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Indonesia's New Growth Center: The IMIP Model

Resource-Driven Industrial Urbanization: Nickel Development and the Transformation of Mining Processing Towns in Indonesia

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Abstract

The rapid expansion of Indonesia's nickel downstream industry has given rise to a distinctive form of industrial urbanization, particularly in Morowali (Central Sulawesi), Weda Bay (Central Halmahera), and Obi Island (South Halmahera). Unlike conventional urban development, which typically evolves gradually through diversified economic activities, these regions exhibit a pattern of resource-driven industrial urbanization marked by rapid inflows of capital, labour, and infrastructure concentrated around large-scale processing facilities. This process has produced industrial boomtowns in which growth is heavily driven by external investment, often outpacing local governments' capacity to ensure adequate spatial planning, regulatory oversight, and public service provision. These dynamics are closely linked to Indonesia's position as the world's leading nickel producer and to national downstream policies, including the 2014 ban on raw ore exports. Using a qualitative approach grounded in secondary data, selective field observations, and policy analysis, this study examines how national industrial strategies, global commodity chains, and local governance structures interact to shape urban development trajectories in these regions. The findings suggest that while nickel industrialization stimulates economic growth and accelerates regional transformation, it also generates significant challenges, including infrastructure gaps, environmental pressures, limited economic diversification, and weak institutional capacity. Without integrated planning and long-term policy frameworks, these emerging industrial towns risk developing structural vulnerabilities commonly associated with resource-dependent cities, underscoring the need for more balanced and sustainable development approaches.

Keywords: boomtowns; energy transition; global commodity chains; Indonesia; industrial urbanization; nickel downstreaming

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I. Introduction

Over the past decade, Indonesia has emerged as the world's leading producer of nickel, a mineral of strategic importance in the global transition toward low-carbon energy systems (International Energy Agency [IEA], 2023; World Bank [WB], 2020). Robust demand from the stainless-steel sector, together with the rapid growth of electric vehicles and battery manufacturing, has substantially driven up global demand for nickel, particularly for high-grade applications used in batteries (IEA, 2023). Leveraging its extensive laterite reserves, Indonesia has repositioned itself from a raw material exporter to a key hub for nickel processing and metallurgical production (Government of Indonesia, 2020; Nugroho & Widyastuti, 2026b). This transformation has been driven by state-led industrial policies, notably the ban on raw ore exports and the promotion of domestic downstream processing (Warburton, 2017; Organisation for Economic Co-operation and Development [OECD], 2019).

A central feature of this strategy is the development of large-scale industrial complexes in previously remote mining regions. Industrial parks such as the Indonesia Morowali Industrial Park and the Weda Bay Industrial Park have rapidly evolved into major global production centers, hosting numerous smelters, attracting substantial foreign investment, and employing tens of thousands of workers (Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2020; IEA, 2023). Smaller but strategically significant operations, such as the Harita Nickel Industrial Complex, further reinforce this pattern of industrial expansion. These developments are not only industrial in nature but also spatially transformative, reshaping settlement patterns and regional economies.

Despite a growing body of scholarship on global value chains and the geopolitics of critical minerals, the local-level spatial and social consequences of nickel industrialization remain underexplored (Bridge, 2008; Sovacool et al., 2020). Existing studies tend to emphasize macroeconomic benefits and geopolitical dynamics, often overlooking how large-scale industrialization reconfigures local spaces, institutions, and livelihoods. In Indonesia, rapid industrial expansion has triggered unprecedented urbanization processes in regions that were previously rural or sparsely populated. In areas such as Morowali, Weda, and Obi, industrialization and urbanization have unfolded simultaneously, producing new forms of "resource frontiers" characterized by accelerated in-migration, spatial fragmentation, and evolving socio-economic hierarchies (Bebbington et al., 2018).

This phenomenon can be understood through the lens of resource-driven urbanization, in which extractive and processing industries act as primary catalysts for the emergence and growth of urban settlements (Freudenburg, 1992; Bridge, 2008). This perspective intersects with broader debates on the "resource curse" (Auty, 2001), which highlights the structural vulnerabilities of resource-dependent economies, and the concept of "enclave economies," where industrial activities are spatially and economically disconnected from local development. In addition, the notion of "splintered urbanism" provides a useful framework for understanding how infrastructure and services in such regions may develop unevenly, reinforcing socio-spatial inequalities.

Indonesia's prior experience with resource-based urbanization—particularly in oil and gas cities such as Bontang, Balikpapan, and Rumbai—demonstrates both the opportunities and risks associated with such development trajectories (Resosudarmo et al., 2009). While these cities benefited from industrial growth and improved infrastructure, they also faced challenges related to economic dependence, environmental degradation, and

uneven development outcomes. However, the speed, scale, and global integration of the current nickel boom introduce new and more complex governance challenges, particularly in the context of the global energy transition.

This study addresses three main research questions:
(1) How has nickel industrialization reshaped settlement patterns and accelerated urbanization in mining regions?
(2) What social, spatial, and governance challenges are emerging in these industrial towns?
(3) What lessons from earlier resource-based cities can inform policy responses?

Despite growing attention to the geopolitics and value chains of critical minerals, the urban dimension of nickel industrialization remains underexplored, particularly how it produces resource-driven industrial urbanization characterized by rapid settlement growth, enclave development, and governance challenges in resource-based regions.

By addressing these questions, this article contributes to the resource-based development literature by explicitly integrating an urban perspective into the study of critical mineral economies. In doing so, it advances the concept of resource-driven industrial urbanization as a framework for understanding the spatial and institutional transformations associated with large-scale industrialization in the Global South.

II. Literature Review

2.1. Resource-Based Industrialization and Downstream Processing

Resource-based industrialization has long been a central theme in development economics and political economy (Auty, 2001; Rodrik, 2008). Many resource-rich countries have sought to transform their economies by moving beyond the export of raw materials toward higher-value-added processing and manufacturing activities. Such strategies are often expected to generate industrial upgrading, technological learning, and broader economic diversification (Rodrik, 2008). However, the outcomes of resource-based industrialization have been uneven, varying significantly across countries depending on factors such as state capacity, the design and implementation of industrial policies, and the degree of integration into global production networks (Auty, 2001).

Within this broader literature, Indonesia's recent nickel policy has attracted considerable international attention. The government's ban on raw nickel ore exports, combined with its promotion of domestic smelting industries, has been widely interpreted as an effort to capture greater value from mineral resources and strengthen the country's position within global supply chains for battery materials (OECD, 2019; IEA, 2023). Existing studies have primarily examined how Indonesia is attempting to reposition itself within the global nickel value chain, particularly in relation to the rapidly expanding electric vehicle industry (Nugroho & Al-Wafiy, 2026a).

