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The Role of Land Use Planning in Influencing the Placement of Logistics Firms near the Port of Cape Town, South Africa

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1 ABSTRACT

The institutional frameworks in maritime services and logistics functions, particularly in emerging markets like South Africa, are ever changing and need to be studied further. The study responds to the research gap in understanding the ever-changing economic activity in the port-city interface. The study aimed to analysethe role of land-useplanning and regulatory frameworks in influencing the location of logistics firms in the vicinity of the Port of Cape Town, South Africa. The study conducted content analysis of the zoning and applicable municipal spatial and management strategies. The results show that there is a land-use planning and regulatory framework creating a conducive environment for logistics operations, and this can be improved by implementing port-centric logistics clusters purposefully. The research concludes that there is an opportunity for strategic concentration of logistics firms in Paarden Eiland to enhance operational efficiencies through shared resources. The study recommends adaptive approaches that consider the impact of the growth and transformation of logistics and supply chain management and the operational strategies of logistics firms through effective land-use planning and port development to improve the interrelationships between port-centric cluster development and urban and regional planning in the City of Cape Town.

Keywords: Port of Cape Town, Paarden Eiland, spatial planning, land-use planning, port-city interface

2 INTRODUCTION

The spatial changes of maritime services offered near ports still remain under researched, particularly in emerging market economic regions (Ye and Jiang, 2021). As a result of the fourth industrial economy's globalisation and new technology revolution, the port's role is expanding and becoming more of an integration platform for production elements (Jacobs and Notteboom, 2011). The port's fundamental purpose is transformed into a hub for the 'factor flow' between the economic hinterland and other locations (Wenyuan et al., 2019; Zhang and Yun, 2019; Guo et al., 2020; Guo and Qin, 2022). The maritime shipping industry, which transports the movement of multiple industrial elements, is a crucial node in the construction of this circulatory network. It completes the network of cargo flows, capital, technology, skills, and information between the port and the urban area in which it is located, so creating the port urban region's 'flow space' (Zhang and Yun, 2019). After the ports have evolved into a system typified by port regionalisation, not only are there transit links between them, but there are also more non-port industries moving there, and urban agglomerations are progressively driving their expansion. However, the usage and purpose of land in port regions have not been delineated on land use maps for centuries. (Hesse, 2010; Hein, 2021). In this regard, further research is required. Using Paarden Eiland as a case study, the research contributes to the gap of knowledge pertaining to the land-use mix in the vicinity of ports.The aim of the research is to analyse the role of land-use planning and regulatory frameworks in influencing the location of logistics firms in the vicinity of the Port of Cape Town, South Africa. This provides insight on how these firms interact spatially and functionally within this strategic urban-port interface. The study seeks to contribute to the broader discourse on port-city dynamics by focusing on the land-use mix and spatial organisation of logistics activities in view of a rapidly evolving global economy and technological landscape. By doing so, the study not only aims to contribute to theoretical knowledge but also to provide practical insights into effective land-use planning and policy formulation for logistics planning related to ports and their surrounding regions.

3 METHODS

The study is based on a mixed methods and single-case study approach. Zoning data from the City of Cape Town Open Data Portal were analysed using ArcGIS to assess the alignment of logistics firms location with zoning regulations. Additionally, content analysis was conducted on the City of Cape Town's Spatial Development Framework (SDF) and District Plans to extract guidelines and visions relevant to logistics

