridge linking marginalized regions to development centers. Theoretically, this research expands development sociology by embedding spatial and ecological dimensions, reinforcing the relevance of the sociology of infrastructure within the Sustainable Development Goals, particularly Goals 9 (Industry, Innovation, and Infrastructure) and 11 (Sustainable Cities and Communities).

Keywords: *Spatial Inequality, Infrastructure Development, Sustainable Development, Small Island Communities, Sociology of Infrastructure*

INTRODUCTION

Spatial inequality remains one of the most visible manifestations of developmental injustice in Indonesia. Although geographically recognized as the world's largest archipelagic nation, with more than 17,000 islands and abundant natural resources, the benefits of development are not distributed evenly across regions (Ghifara et al., 2022; Kartiasih, Nachrowi, et al., 2023). In eastern Indonesia, particularly in small island clusters such as Metimiarang in Southwest Maluku Regency, infrastructure development lags significantly behind urban centers in Java and Sumatra. Access to clean water remains limited, wastewater management systems

are unplanned, and solid-waste and drainage services largely depend on community initiative rather than systematic governmental support (Kartiasih, Djalal Nachrowi, et al., 2023). These conditions illustrate that infrastructure development is not merely a technical issue but also a profoundly social one, rooted in power distribution, resource accessibility, and community welfare.

Spatial disparities in small island regions further demonstrate that development is not always linear nor inclusive (Miranti, 2021; Wahyuni et al., 2022). Instead of acting as a backbone for public welfare, infrastructure often intensifies socio-spatial divides between core and peripheral regions. Meanwhile, small island communities are characterized by strong social and cultural attachment to their environment, relying on community solidarity, collective action, and adaptive strategies to fragile ecological systems (de Zwart, 2022; Hornok & Raeskyesa, 2024; Santos-Marquez et al., 2022). Consequently, infrastructure failures in islands like Metimiarang stem not only from limited financial or technological capacity but also from a lack of integration of sociocultural dimensions in planning and implementation. Infrastructure, therefore, must be viewed not only as a physical outcome but as a social instrument capable of bridging territorial disparities and strengthening community cohesion.

Extant scholarship highlights the relationship between infrastructure and spatial inequality. Lu et al. (2022) and Xu and Zhu (2024) emphasize infrastructure as a key factor in reducing regional disparities by improving mobility of goods, people, and information. In archipelagic contexts, however, infrastructure functions not only as an economic enabler but also as a social space determining access to essential services (Nawir et al., 2023; Wiratama et al., 2023). Studies by He et al. (2025) and Siatan et al. (2024) indicate that infrastructure investments without social capacity building may exacerbate inequality, benefiting regions with stronger institutions first. Concurrently, research by Chen et al. (2023) and Lu et al. (2023) underscores spatial connectivity as critical for inclusive growth across geographically dispersed regions.

Within Indonesia, similar trends are observable. Davidson (2021) reports that more than 60% of national infrastructure projects are concentrated in Java, while eastern regions receive only limited investment. Syam (2025) demonstrates that infrastructure disparities generate not only economic consequences but also poor living conditions, restricted educational access, and weakened social integration in island communities. Maritime development studies further reveal structural dependencies and weak institutional capacities in small islands (Laksana & Rahmat, 2022; Moldicz, 2025).

Sociological perspectives increasingly illuminate infrastructure as a socio-material force. Addie (2022) and Graham and Marvin (2022) introduce the concept of “splintering urbanism,” describing how poorly planned infrastructure can fragment urban space and social relations. Studies on “mobility justice” argue that access to transportation and energy is a form of modern social equity (Bierbaum et al., 2021; Haxhija et al., 2024). In eastern Indonesia, infrastructure development frequently overlooks local socio-cultural realities, provoking conflict (Stacey et al., 2021; Teniwut et al., 2022). Likewise, Blok (2022) and Corchia and Borghini (2025) conceptualize

infrastructure as a socio-material network embedded in daily life rather than isolated physical systems.

