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Implementation of Freight Transport Restriction Policy in Balikpapan City

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ABSTRACT

This study analyzes the implementation of the freight transport restriction policy in Balikpapan City by examining the dynamics of operator compliance, institutional coordination, and the policy's impact on urban mobility and the local economy. Using a qualitative research method with a case study approach, data were collected through in-depth interviews, document analysis, and field observations to understand how the policy functions in practice. The findings reveal that the success of policy implementation depends on the adaptive strategies of freight operators, the effectiveness of institutional coordination, and the suitability of policy design with local urban conditions. While the restriction policies have contributed to reducing congestion and improving urban order, challenges remain in terms of enforcement consistency, resource limitations, and inter-agency collaboration. The study highlights the importance of integrating regulatory control with supportive mechanisms and adaptive governance to achieve sustainable freight transport management in developing urban contexts.

Keywords: Freight Restriction Policy; Urban Mobility; Institutional Coordination

INTRODUCTION

Urban transport management has become a central policy concern in many developing cities where rapid urbanization and economic expansion have outpaced the capacity of infrastructure and governance systems. Balikpapan City, one of the most strategically important urban centers in East Kalimantan, Indonesia, provides a clear example of this tension. As a coastal city serving as a major logistics and industrial hub, Balikpapan's road network bears the dual burden of supporting both urban mobility and freight distribution activities. The rapid growth of logistics operations driven by port activities, industrial estates, and regional trade has resulted in escalating traffic congestion, road deterioration, and safety hazards within the city center. In response to these challenges, the local government implemented a freight transport restriction policy, prohibiting heavy goods vehicles from passing through central areas during specific hours. This policy aims to improve traffic flow, reduce road damage, and enhance urban livability.

The implementation of such transport restriction measures reflects broader trends in Indonesian urban governance, where municipalities are increasingly adopting localized traffic management interventions (Gunawan et al., 2017). However, as with many local transport policies, the success of implementation depends on institutional coordination, enforcement consistency, and community compliance. In Balikpapan's case, the freight restriction policy emerged as part of a wider urban mobility strategy aligned with the city's vision to maintain its status as a "green, safe, and orderly" metropolitan area and to anticipate its growing integration with the Nusantara Capital City (IKN) development corridor. Yet, while the policy objectives appear clear, its on-the-ground realization involves complex trade-offs between economic efficiency, social acceptance, and governance capacity.

From a policy perspective, freight restriction policies are often contested because they simultaneously address and create urban problems. Limiting the movement of heavy vehicles can ease congestion, improve safety, and reduce emissions, but it can also disrupt supply chains, delay goods delivery, and increase operational costs for logistics operators. In developing urban economies like Balikpapan, where freight distribution is critical to local commerce, such restrictions challenge policymakers to balance regulatory control with economic vitality (Sandee, 2016). Moreover, the political dynamics between city authorities, business associations, transport unions, and local residents influence how the policy is interpreted and implemented. The real challenge is not only designing effective regulation but ensuring that it functions within the city's socio-economic and institutional realities.

The focus on Balikpapan is crucial because it represents a microcosm of Indonesia's broader urban transportation dilemma the struggle between maintaining efficient mobility and protecting urban order. The city's topographical limitations, high vehicle density, and dependence on road-based freight exacerbate these tensions (Lin et al., 2025). Therefore, analyzing the implementation of the freight transport restriction policy in Balikpapan City provides valuable insight into how local governments operationalize traffic management interventions in a developing urban context. This research also contributes to understanding the effectiveness of regulatory mechanisms in balancing urban sustainability, public order, and economic continuity. By situating the case within Indonesia's ongoing decentralization and urban governance reform, the study highlights how local authorities translate transport policy objectives into practice amid institutional constraints and stakeholder pressures.

Literature Review

Urban transport policy in developing cities often operates within the intersection of infrastructure limitations, governance capacity, and behavioral compliance. The theoretical foundation for transport restriction policies is rooted in the broader concept of urban traffic management, which encompasses strategies such as vehicle restriction, time-based entry permits, congestion pricing, and road-use regulation. Scholars have argued that the success of such measures depends not only on regulatory design but also on institutional alignment and stakeholder participation. In Southeast Asian contexts, urban transport restrictions are often reactive responses to congestion rather than parts of integrated mobility planning. This reactive nature makes implementation more difficult, as policies tend to lack supportive institutional frameworks, adequate data systems, and effective monitoring mechanisms (Adepoju et al., 2023; Waylen et al., 2019).