operations. To investigate the influence of land-use planning and regulation on the logistics firms' mix and placement, data on zoning and applicable spatial plans were collected. This included GIS shapefiles from the City of Cape Town City Map Viewer, as well as district plans relevant to the Table Bay and Blaauwberg administrative areas. The analysis combined spatial analysis techniques with content analysis of the Paarden Eiland CID Business Plans to identify themes and regulatory frameworks impacting logistics operations. This approach enabled the identification of themes and policy directives shaping the spatial distribution and functional mix of logistics firms. The content analysis of municipal documents revealed how zoning classifications, such as industrial and mixed-use zones, influenced the placement of logistics firms. Frequency analysis was applied to categorise the logistics firms identified in the study area. This method quantified the presence of different types of logistics firms, highlighting their relative significance within the vicinity of the Port of Cape Town and provided basic statistical analysis of types of economic activities based on the mix of logistics firms. Using ArcGIS software, a spatial analysis was performed to look at how logistics companies were distributed and clustered throughout the research area. These techniques provided insights into the spatial logic of logistics operations by assisting in determining how close logistics companies were to important nodes, like the Port of Cape Town, industrial districts, and transportation networks.Figure 1 indicates the locality map locating the Paarden Eiland case study in the national and municipal context. It delineates the municipal administrative boundary, highlighting significant transport routes, including arterial roads and railway lines,logistics landmarks such as the Port of Cape Town and Cape Town International Airportwhich are crucial for understanding the connectivity in the region. Paarden Eiland is marked in red within the city, highlighting its location and relevance to the logistics landmarks and routes illustrated. Additionally, an inset map places Cape Town municipality within the broader geographical context of South Africa.