Much of this scholarship is informed by the analytical frameworks of global value chains (GVCs) and global production networks (GPNs), which emphasize the fragmented and hierarchical nature of contemporary industrial production. Scholars such as Gereffi et al. (2005) and Sturgeon (2002) argue that value creation in globally dispersed industries is unevenly distributed across different stages of production. In this context, the transition from raw material exports to domestic processing represents an effort by resource-rich countries to capture a larger share of value within these global networks. In Indonesia's case, the rapid expansion of smelting facilities is often interpreted as an example of state-led

industrial policy aimed at promoting downstream industrialization (Warburton, 2017; Nugroho & Widyastuti, 2026b).

Nevertheless, while this body of literature provides important insights into the economic and geopolitical dimensions of Indonesia's nickel strategy, it remains largely focused on national-level policies and global supply chains. As a result, relatively little attention has been paid to the spatial and urban transformations associated with the rapid development of large-scale industrial complexes in mining regions.

2.2. The Political Economy of Critical Minerals

The growing importance of nickel in battery technologies has positioned Indonesia within broader debates on the political economy of critical minerals (IEA, 2023; World Bank, 2020). As global demand for electric vehicles accelerates, minerals such as lithium, cobalt, and nickel have become essential inputs in the energy transition. Scholars increasingly examine how competition over these resources is reshaping international political economy and global industrial strategies (Sovacool et al., 2020).

Researchers such as Bridge (2008) and Sovacool et al. (2020) argue that the transition toward low-carbon energy systems is likely to intensify mineral extraction in specific regions of the world. Rather than reducing dependence on natural resources, the energy transition may give rise to new forms of extractivism centered on critical minerals (Bridge, 2008). In this evolving landscape, countries endowed with large reserves of strategic minerals are assuming increasingly important roles within global economic and geopolitical structures.

Indonesia's vast nickel reserves have consequently become a focal point of international investment and strategic interest (IEA, 2023; Nugroho & Al-Wafiy, 2026a). Large-scale industrial complexes—such as the Indonesia Morowali Industrial Park and the Weda Bay Industrial Park—are frequently analyzed as key nodes within the global battery supply chain, linking Indonesian mineral resources with foreign processing technologies, particularly from China, and downstream electric vehicle markets (CSIRO, 2020).

However, similar to the global value chain literature, studies on the geopolitics of critical minerals tend to emphasize macro-level dynamics, including international trade, industrial policy, and global competition. While these perspectives are essential for understanding Indonesia's strategic position in the global mineral economy, they often overlook the local-level consequences of rapid industrial expansion in mining regions, particularly in terms of urbanization, socio-spatial change, and governance challenges.

2.3. Extractive Industries and Resource Urbanization

Another body of literature relevant to this study examines the social and spatial impacts of extractive industries. This scholarship often draws on insights from political ecology and economic geography to analyze how resource extraction reshapes landscapes, local economies, and social relations (Bebbington et al., 2018).

Historically, extractive industries have played a central role in the formation of new settlements and urban centers. Mining booms in regions such as Western Australia, northern Canada, and parts of Latin America have led to the rapid emergence of towns organized around resource extraction and processing activities (Freudenburg, 1992). These settlements are typically characterized by high population mobility, strong dependence on a single industry, and the dominant influence of large corporate actors in shaping local development trajectories.

Such settlements are often conceptualized as resource towns or company towns, where the economic and spatial organization of urban life is closely tied to the operations of a dominant industrial sector (Auty, 2001). Many of these towns experience boom–bust cycles, with periods of rapid expansion followed by economic stagnation or decline when resource prices fall, or deposits become depleted. This pattern is closely linked to the broader concept of the resource curse, which highlights the structural vulnerabilities associated with resource dependence.

Within Southeast Asia, research on extractive industries has tended to focus on environmental conflicts, land-use change, and community resistance. Scholars such as Li (2014) demonstrate how large-scale resource projects can transform rural livelihoods, reconfigure land tenure systems, and generate new forms of social inequality. While these studies provide important insights into the socio-environmental impacts of extraction, they pay comparatively limited attention to the urbanization processes associated with large-scale industrial expansion.

2.4. Resource Cities in Indonesia

Indonesia has previously experienced various forms of resource-driven urban development, particularly in regions associated with the oil and gas as well as mining industries. Notable examples include Tembagapura and Soroako, which were established in response to large-scale copper mining operations in Papua and nickel extraction in South Sulawesi, respectively. During the late twentieth century, cities such as Bontang and Balikpapan developed into major centers for petroleum refining, liquefied natural gas (LNG) production, and related industrial activities. Similarly, the oil-producing districts of Rumbai and Sorong emerged as key hubs for upstream petroleum operations.

These cases illustrate diverse trajectories of resource-based urbanization. Some cities evolved into relatively diversified urban economies, supported by expanding service sectors and stronger regional connectivity. Others, however, remained heavily dependent on a single industrial sector, reflecting the classic characteristics of company towns (Auty, 2001; Bridge, 2008). As highlighted in the literature on extractive economies, such divergence is often shaped by differences in governance capacity, infrastructure provision, and the extent to which industrial development is spatially integrated with surrounding communities (Bebbington et al., 2018).

The experiences of these earlier resource-based cities provide important lessons for understanding the current wave of nickel-driven industrialization in Indonesia, particularly in Morowali, Weda Bay, and Obi. While there are clear continuities—such as dependence on global commodity markets and the dominance of large corporate actors—the scale, speed, and global context of contemporary nickel development are markedly different. Unlike earlier resource towns, which were often oriented toward raw material extraction, current nickel industrialization is closely linked to downstream processing and global battery supply chains associated with the energy transition.

This shift intensifies both the opportunities and the risks of resource-driven urbanization. On the one hand, downstream industrialization offers greater potential for value addition, employment generation, and regional economic transformation. On the other hand, it amplifies pressures on urban systems, including rapid population influx, infrastructure deficits, environmental degradation, and institutional strain. Without proactive and integrated urban planning, these emerging industrial regions risk

reproducing—and potentially exacerbating—the structural vulnerabilities observed in earlier resource-dependent cities.

2.5. Research Gap

Taken together, existing studies on Indonesia's nickel industry provide valuable insights into global supply chains, industrial policy, and environmental impacts. However, the urban implications of the nickel boom remain insufficiently explored (Sovacool et al., 2020; Nugroho & Al-Wafiy, 2026a). In particular, there is limited research examining how large-scale industrial complexes reshape local settlement patterns, generate new forms of urbanization, and create governance challenges for local authorities.

The emergence of nickel-based industrial towns such as Morowali, Weda Bay, and Obi Island represents a new frontier of resource-driven urban development in Indonesia (Bebbington et al., 2018). These regions are experiencing rapid demographic growth, significant infrastructure expansion, and complex socio-economic transformations. However, the institutional and governance frameworks required to manage these changes remain underdeveloped, often in contexts where local administrative capacity is limited.