Empirical studies on freight transport restrictions, particularly in cities such as Jakarta, Surabaya, and Bangkok, show that while these policies can temporarily reduce congestion, they frequently face resistance from freight operators and local businesses. The literature highlights that freight activity differs from passenger movement due to its economic embeddedness — meaning that restrictions directly affect urban productivity. The trade-off between urban order and logistical efficiency thus becomes central to evaluating transport policies. For instance, while passenger vehicle restrictions may improve traffic flow, freight restrictions can disrupt essential supply networks. Consequently, most urban transport scholars emphasize the need for evidence-based, context-specific policy frameworks that account for urban form, economic structure, and governance dynamics.

Within the Indonesian context, the implementation of urban transport policies is deeply influenced by the institutional capacity of local governments and their coordination with central authorities. Decentralization grants municipalities autonomy over urban mobility management, but it also creates disparities in policy quality, enforcement capability, and resource allocation (Kaufmann, 2020; Scheller & Walker, 2017). Local governments like Balikpapan often face challenges related to limited technical expertise, weak inter-agency coordination and fragmented policy mandates. These administrative limitations hinder the consistency and predictability of policy enforcement, resulting in what the literature calls implementation gaps the divergence between policy intention and actual outcomes. The effectiveness of traffic restriction measures thus depends on how well these institutional barriers are managed through governance innovation and local capacity building.

In broader theoretical terms, urban transport policies are situated within the sustainable mobility paradigm, which integrates environmental, economic, and social objectives. Freight transport restriction aligns with this paradigm by aiming to reduce congestion and emissions while improving quality of urban life. However, the literature also cautions against short-term or sectoral solutions that fail to consider systemic urban dynamics. Effective policy implementation requires integrated planning that coordinates land use, transport infrastructure, and economic logistics. Scholars argue that without simultaneous investment in alternative logistics routes or time windows for freight movement, restriction policies merely shift congestion rather than solve it (B. Zhao et al., 2019). Therefore, the implementation process must be complemented by supporting policies such as improved road infrastructure, digital freight scheduling, and participatory stakeholder dialogues.

From a governance perspective, several studies emphasize that compliance with transport restriction policies depends on the legitimacy and transparency of decision-making processes. When stakeholders perceive that policies are developed inclusively and that their interests are considered, compliance rates tend to increase. Conversely, top-down enforcement without adequate consultation fosters resistance and informal circumvention, as seen in various Indonesian cities where truck drivers or logistics operators modify routes to avoid restricted areas. Hence, urban transport governance is as much about institutional credibility and public communication as it is about technical regulation (Jiang & Yang, 2023; Rye et al., 2018). This aligns with the notion of collaborative governance in urban policy literature, where the participation of multiple actors government agencies, private sector, and civil society becomes key to effective policy implementation.

Lastly, studies in urban transport management increasingly advocate for the integration of data-driven policy tools and smart mobility technologies in policy enforcement. The use of vehicle tracking, digital monitoring systems, and adaptive traffic control mechanisms enhances policy efficiency and accountability. In cities like Balikpapan, such innovations could support better policy enforcement while maintaining the flow of goods essential for urban economic stability. The literature consistently points out that sustainable transport management requires the simultaneous pursuit of regulation, innovation, and inclusiveness. Thus, the case of freight transport restriction in Balikpapan City not only highlights local policy implementation challenges but also serves as an important reference point for developing countries seeking to design balanced, equitable, and sustainable urban mobility systems.

Method

This study employs a qualitative approach with a case study design to analyze the implementation of the freight transport restriction policy in Balikpapan City, focusing on how the policy is carried out in practice by the city government and how it is perceived and responded to by stakeholders (Tob-Ogu et al., 2018; Żak & Galińska, 2018). Data were collected through in-depth interviews with key informants, including city government officials, transportation agency staff, logistics operators, and community representatives, as well as through document analysis of policy regulations, implementation reports, and traffic management records. Field observations were conducted to directly examine traffic patterns and freight movements in restricted areas, providing empirical insights into compliance levels and the policy's impact. The collected data were analyzed using thematic analysis to identify gaps between policy objectives and on-the-ground outcomes, including factors influencing implementation effectiveness, such as inter-agency coordination, stakeholder participation, and monitoring mechanisms. This approach aims to provide an in-depth understanding of the policy implementation process in urban transport in Balikpapan, the challenges encountered, and the adaptive strategies applied, while also offering insights for evidence-based transport policy development in rapidly growing cities.