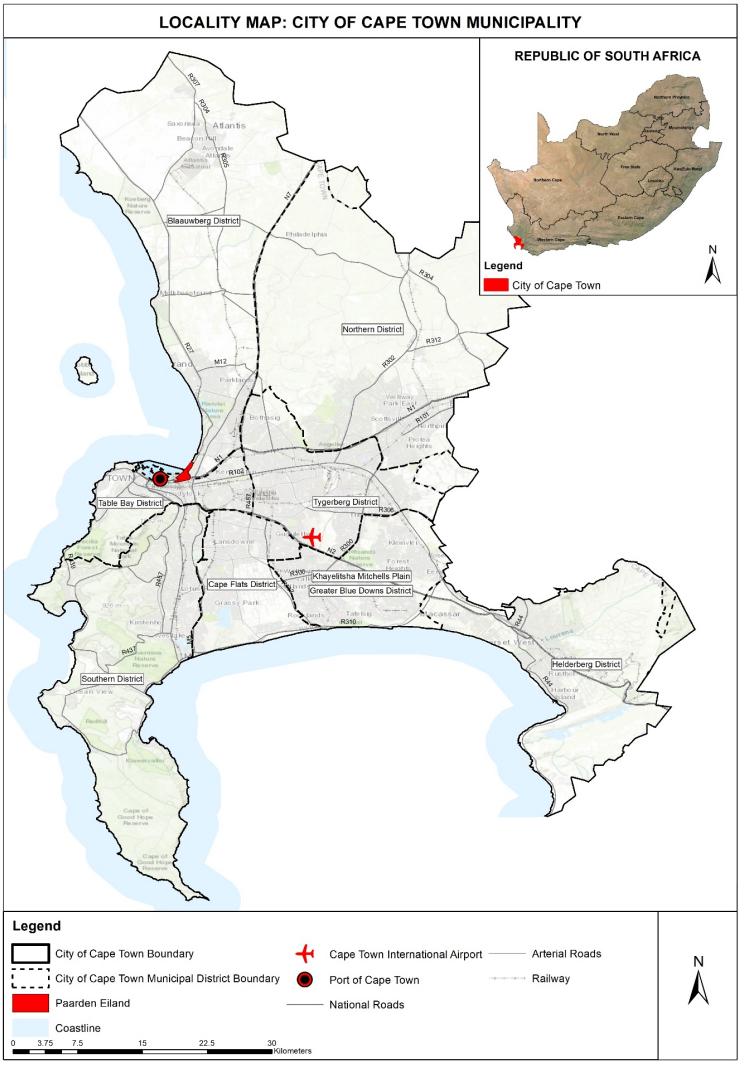

Fig. 1: Locality Map

4 EVOLUTION OF MARITIME ECONOMICS AND LOGISTICS SUPPLY CHAINS

As ports remain significant in global trade networks, understanding their economic and spatial dynamics is essential for planning and policy-making. The evolution of trends in maritime economics and port-centric logistics clusters provides the backdrop for exploring how logistics firms agglomerate in the vicinity of ports, contributing to the broader understanding of port-city interactions against the backdrop of technological and economic shifts. Port attributes include waterfront, estuary, and maritime bases, ship/shore and multimodal/intermodal interfaces, distribution and logistics centres, corridors and gateways, maritime industrial development areas (MIDAs) and trade and distribution maritime centres (TDMCs), industrial clusters and distriparks, free zones, trading hubs, and networks (Bichou and Grey, 2005).Economic activity taking place at ports and their vicinities are denoted by firms such as freight forwarders that serve as crucial intermediaries in the logistics network, managing the shipment process from origin to destination. They ensure compliance with regulatory requirements and address the complexities of global trade, particularly in high-traffic port areas. This role is increasingly supported by advanced technologies that facilitate efficient tracking and scheduling (Heitz et al., 2020). Third party logistics providers are also prominent economic activity near ports that enhance operational efficiency by outsourcing logistics activities, such as warehousing and transportation management, allowing businesses to focus on core operations (Chen et al., 2024). Transportation companies are dedicated to moving goods through various modalities and their proximity to ports is vital for improving operational efficiency (Vitellaro, 2021). The concentration of these firm types near the ports reflects the area's strategic importance as a logistics hub, further enhanced by agglomeration economies that promote shared infrastructure and collaboration among firms.

Freight forwarders are indispensable within the logistics framework, consolidating shipments and coordinating services such as customs clearance and insurance. Their functions are critical in mitigating delays and ensuring compliance with complex regulations. The reliance on modern technologies in this field allows for improved navigation of port congestion and optimised logistics operations (Cooper et al., 2024). Consequently, freight forwarders not only facilitate connectivity within supply chains but also contribute significantly to economic growth through efficient logistical coordination. The recent surge in the significance of third-party logistics providers stems from the evolutions of supply chain management; these providers offer comprehensive services that span the logistics spectrum, enabling firms to improve efficiency through outsourcing (Holl and Marrioti, 2017). The presence of warehousing plants and transportation services at logistics hubs like ports illustrates the pivotal role of these providers in ensuring smooth product flow. Although courier services, representing last-mile delivery, are less prevalent, they indicate adaptations to modern market demands such as e-commerce, showcasing an evolving logistics landscape (Tiupysheva et al., 2023).Research indicates that the strategic engagement of stakeholders boosts profitability and addresses risks in the maritime logistics environment (Vitellaro, 2021). Recognising the diverse roles of these firms allows for tailored strategies that leverage their strengths while addressing operational challenges, thus fostering a robust maritime logistics framework. Logistics firms act as essential facilitators in supply chain management, overseeing various activities such as inventory management and transportation planning. Their strategic location decisions indicate the importance of accessibility to ports, significantly affecting operational efficiency (Tiwari et al., 2003). As global trade dynamics evolve, these firms adapt to technological advancements and market demands, enhancing their capacities to optimise supply chain processes. Collaborative approaches among different logistics stakeholders are crucial in maintaining competitive advantages and addressing emerging logistical challenges, ultimately maximising responsiveness within the logistics network (Vitellaro, 2021).The literature highlights the importance of adopting innovative strategies to harmonise port and city development while addressing their shared challenges and maximising mutual benefits.This perspective emphasises the critical role of geographic dispersion and network effects in shaping the technological and operational dynamics of port systems, port industrial zones, and their interactions with urban centers.

