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CIVIL-MILITARY CORRIDOR RESILIENCE MODEL FOR INFRASTRUCTURE MANAGEMENT IN INDONESIA'S OUTERMOST BORDER ISLAND: EVIDENCE FROM MIANGAS ISLAND

MODEL KETAHANAN KORIDOR SIPIL-MILITER UNTUK MANAJEMEN INFRASTRUKTUR DI PULAU PERBATASAN TERLUAR INDONESIA: BUKTI DARI PULAU MIANGAS

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Abstract

Infrastructure management in outermost border islands is not only a matter of physical development, but also a strategic issue related to sovereignty, community welfare, connectivity and national defence. This article examines infrastructure management on Miangas Island, one of Indonesia's northernmost outer islands bordering the Philippines. Although Miangas already has several basic and strategic infrastructures, including roads, an airport, a port, electricity facilities, clean water sources, telecommunications, health facilities and security infrastructure, these assets have not yet functioned as an integrated and reliable system. The main problem is therefore not the absence of infrastructure, but the gap between physical availability and functional performance. This study uses a qualitative descriptive-analytical approach based on field observation, semi-structured interviews and document review. Data were analysed using the Miles and Huberman model, supported by STEEP+M and SWOT analysis. The findings show that infrastructure management in Miangas is influenced by three main indicators: infrastructure availability and quality, connectivity and accessibility, and infrastructure sustainability. Internally, Miangas has strengths in its strategic geography, existing infrastructure assets, state institutional presence, social cohesion and strong national identity. However, these strengths are constrained by weak service quality, limited maintenance, unstable connectivity, a fragile local economy and inadequate maritime surveillance. Externally, Miangas benefits from national legal support, strategic policy status and Indonesia–Philippines cooperation, but faces threats from cross-border dependence, illegal fishing, border violations, environmental pressure and geopolitical sensitivity. The SWOT analysis places Miangas in the WO quadrant, meaning that external opportunities should first be used to overcome internal weaknesses. This article proposes the Civil-Military Corridor Resilience Model as an integrated framework that connects public services, logistics, energy, local markets, maritime security and territorial defence in one border resilience system.

Keywords : Border Resilience, Civil-Military Relations, Infrastructure Management, Miangas Island, Maritime Security, National Defence, Outermost Islands.

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Abstrak

Pengelolaan infrastruktur di pulau-pulau perbatasan terluar bukan hanya masalah pembangunan fisik, tetapi juga isu strategis yang berkaitan dengan kedaulatan, kesejahteraan masyarakat, konektivitas, dan pertahanan nasional. Artikel ini mengkaji pengelolaan infrastruktur di Pulau Miangas, salah satu pulau terluar paling utara Indonesia yang berbatasan dengan Filipina. Meskipun Miangas telah memiliki beberapa infrastruktur dasar dan strategis, termasuk jalan raya, bandara, pelabuhan, fasilitas listrik, sumber air bersih, telekomunikasi, fasilitas kesehatan, dan infrastruktur keamanan, aset-aset ini belum berfungsi sebagai sistem yang terintegrasi dan andal. Oleh karena itu, masalah utamanya bukanlah ketiadaan infrastruktur, tetapi kesenjangan antara ketersediaan fisik dan kinerja fungsional. Studi ini menggunakan pendekatan deskriptif-analitis kualitatif berdasarkan observasi lapangan, wawancara semi-terstruktur, dan tinjauan dokumen. Data dianalisis menggunakan model Miles dan Huberman, didukung oleh analisis STEEP+M dan SWOT. Temuan menunjukkan bahwa pengelolaan infrastruktur di Miangas dipengaruhi oleh tiga indikator utama: ketersediaan dan kualitas infrastruktur, konektivitas dan aksesibilitas, serta keberlanjutan infrastruktur. Secara internal, Miangas memiliki kekuatan dalam geografi strategisnya, aset infrastruktur yang ada, kehadiran lembaga negara, kohesi sosial, dan identitas nasional yang kuat. Namun, kekuatan-kekuatan ini dibatasi oleh kualitas layanan yang lemah, pemeliharaan yang terbatas, konektivitas yang tidak stabil, ekonomi lokal yang rapuh, dan pengawasan maritim yang tidak memadai. Secara eksternal, Miangas mendapat manfaat dari dukungan hukum nasional, status kebijakan strategis, dan kerja sama Indonesia-Filipina, tetapi menghadapi ancaman dari ketergantungan lintas batas, penangkapan ikan ilegal, pelanggaran perbatasan, tekanan lingkungan, dan sensitivitas geopolitik. Analisis SWOT menempatkan Miangas di kuadran WO, yang berarti bahwa peluang eksternal harus terlebih dahulu digunakan untuk mengatasi kelemahan internal. Artikel ini mengusulkan Model Ketahanan Koridor Sipil-Militer sebagai kerangka kerja terintegrasi yang menghubungkan layanan publik, logistik, energi, pasar lokal, keamanan maritim, dan pertahanan teritorial dalam satu sistem ketahanan perbatasan.