Research also highlights the significance of community participation for sustainable infrastructure. Through the Participatory Rural Appraisal (PRA) approach, Khajuria et al. (2022) and Leal Filho et al. (2021) argue that sustainable development is attainable only when local communities are actively involved in planning and management processes. Goel et al. (2021) and Xiao and Hao (2023) similarly show that participatory infrastructure programs yield greater long-term sustainability than top-down initiatives. In Maluku, Afdhal (2024), Litaay et al. (2025), and Manuputty et al. (2025) reveal that cultural values such as masohi (collective labor) and pela gandong (inter-village brotherhood) strengthen community support for development programs.

Nonetheless, existing research largely prioritizes technical, economic, or public policy perspectives, with limited exploration of infrastructure as a social agent shaping interpersonal relations, perceptions of development, and social cohesion in marginalized areas. Studies on small islands often stop at logistical challenges, neglecting social and cultural dynamics. Yet, small-island societies possess unique socio-ecological characteristics, meaning development success hinges on infrastructure's ability to align with local social and cultural structures.

This scholarly gap motivates the present research. Amid global sustainable development agendas emphasizing spatial justice, there remains an urgent need to understand how infrastructure can function as a socio-infrastructure bridge connecting marginalized islands to developmental centers. Small-island development in Metimiarang offers an opportunity to advance sociological theories of development that are context-sensitive and geographically grounded. Using spatial sociology and social ecology perspectives, this study explores how infrastructure shapes physical space, social relations, collective identity, and ecological awareness in small-island communities.

By employing participatory approaches and social SWOT analysis, this study demonstrates that successful island infrastructure development depends not on investment scale but on community participation, institutional strengthening, and a sense of ownership. Accordingly, infrastructure is reconceptualized as a living social entity embedded in networks of values, interactions, and community solidarity. In this regard, infrastructure development is a social process aimed at reducing spatial inequality, strengthening social integration, and sustaining life in eastern Indonesia's small islands.

The primary objective of this study is to analyze the role of infrastructure in reducing spatial and social inequality in eastern Indonesia's small-island regions, particularly Metimiarang. It further seeks to identify socio-economic and cultural dynamics influencing community acceptance and sustainability of infrastructure, and to formulate an inclusive, participatory development model. By positioning infrastructure as a social bridge, this study contributes to development sociology and supports spatial justice and sustainable development agendas in Indonesia's archipelagic context.

RESEARCH METHOD

This study employs a sociological qualitative approach because the primary focus is to understand infrastructure development not merely as a technical project, but as a social phenomenon that shapes relationships, values, and community structures in small island settings. This approach aligns with the research objective to uncover the social dynamics behind development policies, community participation, and the social meanings attached to infrastructure in the everyday life of residents in Metimiarang Island. A qualitative approach allows the researcher to capture social realities through direct interaction with the community and to understand their views from an emic perspective, as emphasized by Mohd Arifin (2018), Muskat et al. (2018), and Ritter (2022), who argue that such an approach is suitable when the aim is to interpret the social meanings behind actions and policies.

Metimiarang Island was selected purposively based on academic and empirical considerations. Geographically, the island represents typical characteristics of small-island regions in Eastern Indonesia that experience significant limitations in basic infrastructure, such as access to clean water, sanitation, and waste management. Socioculturally, the community maintains strong local values and social structures, including the traditions of masohi (collective labor) and pela gandong (inter-village brotherhood), making it a relevant site for examining the interplay between infrastructure development and social cohesion. Moreover, the regional government has designated this location as a priority development zone within the maritime border area. These considerations make Metimiarang an ideal setting to explore how infrastructure operates as a social bridge that reduces spatial inequality and strengthens citizen participation.

Two primary techniques were applied in this study: SWOT Analysis and Participatory Planning Analysis (PPA). SWOT Analysis was employed to identify strengths, weaknesses, opportunities, and threats in infrastructure development from a socio-local perspective, allowing the mapping of community positioning in the development process, including human resource capacity, social networks, and local institutional capabilities. Meanwhile, PPA was used to assess the extent of community involvement across planning, implementation, and evaluation stages, enabling an understanding of the relationships among development actors, government, community members, and service providers, as well as the sustainability of infrastructure initiatives.