5 RESEARCH FINDINGS AND DISCUSSION

5.1 The role of land-use planning and regulation

The zoning pattern in Paarden Eiland was identified using data from the City of Cape Town Open Data Portal (Figure 2).The predominant zoning in Paarden Eiland is “General Industrial 2”. Industrial zoning caters for manufacturing and general industrial land use which may affect the environment with hazardous or

noxious land uses which need to be managed cautiously. Industrial development has specific waste management needs and road infrastructure (City of Cape Town, 2024). “General Industrial 2” zoning different subzoningsconsisting of a variety of built firms and there is a provision for consent uses associated with industrial activities (City of Cape Town, 2024). The data indicates the presence of logistics firms in the Paarden Eiland are consistent with the zoning regulations. The second predominant zoning in Paarden Eiland is “Open Space 2 – Public Open Space”. This zoning mostly caters for the buffer zone along the coastal edge to cater for environmental considerations. The least predominant zoning in Paarden Eiland is “Mixed Use 2”. Mixed-use zonings accommodate industrial, business and residential development (City of Cape Town, 2024).

Fig. 2: Zoning Schemefor Paarden Eiland

5.2 Content analysis of municipal documents that influence land-use and spatial planning

According to the Blaauwberg District Plan (District B) a gradual change of land use is foreseen in Paarden Eiland. Although Paarden Eiland is historically an industrial area, the analysis from the Spatial Development Plans suggests that it is suited to mixed-use development, including retail, offices and residential use as a

result of its location attributes (City of Cape Town, 2023:276). According to the Table Bay District Plan (District A) general industrial development activity is retained in Paarden Eiland.

Document Name	**Document Content**	**"Paarden Island" Occurrences**	**"Maritime Cluster" Occurrences**	**"Logistics Cluster" Occurrences**
1. City of Cape Town City Map Viewer Open Data Portal	Zoning data	N/A	N/A	N/A
2. City of Cape Town Table Bay District Plan 2012	Socio-economic and spatial planning data	23	0	0
3. City of Cape Town District Blaauwberg District Plan 2012	Socio-economic and spatial planning data	9	0	0
4. City of Cape Town Table Bay District Plan Documents (Volumes) 2023	Socio-economic and spatial planning data	Total = 148	Total = 10	Total = 2
Volumes				
4.1 Volume I: Baseline and Analysis Report (BaAR)		13	0	0
4.2 Volume II: District Plan Main Technical Report		15	0	1
4.3 Volume II: Main Technical Report – Executive Summary		4	0	0
4.4 Volume III: Implementation Plan		2	0	0
4.5 Volume IV: Technical Annexures		114	10	1
5. City of Cape Town District Blaauwberg District Plan Documents (Volumes) 2023	Socio-economic and spatial planning data	Total = 44	Total = 0	Total = 1
Volumes				
5.1 Volume I: Baseline and Analysis Report (BaAR)		22	0	0
5.2 Volume II: District Plan Main Technical Report		15	0	1
5.3 Volume II: Main Technical Report – Executive Summary		2	0	0
5.4 Volume III: Implementation Plan		2	0	0
5.5 Volume IV: Technical Annexures		3	0	0
6. CID Application Report	Urban management data	63	0	0
7. Business Plan for the Management of the Paarden Eiland City Improvement District 01 July 2016 -30 June 2021	Urban management data	32	0	0
8. Business Plan for the Management of the Paarden Eiland City Improvement District 01 July 2021 – 30 June 2026	Urban management data	53	0	0

Table 1: Institutional Land-use and Spatial Planningin Paarden Eiland (Letsoalo, 2024: 69)