Kata Kunci : Ketahanan Perbatasan, Hubungan Sipil-Militer, Manajemen Infrastruktur, Pulau Miangas, Keamanan Maritim, Pertahanan Nasional, Kepulauan Terluar.

1. INTRODUCTION

Outermost border islands hold strategic importance for archipelagic states. They are not only geographic edges of state territory, but also spaces where sovereignty, public services, economic resilience and security are tested in everyday life. For Indonesia, this issue is particularly important because the country has extensive maritime borders and many outermost small islands that are directly related to sovereignty, territorial integrity and maritime security.

Miangas Island is one of these strategic islands. Located in North Sulawesi and directly adjacent to the Philippines, Miangas is not only a frontier of Indonesian sovereignty, but also a vulnerable border space exposed to isolation, cross-border dependence, weak continuity of public services and limited logistical accessibility. The thesis shows that the government has built various basic and strategic infrastructures in Miangas, but these facilities have not yet produced reliable services, stable connectivity or sustainable socio-economic benefits. Therefore, the main issue is no longer the mere availability of infrastructure, but the gap between physical infrastructure and its functional effectiveness in supporting community welfare and national defence.

This article argues that infrastructure management in Miangas should be understood as a strategic defence issue. Infrastructure in a border island does not only serve development purposes. It also supports public service continuity, local economic resilience, logistics, maritime access and the state's effective presence in a sensitive border area. In this context, roads, ports, airports, energy systems, telecommunications, health facilities and logistics infrastructure must be assessed not only by their existence, but also by their ability to function as an integrated system.

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Recent international literature also supports this argument. Studies on small-island resilience show that small islands are highly vulnerable because of geographic isolation, resource constraints, exposure to climate and disaster risks, and limited institutional capacity. Lessy, Lassa and Zander's scoping review on small islands and coastal communities highlights the need for resilience frameworks that are sensitive to island vulnerability, social capacity and disaster risk. Trigg et al. also show that infrastructure in small island states can become a cascading failure point because transport infrastructure may simultaneously carry water, energy and communication functions.

At the same time, recent maritime security literature suggests that maritime security should not be understood only from a state-security perspective. Fabinyi et al. argue that maritime security needs a more holistic approach that includes state security, economic security, human security and environmental security. Mizo and Hauger further show that climate change has become an important maritime security issue in the Indo-Pacific because it may affect resources, sea lanes and maritime stability. These insights are directly relevant to Miangas, where maritime access, weather disruption, illegal fishing and border security are closely connected.

Based on this background, this article addresses two research questions. First, what factors influence infrastructure management on Miangas Island for national defence? Second, what infrastructure management strategy is most relevant for Miangas through the Civil-Military Corridor Resilience Model?

Literature Review and Conceptual Framework

Border Resilience and Small-Island Infrastructure

Border areas are increasingly understood as complex spaces where security, governance, environment and community welfare intersect. Hu et al. show that ecological security in border areas is closely linked to development, environmental management and border governance. Cappellano, Kurowska-Pysz and Jakubowski also argue that cross-border regions require *place-based* policy and multi-level governance because they face both unique risks and unique opportunities.

This perspective is important for Miangas because the island is located in a sovereignty-sensitive border area. Its infrastructure challenges cannot be separated from geographic isolation, domestic connectivity problems, cross-border relations with the Philippines and the state's ability to provide reliable public services. Therefore, Miangas should not be analysed only as a local development area, but as a border resilience system.