By examining the rise of these emerging nickel-based industrial towns and comparing them with earlier oil and gas cities in Indonesia, this article seeks to address this gap in the literature. Understanding how resource-based industrialization interacts with processes of urbanization is essential for informing more sustainable, inclusive, and well-governed development strategies in resource-rich regions.

III. Method

This study adopts a comparative qualitative case study approach to examine the emergence of resource-driven industrial towns in Indonesia's nickel-producing regions. The primary objective is to analyze how large-scale industrial investments associated with nickel processing have transformed local settlements into rapidly growing urban-industrial centers, and to compare these developments with earlier experiences of resource-based urbanization in Indonesia's oil and gas sector. A qualitative case study approach is particularly well-suited for investigating complex socio-spatial transformations in their real-world contexts, as it enables rich, in-depth, and context-sensitive analysis (Yin, 2018; Creswell & Poth, 2018).

The approach of this study is illustrated in Figure 1.

This study adopts a qualitative research design to examine the dynamics of resource-driven industrial urbanization in Indonesia's emerging nickel-producing regions. The analysis focuses on three key industrial areas—Morowali (Central Sulawesi), Weda Bay (Central Halmahera), and Obi Island (South Halmahera)—which have become major nodes in the country's nickel processing industry following the implementation of downstream industrialization policies and the rapid expansion of foreign investment in smelting and battery-related sectors (IEA, 2023; OECD, 2019).

The development of these regions is closely linked to large-scale integrated industrial complexes, including the Indonesia Morowali Industrial Park (IMIP), Weda Bay Industrial Park (IWIP), and the Harita Nickel Industrial Complex. These industrial parks host multiple smelting and processing facilities and employ tens of thousands of workers, a substantial proportion of whom are migrant laborers from other parts of Indonesia. As such, they

provide critical empirical sites for analyzing the intersection between large-scale industrialization and rapid urban growth (CSIRO, 2020; IEA, 2023).

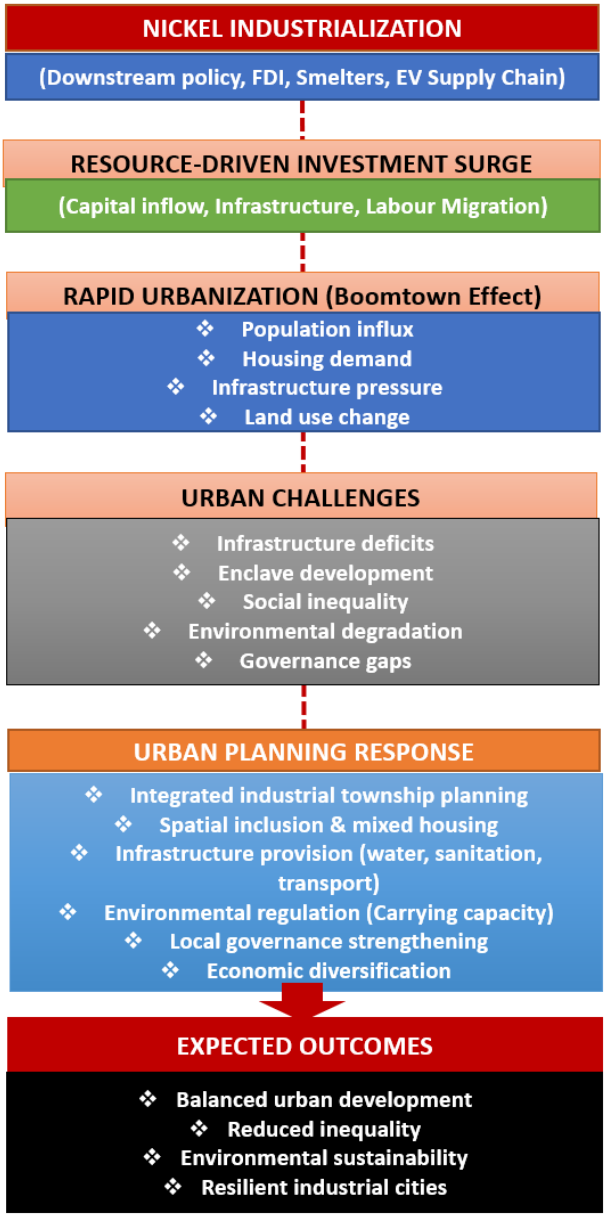

Figure 1. Approach of the study

Source: Authors' elaboration

3.1. Research Design and Data Sources

To situate the analysis within a broader historical context, this study also draws on earlier examples of resource-based urban development in Indonesia's oil and gas sector, particularly Bontang, Balikpapan, and the oil-producing district of Rumbai. These cases offer comparative insights into how extractive industries have historically shaped urban

development trajectories in Indonesia, and they provide important lessons for understanding both the opportunities and risks associated with the current wave of nickel-driven industrialization (Resosudarmo et al., 2009; McCarthy, 2004).

The analysis is based on multiple sources of qualitative and secondary data, enabling triangulation and enhancing the robustness of the findings. First, statistical and demographic data are obtained from official government publications, including reports from Indonesia's national statistics agency (Badan Pusat Statistik [BPS]) and regional development planning documents. These sources provide key information on population growth, economic activity, and infrastructure development in the selected regions (BPS, 2023).

Second, the study utilizes reports and publications from industry stakeholders, including corporate disclosures, investment reports, and policy analyses related to nickel processing and industrial park development. These materials offer insights into investment flows, employment structures, and industrial capacity (OECD, 2019; CSIRO, 2020).

Third, the research draws on academic literature, policy papers, and credible media reports that document the social, economic, and environmental impacts of nickel industrialization. These sources are particularly valuable for capturing the broader transformations occurring in regions experiencing rapid industrial expansion (Sovacool et al., 2020; Bebbington et al., 2018).

In addition, limited field observations are incorporated to provide contextual validation and qualitative insights into on-the-ground dynamics, particularly in relation to settlement expansion, infrastructure conditions, and local socio-economic changes. While not intended as a full ethnographic account, these observations help to ground the analysis in empirical realities and complement the secondary data sources.

3.2. Analytical Approach

The selected cases are analyzed through three interrelated analytical dimensions.

The first dimension focuses on urban transformation, examining how industrial investments reshape settlement patterns, population dynamics, and spatial development in mining regions. Particular attention is given to the transition from rural or semi-rural landscapes to emerging industrial towns (Bridge, 2008; Seto et al., 2010).