Table 1 lists the spatial plans and technical reports containing socio-economic and spatial data applicable to Paarden Eiland. Paarden Eiland suburb boundary spans across two Districts namely, Table Bay District and Blaauwberg Districts. The Paarden Eiland is mentioned the most in Table Bay District Plans than Blaauwberg District Plans for both the 2012 and 2023 Spatial Development Frameworks. In 2012, Paarden Eiland was mentioned 23 times in Table Bay District and only 9 times in Blaauwberg District. In 2023, Paarden Eiland was mentioned 148 times in total from the Table Bay District SDF documents compared to only 44 times in the Blaauwberg District SDF documents. This indicates that there was more intentionality in the planning and development of Paarden Eiland in Table Bay District than in Blaauwberg District. The 2012 SDFs do not mention "marine cluster" or "logistics cluster". This indicated that there was no intentional spatial planning concerning cluster development in 2012 unlike in 2023 where "maritime cluster" and "logistics cluster" are mentioned in the SDF documents. Table Bay District SDF mentions "maritime cluster" ten times and the "logistics cluster" twice. The logistics cluster is mentioned specifically in relation to proximity to the port (City of Cape Town, 2023:290). Blaauwberg District SDF makes no mention of "marine cluster" and mentions "logistics cluster" once. The content analysis shows that there is more land use planning related to cluster development in Table Bay which directly corresponds to the concentration of firms on the southern portion of Paarden Eiland unlike the northern portion of Paarden Eiland that falls under Blaauwberg District jurisdiction. The spatial plans highlight that that Paarden Eiland is strategically situated

next to the Port, about 6 km from the Central Business District (CBD) and around 15 km from Epping Industrial. It's positioning between the Port and the N1, Paarden Eiland serves as an entryway to the Blaauwberg District. Table Bay's 2023 SDF acknowledge the significance of Paarden Eiland's proximity to the port and confirms that the land use is predominantly used for light to medium industry that serves the port (City of Cape Town, 2023:271). The economic analysis from the 2023 SDF indicates Paarden Eiland's significance as an industrial node that serves as a key distributor to maritime-related industries (City of Cape Town, 2023:272).

Logistics firm in Paarden Eiland consist of a diversified mix of categories, including warehousing, freight, distribution, couriers, and other related activities.The spatial distribution of logistics firms shows a geographic concentration of logistics firms on the southern portion of the site, this is directly related to concentrated effort for promoting the Paarden Eiland as an industrial area and part of a Maritime cluster as per the Table Bay District SDF unlike in the Blaauwberg District SDF which is the northern portion of Paarden Eiland. According to the Table Bay District SDF, a significant percent of the industry in Paarden Eiland is centred around a Maritime Cluster (City of Cape Town, 2023: 278). The boat-building cluster is situated in Paarden Eiland due to its excellent access to the Port, which facilitates launching, testing, and shipping abroad. Additionally, its proximity to other components of the value chain and ease of accessibility for staff, whether by train or private vehicles, though less so by MyCity buses thus providing a significant advantage (City of Cape Town, 2023: 278). The Eiland City Improvement District (PECID) has a rich history rooted in community collaboration and a commitment to enhancing the industrial environment. Initially, the Metro Industrial Township joined in 1972, leading to the formation of the Paarden Eiland & Metro Association (PEMA). This organisation focused on maintaining and improving the area, but it soon became clear that the voluntary membership model placed a disproportionate burden on those who paid fees, while others benefited without contributing (Paarden Eiland, 2024). To address this issue, property owners proposed the establishment of a City Improvement District (CID), where all owners would share the responsibility of funding improvements (City of Cape Town 2005). This led to the transformation of PEMA into PECID in 2005, following the approval of a formal application to the City of Cape Town. The shift to a Section 21 Company ensured that all property owners contributed financially to the district's upkeep, fostering a more equitable approach to community improvement (City of Cape Town, 2005, 2015, 2020).The Paarden Eiland City Improvement District (PECID) was established in 2005 in terms of Section 8.1 of the By-law of the City of Cape Town following an application by property owners in the area (City of Cape Town, 2005). It was mandated by the Paarden Eiland and Metro Industria CID Steering Committee to establish a CID in the Paarden Eiland and Metro Industria area and that it be declared a CID subject to the approval of the Paarden Eiland and Metro Industria City Improvement District Management Committee (Section 21 company), in terms of Section 12 of the CID By-law (City of Cape Town, 2005). The PECID reflects the ongoing commitment of local stakeholders to enhance the economic and physical landscape of Paarden Eiland, building on a legacy with Paarden Eiland industrialists ratepayers in 1947 by influential local figure Louis Glassman (City of Cape Town, 2015).

