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Effectiveness of Truck Time Restrictions in West Java Industrial Corridor

Inda Tri Pasa[1], Hadi Prayitno[2], Asep Gunawan Slamet[3], Endang Wahyuni[4]
[1]Politeknik Penerbangan Palembang, Indonesia
[2]Politeknik Penerbangan Surabaya, Indonesia
[3]Bangun Skills, Indonesia
[4]Institut Transportasi dan Logistik Trisakti, Indonesia
Correspondent: indapasa@ymail.com[1]

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ABSTRACT: This study investigates the impact of truck operational time restrictions on traffic safety and congestion in West Java's industrial corridors. As freight traffic intensifies across key logistic routes such as Cikarang–Karawang, policymakers introduced peak-hour bans on heavy-duty vehicles to alleviate congestion and enhance road safety. Employing a qualitative-descriptive approach, the study collected data through in-depth interviews, field observations, and official reports. Results reveal a dual impact: while congestion and accident rates declined during restricted hours, the policy induced new challenges, including secondary congestion near access points, increased fatigue among night-driving truckers, and unequal compliance among logistics stakeholders. Larger logistics companies successfully adapted by integrating digital scheduling and real-time monitoring, while SMEs encountered structural barriers in policy adaptation due to limited access to technology and information. Inconsistent enforcement and lack of policy awareness also hampered regulatory effectiveness. The discussion emphasizes the need for a balanced approach one that combines regulatory intervention with affirmative support for small-scale actors, and investments in smart enforcement technologies. The findings offer valuable insights for developing inclusive, context-sensitive transport policies in industrially dynamic regions.

Keywords: Truck Operational Restriction, Freight Logistics, Congestion Management, Traffic Safety, Digital Adaptation.

INTRODUCTION

The industrial expansion in Bekasi, Karawang, and Purwakarta has increased freight transportation in West Java. Data from BPS (2023) show a 15% rise in freight vehicle volume on the Jakarta–Cikampek Toll Road, intensifying peak-hour congestion, freight vehicle volumes on the Jakarta–Cikampek Toll Road increased by more than 15% in 2023 alone. As a direct consequence, the daily traffic load on major thoroughfares has worsened, especially during peak commuting hours.

A prominent traffic management challenge in West Java's industrial belt lies in the presence of large logistics trucks traveling along main arterial routes during high-traffic periods. These heavy-duty vehicles (HDVs), often transporting goods between manufacturing zones and distribution centers, occupy substantial road space and reduce traffic maneuverability. Their interaction with lighter, more agile vehicles leads to bottlenecks and, more critically, to increased risks of road accidents. According to Indonesia's National Traffic Police (Korlantas Polri), over 30% of accidents on the Jakarta–Cikampek Toll Road in 2022 involved HDVs.

To address these issues, the West Java provincial government, in coordination with the Ministry of Transportation, introduced a policy that restricts the operating hours of trucks with a classification of Group III or above. Specifically, these trucks are prohibited from accessing toll roads and main arteries during peak hours namely, 06:00–09:00 and 16:00–20:00. The policy's dual objectives are to reduce road congestion and enhance road user safety. Such time-based truck restrictions reflect broader global trends in transport demand management (TDM), which aim to balance road usage with infrastructure capacity and safety imperatives (Song et al., 2024; Zulkarnain & Ghiffary, 2021).

Despite its implementation, the policy has sparked considerable debate regarding its overall effectiveness. On the one hand, government reports claim that congestion levels have decreased by up to 20% in critical corridors like Cikarang Barat–Karawang Timur during peak hours (Kemenhub RI, 2023). On the other hand, industrial stakeholders particularly within the logistics and manufacturing sectors express concerns over delayed deliveries and disruptions in just-in-time (JIT) supply chains. These opposing views highlight the tensions between achieving public road safety and maintaining supply chain efficiency.