Small-island infrastructure literature also strengthens this argument. Trigg et al. demonstrate that infrastructure in small island developing states should be analysed as an interconnected system because disruption in one facility can affect transport, water, energy, communication and emergency services. Jansson et al. also show that small island states face distinct climate vulnerability and compounded social-environmental pressures. These studies support the view that Miangas requires infrastructure management that is adaptive to small-island characteristics.

Infrastructure as a Functional System

Infrastructure should not be evaluated only by physical availability. Aschauer's infrastructure theory argues that infrastructure contributes to productivity and quality of life when it supports mobility, services and economic activity. In Miangas, this means that an airport, port, road network, electricity system or telecommunications facility cannot be considered successful merely because it exists. It must also provide reliable service, reduce isolation, support local livelihoods and strengthen the state's presence.

This logic is consistent with the thesis finding that Miangas already has basic and strategic infrastructures, but the quality of services, connectivity and long-term sustainability remain suboptimal. The central problem is therefore the gap between infrastructure existence and infrastructure performance.

Strategy: Ends, Ways and Means

The article uses Clausewitz's strategic logic of *ends, ways and means* to analyse infrastructure management in Miangas. The *ends* are clear: to strengthen community welfare, safeguard sovereignty

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and support national defence in an outermost border area. The *ways* include infrastructure development, public service delivery, local economic support, logistics management and civil-military cooperation. However, the *means* remain insufficient, especially in fuel supply, maintenance, logistics, operational personnel and maritime surveillance.

This imbalance explains why infrastructure development in Miangas has not yet fully produced strategic results. Policy direction exists, and physical infrastructure has been built, but operational resources and institutional support have not yet been sufficient to make these facilities function reliably.

Civil-Military Coordination and Dual-Use Logistics

Civil-military coordination is central to infrastructure management in border areas. Civilian institutions should lead development planning, public service delivery and community welfare. Military and security institutions should support territorial security, protection of vital assets, maritime patrols, emergency response and logistics support. This division of roles is consistent with the principle that military support should strengthen, not replace, civilian governance.

Recent studies support this position. Sakib and Haque show that military engagement in domestic disaster response requires clear legal frameworks, institutional coordination and civilian-military mechanisms. Ekström's study on military supply-chain resilience highlights the importance of preparedness, adaptive capacity, barriers and enablers in military logistics. Loska et al. further show that military supply-chain logistics requires dynamic capabilities to respond to disruption. These studies strengthen the logic of a *dual-use logistics* approach in Miangas, where logistics should support both community needs and defence readiness.

Maritime Security

Miangas' infrastructure problem is inseparable from maritime security. The island depends heavily on sea and air connectivity, while the surrounding maritime space remains vulnerable to illegal fishing, border violations, weather disruption and cross-border dependence. Mahan's maritime perspective is therefore relevant because connectivity and defence readiness in Miangas depend on secure sea lanes and adequate maritime control.

Recent maritime security literature expands this perspective. Fabinyi et al. propose a broader maritime security approach that includes human and ecological dimensions, while Mizo and Hauger demonstrate that climate-related risks can affect Indo-Pacific maritime security. This supports the argument that maritime security around Miangas should include not only patrols, but also logistics, fisheries, community welfare, environmental conditions and secure access.

Civil-Military Corridor Resilience Model

The Civil-Military Corridor Resilience Model, or CMRC, is proposed as the main conceptual contribution of this article. The model integrates public services, defence logistics, local markets, energy support, disaster mitigation, maritime security and territorial defence into one strategic infrastructure corridor. It connects human security and hard security by placing infrastructure as a bridge between community welfare and national defence.

In the Miangas context, the CMRC is relevant because the island's problems are interconnected. Weak clean water, unstable electricity, limited fuel, weak telecommunications, irregular transportation, fragile local markets and limited maritime surveillance cannot be solved separately. They require an integrated system that connects civilian development and defence support.

2. RESEARCH METHOD

This study uses a qualitative descriptive-analytical approach. This approach was selected because the research problem is closely related to local context, actor perspectives, institutional interaction and field realities in a frontier border area. The research was conducted in Miangas Special Sub-District, Talaud Islands Regency, North Sulawesi Province, from November 2025 to June 2026. The thesis states that data were collected through semi-structured interviews, field observation and literature review, and analysed using the Miles and Huberman model, while SWOT analysis was used to formulate strategic priorities.

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The research subjects consisted of local government actors, military personnel, police personnel, border-related officers and members of the local community. These actors were selected because they are directly connected to infrastructure management, public service delivery, local socio-economic conditions and border security in Miangas.