5.3 Economic activity and types of firms located in Paarden Eiland

The observed mix of types of logistics firms in the case study aligns with the strategic significance of Paarden Eiland's location. Proximity to the Port of Cape Town facilitates freight and warehousing operations, which rely heavily on seamless connections to shipping routes (Letsoalo, 2024). The predominance of distributors validates the area's function as a bridge between the port and broader markets within the City of Cape Town and beyond. While smaller in proportion, Couriers reflect the adaptation of logistics clusters to contemporary market demands, such as e-commerce and time-sensitive delivery services. Firms' diversity also highlights agglomeration economies' role in Paarden Eiland. Businesses benefit from shared infrastructure, proximity to key transport routes, and synergies among firms, such as those between warehousing and freight operators. However, the relatively smaller representation of specialised services like packaging and movers points to potential areas for strategic development. According to the data presented in Table 2, the largest typology in Paarden Eiland is distributors, making up 36% of the total indicating a strong focus on distribution in the area. Suppliers also represent a significant portion at 31% (Letsoalo, 2024). Couriers account for the smallest percentage at 2%. Distributors and suppliers play crucial roles in the logistics ecosystem, indicating a focus on the supply and distribution side. An examination of the frequency of firms within each typology highlights a significant presence of distributors and freight firms in Paarden

Eiland. Couriers, while fewer in number, illustrate the growing importance of last-mile delivery, particularly with the rise of e-commerce. Packaging and movers, though minor contributors, enhance the cluster's overall service diversity. Logistics firms also play a significant role with 8 firms actively involved in managing supply chains.

Typology	Number of Firms per Typology	Percentage
Warehousing	2	3%
Freight	3	5%
Distributors	21	36%
Couriers	1	2%
Movers	3	5%
Packaging	2	3%
Logistics	8	15%
Suppliers	18	31%
Total Data Points	58	100%

Table 2: Logistic firms in Paarden Eiland(Letsoalo, 2024:54)

Figure 3represents firms within the case study using a typology legend, with colour-coded symbols representing various industries such as logistics, freight, distributors, packaging, warehousing, suppliers, movers, and couriers. The map illustrates the boundaries of Paarden Eiland site based on the City of Cape Town's land administration suburb boundaries. The Paarden Eiland site spans two planning districts, namely, Table Bay District and Blaauwberg District. The site is accessible through the N1 National Road and arterial roads providing transport links. Figure 3 below shows the port firms typology for Paarden Eiland in the City of Cape Town Municipality. It categorises different businesses within the area using a typology legend, with colour-coded symbols representing various industries such as logistics, freight, distributors, packaging, warehousing, suppliers, movers, and couriers. The maps also illustrate the boundaries of Paarden Eiland site based on the City of Cape Town's land administration suburb boundaries. The Paarden Eiland site spans two planning districts, namely, Table Bay District and Blaauwberg District. The site is accessible through the N1 National Road and arterial roads providing transport links.

The findingsindicate a diverse range of services provided by these firms. For instance, some locations combine logistics and warehousing capabilities, allowing them to manage both storage and transportation efficiently. Other businesses act as both distributors and suppliers, handling the flow of goods to various markets. Additionally, some entities manage freight operations while also providing courier services, thus accommodating both large-scale shipments and local deliveries. Having multiple typologies can reflect a flexible business model, allowing these companies to meet various customer needs, optimise operations, and adapt to market demands. It may also indicate a strategic advantage in Paarden Eiland, facilitating comprehensive service offerings in proximity to key transport infrastructure.