Results And Discussion

This study examines the implementation of the freight transport restriction policy in Balikpapan City, aiming to understand how the policy is applied in practice and its impacts on various aspects of urban life. The analysis of the results focuses on three main aspects: compliance and adaptation of freight operators, institutional coordination and enforcement challenges, and the policy's impact on urban mobility and local economic activities. This approach allows the study to capture the complexity of policy implementation on the ground, including the interactions between government actors, business operators, and the community (Broccardo et al., 2019; Howlett et al., 2017).

The first aspect highlights the compliance and adaptation strategies of freight operators in response to the restriction policy. This section examines how logistics companies and truck drivers respond to regulations limiting operating hours in specific areas, the strategies they employ to adjust delivery schedules, and the obstacles they face in adhering to the rules. This analysis is essential for understanding the extent to which the policy is accepted by those directly affected and the factors that facilitate or hinder compliance.

The second and third aspects focus on the role of government and the broader impacts of the policy at the city level. Institutional coordination and enforcement challenges explore how different government agencies collaborate in implementing the policy, the barriers to coordination, and existing monitoring mechanisms (Andrew et al., 2015). Meanwhile, the impact of the policy on urban mobility and the local economy assesses the effects of freight restrictions on traffic flow, road safety, environmental quality, and their implications for logistics distribution and economic activities in Balikpapan. This approach provides a holistic understanding of the policy's effectiveness within a dynamic and complex urban context.

Compliance and Adaptation of Freight Operators to Restriction Policies

Compliance and adaptation of freight operators to restriction policies represents a complex interaction between regulatory frameworks and the operational realities of the logistics sector. Freight operators are often subject to policies aimed at controlling traffic congestion, reducing environmental impacts, and ensuring safety on road networks. These regulations may include limitations on vehicle weight, time-based restrictions for entering urban centers, emission standards, and route limitations. Compliance with such policies requires not only awareness of legal obligations but also a strategic adjustment of operational procedures, including route planning, scheduling, and fleet management. Operators must constantly monitor changes in regulations to avoid penalties while maintaining service efficiency and profitability.

Adaptation strategies adopted by freight operators vary depending on their size, resource availability, and type of goods transported. Large operators often invest in technology-driven solutions, such as GPS-based route optimization, fleet telematics, and digital monitoring systems, which allow them to adjust delivery schedules and reroute vehicles in real time. Smaller operators, however, may rely on local knowledge and experiential adjustments, such as avoiding restricted zones during peak hours or consolidating shipments to minimize trips (Allen et al., 2017; Mittal et al., 2018). The effectiveness of these adaptations is influenced by the clarity, consistency, and enforcement of the restriction policies, as well as the support mechanisms provided by regulatory authorities.

Economic considerations play a critical role in determining the level of compliance and adaptation among freight operators. Policies that impose high compliance costs, such as mandatory vehicle retrofitting to meet emission standards, can create financial burdens, particularly for small and medium-sized operators. Consequently, some operators may adopt minimal compliance strategies that fulfill the letter of the regulation without significantly altering

their operational practices, while others may innovate to find cost-effective solutions that align with both policy requirements and business objectives. The balance between regulatory enforcement and economic feasibility is essential for ensuring that freight operators can sustain compliance without compromising service quality or profitability.

Social and environmental factors also influence how freight operators respond to restriction policies. Public pressure for cleaner air, reduced traffic congestion, and safer roads encourages operators to integrate sustainable practices into their operations (Hosseinian et al., 2024; Musa et al., 2023). Compliance can enhance the company's reputation, improve community relations, and contribute to long-term operational resilience. Moreover, collaborative approaches, such as sharing best practices within industry associations or participating in government-supported training programs, enable operators to learn from each other and adapt more effectively. The dynamic between regulatory expectations, operational constraints, and societal pressures underscores the multifaceted nature of compliance and adaptation in the freight sector, highlighting the need for continuous learning and proactive engagement.