Data analysis involved three stages. First, data were reduced by selecting and organising information relevant to infrastructure, welfare, connectivity and defence. Second, data were displayed in matrices and structured narratives. Third, conclusions were drawn through iterative verification. In addition, STEEP+M analysis was used to identify social, technological, economic, environmental, political and military factors. SWOT analysis was then used to map strengths, weaknesses, opportunities and threats and to formulate priority strategies.

3. RESULT AND DISCCUSSION

Findings

Infrastructure Availability and Quality

The findings show that Miangas already has several basic and strategic infrastructures, including roads, an airport, a port, electricity, telecommunications, educational facilities, health facilities, government offices and security infrastructure. However, these facilities have not yet provided fully reliable service quality. Clean water remains insufficient, electricity depends heavily on fuel availability, telecommunications are weak and unstable, and several public facilities require better maintenance.

This means that the central problem is no longer the total absence of infrastructure. The deeper problem is the gap between physical provision and functional performance. Infrastructure exists, but it has not yet fully supported welfare, connectivity and defence in an integrated manner.

Connectivity and Accessibility

Miangas already has major transportation nodes, especially the airport and port. However, connectivity remains low and unstable. Transportation access depends on schedules, distance and weather conditions. This affects the movement of people, goods and services. It also affects the price of basic necessities, access to health referrals, marketing of fishery products and the overall orientation of the local economy.

Because Miangas is geographically closer to the Philippines than to Indonesian distribution centres, weak domestic connectivity may create stronger cross-border dependence. This does not automatically mean a loss of national identity, but it creates strategic vulnerability if the state cannot provide domestic services that are more reliable, affordable and secure.

Infrastructure Sustainability

Infrastructure sustainability in Miangas remains weak in technical-operational, socio-economic and environmental terms. Maintenance support is inconsistent, fuel supply is unstable, and some facilities have not produced strong socio-economic benefits. Airport development has also created trade-offs, especially the reduction of plantation land, including coconut groves that are part of local livelihood systems.

This finding shows that infrastructure sustainability is not only about whether facilities continue to exist. It is about whether they continue to function, support livelihoods, adapt to environmental constraints and strengthen welfare and defence simultaneously.

STEEP+M Factors

The STEEP+M analysis shows that infrastructure management in Miangas is shaped by six interacting dimensions.

The social dimension shows strong social cohesion, customary institutions and national loyalty, but local service capacity remains limited. The technological dimension shows weaknesses in fuel supply, clean water, electricity, telecommunications and maintenance. The economic dimension shows that infrastructure has not yet fully strengthened local markets, fisheries and livelihoods. The

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environmental dimension shows that weather, sea conditions, limited land and water resources create structural constraints.

The political dimension shows that Miangas has strong legal and policy support, but post-construction governance remains weak. The military dimension shows the presence of defence and security institutions, but maritime surveillance capacity remains limited. Thus, infrastructure management in Miangas is not only a technical issue. It is also a welfare, logistics, governance, maritime and defence issue.

SWOT Position

Internally, Miangas has several strengths: strategic location, existing infrastructure assets, state institutional presence, social cohesion and strong national identity. However, these strengths are constrained by weak basic services, weak maintenance, limited domestic connectivity, fragile local economy and limited maritime surveillance. Externally, Miangas has opportunities from national legal support, strategic policy status, Indonesia–Philippines cooperation and the potential to become Indonesia's northern node. At the same time, it faces threats from cross-border dependence, illegal fishing, border violations, external socio-cultural influence, weather disruption and geopolitical sensitivity.

The SWOT analysis places Miangas in Quadrant II, or the WO position. This means that Miangas has strong external opportunities, but also dominant internal weaknesses. Therefore, the most logical strategy is to use policy support, budget priority, bilateral cooperation and regional connectivity opportunities to reduce weaknesses in basic services, logistics, maintenance, local economy and maritime surveillance.

Discussion

From Physical Infrastructure to Operational Performance

The findings confirm that infrastructure in Miangas cannot be understood only through the lens of physical development. In a border island, infrastructure is also an instrument of welfare, connectivity and defence. Therefore, the adequacy of infrastructure should be assessed by service quality, mobility, socio-economic benefits and defence support.