Alongside these methods, a participatory approach was applied through Participatory Rural Appraisal (PRA), enabling community members to serve as active subjects rather than objects of the research. PRA helped capture community perceptions, experiences, and aspirations regarding infrastructure development. Data collection included in-depth interviews with key stakeholders, village authorities, traditional leaders, women and youth representatives, facility beneficiaries, and officials from the district public works and spatial planning agency. A total of 18 key informants were selected purposively to ensure representation of diverse perspectives and to enable structural and cultural analysis.

Data were collected through three main techniques: field observation, in-depth interviews, and focus group discussions (FGDs). Field observation was conducted for three weeks to examine infrastructure conditions, social activities, and community involvement in public facility management. Semi-structured interviews allowed informants to express their views openly, while FGDs helped capture collective perspectives and validate individual interview findings. Secondary data were obtained from regional planning documents, development policies for small islands, project reports, and academic literature on development sociology and spatial sociology.

To ensure validity and credibility, triangulation techniques were adopted. Source triangulation compared information from different informant categories (government, traditional leaders, community members), and methodological triangulation combined SWOT, PRA, observation, and FGDs to avoid analytical bias. Member checking was also conducted by confirming preliminary interpretations and findings with key informants, ensuring that the data accurately reflected community perspectives and lived experiences.

RESULTS AND DISCUSSION

Infrastructure as an Agent of Social Integration in Small-Island Communities

Infrastructure plays a critical role in shaping social, economic, and cultural connectivity across Indonesia, particularly in small-island regions that remain peripheral to national development flows. In Metimiarang Island, infrastructure functions not only as physical facilities, such as roads, clean water networks, and sanitation systems, but also as a social integrator that binds residents within a broader system of collective life. Infrastructure represents a symbolic link between the state and citizens, between central and peripheral areas, and between individuals and their social space. Thus, infrastructure operates as a social bridge that facilitates economic activity while also mediating inclusive and equitable social relationships.

Before infrastructure development, Metimiarang experienced significant isolation. Access to clean water was limited, with most residents relying on rainwater stored in makeshift containers, and sanitation and waste systems were largely absent. The main paths connecting the coastal and inland settlements consisted of slippery limestone tracks, hindering mobility and economic activities. Field observations from July–August 2024 revealed that local livelihoods centered on small-scale fisheries and dryland farming, with limited market access due to transport constraints. Such spatial inequality reinforced social and structural exclusion.

Infrastructure development initiated in 2020 through collaboration between local government and community members brought significant transformation. PPA results indicate that 85% of respondents experienced improved access to clean water, while 72% reported better land and sea transportation access. An interview with a community leader noted that the construction of bore wells and water pipelines fundamentally improved daily life by providing equitable access to water, strengthening not only physical welfare but also a sense of citizenship.

Improved roads and small port facilities increased inter-household interactions and collective economic activities, including transport of fish catches and agricultural products. FGDs with women and youth groups highlighted enhanced access to education, religious activities, and communal work (gotong royong). One participant noted that improved roads enabled children to attend school consistently and supported women in transporting goods, demonstrating indirect social empowerment through physical investment.

In line with the concept of socio-infrastructural embeddedness (Büscher & Fletcher, 2019), infrastructure functions within a network of power, norms, and local values. SWOT analysis revealed strong communal solidarity (masohi) as a major asset, but limited technical capacity as a key challenge. Opportunities include provincial development support and eco-cultural tourism potentials, while threats arise from environmental risks and logistical constraints.

