

The Competitiveness of Ports in Emerging Markets : The case of Durban, South Africa

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International Transport Forum



The Competitiveness of Ports in Emerging Markets

The case of Durban, South Africa



Country-Specific Policy Analysis

OECD

The Competitiveness of Ports in Emerging Markets

The case of Durban, South Africa



Country-Specific Policy Analysis

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Executive Summary

Durban is the main gateway port of Africa. It is the largest port in Africa, which concentrates more than two thirds of the total container traffic to and from South Africa. It has strong maritime connections with the rest of the world: it has both a central position in port networks and a large diversity of connections with other ports. Durban, also called eThekwini, serves as the main gateway for the Gauteng metropolitan area (which includes Johannesburg), other regions in South Africa as well as other sub-Saharan countries, in addition to serving its own metropolitan area (the eThekwini/Mzunduzi area), the largest metropolitan economy on the South African coastline. It handled 2.6 million containers[1] in 2012, twice as much as in 2000.

Despite its dominant position in Africa, the performance of the port of Durban is sub-optimal. The port of Durban is one of the most expensive in the world, basically due to high cargo dues. Although port efficiency might be in line with African ports on average, it is far below scores found in main ports around the world. As of 2012-13, the average anchorage time for containerships was 39.2 hours, while the average turnaround time was 60.4 hours, accounting to close to 100 hours of total port time. More than half of the imported and exported containers are going to or come from the Durban metropolitan area, transported by truck, creating urban congestion. Only 15% of the containers related to the port of Durban are transported by train. In addition, significant constraints on land availability for container stacking, congestion at the port gate and terminal inefficiencies have led to increased ship waiting times. This increases the costs of imports and exports and thus undermines the competitiveness of the South African economy.

Durban has substantial economic benefits from its port. Existing studies find estimations of port-related jobs up to 100,000 jobs (approximately 10% of metropolitan employment) and 8%-14% of metropolitan value added. This value added includes the automotive industry and a diverse maritime cluster, consisting of logistics, warehousing and transportation services. Every port call does not only lead to direct spending, but is multiplied via the indirect spending, for example by suppliers related to the port. This output multiplier has in various studies on Durban been estimated in the range of 1.7-2.4.

However, the city also suffers from port-related congestion and other negative impacts. Approximately 690 million tonnes of goods are transported on the major roads of the metropolitan area of Durban, according to the eThekwini Transport Authority, associated with congestion, pollution, delays, road damage and accidents (7,379 in 2011). Port-related activities have transformed residential areas, such as Clairwood, into *de facto* port-centric logistics areas. Port-related activities, including shipping, terminal operations and hinterland transport, account for a considerable share of the air emissions in Durban, even if the exact amount of these emissions is not known.

Durban Bay is one of three estuarine bays in the country, and considered to be critical in terms of biodiversity goals. Port activities have reportedly led to considerable transformation, greatly reducing the coverage of the rare habitats within this system. According to the 2012 *Bay of Natal Estuary*

1. Measured here as twenty foot equivalent units (TEUs).

Management Plan Situation Report, the Bay is at a tipping point where relatively minor degradations could have disproportionate negative impacts.

In order to solve these bottlenecks, the institutional cooperation between port and city could be expanded, building upon recent collaboration efforts. Relations between port and city have improved over the last decade, leading to joint projects related to new port development and corridor development. These new projects include the development of a new port site in Durban (also called dig-out port at the former airport site) and strengthening of the transport corridor between Durban and Gauteng. Thanks to the cooperation between Transnet and eThekwini, and their common planning as conducted through the TEMPI initiative, these projects have become a presidential priority. Increasing net positive impacts and mitigating negative impacts related to the port of Durban, such as road congestion, land use development for logistics and economic value creation would require sustaining, expanding and streamlining this cooperation. In order to increase this cooperation, the institutional fragmentation at both sides would need to be resolved.

The sub-optimal port performance of Durban might be related to its institutional framework, characterised by limited competition and cross-subsidisation at the cost of Durban. Privatisation of terminal operations is foreseen in the National Ports Act, but not implemented yet. Main terminal operations in containers and roll on-roll off-traffic have remained so far in the hands of the state-owned company Transnet, along with port authority functions, railway operations and pipelines. This has made Durban a quasi-monopolist, whose financial benefits are used to support railway operations and other ports in South Africa, with high cargo dues for the port of Durban as a consequence. An independent Ports Regulator is active in South Africa to ensure fair competition. This whole institutional setting is unique: no other OECD country combines regulation and port operations in one national organisation, alongside railways and pipelines.

The new port planned for Durban will require a reconsideration of the institutional framework, including the introduction of private operators. In order to accommodate foreseen maritime traffic demand, a new port has been planned for Durban (the digout port), estimated to be operational from 2020. This port project will most likely take the form of a public-private partnership, which would have important ramifications for the sustainability of the current institutional framework of the port of Durban. Transnet is investigating an option for public-private partnership. The project provides a window of opportunity to consider competition within the eastern ports system of South Africa and tackle some of the current distortions including the combination of operational and regulatory roles and the limited autonomy of Transnet National Port Authority (TNPA). It might also ease some of the current pressure on the port-city interface: examples of other city-ports creating new sites have shown shifts of port cargo to the non-urban port.

Recommendations

Create an inter-departmental freight unit within the city of Durban that can bundle expertise and act as a one-stop shop for freight-related issues in the city. This unit could act as a vehicle to improve coordination on freight transport and engage in joint planning, aligning various actors including Transnet, SANRAL, the national and provincial departments of Transportation and the various departments within the city of Durban.