The Miangas case shows that the state already has clear objectives and has built several facilities. However, the operational means required to make those facilities function remain inadequate. Fuel, logistics, maintenance, technical personnel and maritime surveillance are still limited. This creates a gap between policy ambition and operational performance.

Infrastructure as State Presence

In Miangas, infrastructure represents the tangible presence of the state. When clean water is limited, electricity is unstable, logistics are expensive and transportation is uncertain, the state's presence becomes weak in daily life. Conversely, when infrastructure works well, the community experiences the state as present, useful and reliable.

This finding is consistent with Nye's logic of influence. In border areas, loyalty and national identity should not depend only on symbols. They must also be supported by social and economic benefits that are felt by the people. For Miangas, stronger domestic services are important to reduce excessive cross-border dependence and maintain the community's orientation toward Indonesia.

Civil-Military Integration

The study also shows that Miangas requires more functional integration between civilian and military roles. Civilian institutions should lead planning, public services and community welfare. Military and security elements should support territorial security, vital asset protection, maritime patrols, emergency response and logistics support.

The CMRC model is relevant because it avoids sectoral fragmentation. Instead of treating public services, logistics, local markets, energy, disaster mitigation and territorial defence as separate sectors, the model places them in one resilience corridor. This is important for outermost islands where civilian infrastructure and defence support are practically interconnected.

Dual-Use Logistics

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A key contribution of this article is the emphasis on dual-use logistics. In Miangas, logistics and energy should support both community needs and defence readiness. Fuel, for example, is required for public electricity and local economic activity, but it can also support refuelling needs for military ships and aircraft operating in the border area. Similarly, military ships or aircraft carrying logistics can also support maritime and air patrols.

This approach is consistent with recent military logistics literature. Ekström highlights the need for resilience in defence supply chains, while Loska et al. show that military logistics requires dynamic capabilities to respond to disruption. In Miangas, dual-use logistics can become a practical way to connect welfare and defence without creating unnecessary institutional separation.

Contribution to the Literature

This article contributes to the literature in three ways. First, it extends border resilience studies by showing that infrastructure in outermost islands is simultaneously a welfare, connectivity and defence instrument. Second, it contributes to small-island infrastructure literature by showing that infrastructure vulnerability in Miangas is not only caused by geography, but also by weak maintenance, unstable logistics and limited institutional integration. Third, it contributes to civil-military coordination literature by proposing the Civil-Military Corridor Resilience Model as a framework for integrating public services, logistics, energy, maritime security and territorial defence.

Strategy: Civil-Military Corridor Resilience Model

The strategy should be implemented in three phases.

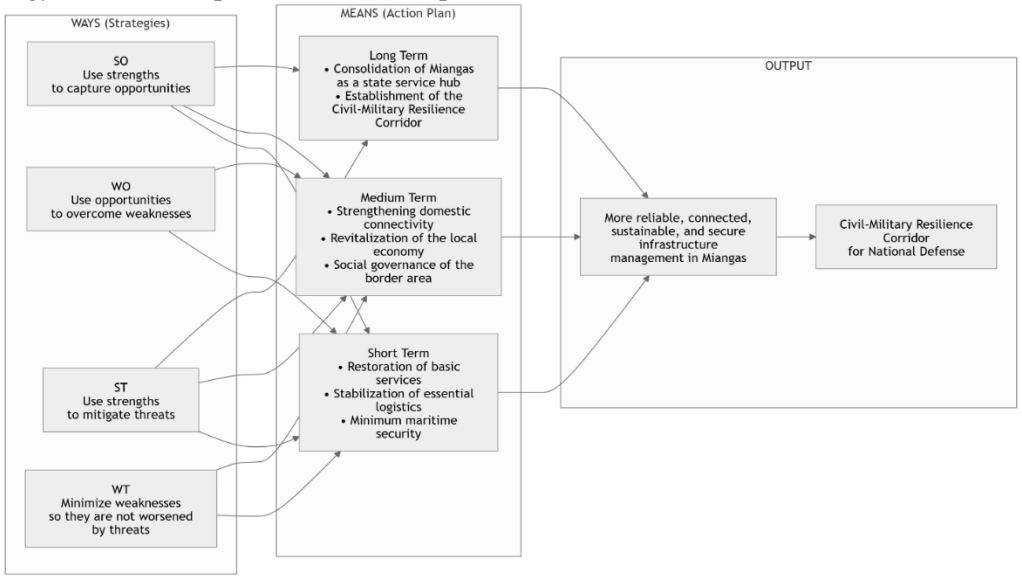

Figure Priority Action Plan for Infrastructure Management on Miangas Island

Short-Term Priority: Restoring Basic Services and Logistics

The first priority is to restore the daily functions of existing infrastructure. This includes clean water, electricity, fuel, telecommunications, health services, medicines, food and essential logistics. Minimum maritime surveillance must also be strengthened. Damaged or underused facilities, especially fuel storage, logistics facilities and basic public service infrastructure, should be repaired and assigned clear managers.