Table 1 SWOT Analysis of Infrastructure Development in Metimiarang Island

Strengths	Weaknesses	Opportunities	Threats
High social solidarity and gotong royong	Limited technical capacity of village government	Policy support for small-island development	Climate change and water scarcity
Local knowledge in resource management	Dependence on external support	Eco-cultural tourism potential	High transportation and logistics costs
Active community participation	Weak infrastructure maintenance systems	Enhanced regional connectivity	Urbanization and outward migration
Strong kinship networks	Limited data and technology access	Partnerships with NGOs and universities	Potential land-use conflicts
Adaptive social structures	Fragmented stakeholder coordination	SDGs and climate adaptation agendas	

Source: Author's analysis, 2025

Participatory processes (PRA) showed that the community was not a passive beneficiary but a co-producer of development. Collective decision-making ensured technical choices aligned with social and environmental conditions. Infrastructure also strengthened collective identity, reducing fragmentation between coastal and inland groups and fostering new community-based management units for water and sanitation, in line with Graham and Marvin's (2022) conception of infrastructure as social fabric.

Empirical findings show improvements in quality of life: 68% of female respondents reported reduced labor burden due to improved water access, and 74% of participants noted enhanced access to health services and increased informal economic activities. Infrastructure thus generated dual impacts, material improvements and social transformation, by expanding mobility, participation, and collective agency.

Spatial and Social Inequalities in Infrastructure Development

Spatial and social inequalities in infrastructure development represent one of the most visible forms of development injustice in Eastern Indonesia's archipelagic regions. This reality is strikingly apparent in Metimiarang Island, Maluku Barat Daya, a small island that has long occupied a peripheral position within the national development system. Despite Indonesia's identity as a maritime nation, infrastructure policies remain disproportionately oriented toward major land-based regions such as Java and Sulawesi, leaving small islands with significant deficits in access to basic facilities including clean water, sanitation, and transportation. Field observations conducted over a two-month period in 2024 show that most residents still rely on rainwater as their primary source of clean water, creating acute vulnerability during the dry season when water supplies decline and households are forced to purchase water from tankers arriving from Moa Island at high cost. In this context, infrastructure is not merely a physical asset but also a representation of the structural gap between the center and periphery, reflecting uneven distribution of state presence and development benefits.

Empirical findings from the Participatory Planning Analysis (PPA) reveal that spatial disparities manifest across multiple dimensions of community life. Focus group discussions (FGDs) with village authorities and women's groups indicate that only 40% of households in Metimiarang have adequate access to clean water systems, while the remainder depend on unregulated natural sources. Sanitation systems remain largely individual, with many households using rudimentary pit latrines that pose risks of groundwater contamination. Meanwhile, maritime transport, the backbone of inter-island mobility, is frequently disrupted by extreme weather, delaying the delivery of essential goods and restricting socioeconomic mobility. During an in-depth interview, a senior fisherman stated, "When the sea is rough, logistics boats cannot dock for days. We run out of food, and our fish cannot be sold outside the island." This testimony illustrates how unstable maritime infrastructure shapes economic precarity and social vulnerability on small islands.

As scholars have emphasized, spatial inequity is not solely a geographic issue but a form of structural marginalization rooted in development policies that ignore principles of spatial justice (Bierbaum et al., 2021; Haxhija et al., 2024). The SWOT analysis in this study identifies limited institutional capacity and weak coordination between district and village governments as primary constraints on infrastructure planning and implementation. Decisions are often made through top-down approaches that fail to consider local sociocultural conditions, leading to infrastructure that does not align with community needs. For instance, a pier constructed in 2021 to support economic activity now serves mainly as a social gathering space rather than a logistical hub because planners did not account for tidal patterns and dominant wind directions. Field observations show that this facility has become a site for youth recreation rather than economic exchange, demonstrating how poorly contextualized infrastructure reinforces social dependency and reproduces inequality.

Social inequality stemming from non-inclusive development also affects intergenerational mobility. According to interviews with a local primary school teacher, many children cannot continue to junior secondary school because the nearest one is located on another island, requiring costly maritime transport. Access to health services likewise depends on facilities on the mainland, with emergency referrals possible only on the weekly transport schedule to Tiakur, the district capital. Such conditions exemplify spatial injustice, where residents of remote islands bear compounded social and economic risks due to their marginal geographic position.