The second dimension addresses social and governance challenges, including pressures on housing, infrastructure, public services, and local administrative capacity. Rapid in-migration and the concentration of industrial workforces often generate complex governance demands that local authorities must navigate (Freudenburg, 1992; Bebbington et al., 2018).

The third dimension considers economic sustainability, assessing the extent to which these emerging industrial towns are vulnerable to fluctuations in global commodity markets and evaluating their potential for economic diversification beyond a single dominant industry (Auty, 2001).

By comparing these dimensions across the selected nickel-producing regions and earlier oil and gas cities, the study identifies both recurring patterns of resource-driven urbanization and emerging dynamics associated with Indonesia's contemporary mineral industrialization strategy.

IV. The Rise of Indonesia's Nickel Industrial Towns

4.1. Morowali: From Peripheral District to Global Nickel Hub

Among Indonesia's emerging nickel regions, Morowali represents the most striking example of resource-driven urban transformation. Located in Central Sulawesi, the region was historically characterized by small coastal settlements and rural communities whose livelihoods were largely based on fishing, agriculture, and small-scale trade (BPS, 2015).

This trajectory changed rapidly in the mid-2010s following the implementation of mineral export restrictions and the subsequent influx of foreign investment into nickel processing (OECD, 2019; Warburton, 2017). The establishment of the Indonesia Morowali Industrial Park (IMIP) marked a critical turning point, transforming the region into a major hub of nickel processing and metallurgical production (CSIRO, 2020).

Within a relatively short period, Morowali—particularly its Kecamatan Bahodopi—has experienced rapid economic expansion and population growth. Large numbers of workers have migrated to the region to access employment opportunities in smelting operations, construction, and supporting industries (IEA, 2023). This influx has driven the emergence of new residential areas, commercial zones, and transport infrastructure.

IMIP has evolved into a highly integrated industrial ecosystem encompassing smelting facilities, captive power plants, dedicated ports, logistics systems, and worker residential complexes. This vertically integrated model enables large-scale, continuous production while minimizing logistical constraints. However, it also reinforces an enclave-style development pattern, in which industrial activities remain spatially and functionally separated from surrounding urban areas, thereby limiting broader local economic spillovers.

The development of IMIP in Central Sulawesi has reached significant milestones, establishing itself as a leading global center for nickel production. Nevertheless, the industrial park faces several challenges that warrant further evaluation. Residential areas have expanded rapidly, particularly in Bohomakmur Village, located in the northwestern part of the Morowali Industrial Estate and designated as a transmigration destination. Land transformation has also occurred on Poloe Island, where artificial reclamation has altered the landscape from a small mangrove-covered island into a jetty harbour and guesthouse complex.

Environmental conservation remains a critical concern. While the development of the Morowali Industrial Estate has generated substantial economic benefits, it also poses risks to protected areas and conservation zones in the region. Key water sources, such as the Fatufia and Wawoolipa Springs—both essential for drinking water supply—face potential degradation, while the Dampala and Lele shallow wells are being overexploited to meet rising community demand. The Bahodopi mangrove forest is similarly under threat from nearby industrial expansion. Moreover, proposals to convert 6.35 hectares of production forest into industrial zones, along with plans to exploit 423.57 hectares for mining in Bahodopi and East Bungku, further endanger forest ecosystems. Nature-based tourism destinations, including Langala Island, Kanda Pute Island, and Kea Kea Beach, are also at risk due to their proximity to industrial activities and increased ship traffic (Pradana et al., 2024).

The scale and speed of transformation have been profound. Based on limited field observations, previously rural landscapes have evolved into densely populated industrial settlements characterized by large factory complexes, worker dormitories, and expanding informal housing clusters. Local economic structures have also shifted, with traditional

livelihoods increasingly coexisting alongside industrial employment and service-sector activities linked to the nickel industry.

However, this rapid growth has generated significant challenges. Infrastructure provision has struggled to keep pace with population increases, resulting in pressures on housing, transportation networks, and basic public services. Local governments have also faced difficulties in managing large-scale in-migration and regulating land use in areas undergoing intensive industrial expansion.

Importantly, formal spatial planning frameworks have lagged behind these developments. The *Masterplan Pengembangan dan Penataan Kabupaten Morowali* (Bappenas, 2023a) was introduced only after substantial industrial expansion had already occurred. The document identifies key structural challenges, including unplanned settlement growth in Bahodopi, inadequate infrastructure provision, and spatial fragmentation between industrial zones and surrounding communities. It emphasizes the need for integrated land-use planning, the development of urban service centers, and improved connectivity between industrial areas and regional hinterlands.

This delayed planning response reflects a broader governance gap: urbanization in Morowali has been largely reactive rather than anticipatory. Consequently, spatial development has been driven more by market forces and industrial expansion than by coordinated public planning, resulting in uneven urban outcomes and increasing pressure on local governance systems. The presence of large industrial enclaves has further intensified socio-spatial differentiation, as industrial parks often provide internal infrastructure and services, while surrounding communities experience uneven access to economic opportunities and public resources.

4.2. Weda Bay: Industrial Expansion in a Remote Archipelagic Region

Similar dynamics are unfolding in Weda Bay, located in Central Halmahera, North Maluku. Historically, the Weda region consisted of small coastal villages whose economies were based on fishing, small-scale agriculture, and local trade (BPS, 2016). However, the development of the Indonesia Weda Bay Industrial Park (IWIP) has significantly altered this trajectory.

Like IMIP, IWIP operates as a large-scale, integrated industrial complex designed to support nickel processing and downstream battery-related industries. The development model emphasizes industrial clustering supported by dedicated infrastructure, including power generation facilities, port systems, and internal transport networks. While this approach enhances production efficiency and attracts foreign investment, it also contributes to the formation of spatially concentrated industrial zones that are not fully integrated with surrounding settlements.

The expansion of industrial activity in Weda Bay has triggered substantial in-migration, rapid population growth, and the emergence of new urban settlements. At the same time, this transformation has placed considerable pressure on housing, land markets, and environmental systems (Bappenas, 2023b).

The establishment of the Indonesia Weda Bay Industrial Park (IWIP) in Lelilef Village, Central Halmahera, has generated a range of adverse impacts on both the local community and the surrounding environment. Increased exposure to air and water pollution has elevated the risk of various health problems among residents, including respiratory, cardiovascular, and dermatological conditions.

Moreover, land clearing and coastal reclamation associated with industrial development have caused significant degradation of local ecosystems, affecting both forested areas and coral reefs. Alterations in river flow patterns resulting from ongoing development have also contributed to more frequent flooding in nearby settlements.

At the same time, the presence of IWIP has attracted a substantial influx of workers from outside the region. In response, local residents have adapted by providing accommodation—such as boarding houses—to meet the growing demand from incoming workers (Salauwe et al., 2025).