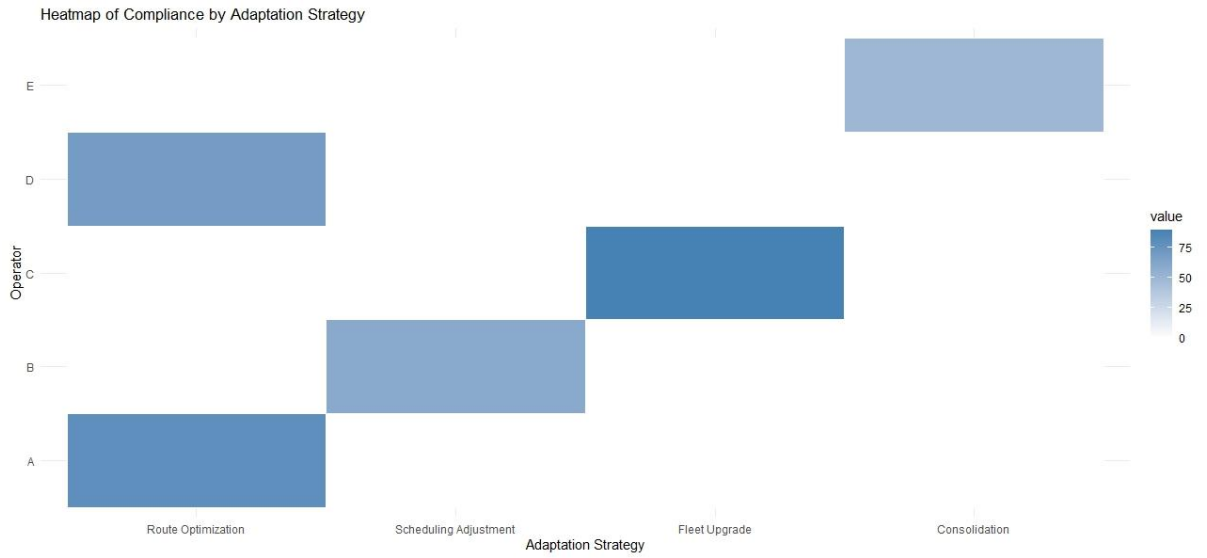

Figure 1 Compliance by Adaptation Strategy
Source Data Processes by the Author

Figure 1 presents a map depicting the level of compliance among several operators with different adaptation strategies. A heat map is an effective form of data visualization that displays the variation in values in a matrix, with the intensity of the color representing the magnitude of the observed value. In this graph, the horizontal axis represents the adaptation strategy categories, which include Route Optimization, Scheduling Adjustments, Fleet Enhancement, and Consolidation. Meanwhile, the vertical axis displays the operator's identity, labeled A through E. Darker blue shades indicate higher levels of compliance, while lighter shades indicate lower levels of compliance.

The figure shows that each operator exhibits varying focus and levels of compliance with their implemented adaptation strategies. Operator A demonstrates a high level of compliance with the Route Optimization strategy, indicated by the dark blue shade. This indicates that Operator A is very consistent in implementing route optimization as a means of improving operational efficiency. In contrast, this operator does not demonstrate compliance with other strategies, such as Fleet Enhancement or Consolidation, possibly due to resource constraints or internal policies that prioritize route efficiency over fleet renewal (Bentley & Hodge, 2020; Wang et al., 2025).

Operator B demonstrates compliance with the Scheduling Adjustment strategy, as indicated by the blue block appearing in that category. Compliance with scheduling adjustments indicates that Operator B focuses more on time management and reorganizing operational schedules to adapt to environmental or market changes. This could be done to reduce workload during peak hours or to optimize the use of human and material resources. However, this operator appears to pay less attention to other adaptation strategies, which could be due to budget constraints or specific company priorities.

Unlike the other operators, Operator C appears to be focused on the Fleet Improvement strategy, demonstrating the highest level of compliance. This is reflected in the darkest blue color in the Fleet Improvement category, indicating that the operator has made substantial efforts to modernize or upgrade its fleet to improve service performance and efficiency (Wang et al., 2025). Because this strategy typically requires significant investment, Operator C's high compliance likely reflects stronger financial capabilities or a supportive policy framework that encourages infrastructure improvements. Thus, this operator may view fleet improvements as a long-term investment to strengthen competitiveness.

Meanwhile, Operator D demonstrates a moderate level of compliance with the Route Optimization strategy, although not as strong as Operator A. This suggests that Operator D is also implementing route optimization, but perhaps to a more limited extent or intensity. This compliance may reflect efforts to reduce operational costs and travel times, although it may not be fully optimal. Factors such as limited navigation technology or inadequate real-time data may hinder more effective implementation. Nevertheless, this strategy still contributes significantly to improving service efficiency.