Table 2 Spatial and Social Inequalities in Metimiarang Island

Aspect	Manifestation of Inequality	Social–Development Implications
Clean Water	Reliance on rainwater and imported tanker supplies; uneven distribution across settlements	Social tensions, reduced quality of life, burden on women and children
Sanitation & Waste	Predominantly simple latrines; limited communal sanitation facilities	Health risks, environmental degradation, weak collective sanitation norms
Maritime Transport	Weather-dependent inter-island connectivity; high logistics costs	Supply delays, education and mobility constraints, reinforced isolation
Social & Economic Mobility	Limited access to secondary education and healthcare facilities	Constrained vertical mobility, widening intergenerational inequality
Local Institutions	Limited planning capacity; weak formal participation structures	Misaligned infrastructure priorities; low public legitimacy
Information & Technology	Unstable and uneven digital connectivity	Limited digital engagement and socio-economic networking

Source: Author’s field data, observation, interviews, and FGD, 2025

FGD data show that many residents perceive these inequalities as normalized conditions of island life, fostering a resignation to limited infrastructure. However, emerging activism among youth reveals a growing critical awareness and demand for fair public services, exemplified by online community campaigns advocating for improved facilities. This demonstrates that while spatial inequality produces marginality, it can also catalyze social consciousness and grassroots agency.

Reflecting insights from spatial justice scholarship, infrastructure disparities in Metimiarang illustrate how unequal spatial distribution of services entrenches systemic disadvantage (Bierbaum et al., 2021; Chen et al., 2023; Haxhija et al., 2024). PRA and PPA findings further reveal that meaningful community involvement enhances relevance and sustainability in infrastructure planning. For example, during the 2023 village planning forum, residents proposed a locally sourced sand-and-charcoal filtration system, which proved more effective and sustainable than costly pipe-based systems that strained maintenance capacity, demonstrating community-driven innovation in addressing infrastructural inequity.

Sociologically, spatial inequality has produced differentiated social strata based on infrastructure access. Households near the port and major paths enjoy greater economic opportunities, while those inland remain constrained by limited mobility and services. Yet, grassroots collective action, such as building community-managed water pipelines, shows how local solidarity mitigates structural exclusion. These dynamics reveal a paradox in development: top-down infrastructure policies may create inequality, yet they also inspire bottom-up collectivism and localized resilience.

Social Participation and Local Wisdom in Infrastructure Sustainability

Infrastructure sustainability in small-island settings is determined not only by technical and policy dimensions but also by the extent of social participation and embedded local values. Using the Participatory Rural Appraisal (PRA) approach, this study finds that community participation and indigenous knowledge form the foundation of sustainable, community-based infrastructure governance. Participation extends beyond planning to encompass monitoring, maintenance, and grassroots social innovation.

Field observations show that the community has established collective management systems for clean water and waste. The “Saniri Air” group, comprising family representatives, customary leaders, and youth, collectively oversees water distribution and pipeline maintenance. As a community elder stated, “Water is not only a need but a shared trust; when it breaks, we fix it together.” This reflects deeply rooted social norms of mutual responsibility and ecological stewardship.

Women’s groups play strategic roles in waste management through a community-based recycling initiative (“Bank Sampah Komunitas”) that transforms waste into craft products, enhancing household income and environmental awareness. Youth participate in collective road maintenance and drainage repair, fostering social leadership and intergenerational cooperation.