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These challenges are highlighted in the *Masterplan Pengembangan dan Penataan Sekitar Kawasan Industri Teluk Weda* (Bappenas, 2023b), which underscores the risks of uncoordinated urban expansion in an archipelagic and environmentally sensitive context. The master plan emphasizes the importance of integrated coastal zone management, improved inter-settlement connectivity, and the provision of basic urban services in newly emerging settlements. Without proactive and coordinated planning, industrial growth in Weda Bay risks producing fragmented urban forms, intensified land-use conflicts, and increased environmental pressures, particularly in coastal and marine ecosystems.

4.3. Obi Island: Industrialization in a Small Island Context

A third example of resource-driven urban transformation can be observed on Obi Island in South Halmahera, North Maluku, where nickel processing has expanded rapidly around the Harita Nickel Industrial Complex (IEA, 2023).

Before industrial development, Obi Island was characterized by sparsely populated rural communities reliant on fishing and smallholder agriculture (BPS, 2017). The expansion of nickel processing facilities has fundamentally reshaped the island's spatial and economic structure through the development of industrial infrastructure, worker housing, and port facilities.

Industrial activities on Obi Island, led by Harita Nickel (operated by Trimegah Bangun Persada), follow a vertically integrated model that combines mining, processing, and supporting infrastructure within a single system. This includes ferronickel production, high-pressure acid leach (HPAL) facilities, and associated energy and logistics infrastructure. While this integration enhances operational efficiency and supports value-added processing, it also concentrates economic activity around a single dominant actor, increasing structural dependence and limiting opportunities for economic diversification.

A study using Landsat imagery and a Random Forest classification approach identified significant land cover changes in Obi Subdistrict over the first half of the 2010s. The findings indicate rapid expansion of built-up areas alongside a substantial decline in sparse vegetation. At the same time, dense vegetation increased markedly, suggesting processes of regrowth or land rehabilitation in certain areas.

The study also reports improved classification performance with the use of newer satellite data, particularly in identifying dense vegetation and urban areas (Listyono et al., 2025). Overall, Obi Subdistrict experienced accelerated urban growth, notable shifts in vegetation patterns, and enhanced analytical accuracy with advances in remote sensing technology.

Figure 2 shows Indonesia's several nickel and oil & gas-based towns.

The island context introduces additional constraints. Limited land availability restricts urban expansion, while intensified industrial activity places significant pressure on coastal ecosystems and marine resources (Sovacool et al., 2020). Moreover, the high degree of economic concentration increases vulnerability to fluctuations in global commodity markets, reflecting the classic risks associated with resource-dependent economies (Auty, 2001).

Figure 2. Several nickel and oil & gas-based towns in Indonesia

4.4. Synthesis

Across these three cases, a consistent pattern emerges: nickel industrialization in Indonesia is not only driving economic transformation but also producing a distinctive model of enclave-based industrial urbanization. This model is characterized by large, vertically integrated industrial parks with dedicated infrastructure systems, rapid labour in-migration, and the accelerated emergence of urban settlements in previously peripheral regions.

While this model enables rapid industrial growth and integration into global value chains, it simultaneously generates significant governance challenges, including spatial inequality, infrastructure deficits, environmental pressures, and limited economic diversification. These dynamics underscore the urgent need for more proactive, integrated, and context-sensitive urban planning approaches to manage the complex transformations associated with resource-driven industrialization.

V. Urban Challenges in Emerging Nickel Towns

The rapid emergence of nickel-based industrial towns in Indonesia has generated a complex set of urban challenges. While many of these challenges reflect broader dynamics associated with resource-driven urbanization, they are intensified by the unprecedented speed and scale of industrial expansion in Indonesia's nickel sector (Bridge, 2008; Bebbington et al., 2018). These pressures manifest across multiple dimensions, including infrastructure provision, socio-spatial organization, environmental sustainability, and economic resilience.

5.1. Infrastructure Deficits and Rapid Population Growth

One of the most immediate challenges confronting emerging nickel towns is the mismatch between rapid population growth and the provision of urban infrastructure. The development of large-scale industrial complexes has attracted thousands of workers from across Indonesia within a relatively short period (IEA, 2023). As a result, local infrastructure systems—including housing, water supply, sanitation, transportation, and healthcare—have often struggled to keep pace with this sudden demographic expansion.

In many cases, industrial parks have developed dedicated internal infrastructure for their workforce, including dormitories, roads, and utilities. However, access to these services is typically limited to employees within the industrial enclaves. Surrounding communities frequently experience uneven or inadequate access to basic urban services. As migrant workers seek affordable accommodation outside company-managed facilities, informal housing settlements often emerge in proximity to industrial zones (Freudenburg, 1992). In the absence of effective urban planning and regulatory oversight, such patterns can result in congestion, environmental degradation, and substandard living conditions.

5.2. Social Segregation and Spatial Inequality

A second major challenge concerns the emergence of socio-spatial divisions within rapidly expanding industrial towns. Large industrial complexes often function as semi-enclosed enclaves, equipped with their own infrastructure systems, administrative arrangements, and labour management practices (Bridge, 2008). This configuration can produce clear economic and spatial boundaries between industrial zones and surrounding local communities.

These divisions are further reinforced by labour segmentation. Migrant workers, expatriate specialists, and residents frequently occupy distinct positions within the local economy and are often spatially segregated across different types of housing and neighbourhoods. Over time, such patterns contribute to the formation of visible socio-spatial inequalities within emerging urban settlements (Bebbington et al., 2018).

Although similar dynamics have been observed in extractive regions globally, particularly in enclave-based economies (Auty, 2001), the scale and speed of Indonesia's nickel industrialization amplify these patterns. In regions such as Morowali and Weda Bay, rapid in-migration and industrial concentration intensify the risk of fragmented urban development and social stratification.

5.3. Environmental Pressures, Urban Expansion, and Health

The rapid industrialization of nickel-producing regions also raises significant concerns regarding environmental sustainability. Mining operations, metallurgical processing, and associated urban expansion place considerable pressure on local ecosystems, particularly in ecologically sensitive coastal and island environments (Sovacool et al., 2020).

Urban expansion driven by industrial growth often entails the conversion of forests, agricultural land, and coastal areas that previously sustained local livelihoods (Bebbington et al., 2018). Concurrently, concerns related to pollution, waste management, and land degradation have become increasingly prominent in public discourse surrounding Indonesia's nickel industry.

Environmental degradation, in turn, has significant implications for public health. Declining environmental quality—particularly air and water pollution—can contribute to respiratory illnesses and elevate the risk of stunting, especially among children, through pathways such as poor nutrition and exposure to contaminants. Beyond these environmental pressures, shifts in social structures and community dynamics associated with rapid industrialization may also facilitate the emergence and spread of diseases, including HIV/AIDS, particularly in contexts where access to education, healthcare services, and preventive information remains limited.