Increase the autonomy of TNPA and streamline decision-making procedures within Transnet. This includes more financial autonomy, e.g. by creating a separate fund at the disposal for TNPA for port infrastructure and maintenance.

Focus performance indicators on the performance of the whole supply chain. Currently much focus seems to be on part of the picture (e.g. crane productivity) without much consideration for (and sometimes even at the detriment of) other indicators.

Undertake a comprehensive environmental port impact study and implement green-port mitigation policies if necessary

Chapter 1

Port Performance

The South African Port Context

The sub-Saharan African container port system

The Sub-Saharan African container port system in general remains underdeveloped in comparison to other port systems around the world. The main factors linked with this situation are:

- *Limited draft at many port sites*. The growth of containerized traffic in sub-Saharan Africa remains highly constrained by port capacity issues, particularly in terms of draft. Sub-Saharan ports, with the exception of South African ports, rarely exceed a draft of more than 13 meters. This implies that many Sub-Saharan African ports (excluding South Africa) cannot accommodate ships of more than 3,000 TEU and must thus require services to transhipment hub using smaller ships to access the global freight market.

- *Lack of equipment*. Only a few ports in the Sub-Saharan countries besides South Africa are equipped with container cranes (Dakar, Mombasa, Lagos, Abidjan are among the few that have portainers[2]) and yard equipment, implying that most of the operations are either done by lower capacity (mobile cranes) or ship-based equipment (geared ships).

- *Low levels of port performance*. In part because of the previous point, Sub-Saharan African ports usually range between 7 and 20 moves per hour per crane while the global standard is usually around 25. This increases ship turnaround times and does not incite the use of large ships.

- *Limited capital investment*. Ports are usually in a situation of under capacity with expansion and improvement projects prone to delays, including ancillary infrastructure such as road access. Many ports are thus ill-prepared to play an inducing role in regional economic development.

- *Political instability and uncertainty*. Many sub-Saharan African countries have been prone to political instability, or have neighbouring countries facing political instability. Countries such as Zimbabwe, Chad or the Democratic Republic of Congo rank amount the most politically

2. A large gantry crane for loading and unloading intermodal containers from container ships.

unstable countries in the world[3]. The climate of uncertainty substantially increases the risk of capital investment in port terminals.

- *Regulatory impediments*. They particularly concern trade and customs procedures (e.g. inspection requirements and delays), which irrespective of infrastructure and managerial constraints increase transaction costs. On many occasions, the issue is not necessarily the regulatory rules, but that their enforcement is either discretionary (e.g. corruption) or subject to additional costs and delays. According to the World Bank, in 2012 Sub-Saharan Africa had an average time to import of 36 days while the global average was 24 days[4].

In large part because of the above sub-Saharan Africa only accounted for 2.3% of global container volumes in spite of accounting for 12.8% of the global population[5]. A fundamental factor behind this gap remains the more limited economic development prospects that the continent has experienced in recent decades, particularly when comparing with the growth of port traffic in the Middle East, South Asia, Southeast Asia and China. Further, accessibility to the hinterland remains challenging, which impairs port development prospects.

In this setting, South African ports are faring much better. With respect to the depth alongside the berth, there are two South-African ports in excess of 13 metres, namely Ngqura and Cape Town. In the case of the port of Durban, vessels up to 4500 TEU can be safely accommodated, whereas larger vessel sizes can be brought in on high tide and partially laden. South African ports are equipped with modern container cranes. Durban recently acquired tandem-lift cranes, so uses modern ship to shore (STS) cranes, coupled with straddle carriers and rubber tyre gantries. South African ports handle about 23% of the Sub-Saharan Africa container volume. A great share of this volume is hinterland traffic linked with the dynamism of the national economy that in 2011 accounted for 31.7% of the regional GDP. Still, containerized traffic has a high level of concentration with Durban accounting for 69% of the national throughput. This high level of traffic concentration is mainly attributed to the easy accessibility of goods to the Gauteng (Johannesburg) region, which is the country's main economic hub.

Box 1.1 **Sub-Saharan port hinterlands**

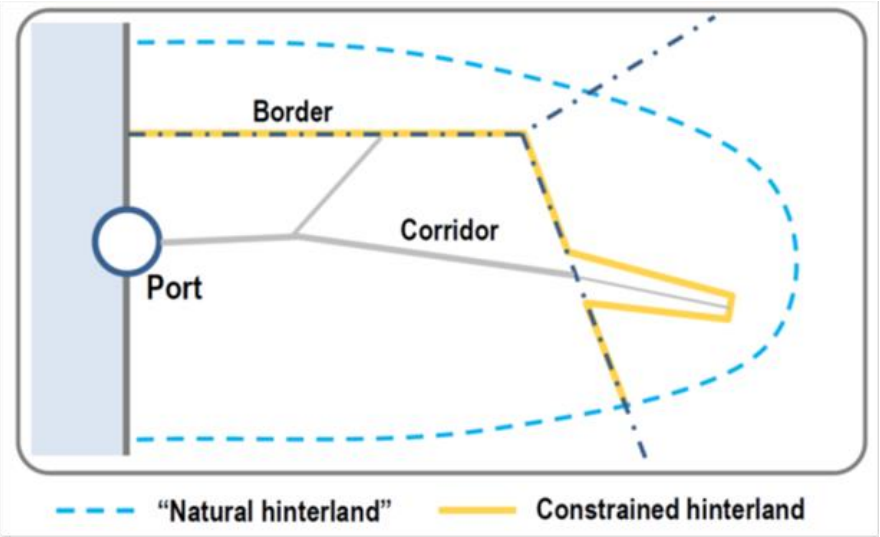
The "boxed-in" effect concerns a port that could in theory have access to a larger hinterland simply from a distance-based consideration (accessibility), but this hinterland access is constrained by the dual impacts of limited corridor development and the additional friction imposed by borders (Figure 1.2). This creates accessibility and market distortions, particularly at border crossings, further challenging port development [cite a few studies]. Geopolitical considerations that are mostly the outcome of the colonial era have incited the setting of national hinterlands in Sub-Saharan Africa that are not necessarily natural hinterlands, implying that several ports are "boxed in". Additionally, few river systems offering a comprehensive long distance access to the hinterland are present in Sub-Saharan Africa, imposing a reliance on road and rail transportation. Since rail transportation in many Sub-Saharan African countries is not present, operational or able to provide adequate hinterland services, the load is usually dominantly assumed by road transportation.