Operator E exhibits a different pattern compared to the others, as the only strategy with observable compliance is Consolidation. Blue shading in this category indicates that the operator is focusing on integrating or consolidating resources, such as routes, service units, or management functions. This strategy is often used to reduce costs and strengthen operational capacity in response to policy changes or decreased demand. Consolidation compliance implies that the company is undergoing internal restructuring to adapt to environmental or organizational challenges.

Institutional Coordination and Enforcement Challenges

Institutional coordination and enforcement challenges are central issues in the effective implementation of policies across various sectors. Coordination among institutions requires clear communication channels, alignment of goals, and the establishment of mechanisms that facilitate joint decision-making. Often, policies involve multiple agencies with overlapping responsibilities, which can lead to confusion, duplication of efforts, and delays in implementation. Effective coordination depends not only on formal structures such as inter-agency committees but also on informal networks, trust, and shared understanding of policy objectives. When institutions fail to coordinate, enforcement becomes fragmented, reducing the overall effectiveness of regulatory measures and undermining public confidence in governance (Admati, 2017; Cihon et al., 2020).

Enforcement challenges are frequently compounded by the complexity of the regulatory environment. Agencies may lack sufficient resources, including trained personnel, technological tools, and funding, to monitor compliance effectively. Legal ambiguities or inconsistencies across regulatory frameworks can also create loopholes that hinder enforcement. Furthermore, enforcement authorities may face practical difficulties in reaching certain areas or sectors, particularly in contexts where operations are decentralized or informal (Darbi et al., 2018; Smoke, 2015). As a result, the implementation of policies can vary significantly across regions,

leaving some communities or sectors less protected or more exposed to risks, while others adhere strictly to regulations.

Institutional coordination is also influenced by political and organizational dynamics. Agencies may prioritize their own mandates over collective goals, leading to competition rather than collaboration. Differences in institutional culture, incentive structures, and leadership commitment can further complicate coordination efforts. Achieving harmonized enforcement requires not only technical solutions but also strategies to build consensus, align priorities, and incentivize cooperation. Policy design that anticipates these challenges and incorporates mechanisms for conflict resolution, information sharing, and accountability tends to be more resilient and effective in practice.

Socioeconomic and contextual factors play a critical role in shaping enforcement outcomes. Stakeholders, including private actors and the public, respond differently to regulatory pressure depending on perceived legitimacy, fairness, and feasibility of compliance. Lack of awareness, limited capacity, or resistance to change can weaken enforcement even when institutional coordination is strong. Conversely, transparent, participatory approaches that engage stakeholders can strengthen compliance and reduce enforcement burdens. Understanding the interplay between institutional arrangements, enforcement capacity, and societal behavior is essential for designing policies that are both implementable and sustainable over time.