This phase is urgent because Miangas' greatest vulnerability lies in the weakness of daily operational functions. Without reliable basic services and logistics, the community remains vulnerable and the state's presence remains fragile.

Medium-Term Priority: Strengthening Connectivity and the Local Economy

The medium-term priority is to improve domestic connectivity and revive the local economy. The airport and port must become more functional, not only physically present. Sea and air

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transportation should become more regular and affordable. Distribution of goods, fuel, medicines and basic necessities should be more reliable.

At the same time, local economic functions should be strengthened through public markets, cooperatives, cold chains, fishery support facilities, boat moorings and post-harvest support. This is important because infrastructure should not only connect Miangas physically, but also create economic benefits for the local community.

Long-Term Priority: Establishing the Civil-Military Resilience Corridor

The long-term priority is the full establishment of the Civil-Military Resilience Corridor. At this stage, Miangas should develop into a strategic frontier system that integrates public services, defence logistics, local markets, energy, disaster mitigation, maritime security and territorial defence.

The expected outcome is a border infrastructure system that is reliable, connected, sustainable and secure. Miangas should no longer be treated as a vulnerable peripheral island, but as a resilient northern frontier node of Indonesia.

Policy Implications

This article offers several policy implications.

First, Miangas should be treated as a priority border area. Infrastructure management should be placed in one policy framework that integrates welfare, national connectivity, maritime security, local economic resilience and border governance.

Second, cross-sectoral coordination must be strengthened among ministries, local government, defence institutions, security agencies and community actors. Fragmented programmes will not be sufficient because the problems in Miangas are interconnected.

Third, the state should develop a dual-use logistics scheme. Water, fuel, energy, food and essential goods should be managed to support both community welfare and defence operations.

Fourth, operational governance must be improved. Each public and economic facility should have a clear manager, sufficient maintenance budget and regular evaluation mechanism.

Fifth, maritime and border surveillance should be improved through regular minimum patrols, community-based early warning systems, monitoring of vulnerable points and rapid inter-agency coordination.

Sixth, community participation should be strengthened. Customary institutions, religious leaders, fishermen's groups, women's groups and local communities should not only be beneficiaries of infrastructure development, but also active actors in maintaining infrastructure sustainability and border resilience.

These recommendations are consistent with the thesis conclusion that Miangas requires an integrated, phased and adaptive management model so that development does not stop at physical projects, but produces real territorial resilience.

4. CONCLUSION

This article concludes that infrastructure management on Miangas Island has not yet fully functioned as an integrated instrument for community welfare and national defence. The main problem is not simply the absence of infrastructure, but the gap between physical availability and functional performance.

The factors influencing infrastructure management are multidimensional. Internally, Miangas has strategic location, infrastructure assets, state institutions, social cohesion and strong national identity. However, these strengths are constrained by weak basic services, limited maintenance, unstable connectivity, fragile local economy and inadequate maritime surveillance. Externally, Miangas benefits from legal support, strategic policy status and bilateral cooperation, but faces threats from cross-border dependence, illegal fishing, border violations, weather disruption and geopolitical sensitivity.

The SWOT analysis places Miangas in the WO quadrant. Therefore, the priority strategy is to use external opportunities to reduce internal weaknesses. This should begin with restoring basic services

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and logistics, continue with strengthening connectivity and the local economy, and culminate in the establishment of the Civil-Military Corridor Resilience Model.

The main contribution of this article is the proposition that infrastructure in outermost border islands should be managed not as isolated physical assets, but as an integrated civil-military resilience corridor. In this model, infrastructure, welfare, logistics, energy, maritime security and territorial defence reinforce one another. For Miangas, this approach is essential to transform the island from a vulnerable frontier into a resilient strategic border system.

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