3. The Economist, Political Instability Index.

4. World Bank, Doing Business project.

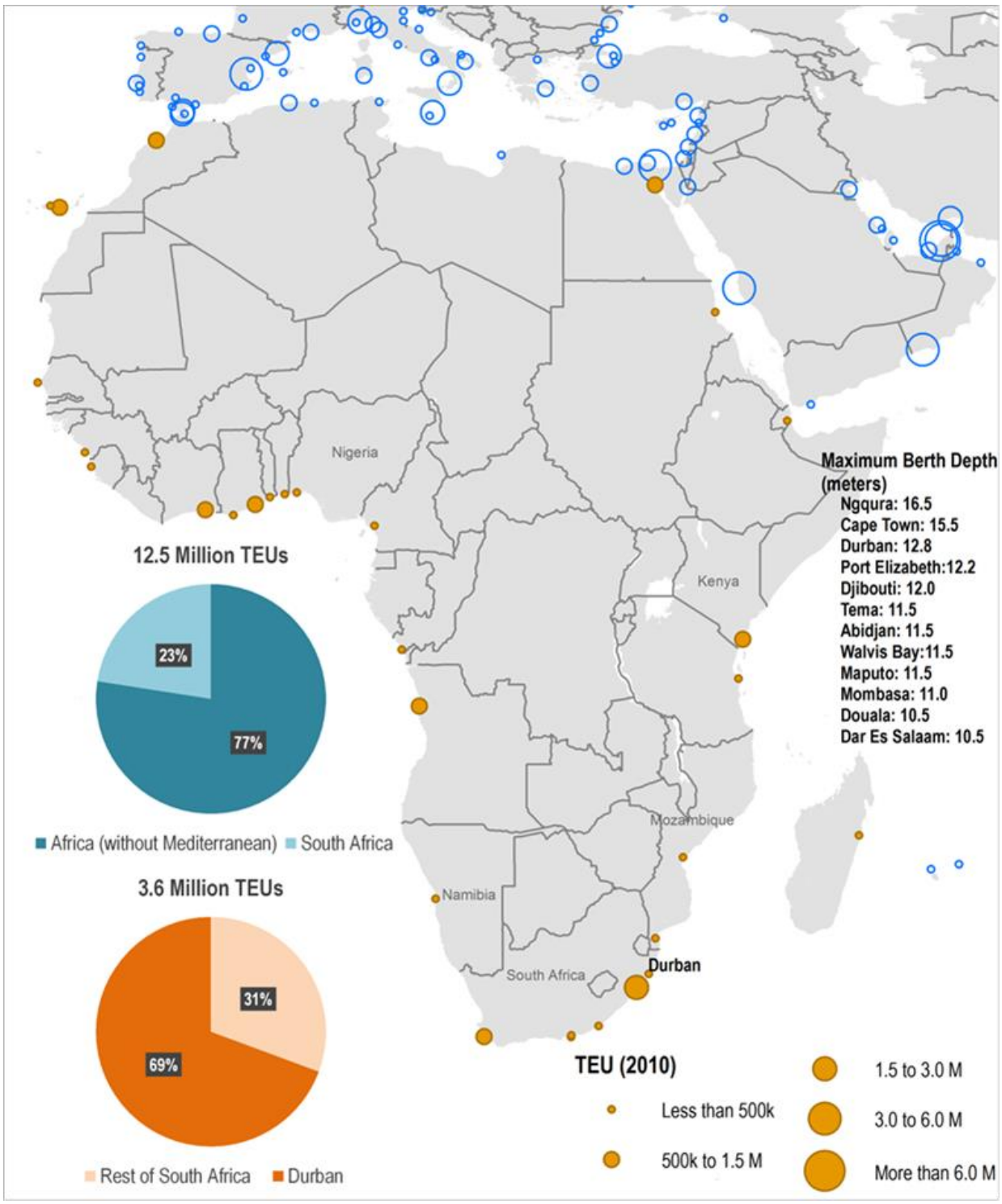
5. 2010 figures.

Figure 1.1 **Hinterland access issues for Sub-Saharan African Ports**



Source: OECD/ITF

Figure 1.2 **The African container ports system (without Med-ports)**



Source: Data compiled from Containerization International and port authorities.