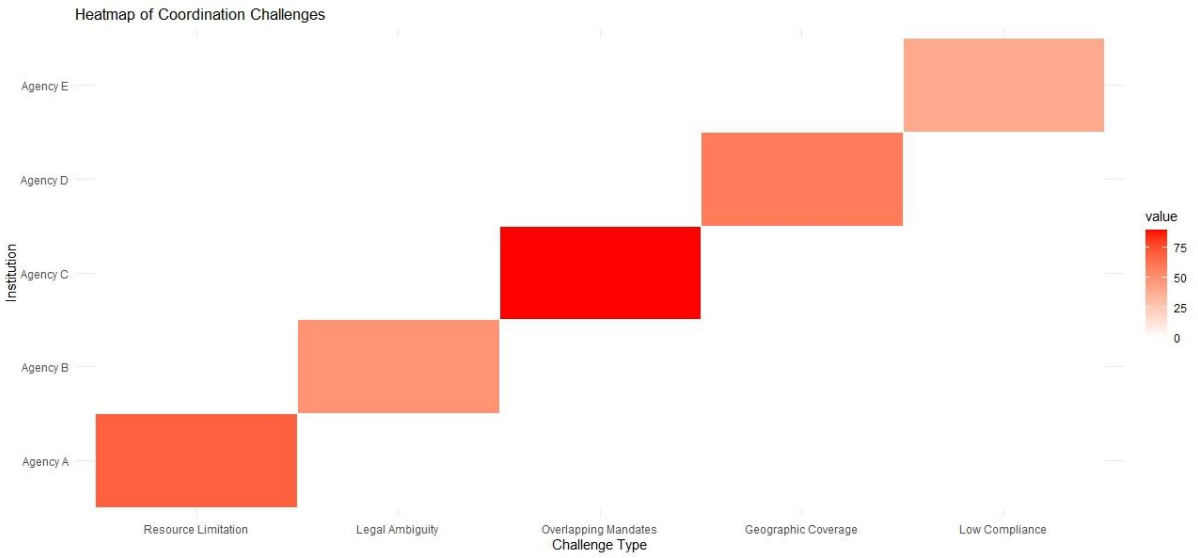

Figure 2 Coordination Challenges
Spurce Data Processes by the Author

Figure 2 presents the Coordination Challenges Map, which illustrates the intensity of various types of obstacles faced by several agencies in carrying out their coordination functions. On the horizontal axis, there are five main types of challenges: Resource Constraints, Legal Ambiguity, Overlapping Mandates, Geographic Coverage, and Low Compliance. Meanwhile, the vertical axis lists five agencies, labeled Agency A through Agency E. The color scale indicates the severity or intensity of each challenge, with darker red indicating higher levels of difficulty and lighter shades indicating lower levels of difficulty. This visualization provides a clear picture of how different agencies experience varying coordination challenges, depending on their operational context and organizational structure.

The figure clearly demonstrates that each agency faces different coordination challenges, depending on its institutional characteristics and scope of responsibilities. Agency A faces the greatest challenges in the area of Resource Constraints, represented by the darker red color. This indicates that the agency experiences a lack of funding, personnel, and infrastructure, all of which hinder its coordination effectiveness. This situation is common among agencies operating with limited budgets or broad areas of responsibility, where available resources do not match the demands of their tasks (Alexander, 2015; Raza et al., 2017). Consequently, a lack of adequate capacity can undermine agencies' ability to engage in timely and effective collaboration.

In contrast, Agency B faces its primary challenge in the area of Legal Ambiguity, indicated by the lighter shade of red. While the problem is less severe than the others, it remains a significant barrier to coordination. Legal Ambiguity occurs when the regulatory framework fails to clearly define roles, responsibilities, and jurisdictions between agencies, leading to overlapping tasks and confusion in policy implementation. This uncertainty often results in delays, inefficiencies, and inconsistent interpretations of legal mandates. As a result, agencies may struggle to coordinate effectively because they operate under unclear or conflicting rules, ultimately weakening interagency collaboration.

In the center of the heat map, Agency C stands out as facing the most significant challenges among all agencies, particularly in the area of Overlapping Mandates. The dark red color in this category indicates a severe problem of overlapping authority. This condition arises when multiple agencies share similar functions or responsibilities without adequate coordination mechanisms or role differentiation. Such overlap can lead to duplication of work, bureaucratic competition, and inefficiencies in policy implementation. This challenge is particularly common in complex bureaucratic systems where institutional boundaries are poorly defined, resulting in fragmented and redundant efforts (McDonnell, 2017; Raynard, 2016).

Meanwhile, Agency D appears to face its primary challenge in Geographic Coverage, indicated by the slightly darker orange color. This indicates difficulties in managing coordination across large or geographically diverse areas, such as remote areas, border zones, or regions with inadequate infrastructure. Geographical constraints often hinder communication and information flow, increasing coordination time and costs. Consequently, agencies operating in this environment may struggle to implement integrated policies that require close interregional cooperation, reducing the overall effectiveness of collaborative governance.

On the other hand, Agency E faces its primary challenges in Low Compliance, represented by a lighter shade of orange. This reflects low levels of adherence to established regulations or agreed-upon coordination frameworks. Non-compliance can be caused by weak monitoring systems, inadequate enforcement mechanisms, or a lack of institutional commitment to shared goals. Low compliance undermines collaborative efforts by creating gaps in implementation and accountability. When one or more agencies fail to follow established coordination protocols, the effectiveness of joint initiatives declines, ultimately limiting policy outcomes.

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Impact of Freight Restriction on Urban Mobility and Local Economy

The impact of freight restriction on urban mobility and the local economy manifests in both transportation efficiency and economic dynamics. Limiting the movement of heavy vehicles in urban areas, whether through time windows, weight limits, or restricted zones, aims to reduce congestion, enhance safety, and lower environmental pollution. Such measures can improve traffic flow for commuters, public transportation, and emergency vehicles, creating a smoother and more predictable urban mobility pattern. However, these benefits may be accompanied by operational challenges for freight operators, as they must adjust schedules, routes, and delivery practices to comply with the imposed restrictions (Mukhtarov, 2023; Song, 2021).