Table 3 Social Roles in Infrastructure Sustainability in Metimiarang

Community Group	Infrastructure Managed	Form of Participation	Social Impact
Customary Leaders (Saniri)	Water and environmental irrigation	Supervision and coordination	Fair water distribution; strengthened social cohesion
Women’s Groups	Waste and environmental sanitation	Community waste bank and 3R initiatives	Household income growth; environmental awareness
Youth Groups	Roads and drainage	Collective repair and maintenance	Strengthened solidarity and community leadership
Local Government	Technical and logistical support	Training facilitation and material provision	Enhanced state–community collaboration

Source: Field data from interviews and FGD, 2025

These findings highlight that social capital and local cultural values, including masohi (collective labor), baku bae (mutual care), and saniri adat (customary deliberation), underpin

infrastructure resilience. According to Chen et al. (2023), sustainable development requires not only environmental sensitivity but also inclusive participation and equitable distribution of benefits. SWOT analysis indicates that Metimiarang's strengths lie in social trust and adaptive local wisdom, while risks include potential erosion of community solidarity if external assistance generates dependency.

Community-driven management of water systems and innovative waste initiatives demonstrate a transition from dependence to collective autonomy. As one youth participant expressed, "We do not wait for orders or assistance; if we do not protect our water, we all suffer." This shift reflects an internalization of sustainability values within daily practice, positioning infrastructure as a medium for social learning and empowerment.

These findings affirm that sustainable infrastructure in small-island contexts is not solely the outcome of government intervention. It emerges from dynamic social processes characterized by collaborative governance, participatory engagement, and respect for local knowledge, aligning with social sustainability theory that emphasizes empowerment and equity as core elements of justice-based development.

Local Governance and Institutional Challenges in Small-Island Development

Local development governance in small island settings such as Metimiarang Island represents a complex challenge involving multi-actor interactions among village government, district authorities, technical agencies, and local communities that serve as primary beneficiaries of infrastructure programs. Governance in this context extends beyond the capacity of government institutions to plan and implement policies; it also encompasses the coordination, participation, and accountability mechanisms embedded at the local level. Field findings indicate that institutional fragility remains a central barrier to achieving inclusive and sustainable development outcomes in small-island regions.

Based on field observations and SWOT analysis, the technical capacity of the village government in Metimiarang remains limited, particularly in planning and infrastructure management. Village officials lack technical expertise in areas such as clean-water systems, sanitation, and waste management. Consequently, decision-making processes heavily rely on external guidance from contractors or district technical offices. As stated by the Village Head of Metimiarang, "We understand community needs, but for technical planning and budgeting, we usually wait for instructions from the district office." This reflects a structural capacity gap between local and regional institutions, ultimately slowing implementation and diminishing development effectiveness.

Institutional fragmentation further complicates coordination. Findings from Participatory Planning Analysis (PPA) reveal that infrastructure projects are frequently administered by different government units without integrated coordination mechanisms. For example, water-supply construction falls under the Public Works Department, while waste management infrastructure is overseen by the Environmental Agency. The absence of a coordination forum

leads to overlapping programs misaligned with village development priorities. During a focus group discussion (FGD), a community representative noted, “Sometimes a project arrives, and we have no idea which agency it comes from; once it’s built, we must maintain it without any training.” This illustrates weak multilevel integration, where government institutions operate sectorally and lack responsiveness to socio-local dynamics.

From a multi-level governance perspective, development in island territories should be collaborative and interlinked across national, regional, and community levels (Mahaarcha & Sirisunhirun, 2023). As noted by Mahaarcha and Sirisunhirun (2023), governance effectiveness in peripheral regions depends on managing vertical relationships (central–local) and horizontal networks (across agencies and communities). Yet the situation in Metimiarang demonstrates fragmented vertical coordination at the implementation level and informal, unsupported horizontal linkages between local institutions and communities. Consequently, policies are often administrative and project-oriented rather than truly reflecting grassroots aspirations.

Field observations show that village development planning meetings remain largely symbolic, functioning primarily as socialization platforms for pre-determined district decisions. A member of the Village Consultative Body stated, “Community proposals are often rejected due to technical or budgetary reasons.” This reveals persistent power asymmetry, where local voices hold minimal influence in planning processes. As a result, infrastructure priorities frequently diverge from community needs, for instance, emphasis on village-center roads over coastal access routes crucial for fisheries and daily mobility.