Port trade cost structure

Issues of hinterland accessibility in Africa are clearly reflected in the import costs On average, sub-Saharan African countries have import costs per TEU 47% higher than the global average ($2567 versus $1,742 per TEU in 2012). Substantial regional variations are observed which is in part be explained by geographical factors impacting hinterland accessibility, but also by policy, trade facilitation and supply chain management issues. These figures are reflective of several challenges:

- *Geography*. Landlocked African countries are at a particular disadvantage with average import costs of containerized cargo 129% higher than the global average, while the global average for landlocked countries is 85% higher. This underlines that maritime access issues that landlocked countries are generally facing are even more acute in the sub-Saharan African context.

- *Hinterland connectivity*. It remains an enduring issue since African countries have yet to develop comprehensive national highway systems, leaving crossborder connectivity a recurring issue. There are limited if any rail services, undermining the setting of economies of scale over the hinterland. Traffic which under normal circumstance should be circulating on rail is forced to use long distance trucking, adding costs and delays. Still, corridors are being developed (some examples; Maputo, Walvis Bay).

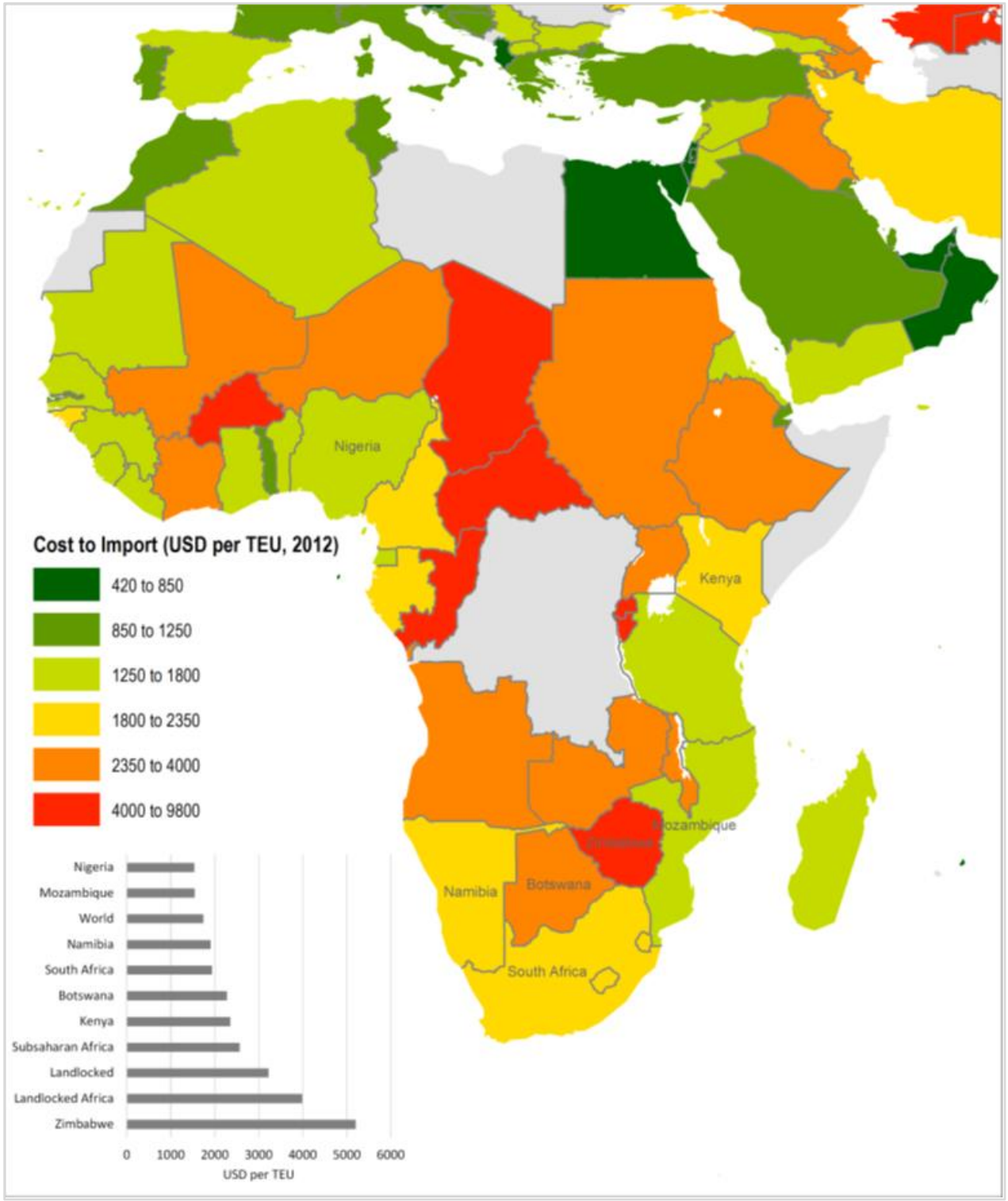
- *Regulatory and trade facilitation*. While a lack of capacity and maintenance of the road system hinders road circulation, various regulatory measures are also playing a substantial role. For instance road check points are the major sources of delays as public authorities adopt a rent seeking behavior.

- *Supply chain management*. The issue of hinterland access compounds difficulties in supply chain management as deliveries are unreliable, forbidding standard inventory management methods. Container assets are also an issue since delays in accessing the hinterland impose additional demurrage charges since the owners of the containers (shipping or leasing companies) get lower asset utilization levels when servicing African ports. These issues impose additional costs.