Economically, freight restrictions influence businesses differently depending on their scale and reliance on timely deliveries. Improved traffic conditions can facilitate faster access for customers, reduce delays in goods distribution, and create a more attractive environment for commerce and service activities (Asawawibul et al., 2025; Bosona, 2020; Farooq et al., 2019). Conversely, enterprises that depend on frequent or bulky deliveries may experience increased operational costs, such as longer routes, additional labor hours, or investments in compliance measures. Smaller businesses are particularly vulnerable, as they often have limited resources to absorb these additional burdens, which can affect profitability and market competitiveness within the urban economy.

Adaptation strategies play a crucial role in mitigating the potential economic drawbacks of freight restrictions while sustaining their positive effects on mobility. Logistics operators may implement route optimization, consolidate shipments, or adjust fleet composition to navigate regulatory requirements efficiently. Local authorities can support these adaptations by providing clear enforcement policies, flexible delivery windows, and infrastructure improvements such as designated loading zones. The overall success of freight restrictions depends on the coordination between regulatory frameworks, operator compliance, and supportive urban planning, which together determine whether the measures enhance both mobility and the resilience of the local economy.

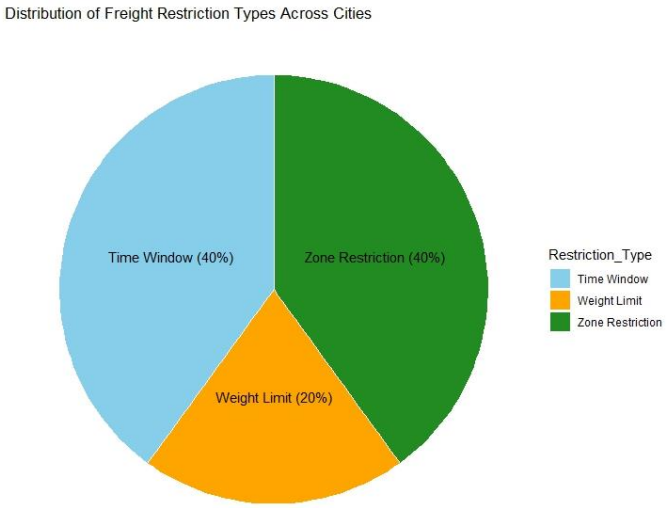

Figure 3 Distribution of Freight Restriction Types Across Cities
Source Data Processes by the Author

Figure 3 presents a pie chart depicting the distribution of freight transport restriction types across various cities. The primary purpose of this chart is to demonstrate the proportion of various traffic restriction policies implemented by city authorities to regulate freight movement. The chart is divided into three main categories: Time Windows, Weight Limits, and Zone Restrictions. Light blue represents Time Windows, orange represents Weight Limits, and green represents Zone Restrictions. Each segment is labeled with a percentage indicating its relative contribution to the total.

This chart shows that two types of restrictions dominate urban freight transport management policies: Time Windows and Zone Restrictions, each accounting for 40% of the total. This balanced proportion indicates that cities rely equally on these two main approaches to manage freight traffic. Time Window Restrictions typically regulate delivery hours, allowing freight transport vehicles to operate only during off-peak hours (Fu & Jenelius, 2018; Sánchez-Díaz et al., 2017). Conversely, Zone Restriction policies prohibit freight transport vehicles from entering certain areas, such as downtown areas, residential areas, or environmentally sensitive areas.

The third type of restriction, Weight Limits, accounts for 20% of the total. Although smaller in proportion than the other two policies, this policy remains crucial, particularly for protecting road infrastructure and ensuring transportation safety. Weight Limit restrictions are typically implemented in areas with bridges, narrow roads, or aging infrastructure that cannot support heavy loads. The smaller percentage indicates that weight-based restrictions are applied selectively, depending on local conditions, rather than as a general policy.

The balance between Time Window and Zone Restrictions reflects variations in local strategies for addressing congestion, pollution, and pressure on urban infrastructure (Mutambik, 2025; Rajé et al., 2018; X. Zhao et al., 2022). Larger cities with high economic activity tend to rely more on Time Window policies to maintain logistical flexibility without completely restricting access to central areas. Meanwhile, cities with more stringent spatial planning or higher population densities often prefer Zone Restrictions to ensure traffic flow and protect environmental quality. Therefore, both approaches represent an attempt to balance economic needs with environmental sustainability.