Institutional weaknesses further exacerbate spatial inequality. Inadequate resource allocation governance leaves island communities increasingly marginalized relative to mainland regions. SWOT analysis highlights weak post-project monitoring as a major threat. Without continuous evaluation, many facilities rapidly deteriorate, field data indicate approximately 37% of clean-water pipelines developed leaks within two years due to lack of scheduled maintenance. Table 4 summarizes key institutional weaknesses and their development impacts.

Through a Participatory Rural Appraisal (PRA) approach, this study finds that despite deficiencies in formal governance, community-driven informal mechanisms have emerged to mitigate institutional gaps. Local elders and youth groups often serve as mediators between village government and residents to articulate priorities and resolve infrastructure issues. As noted by a traditional leader, “If we wait for coordination from above, nothing will be resolved; so we use customary dialogue to find solutions.” This illustrates grassroots governance as a bottom-up response to formal institutional limitations.

Sociological analysis highlights ongoing negotiation between community actors and government institutions. Resistance arises not as opposition to development, but as an assertion of local autonomy in setting context-appropriate priorities. For instance, while the district government prioritized road construction to the port, residents initially advocated for rainwater catchment facilities due to urgent water needs. Through deliberation and customary consultations, a phased approach was agreed upon, reflecting adaptive, justice-oriented

governance practices rooted in social negotiation.

Table 4 Institutional Weaknesses and Their Impact on Infrastructure Development in Metimiarang

Institutional Aspect	Identified Weakness	Impact on Development
Technical Capacity of Village Government	Limited technical personnel and insufficient technical knowledge	Ineffective planning and high dependence on external institutions
Inter-agency Coordination	Fragmentation between technical departments and village government	Unsynchronized and overlapping programs
Monitoring and Evaluation	Absence of post-project monitoring system	Rapid infrastructure deterioration and lack of sustainability
Community Participation	Community proposals not structurally accommodated	Declining public trust in government
Funding	High dependence on grant funding	Low local initiative for alternative financing mechanisms

Source: Field interviews, FGDs, and observations in Metimiarang Island, 2025

Socio-Infrastructural Bridging as a Framework for Sustainable Island Development

The socio-infrastructural bridging approach emerges from the recognition that infrastructure development in remote island regions is not merely a matter of physical construction but is deeply intertwined with the social dynamics of the communities it serves. In the context of Metimiarang Island, this concept becomes particularly relevant when field observations indicate that the presence of infrastructure, such as a jetty, local access roads, and clean water facilities, has not only enhanced economic conditions but also transformed patterns of interaction, participation, and social connectivity with external networks. Accordingly, socio-infrastructural bridging can be understood as a social process in which infrastructure functions as a relational bridge linking marginalized local communities to centers of political, economic, and knowledge power. As noted by Corchia and Borghini (2025), within the relational infrastructure perspective, infrastructure embodies social, political, and symbolic meanings embedded in everyday life.

Field observations and focus group discussions on Metimiarang demonstrate that the construction of a new jetty in 2023 marked a turning point in local social and economic transformation. Prior to its development, maritime access relied solely on small wooden boats vulnerable to weather conditions. As one informant, Mr. M., a local fisherman, explained, “in the past, when the waves were high, we could be isolated for days, and our catch could not be sold.” Following the jetty’s completion, residents gained more reliable market access to Tulehu and Ambon, while also benefiting from emerging opportunities in marine tourism and inter-island trade. This shift illustrates how infrastructure operated as a social bridge, connecting the island’s inhabitants to regional economic networks and expanding their social mobility through improved access to resources and economic opportunities.

SWOT analysis and Participatory Planning Analysis (PPA) conducted in this study further reinforce these findings. Although initially conceived as technical interventions, infrastructure projects generated unforeseen social strengths by broadening community participation in the blue economy and encouraging collaboration among fishermen, women seafood processors, and local youth groups. Collective awareness emerged, observed during deliberations between community representatives and village government, that infrastructure serves not merely as state property but as part of a new collective identity of island communities. This awareness aligns with inclusive development principles that emphasize social inclusion across development stages, consistent with the Sustainable Development Goals (SDGs), particularly Goals 9 (Industry, Innovation, and Infrastructure) and 11 (Sustainable Cities and Communities).