The cost structure of servicing African ports is thus usually different than at other ports around the world (CPCS Transcom, 2010). A share of the logistics costs are standard transport and terminal charges such as sea shipping rates and port handling charges. The shipping lines charges are more controversial since they include fees such as delivery order fee, bill of lading fee and piracy risk surcharge (the freight forwarding community often call these "junk fees"). All these charges put together can be almost equivalent to the sea shipping rate.

The inland routing costs are the contracted rate of a local trucking company. More than 40% of the total logistics costs are indirect costs due to delays that include additional and inventory demurrage costs, but also bribe costs paid at a wide variety of police checkpoints and weighting stations, which can alone add more than $1,000 for an import container, depending on the value of the cargo. For instance, due to low profit margins trucking companies have a tendency to overload and pay a bribe at the weight stations to be allowed to go through. Therefore, such a system hinders economic development because supply chains tend to be unreliable while consumers and manufacturers pay higher prices for goods and inputs. In such a setting, various public authorities are using freight transportation to generate income in a rent seeking (predatory) fashion.

Figure 1.3 **Cost to import a 20 foot container, 2012**



Source: World Bank, Doing Business project. Note: Cost measures the fees levied on an imported 20-foot container in U.S. dollars (USD). These include costs for documents, administrative fees for customs clearance and technical control, customs broker fees, terminal handling charges and inland transport. The cost measure does not include tariffs or trade taxes.

South African Port Hinterlands

In contradiction with some sub-Saharan containerized imports, South Africa is facing comparatively higher import costs. This is in part due to the hinterland effect since South Africa has an active hinterland as opposed to the coastal concentration of economic activities in other parts of the continent. However, there are regulatory issues at play. As such, a particular emphasis must be placed over the following issues (Fraser and Notteboom, 2012):

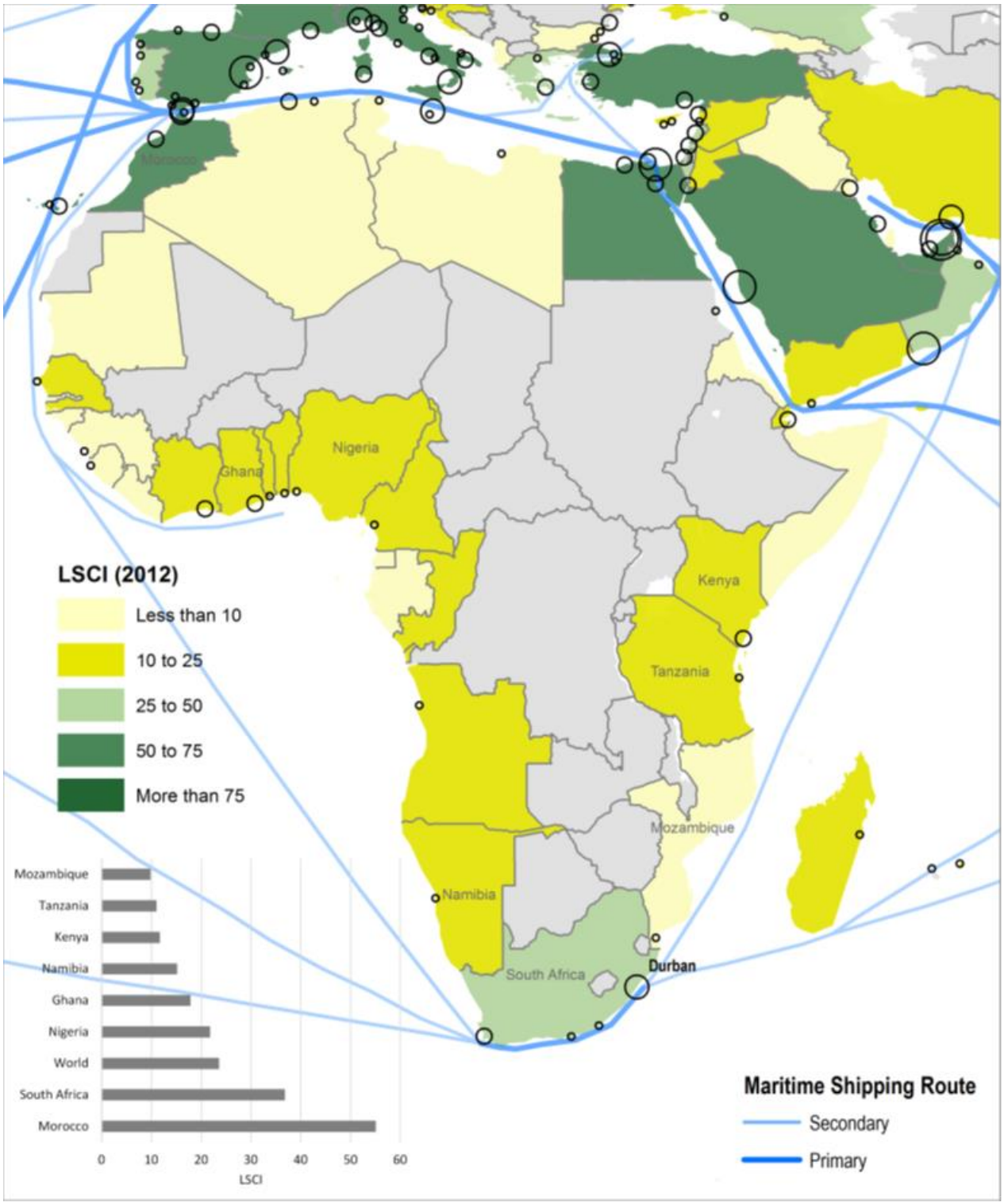
- Existing and potential gateway and corridor strategies within South Africa, but also through its neighbours (Namibia and Mozambique).
- The emerging role of South African intermediate hubs (transhipment), within the region (east and west coasts of sub-Saharan Africa), but also within the emerging south-south maritime routes (e.g. between Asia and Latin America).
- Regulatory and governance issues concerning the South African port system that dictate the cost structure and investment priorities.