Most prior studies focus on metropolitan Jakarta, leaving West Java's industrial clusters underexplored. The unique spatial dynamics and uneven enforcement in this corridor demand localized evaluation, especially regarding different impacts on multinational operators versus SMEs (Johansson et al., 2024; Pirra & Diana, 2019).

This study therefore emerges from the need to conduct an evidence-based evaluation of truck operational time restrictions in West Java's industrial corridors. It focuses on two core dimensions: (1) the policy's impact on traffic flow efficiency, and (2) its influence on road safety outcomes for both heavy and light vehicle users. These objectives are pursued through a qualitative-descriptive approach involving primary data from field observations, interviews with key stakeholders (including logistics personnel, truck drivers, and transportation authorities), and secondary data such as government transportation reports and traffic accident records. By triangulating these sources, the study aims to uncover the practical, operational, and institutional dynamics shaping the policy's implementation and performance.

Within the broader theoretical context, this research builds upon several strands of literature. First, it draws from transport demand management (TDM) theories, which advocate for strategic regulation of road use based on vehicle type, time of day, and functional road classifications (Aung et al., 2020; Talebpour et al., 2017). Second, it references empirical findings from international case studies demonstrating how night-time restrictions for freight vehicles can reduce peak-hour

congestion, albeit sometimes creating new forms of secondary congestion near logistics hubs or buffer zones (Marazi et al., 2024; Menelaou et al., 2019). Third, it engages with safety studies that highlight how interaction between heterogeneous vehicle types during peak traffic periods increases accident risks, especially in logistics-dense environments (Çolak et al., 2016; Zhao et al., 2022).

A particularly salient challenge emerges in developing economies like Indonesia, where infrastructure limitations, insufficient policy communication, and uneven institutional capacity complicate policy enforcement. In these settings, balancing public safety with industrial competitiveness demands not only regulatory frameworks but also investment in technological enablers and inclusive stakeholder engagement (Belhassine et al., 2022; Castillo et al., 2022). Research suggests that without such enabling conditions, even well-designed traffic management policies may yield suboptimal outcomes, such as increased operational burdens on drivers forced into night shifts and SMEs struggling to adapt without digital logistics tools (Nkosi et al., 2023).

The current study seeks to address this research gap by evaluating the operational, institutional, and human impacts of the truck time restriction policy in one of Indonesia's most logistically active regions. It contributes novel insights into how freight regulation interacts with real-world logistics practices, particularly in contexts marked by rapid industrialization, infrastructure stress, and regulatory asymmetry. By doing so, it adds empirical depth to the theory-practice interface in transport policy and logistics governance.

This study is guided by the hypothesis: "Truck time restrictions improve traffic flow and safety, but their effectiveness depends on enforcement, adaptability, and stakeholder engagement." Evaluating policies within regional specificities is essential for sustainable and equitable solutions.

In sum, this research offers both theoretical and practical contributions: enriching freight regulation literature in industrial regions and guiding policymakers to balance safety, efficiency, and equity through adaptive and inclusive transport interventions.

METHOD

This study employed a qualitative-descriptive design to assess the effectiveness of truck time restrictions in West Java's industrial corridor. This approach captures socio-political nuances and institutional dynamics. Qualitative inquiry is particularly suitable for exploring stakeholder experiences and perceptions that may not emerge in quantitative surveys (Beojone & Geroliminis, 2020). Although qualitative research has limitations such as subjectivity and limited generalizability, this study mitigated them by applying triangulation and validation strategies (Setiawan & Setiyo, 2024).

The research was conducted along the Cikarang–Karawang corridor, a vital distribution artery in West Java with high freight density and recent policy interventions. Its strategic role in national

supply chains makes it an ideal context for evaluating logistics operations, public road use, and policy enforcement.