Nevertheless, socio-infrastructure bridging does not unfold automatically. Field data reveal complex phases of social negotiation surrounding infrastructure utilization. Some community members perceived increased tourism activities at the jetty as a threat to traditional fishing spaces. Through a Participatory Rural Appraisal (PRA) process, however, such tensions opened constructive dialogue. For instance, during a subsequent focus group meeting, a women's representative (Mrs. S.) proposed that the jetty be designated as a shared economic space managed through a rotation and community-based oversight system. This proposal was later formalized in a village regulation. This process illustrates that socio-infrastructure bridging reinforces not only physical connectivity but also social capacities for negotiation, resource sharing, and collaborative governance.

In line with Larkin's (2020) conceptualization of infrastructure as a mediating form that facilitates material flows while shaping social relations and cultural meanings, this study observes how everyday practices in Metimiarang reflect growing collective agency. Roads and clean water infrastructure have become symbols of the island's connection to national development narratives. Children now walk to school without navigating muddy terrain, while women's groups have established a clean-water cooperative to regulate distribution. These micro-level transformations demonstrate that sustainable infrastructure development involves not only physical improvements but also shifts in social structures and community perceptions regarding future aspirations.

Theoretically, socio-infrastructure bridging integrates insights from multi-level governance and relational infrastructure theories. Mahaarcha and Sirisunhirun (2023) argue that successful development governance depends on synergy among local, regional, and national actors. Empirical evidence from Metimiarang confirms that social bridges forged through infrastructure function effectively when supported by participatory cross-level coordination. For example, county-level institutions provide technical support, while village governments and local communities collaboratively manage infrastructure use. This co-production of development positions citizens not merely as beneficiaries but as co-producers in shaping development trajectories.

Furthermore, socio-infrastructural bridging offers a strategic lens to address spatial inequality, a persistent challenge in eastern Indonesian archipelagos. Socially oriented infrastructure helps reduce center–periphery divides while fostering a sense of collective ownership over development outcomes. As expressed by a young resident, Mr. A., “the new road makes us feel connected; now we can sell our products to the market and learn business skills from people outside the island.” Such testimonial evidence highlights how infrastructure can expand social-economic horizons, nurture aspirations, and facilitate meaningful engagement with broader regional networks.

CONCLUSION

This study concludes that infrastructure development in small island contexts, such as Metimiarang, constitutes not merely a technical project but a social process functioning as a mechanism that connects marginalized communities to centers of economic and policy power. Infrastructure plays a strategic role in bridging spatial inequality by enhancing access to basic services, expanding social mobility, and fostering cross-regional socio-economic networks. However, its effectiveness depends on the extent to which local governance integrates community participation, local knowledge, and multilevel institutional coordination. By applying a socio-infrastructural bridging approach, this study demonstrates that sustainable island development can only be achieved when infrastructure is conceptualized as a “social bridge” linking physical, social, and ecological dimensions in a balanced manner. This paradigm shift, from material-centric development toward socially rooted, spatially just, and ecologically responsible development, contributes both empirically and theoretically to strengthening the sociology of infrastructure in eastern Indonesia.

ETHICAL STATEMENT AND DISCLOSURE

This study was conducted in accordance with established ethical principles, including informed consent, protection of informants’ confidentiality, and respect for local cultural values. Special consideration was given to participants from vulnerable groups to ensure their safety, comfort, and equal rights to participate. No external funding was received, and the authors declare no conflict of interest. All data and information presented were collected through valid research methods and have been verified to ensure their accuracy and reliability. The use of artificial intelligence (AI) was limited to technical assistance for writing and language editing, without influencing the scientific substance of the work. The authors express their gratitude to the informants for their valuable insights, and to the anonymous reviewers for their constructive feedback on an earlier version of this manuscript. The authors take full responsibility for the content and conclusions of this article.

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