Maritime connectivity

A multi-gateway port system

South Africa has the highest level of maritime connectivity of Sub-Saharan Africa, a status in part explained by its development level (generator and attractor of cargo) and in part by its intermediary location at the convergence of Atlantic and Indian oceans maritime routes. This intermediacy is a factor behind the development of transhipment activities in South Africa. Since 2004, the maritime connectivity of South Africa has almost doubled (from 23.13 to 43.02), reflective of a greater number of destinations available from South African ports as well as larger ships servicing them.

Figure 1.4 **Liner shipping connectivity index of African countries (2012)**



Source: UNCTAD. The Liner Shipping Connectivity Index (LSCI) aims at capturing a country's level of integration into the existing liner shipping network by measuring liner shipping connectivity.

South Africa is a multi-gateway port system, with Durban the main gateway and the secondary gateways of Cape Town and Port Elizabeth (Notteboom, 2011). South Africa is geographically extensive and has a level of economic development substantive enough to support several gateways and their continuous growth. In 2009, a new port was opened at Ngqura, in proximity to Port Elizabeth, with the purpose of becoming a transhipment hub. Although transhipment is not an activity which is new to South African ports, changes in the global maritime shipping industry is placing the transhipment activity in a new context and with new imperatives.

The setting of transhipment hubs

Transhipment usually concerns gateways that are able to combine feeder services and hinterland access or "pure" transhipment hubs that are almost entirely focusing on feeder (linking deep-sea and short sea services) or relay (linking different deep-sea services) functions. Irrespective of the function of transhipment hubs they exist to meet three interrelated imperatives:

- *Shipping operations imperatives*. Container shipping lines are trying to optimize the utilization of their assets and well as their revenue. The usual outcome of such a process is the use of large ships (economies of scale) making a relatively limited number of port calls over long haul services covering two or more maritime ranges and to use smaller ships over feeder services (the "last maritime mile"). Also, maritime shipping has a low tolerance for detours, implying the transhipment activities tend to be in proximity to main long distance shipping lanes.

- *Terminal operations imperatives*. Intermediate hubs must also meet operational requirements, namely greater depth to accommodate modern containership drafts, placing them at a technical advantage over many older port sites, many of which becoming feeders. Transhipment also requires large yard areas since few containers are leaving the terminal and may be stored for several days while waiting to be transhipped. They should include land for future expansion, which is a positive factor to help securing existing and future traffic. Another important factor in transhipment remains terminal costs and efficiency (e.g. high crane throughput), with ports located in developing countries usually having lower labour costs.

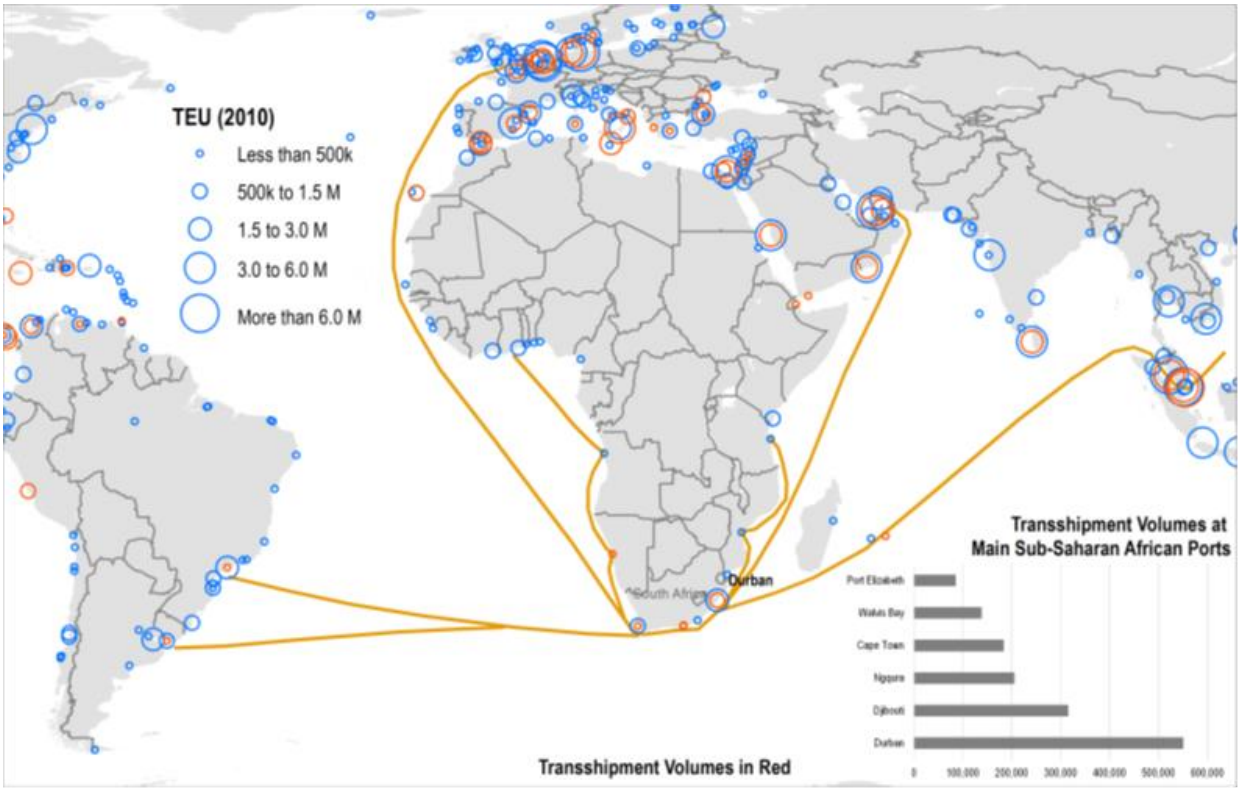
- *Cargo imperatives*. Optimally, shippers prefer direct point-to-point services, a preference that can obviously not be met. Under such circumstances, transhipment is a balancing act between the constraints behind operating maritime shipping services and the requirements of shippers (importers and exporters) preferring an array of service options with timely and reliable services. Transhipment may add additional delays in supply chains, imposing mitigation strategies when the inventory is in transit. Further, the growth in the reefer trade is placing additional pressures on transhipment hubs as refrigerated cargo is shifting from conventional reefer ships to container shipping services. Last, the hinterland usually has an anchoring effect on transhipment since hubs that are able to combine hinterland traffic with transhipment tend to be more stable than pure transhipment hubs with little hinterland traffic. Durban is a good example of a port that combines substantial hinterland traffic with transhipment activities.