Purposive sampling was used to recruit **32 informants**, including: (1) 12 truck drivers engaged in intercity logistics, (2) 8 managers/owners of logistics companies (large-scale and SMEs), (3) 6 traffic enforcement officers from the West Java Transportation Agency and National Police, (4) 3 Ministry of Transportation officials, and (5) 3 local residents affected by the policy. Selection criteria included at least two years of experience with freight transport in the corridor and direct involvement with the policy's implementation (Aung et al., 2020; Hall, 2021).

Although purposive sampling allows for the inclusion of informed participants, it also introduces potential selection bias. The study therefore accounts for this limitation by incorporating diverse stakeholder categories and triangulating their perspectives with independent data sources (Quessada et al., 2020).

Data were collected through three primary methods:

1. **In-depth Interviews**: Semi-structured interviews were conducted to capture narratives on how the policy was experienced and perceived by various stakeholders. This method enabled the researcher to explore detailed opinions on policy effectiveness, operational constraints, and adaptive strategies.
2. **Field Observations**: Observational sessions were conducted at selected traffic nodes identified as congestion-prone or safety-critical points. These observations allowed for real-time validation of stakeholder claims and offered visual insights into traffic patterns during restricted and non-restricted hours.
3. **Document Analysis**: Supplementary data were gathered from governmental reports issued by the West Java Transportation Agency, accident records from the National Traffic Police (Korlantas), and official documents detailing the scope and rationale behind the restriction policy. These documents served as secondary sources to contextualize and verify primary data findings.

The data analysis followed a thematic approach, wherein key patterns and recurring concepts were identified, grouped, and interpreted. The analysis began with data transcription and initial coding, which was iteratively refined to form overarching themes reflecting stakeholder evaluations of the policy's outcomes. This approach is appropriate for policy-focused studies, allowing complex social phenomena to be synthesized into actionable insights.

To enhance the validity of the findings, this study implemented triangulation techniques across both sources and methods. By comparing data across interviews, field observations, and document reviews, the researcher ensured that conclusions drawn were not solely reliant on individual testimonies or single-source bias. This methodological rigor aligns with best practices in qualitative transport policy research and ensures that findings hold relevance across institutional and operational domains.

In sum, the adopted methodology allows for a contextually rich and analytically robust evaluation of the truck operational time restriction policy. By integrating multiple data sources and incorporating a diverse array of stakeholder voices, the study aims to contribute grounded recommendations for improving traffic regulation in high-density logistics zones.

RESULT AND DISCUSSION

The results of this study reveal both the intended benefits and the unintended consequences of truck time restrictions in West Java's industrial corridor. Overall, the policy has improved peak-hour traffic conditions and reduced accident rates. However, secondary congestion, driver fatigue, and unequal adaptation across logistics actors emerged as new challenges. To present these findings more systematically and concisely, the key themes and stakeholder perspectives are summarized in the following table.

Table 1. Summary of Key Findings from Stakeholders (n=32)

Theme	Main Findings	Evidence (n/32)
Congestion Impact	Reduced congestion during peak hours, but new bottlenecks at toll gates.	26 informants
Road Safety	Accident rates declined, but fatigue increased among night-shift drivers.	6 officials, 14 drivers
Enforcement Challenges	Limited monitoring capacity and policy evasion via alternative routes.	9 informants
Policy Awareness	Weak dissemination created confusion, especially among SMEs.	9 informants
Logistics Adaptation – Large Firms	Digital scheduling, GPS tracking, buffer zones → effective compliance.	8 managers
Logistics Adaptation – SMEs	Limited resources, small fleets, high vulnerability to fines/delays.	5 owners

The majority of informants acknowledged a tangible reduction in congestion along main industrial roads during peak hours as a result of truck operational time restrictions. According to a private sector employee commuting daily from Bekasi to Karawang, the contrast in traffic conditions before and after the policy implementation was notable: "Previously, traffic jams from 6:30 to 9:00 AM were extreme, especially with container and articulated trucks on the road. Now, although traffic remains heavy, it's much more manageable" (Informant 1).