Based on the spatial representation of the mix of logistics firms in Paarden Eiland the data points located on one address were grouped as one firm consisting of typology combinations. This ensured that there was no overlap in the counts. Table 3 summarises the consolidation of combination and singular typologies indicating a total unique firm count of 48 when avoiding doubling counting in combination firms. Distributors are still the largest typology in the table, emphasising their significance in the supply chain of firms located in Paarden Eiland in proximity to the Port of Cape Town. In contemporary logistics, the role of Third-Party Logistics (3PL) providers has gained significant prominence due to the complexities of supply chain management. The integration of advanced technologies within 3PL services facilitates real-time tracking and inventory management, informing decision-making processes and enhancing service delivery (Verhetsel et al., 2015). Courier operators specialise in last-mile delivery, catering to e-commerce and time-sensitive logistics needs and are least prominent typology of logistics firms in Paarden Eiland. There is only one courier company in Paarden Eiland, thus confirming the global observations of shifts in logistics firms land use patterns near ports, e-commerce and decentralisation of delivery. The role of ports as logistics hubs is evolving, shifting from multinational functions to more regionally integrated activities (van de Lugt and de Langen, 2005). According to Fried and Goodchild's (2023) findings, certain e-commerce couriers serving last-mile deliveries are decentralised and opt to locate closer to end-user consumers than upstream distribution platforms to improve the time it takes to fulfil customers' time demands.Decentralisation of delivery includes shifts in regulatory frameworks and decentralisation of transport to air and sea. The evolution of logistics concepts delineates logistics markets for distribution areas and consolidation areas(van de Lugt and de Langen, 2005).