The South African transhipment system

Transhipment is an activity that is not only servicing the South African market, but the whole region. Since many Sub-Saharan ports have low capacity and limited draft, the development of the port systems requires transhipment hubs able to connect the regional system to deep-sea lines. Transhipment thus offers a higher level of connectivity to international trade. The development of transhipment activities in South Africa will have a substantial impact on the structure of the port system and hinterland

developments. These developments are contingent to the increase in containerships sizes, which is inciting shipping lines to rely on less port calls for their long haul services. Also, the increase in Suez Canal tolls is inciting shipping lines to look at alternatives, an issue that was compounded in recent years by piracy on lanes leading to the Red Sea.

Figure 1.5 **Main routes servicing South African transhipment hubs**



Source: Containerization International, Drewry Shipping Consultants & Port Authorities.

Note: Transhipment volumes are the average of the volumes available during the 2008 – 2011 period. This data is rarely systematically collected and available on a port basis.

Transhipment by South African ports service three systems of maritime circulation:

- *National feeders* where cargo is bound to a smaller South African port such as Port Elizabeth. For Durban, this accounts for about 36% of the transhipment volume.

- *Regional feeders* where South African hubs are used for feeder services towards ports along the east and west coasts of sub-Saharan Africa. East and West Africa account respectively for 14% and 35% of the transhipment activity at Durban.

- *Global relay* between long distance deep-sea services using large ships. This involves services to the east coast of South America, northern Europe, the Middle East and Southeast Asia, which account for 13% of the transhipment activity at Durban.

It is unclear which transhipment function and balance will emerge. Two scenarios can be identified. The first is where the maritime imperative prevails and involves a pure transhipment hub accommodating the latest generation of large containerships (Ngqura). The second is where the cargo imperative prevails. Maritime shipping companies find advantageous to use transhipment hubs also giving the opportunity to access hinterland cargo, which confers a level of stability by anchoring traffic. Within this scenario the use of a gateway (Durban) for transhipment would be preferred. Considering the size of South Africa, there is likely room for both scenarios so that transhipment can continue to be an important activity at the port of Durban, which is supported by a pure transhipment hub (Ngqura).

Regional gateway functions

Durban is the main gateway and hub-port for Africa. The hub-and gateway-functions of ports can be quantified with three different measures: degree centrality, betweenness centrality and clustering coefficients. These three different port hub measures were calculated for a set of 2177 world ports and their connections in 2011, assessing both absolute values and ranking amongst world ports. Results for main African ports are summarized in Table 1.1. The overall picture that emerges from this assessment is a clear dominance of the port of Durban on centrality indexes, having considerably higher scores on the rankings than almost all other ports in Africa. Only the port of Alexandria has scores and ranks that are to some extent comparable to Durban on the centrality scores, with both ports among the top 60 ports with regards to degree centrality (DC) and betweenness centrality (BC).[6] Its ranking with respect to the clustering coefficient (CC) is even higher, indicating considerable hub functions. The port of Durban serves as a regional gateway and a global hub-port for Africa. Competitor ports in South Africa, such as Ngqura, Cape Town and Port Elizabeth, as well as other competitors in southern Africa, such as Maputo, all have much lower scores on the centrality indexes, hence they do not possess the same gateway- and hub-functions. As the data relate to 2011, the scores of Ngqura might in the meantime have improved due to increased traffic there.