However, this improvement is accompanied by adverse secondary effects. Freight drivers reported congestion build-up at rest areas or toll entrances, as they waited for the restriction period to end. One truck driver explained, "We're forced to idle roadside until 6 PM. Once the restriction lifts, all trucks move at once, creating long queues and new bottlenecks" (Informant 2). Such effects align with broader literature indicating that temporal redistribution of freight activity can

unintentionally shift rather than solve congestion, especially without complementary scheduling strategies (Lai et al., 2024).

Traffic police and transport authorities reported a noticeable decline in accident rates following the enforcement of time restrictions, especially during previously high-risk periods such as morning rush hours. A police officer from Karawang stated, "Collisions have declined significantly in areas like the industrial arterials where private vehicles no longer share space with heavy trucks during rush hours" (Informant 3). This supports findings that separating freight traffic temporally reduces crash potential due to fewer vehicle-type conflict points (Belhassine et al., 2022).

Nevertheless, these safety gains may come at the cost of truck driver welfare. Drivers described increased fatigue from having to operate during the night. A container truck driver from Subang recounted, "I often start driving at 11 PM to reach Cikarang before the restriction begins. It's exhausting and risky, especially with inadequate rest" (Informant 4). This mirrors global findings on fatigue-related crash risks associated with nighttime trucking (Premnath & Murugan, 2021).

Enforcement inconsistencies emerged as a recurring issue. Traffic officials admitted limited capacity to monitor all routes, especially alternative roads used to bypass restrictions. One official from the West Java Transportation Agency explained, "There are too many critical points to monitor. Some drivers exploit unmonitored alternate routes, and with our limited personnel, enforcement is not comprehensive" (Informant 5).

Equally problematic is the lack of uniform awareness among truck operators. A small logistics company owner from Bekasi commented, "Our drivers aren't always updated. Socialization is limited and many are confused about when they can legally operate" (Informant 6). These findings highlight the need for improved policy communication and coordinated enforcement mechanisms (Setiawan & Setiyo, 2024).

Larger logistics firms demonstrated considerable adaptive capacity. A national freight company manager noted, "All our fleets now use GPS tracking and time management systems. We've staggered shifts and set up buffer zones to handle waiting trucks. It's now part of our SOP" (Informant 7). Their approach reflects best practices in digital logistics management to comply with restrictive policies (Budihardjo et al., 2021).

Conversely, SMEs face notable constraints. A small distributor from Cikampek lamented, "We only have three trucks. If one gets delayed or fined, it disrupts everything client satisfaction, delivery deadlines, and costs" (Informant 8). Such disparities point to a digital divide and policy-induced inequalities that affect smaller actors disproportionately (Dikshit et al., 2023).

In conclusion, the results demonstrate a nuanced impact of truck time restrictions: while traffic flow and safety have improved, new congestion patterns, implementation barriers, and adaptation inequalities pose significant challenges to sustained effectiveness.

Truck time restrictions in West Java illustrate both the benefits and unintended consequences of traffic demand management (TDM). This section interprets findings in light of theory and practice, emphasizing policy effectiveness, equity, and sustainability.

The main benefit of the policy is reduced congestion during peak hours, confirming TDM principles. However, the emergence of bottlenecks at toll gates indicates a shift rather than a

solution to congestion. This finding highlights the need for structured buffer zones, staggered scheduling, and digital queue management as concrete measures to prevent secondary congestion (Nugroho, 2020).

From a theoretical perspective, the policy is grounded in transport demand management (TDM), which advocates for regulating road use by vehicle type and operating time. Yet the success of TDM strategies relies heavily on institutional capacity, technological integration, and collaborative engagement with stakeholders factors not uniformly present in this case (Zulkarnain & Ghiffary, 2021).