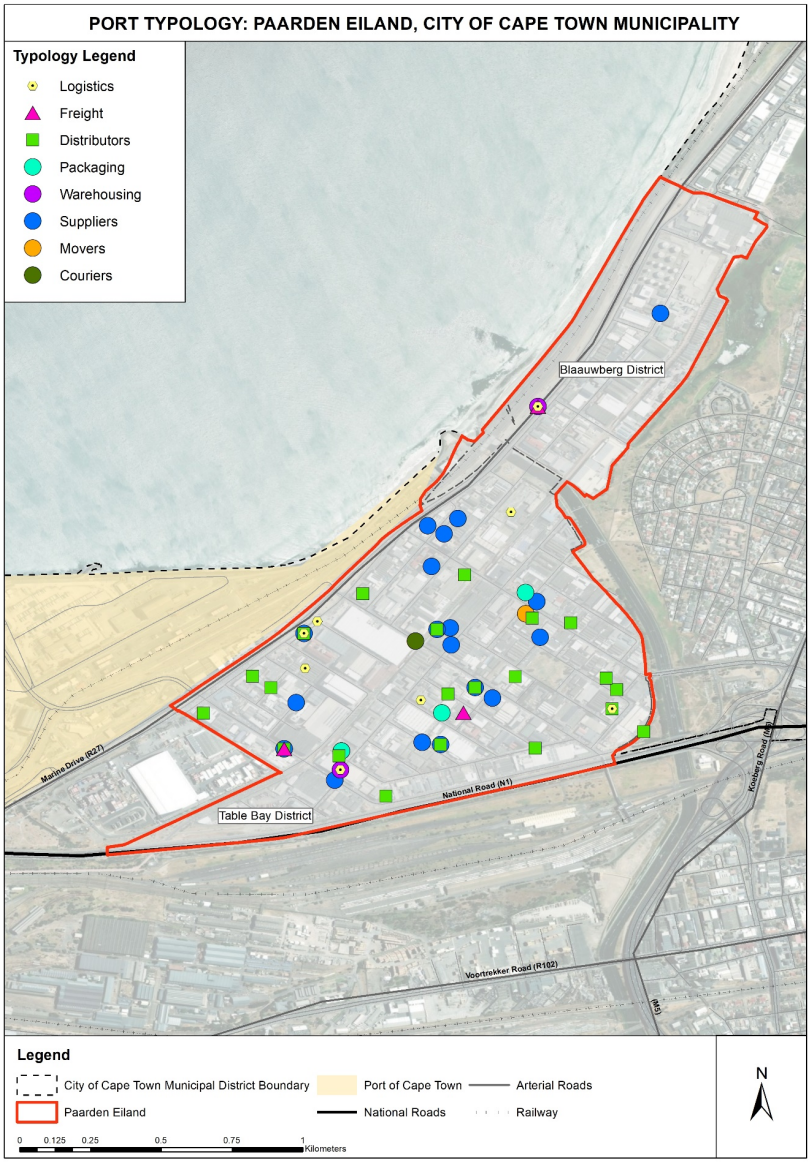

Figure 3: Spatial representation of the mix of logistics firms in Paarden Eiland

Consolidated Typologies	Number of Firms	Description
1. Logistics, Distributors and Suppliers	1	Firms that supply products and oversee distribution networks, ensuring products reach various markets effectively.
2. Logistics, Freight and Warehousing	1	Firms that manage both the storage and transportation of goods, providing an integrated service for efficient supply chain management.
3. Logistics and Warehousing	1	Firms that integrate logistics operations with warehousing, providing comprehensive storage and management of goods
4. Logistics and Distributors	1	Firms that combine logistics functions with distribution services to ensure effective delivery and supply chain efficiency.
5. Logistics, Freight, Suppliers	1	Firms combining elements of logistics and freight services with a focus on supplying products, facilitating both storage and transportation
6. Distributors and Suppliers	3	Firms that focus on handling larger shipments while also managing more localised delivery services to meet diverse customer needs.
7. Logistics	4	Firms involved the planning and management of the flow of goods, services, and information throughout the supply chain.
8. Distributors	16	Firms focused on supplying products and large-scale distribution.
9. Freight	1	Firms that specialise in the transportation of goods in bulk, typically involving trucks, ships, or trains.
10. Couriers	1	Firms involved in fast delivery services for small parcels and documents based on end-user demand.
11. Movers	3	Companies that specialise in relocating household goods or office contents.
12. Packaging	2	Firms that specialise in the process of preparing goods for transport, storage, and sales, ensuring safety and presentation.
13. Suppliers	13	Firms that provide raw materials or products to manufacturers or other businesses.
Total unique firm count	48	

Table 3: Summary of logistics firms in Paarden Eiland (Letsoalo, 2024: 58)

6 CONCLUSIONS AND RECOMMENDATIONS

The study shows the significance of land-use planning and regulatory frameworks in fostering a conducive environment for logistics operations. This was shown by analysing the zoning patterns in Paarden Eiland, explanatory content analysis of institutional land use and spatial strategies by the City of Cape Town. The findings also established that institutional regulatory instruments such as City Improvement Districts, can facilitate improved safety, cleanliness, and operational standards, ultimately enhancing the attractiveness of the industrial hub, and making it an ideal location for logistics firms despite changing global trends. Land use planning regulations play a significant role in shaping the logistics landscape, particularly in proximity to ports, which are characterised by multimodal transportation and economic nodes. land use regulations serve as both a framework for planning and a catalyst for fostering a competitive and sustainable logistics sector adjacent to major ports, thereby enhancing regional economic vitality. According to the City of Cape Town land use zoning scheme, the predominant zoning in Paarden Eiland is industrial use. Land use planning regulations facilitate the optimal locations for logistics firms, particularly near ports where proximity to transport hubs can significantly influence operational efficiency. These regulations not only facilitate the allocation of land for various logistics activities but also ensure that such activities align with broader urban development goals.Consequently, well-structured land use regulations can help balance the needs of logistics firms with community and environmental interests, promoting sustainable development while ensuring that firms benefit from strategic locations that enhance their competitiveness in the global market. The research contributed to understanding how logistics firms located near the port in the case of Paarden Eiland drive economic development and urban growth in the vicinity of ports while addressing contemporary challenges of spatial integration, land-use management, and sustainable development. They are influenced by zoning and land use planning. The study recommends that agglomerations near the port can be further supported by spatial development frameworks recommending and facilitating cluster development and strengthening agglomeration.

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