Balancing the demands of industrial growth with environmental protection, therefore, represents a critical governance challenge. Without effective regulatory frameworks and enforcement mechanisms, the cumulative environmental impacts of industrialization and urbanization may undermine the long-term sustainability of these regions (Bridge, 2008).

5.4. Economic Vulnerability and Single-Industry Dependence

A further challenge lies in the economic structure of emerging nickel towns, which remains highly dependent on a single industrial sector. While nickel processing has generated significant employment opportunities and stimulated local economic growth, such dependence also creates structural vulnerabilities (Auty, 2001).

Resource-dependent towns are often subject to boom–bust cycles driven by fluctuations in global commodity prices. Changes in global demand, technological shifts in battery production, or evolving energy transition pathways may significantly affect the long-term viability of nickel-based industries (Sovacool et al., 2020). In such scenarios, local economies that lack diversification may face severe adjustment pressures.

Historical experiences from resource-based urban centers demonstrate that economic diversification is essential for long-term resilience and sustainability (Auty, 2001). Without deliberate efforts to broaden the economic base, emerging industrial towns risk becoming locked into mono-industrial trajectories that are difficult to sustain beyond the initial phase of resource-driven growth.

VI. Lessons from Indonesia's Earlier Oil and Gas Cities

Indonesia's earlier experience with oil and gas–driven urbanization provides an important analytical lens for understanding the contemporary emergence of nickel-based industrial towns. From a theoretical perspective, these cases reflect key debates in the literature on the resource curse (Auty, 2001), global production networks (GPNs) (Gereffi et al., 2005; Bridge, 2008), and enclave economies (Freudenburg, 1992).

During the late twentieth century, the expansion of the oil and gas sector generated urban growth in several regions, including Bontang, Balikpapan, and Rumbai. These cities illustrate different development pathways shaped by the interaction between global capital, state policies, and local institutional capacity (Resosudarmo et al., 2009). Their experiences

offer critical insights for contemporary nickel hubs such as Morowali, Weda Bay, and Obi, which are similarly embedded in global battery and electric vehicle value chains.

6.1. Bontang: Company-Led Urban Development and Path Dependency

Bontang represents a classic case of company-led urbanization, in which large-scale industrial actors—particularly in the liquefied natural gas (LNG) sector—have played a dominant role in shaping urban development. Since the 1970s, corporate investment in housing, healthcare, education, and urban amenities has created relatively high-quality infrastructure within company-managed areas (McCarthy, 2004; Nugroho, 2022). The LNG industry in Bontang itself was developed through a consortium involving Pertamina and several international energy companies, many of which were both producers of natural gas and major buyers of LNG, particularly from Japan.

In addition to LNG, Bontang hosts large-scale fertilizer and gas-based industries, which have also contributed to urban development through the provision of residential areas, hospitals, educational facilities, and recreational infrastructure. This extensive corporate involvement has resulted in a relatively well-developed urban environment, albeit one strongly shaped by industrial priorities.

From a Global Production Network (GPN) perspective, Bontang functioned as a strategic node in global energy supply chains, with local development closely tied to the operational needs of multinational and state-owned enterprises. However, this model also generated strong path dependency, whereby the city's economic structure became heavily reliant on a limited number of industries.

This experience is highly relevant to contemporary nickel hubs such as Morowali and Weda Bay. Similar to Bontang, these regions are characterized by significant corporate provision of infrastructure and services within industrial zones. While this can accelerate early-stage development, it also risks creating corporate enclaves with limited integration into the broader local economy. Over time, such dependence may constrain economic diversification and increase exposure to volatility in global commodity markets. However, compared to Bontang, nickel-processing regions require significantly larger labour forces, resulting in much faster urban population growth and placing greater pressure on urban infrastructure and public services.

6.2. Balikpapan: Diversification and Regional Hub Formation

Balikpapan presents a contrasting trajectory, demonstrating the potential for structural transformation beyond reliance on resources. The city's origins date back to the early development of the oil industry, with the first oil well drilled on 10 February 1897—now commemorated as the city's founding date. In 1907, Bataafsche Petroleum Maatschappij (BPM) established operations in the area, followed by significant investment from multinational companies. Over time, oil infrastructure—including refineries and port facilities—was developed, and Pertamina later established one of Indonesia's largest refineries in the city, further reinforcing its role as a key oil and gas hub.

Despite its strong industrial foundation, Balikpapan gradually diversified its economy into services, logistics, trade, and education (Resosudarmo et al., 2009; BPS, 2025a). This transition reflects a partial escape from resource dependence, supported by sustained investment in infrastructure, strong regional connectivity, and relatively effective urban governance.

In GPN terms, Balikpapan evolved from a single-sector extraction node into a multi-functional regional hub, supporting a wide range of economic activities beyond oil and gas. The city also expanded its role in supporting other resource sectors, including timber, forestry products, and coal. As a result, Balikpapan has become one of the largest and most economically diversified cities in Kalimantan, no longer solely dependent on hydrocarbons.

For emerging nickel towns, this case underscores the importance of early and deliberate diversification strategies. Without such efforts, regions such as Morowali and Obi risk remaining locked into narrow positions within global value chains, primarily as processing hubs for intermediate products such as ferronickel or nickel pig iron. Developing downstream industries, service sectors, and broader urban functions will be essential for achieving more resilient and inclusive growth.

6.3. Rumbai: Enclave Development and Limited Spillovers

Rumbai exemplifies an enclave model of resource-based development, in which industrial activities are spatially and institutionally separated from surrounding communities. Established in the early 1950s as the Sumatra headquarters of Caltex Pacific Oil Company (now Chevron Pacific Indonesia), Rumbai was developed as a highly self-contained company town along the Siak River.

In its early years, the area was accessible primarily by river transport from Pekanbaru or Bengkalis. Over time, Caltex developed critical infrastructure, including roads connecting Rumbai to major oilfields such as Minas and Duri, as well as an oil port in Dumai. The Rumbai oil camp itself functioned as a fully integrated enclave, with company-provided housing, schools, hospitals, water treatment systems, electricity generation, and recreational facilities, including sports and leisure amenities.

While this model enabled efficient resource extraction, it generated limited economic spillovers to local communities, consistent with the enclave economy thesis (Bridge, 2008; Freudenburg, 1992). Local economic linkages remained weak, and broader regional development was constrained by the concentration of economic activity within company-controlled spaces.

The structure of Rumbai is directly comparable to contemporary nickel industrial parks in Morowali, Weda Bay, and Obi, which often operate as semi-autonomous enclaves with dedicated infrastructure, governance arrangements, and labour systems. While such arrangements can enhance efficiency, they may also limit integration with surrounding regions and reduce the broader developmental impact.