Separating HDVs from lighter vehicles lowered accident risks, consistent with conflict point theory. Yet, driver fatigue from night shifts creates new vulnerabilities. A critical implication is that safety must extend to both road users and logistics workers. Policy responses should include rest area expansion, incentives for safe night shifts, and regulated driving hours to prevent fatigue-related crashes (Belhassine et al., 2022).

The challenges in policy implementation reflect broader systemic issues in developing transportation systems. Enforcement inconsistencies stem from insufficient personnel and infrastructure, allowing policy evasion via unmonitored alternative routes. Furthermore, weak communication has led to misinformation and confusion, especially among SME logistics operators and individual truckers. In this regard, the principle of policy communication becomes critical. Effective dissemination through industry associations, media, and driver communities is essential for ensuring compliance and fostering legitimacy (Setiawan & Setiyo, 2024).

In addressing enforcement limitations, digital governance offers promising solutions. Technologies such as Automatic Number Plate Recognition (ANPR), real-time traffic sensors, and crowdsourced reporting platforms can bolster transparency and accountability. Smart enforcement models not only optimize limited resources but also enable more consistent policy application across vast networks (Rajendran & Srinivas, 2020).

The adaptive strategies employed by logistics actors further illuminate the policy's socio-economic ramifications. Large firms, equipped with technological resources, have integrated route optimization, digital fleet management, and temporal shift adjustments into their operations. These adaptations not only ensure compliance but enhance operational efficiency demonstrating the role of digital infrastructure in policy resilience (Budihardjo et al., 2021).

Conversely, SMEs struggle with adaptation due to financial constraints, limited access to digital tools, and insufficient human resources. This digital divide amplifies operational inequalities and could marginalize smaller actors in increasingly regulated transport environments. Addressing this requires affirmative policies such as subsidized training, equipment grants, and participatory policymaking mechanisms to support equitable adaptation (Johansson et al., 2024).

Conceptually, the findings affirm that effective transport policy requires not only regulatory enforcement but also adaptive capacity among stakeholders. In contexts of rapid industrialization and logistical intensity, top-down interventions must be paired with bottom-up support to foster sustainable compliance. Public intervention without private empowerment may yield short-term compliance but long-term instability.

Finally, digital infrastructure forms the cornerstone of future-ready transport governance. Smart cities initiatives that integrate data analytics and real-time management systems offer scalable models for balancing freight mobility with public safety (Zhou et al., 2024). As freight activity increases with economic growth, strategic investment in digital monitoring and flexible policy mechanisms will be essential to ensuring resilient, inclusive, and efficient urban mobility systems.

In summary, truck time restrictions reduced congestion and accidents but also introduced fatigue risks, enforcement gaps, and adaptation inequalities. Addressing these trade-offs requires a balanced approach that combines digital enforcement, SME capacity-building, targeted communication, and humane driver support systems**.** Limitations of this study include its qualitative sample size (32 informants) and corridor-specific scope. Future research should expand to comparative regions and employ mixed-methods to assess long-term impacts.

CONCLUSION

This study demonstrates that truck time restrictions in West Java's industrial corridor reduced peak-hour congestion and accident risks by temporally separating heavy-duty vehicles from general traffic. However, the policy also produced unintended consequences, including secondary congestion near toll gates, fatigue among night-shift drivers, and unequal adaptation capacities between large firms and SMEs.

The findings highlight trade-offs between regulatory efficiency and operational equity. While large firms adapted through digital technologies, SMEs struggled due to limited resources. Weak enforcement and insufficient communication further constrained effectiveness, indicating the need for targeted dissemination, smart enforcement systems, and supportive measures for smaller operators.

This research contributes to transport policy discourse by showing that sustainable traffic management requires more than regulatory restrictions. It must integrate digital infrastructure, equitable capacity-building, and humane driver support systems. The study's limitations include its qualitative sample size (32 informants) and corridor-specific scope, which constrain generalizability. Future studies should expand to other industrial regions, employ mixed-methods designs, and explore long-term economic and safety impacts.

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