The implementation of these three types of restrictions also demonstrates how urban policies adapt to modern transportation challenges. Time Windows emphasize time efficiency, Weight Limits focus on safety and infrastructure protection, and Zone Restrictions prioritize spatial control. By combining these strategies, local governments can tailor their policies to specific urban contexts, taking into account traffic density, land use, and long-term goals such as carbon emission reduction. This diversity of policies demonstrates that freight traffic management is not just about restrictions, but also about optimizing sustainable urban logistics systems.

From a policy analysis perspective, the distribution shown in this diagram highlights that no single model is dominant (Keele, 2015; Lucas et al., 2015; Montenegro et al., 2021). Instead, each city adopts a combination of policies that best suits its circumstances and priorities. Factors such as economic structure, population density, topography, and infrastructure capacity all influence these choices. For example, a port city might focus more on Weight Limit restrictions due to its higher volume of heavy freight transport, while a tourism-oriented city might prioritize Zone Restrictions to maintain public convenience.

Overall, this figure provides a comprehensive understanding of how different cities regulate freight transportation to balance economic mobility with traffic efficiency and quality of life. The relatively balanced proportions among the three types of restrictions demonstrate adaptive and context-based policymaking. This visualization not only presents statistical data but also reflects the dynamic nature of urban transport policies aimed at addressing complex challenges from congestion and logistical efficiency to long-term environmental sustainability.

The three findings presented in this study compliance and adaptation strategies of freight transport operators, institutional coordination and enforcement challenges, and the distribution of types of freight transport restrictions collectively highlight the complex dynamics of policy implementation in urban freight transport management. The first finding illustrates how freight transport operators respond to restriction policies differently based on their resources, capacity, and operational priorities (Akgün et al., 2019; Lordieck & Corman, 2021). Some operators adopt sophisticated technological adaptations, such as route optimization and fleet upgrades, while others rely on simpler, experience-based adjustments. This variation suggests that compliance is not solely determined by regulatory enforcement, but also by economic feasibility and the institutional support available to operators. Thus, policy success depends on the balance between regulatory pressure and supportive measures that enable operators to comply without jeopardizing their economic sustainability.

The second finding, regarding institutional coordination and enforcement challenges, reveals administrative and structural constraints that hinder effective policy implementation. This analysis shows that agencies often face overlapping mandates, unclear legal frameworks, and limited resources, all of which undermine coordination and enforcement. These institutional gaps not only reduce consistency in policy implementation but also foster inefficiency and inter-agency competition. This heat map further illustrates how challenges vary across agencies, demonstrating that coordination issues are multidimensional, rather than uniform (Boschken, 2017; Shil & Eusufzai, 2022). Therefore, strengthening governance capacity, enhancing legal clarity, and improving inter-agency communication are crucial to ensuring that policies function as intended and enforcement mechanisms operate effectively at all levels of government.

An analysis of the distribution of freight transport restrictions across cities highlights the diversity of policy approaches used to address urban transport issues. The balance between Time Window and Zone Restriction policies, along with the selective application of Weight Limits, reflects local governments' efforts to adapt to specific urban conditions such as traffic density, infrastructure capacity, and environmental priorities. This demonstrates that urban freight transport policy is context-driven, requiring flexibility and innovation to align with local needs. When these three findings are examined together, the results suggest that successful implementation of freight transport restriction policies depends on the interaction between adaptive operator behavior, effective institutional coordination, and context-sensitive policy design. Integrating these elements can lead to a more sustainable, efficient, and equitable freight transport system in urban environments.

CONCLUSION

Based on the overall findings, it can be concluded that the implementation of freight transport restriction policies in Balikpapan City reflects a multidimensional process influenced by the interaction between operator compliance, institutional coordination, and policy design. The level of adaptation among freight operators shows that effective compliance depends not only on enforcement but also on the availability of resources, technological capacity, and regulatory support. At the same time, the challenges of institutional coordination reveal that overlapping mandates, limited resources, and weak inter-agency collaboration remain key barriers to consistent policy execution. Furthermore, the variation in freight restriction types across cities demonstrates that local governments apply adaptive strategies according to their unique urban contexts, balancing economic, social, and environmental priorities. Therefore, the success of freight restriction policies lies in integrating adaptive operator behavior, collaborative governance, and context-specific policy innovation to achieve sustainable and efficient urban mobility.

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