The long-term trajectory of Rumbai also highlights the risks associated with resource depletion. As oil production declined—particularly following reduced output from Chevron's operations—the area's economic significance diminished. In contrast, the nearby city of Pekanbaru was able to sustain growth by diversifying into sectors such as agriculture, palm oil, and forestry (BPS, 2025c).

This divergence illustrates a key lesson: regions that fail to build strong economic linkages and diversify their economies during periods of resource boom are more vulnerable to post-boom decline.

6.4. Synthesis: Key Lessons for Nickel Industrial Towns

Taken together, the experiences of Bontang, Balikpapan, and Rumbai highlight three distinct trajectories of resource-based urbanization: company-led development with path dependency, successful diversification into a regional hub, and enclave-based growth

with limited spillovers. These historical cases provide important lessons for Indonesia's emerging nickel industrial towns.

They underscore the importance of avoiding excessive dependence on single industries, strengthening local economic linkages, and adopting proactive urban planning strategies. Without such measures, contemporary nickel regions risk reproducing the structural weaknesses observed in earlier resource-based cities, including economic vulnerability, spatial inequality, and limited long-term sustainability.

6.5. Policy Implications for Emerging Nickel Towns

Drawing on these historical experiences and theoretical insights, several policy implications emerge for Indonesia's nickel-based industrial towns.

First, governments must anticipate the dynamics of resource-driven urbanization, particularly rapid population inflows and spatial expansion. Integrated urban planning is essential to prevent infrastructure deficits, informal settlements, and environmental degradation.

Second, policies should aim to strengthen local linkages within global production networks. This includes promoting domestic supplier development, supporting small and medium enterprises, and encouraging knowledge transfer from foreign investors.

Third, economic diversification must be prioritized from the early stages of development to mitigate the risks of path dependency and commodity price volatility (Auty, 2001). This requires coordinated industrial, spatial, and human capital policies.

Fourth, institutional capacity at the local level should be enhanced to manage complex industrial ecosystems, regulate environmental impacts, and ensure equitable development outcomes (Bebbington et al., 2018; Bappenas, 2023a, 2023b).

Finally, effective mechanisms for resource revenue management and redistribution are critical to avoid enclave development and ensure that the benefits of industrialization are broadly shared (Sovacool et al., 2020).

VII. Policy Framework for Nickel Industrial Cities

Despite sharing a common industrial driver, Morowali, Weda Bay, and Obi exhibit distinct spatial and developmental trajectories.

Morowali represents the most advanced case of rapid industrial urbanization (Muhyiddin et al, 2026). The development of large integrated industrial estates has generated substantial population inflows, placing acute pressure on housing, sanitation, and public services. Urban expansion in this context tends to be fragmented, with a pronounced divide between well-serviced industrial enclaves and underdeveloped surrounding settlements. This reflects a broader pattern of enclave-based development, in which industrial zones operate semi-autonomously from the local urban system.

In contrast, Weda Bay illustrates an emerging industrial region where urbanization is still in formation. The absence of pre-existing urban infrastructure has created both constraints and opportunities. While the region faces logistical challenges, limited connectivity, and potential land-use conflicts, it also offers a strategic opportunity to implement proactive spatial planning. This includes the development of a planned industrial town integrated with transport corridors and regional spatial frameworks.

Obi Island represents a distinct case of island-based industrialization, where geographical constraints fundamentally shape urban development. Limited land availability, ecological sensitivity, and high logistical costs necessitate a compact and efficient urban form. At the same time, the local economy remains highly dependent on a single industrial sector, raising concerns regarding long-term sustainability and vulnerability to commodity cycles.

Across these cases, several structural challenges emerge.

First, there is a persistent mismatch between the speed of industrial investment and the pace of urban planning. Industrial projects are often implemented rapidly, while spatial planning instruments—such as regional spatial plans (RTRW) and detailed spatial plans (RDTR)—tend to lag.

Second, the dominance of large industrial actors contributes to enclave urbanism, whereby infrastructure and services are concentrated within industrial estates, leaving surrounding communities underserved. This pattern generates spatial inequality and potential social tensions.

Third, all three regions face significant environmental pressures, including deforestation, coastal degradation, and industrial pollution. These challenges are particularly acute in ecologically sensitive areas such as coastal zones and small islands.

Fourth, institutional capacity remains a key constraint. Local governments in these regions often lack the technical, financial, and regulatory capabilities required to manage complex and large-scale processes of industrial urbanization.

7.1. Integrated Planning for Industrial Urbanization

The first policy priority is the adoption of integrated urban planning approaches in rapidly industrializing regions. Large industrial parks—such as the Indonesia Morowali Industrial Park and the Weda Bay Industrial Park—function not only as production hubs but also as catalysts for broader urban transformation. As labor migration accelerates, surrounding settlements expand quickly and often evolve into new urban centres.

Urban planning frameworks must therefore anticipate population growth and ensure coordinated infrastructure provision across sectors, including housing, transportation, water supply, sanitation, and public services (Bappenas, 2023a, 2023b). Governments should develop long-term spatial plans that integrate industrial zones with residential areas, public facilities, and environmental protection measures, rather than allowing uncoordinated and fragmented urban expansion.

Crucially, planning interventions must be undertaken at the earliest stages of industrial development. Delayed responses tend to produce path-dependent spatial patterns that are both costly and difficult to reverse. Evidence from earlier resource-based cities demonstrates that early integration of land-use planning and infrastructure provision significantly enhances long-term urban outcomes.

Equally important is the alignment of urban planning for industrial areas with the development plans of industrial operators and mining companies. Such integration helps ensure that land use, infrastructure provision, and environmental management are coordinated rather than fragmented. In the absence of alignment, there is a heightened risk of inefficiencies, overlapping land use, and escalating environmental and social pressures. Effective collaboration between government authorities and private sector actors is therefore essential, particularly during the implementation phase. Through well-structured

partnerships, both parties can coordinate the development of supporting infrastructure, including roads, housing, utilities, and public services.

7.2. Economic Diversification Beyond Nickel

The second policy priority is reducing long-term dependence on a single commodity sector. Resource-based towns often experience rapid growth during commodity booms but face structural vulnerabilities when global demand declines (Auty, 2001).

Diversification strategies should operate along two dimensions. First, they should strengthen backward and forward linkages within the nickel value chain, including engineering services, maintenance, logistics, and downstream industries such as battery components. Second, they should promote the development of non-resource sectors, including education, healthcare, tourism, and regional trade.

The experience of Balikpapan demonstrates how a resource-based city can evolve into a diversified regional hub (Resosudarmo et al., 2009). For emerging nickel regions such as Morowali, Weda Bay, and Obi, early investment in diversification is essential to avoid long-term lock-in within narrow segments of global value chains.

7.3. Strengthening Local Governance Capacity

A third policy priority is strengthening the institutional capacity of local governments. Many nickel-producing regions were historically rural districts with limited administrative capabilities. The rapid influx of industrial investment and population growth places significant pressure on governance systems (Bebbington et al., 2018).

Local governments must manage increasingly complex challenges, including land-use regulation, environmental monitoring, labour migration, housing provision, and infrastructure development. Effective governance, therefore, requires adequate fiscal resources, technical expertise, and strong coordination between national and subnational institutions.

One important policy instrument is the enhancement of resource revenue-sharing mechanisms, ensuring that a portion of industrial revenues is allocated to local governments. This can improve their capacity to deliver public services and manage urban development more effectively. In addition, coordination among ministries, regional governments, and industrial park authorities is essential to avoid fragmented governance.

7.4. Environmental Sustainability and Urban Development

The final dimension of the policy framework concerns environmental sustainability. Nickel mining and processing generate substantial environmental pressures, particularly in ecologically sensitive regions (Sovacool et al., 2020). Rapid urban expansion further intensifies these pressures through land-use change, rising resource demand, and increased waste generation.

Sustainable urban development, therefore, requires the systematic integration of environmental considerations into both planning and governance frameworks. This includes strengthening environmental monitoring systems, regulating industrial emissions, improving water and waste management, and safeguarding critical ecosystems affected by industrial expansion (Bebbington et al., 2018).

Moreover, environmental governance should move beyond compliance-based approaches toward long-term ecological restoration and meaningful community

participation. Without such measures, the environmental costs of rapid industrialization risk undermining long-term urban sustainability.

Mining areas frequently overlap with regions of high biodiversity, where land clearing and extraction activities can significantly reduce species diversity and disrupt ecological balance. Species dependent on these habitats may decline or disappear, with implications not only for biodiversity but also for ecosystem services that sustain local communities. To address these challenges, it is essential to reassess and continuously monitor the *Indeks Keanekaragaman Hayati* in affected areas as a baseline for planning and evaluation. This process should include the identification of key species, critical habitats, and ecological functions requiring protection. In parallel, conservation and restoration measures need to be implemented, such as designating protected zones, rehabilitating degraded land, and, where feasible, reintroducing native species.

7.5. Towards a Coherent Policy Framework

Addressing the complex challenges associated with nickel-driven urbanization in Indonesia requires a fundamental shift from reactive to proactive urban governance. The rapid emergence of industrial towns such as Morowali, Weda Bay, and Obi has demonstrated that uncoordinated growth can lead to spatial fragmentation, infrastructure deficits, and environmental pressures. To ensure more sustainable and inclusive urban outcomes, a coherent policy framework must be developed that integrates industrial expansion with broader urban and regional planning objectives.

A central component of such a framework is the adoption of **integrated industrial township planning**. Industrial development should not be treated as a standalone process but rather as a catalyst for broader urban transformation. This requires comprehensive spatial planning frameworks that align industrial zones with residential areas, public services, and environmental protection measures. By coordinating land use and infrastructure provision from the outset, governments can better anticipate population growth and avoid the emergence of unplanned settlements and service gaps.

Equally important is the need to promote **spatial integration and inclusivity**. The dominance of large industrial enclaves has often resulted in uneven development patterns, where well-serviced industrial zones coexist with underdeveloped surrounding communities. Addressing this disparity requires inclusive zoning policies, the provision of mixed-income housing, and equitable access to urban infrastructure and services. Strengthening linkages between industrial areas and local communities is essential to ensure that the benefits of industrialization are more broadly distributed.

Another critical priority is **strengthening local governance capacity**. Many nickel-producing regions were previously rural districts with limited administrative and technical capabilities. The scale and speed of industrialization have placed unprecedented demands on local governments, particularly in areas such as land-use regulation, infrastructure planning, and environmental management. Enhancing institutional capacity—through improved fiscal resources, technical expertise, and intergovernmental coordination—is therefore essential for effective urban governance.

In parallel, **environmental sustainability** must be embedded at the core of urban development strategies. Nickel mining and processing, combined with rapid urban expansion, generate significant environmental pressures, particularly in ecologically sensitive coastal and island regions. Urban planning must therefore be aligned with ecological limits, incorporating principles of carrying capacity, environmental monitoring,

and resource management. Without such safeguards, the long-term viability of these urban regions may be compromised.

The issue of **economic diversification** also plays a crucial role in shaping the sustainability of nickel industrial cities. Heavy reliance on a single commodity sector exposes regions to global market volatility and limits long-term resilience. Policy efforts should therefore promote the development of complementary industries, both within and beyond the nickel value chain. This includes downstream processing, supporting services, and broader non-resource sectors such as education, healthcare, and trade.

Finally, the scale of urban transformation in these regions necessitates innovative approaches to infrastructure financing. **Infrastructure co-financing mechanisms**, including public–private partnerships and corporate contributions, can play a vital role in supporting the provision of housing, transport systems, and basic services. Given the significant role of private investment in driving industrial growth, it is both necessary and appropriate for corporate actors to contribute to the development of surrounding urban areas.

In sum, the development of nickel industrial cities in Indonesia presents both significant opportunities and complex challenges. A coherent policy framework—grounded in integration, inclusivity, sustainability, and institutional strengthening—is essential to ensure that these emerging urban centers evolve into resilient and well-functioning cities, rather than fragmented and unequal industrial enclaves.

VIII. Conclusion

Indonesia's nickel boom represents one of the most significant transformations in the global mineral economy in recent years (IEA, 2023). Through a combination of abundant resource endowments and proactive industrial policies, the country has emerged as a central player in global battery supply chains.

Beyond their economic significance, these developments have generated profound spatial and social transformations. The emergence of rapidly growing industrial settlements in Morowali, Weda Bay, and Obi Island reflects a new form of resource-based urbanization characterized by large-scale industrialization, labour mobility, and evolving socio-economic structures (Bridge, 2008).

However, these emerging industrial towns also face significant challenges, including infrastructure constraints, spatial inequality, and environmental risks (Bappenas, 2023a, 2023b). Lessons from earlier resource-based cities in Indonesia demonstrate that long-term sustainability depends on proactive planning, economic diversification, and strong institutional capacity (Nugroho et al., 2026c).

This article argues that nickel-based industrial cities represent a new frontier of urban development in Indonesia. Their trajectories will not only shape regional economies but also influence broader patterns of industrialization and spatial transformation.

As global demand for critical minerals continues to rise, Indonesia's experience offers valuable insights into how industrial policy, global production networks, and local governance interact in shaping resource-based urbanization (Nugroho & Widyastuti, 2026b; IEA, 2023).

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