6. *Degree centrality* expresses the number of adjacent neighbours of a node; it is the simplest and most commonly accepted measure of centrality. It often correlates with total traffic (more connections imply more traffic). *Betweenness centrality* expresses the number of shortest paths going through each node. The *clustering coefficient* estimates whether the adjacent neighbors of a node are connected to each other (i.e. "my friends are also friends"), thus forming triangles (triplets); the coefficient is the ratio between the number of observed triplets and the maximum possible number of triplets connecting a given node. The ratio goes from 0 (no triplets observed) to 1 (all neighbors connected). When it comes to hub-functions in a transport system, in theory the "pure hub" will have a clustering coefficient near zero because it serves as a pivotal platform redistributing flows to/from satellite platforms (spokes) which are only connected to the hub (star-shaped network). Conversely, values close to 1 depict a denser pattern with more many transversal (and thus less hierarchical) links. In a maritime network, transshipment hubs should have low clustering coefficients as opposed to other configurations where links are more evenly distributed among ports (e.g. absence of hubs such as in the Baltic Sea or in the USA). The different port hub-measures are related, but also complementary to each other. Very central nodes (high betweenness centrality) often act as hubs (low clustering coefficient) and it is common to observe a high correlation between degree centrality and betweenness centrality due to the physical constraint of coastlines for circulation. In some cases such as relay and remote hubs, some nodes can have higher betweenness centrality than degree centrality, i.e. they are very central globally but have only a few links locally. This is because they act as "bridge" between sub-components of the network, such as Anchorage in the global network of air freight being a bridge between Asia and North America.

Table 1.1 **Port centrality indexes**

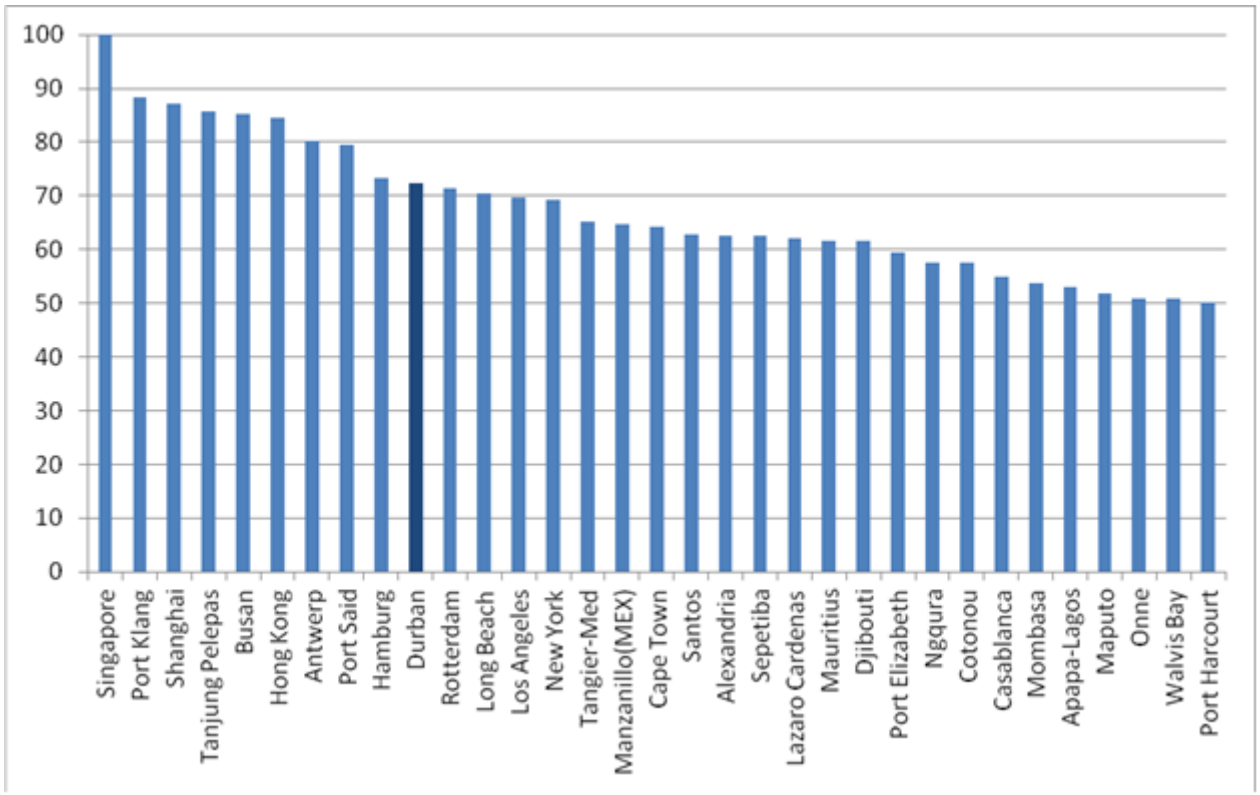
	CC score	CC rank	BC score	BC rank	DC score	DC rank
Durban	0.1963	30	37833	37	176	51
Alexandria	0.2627	141	25231	61	171	59
Tangier-Med	0.2990	232	12209	148	140	101
Cape Town	0.3090	266	5754	272	87	253
Maputo	0.3106	270	1173	640	33	727
Apapa-Lagos	0.3581	431	5637	280	58	439
Port Elizabeth	0.3737	483	2085	515	47	549
Walvis Bay	0.4215	651	3185	428	26	849
Mombasa	0.4573	782	791	725	43	588
Port Said	0.4763	858	5761	271	100	193
Ngqura	0.5161	1004	367	894	31	775

Source: calculations and elaborations of OECD secretariat based on data of Lloyd's Marine Intelligence Unit (LMIU)

Note: CC: cluster coefficient; BC: betweenness centrality; DC: degree centrality

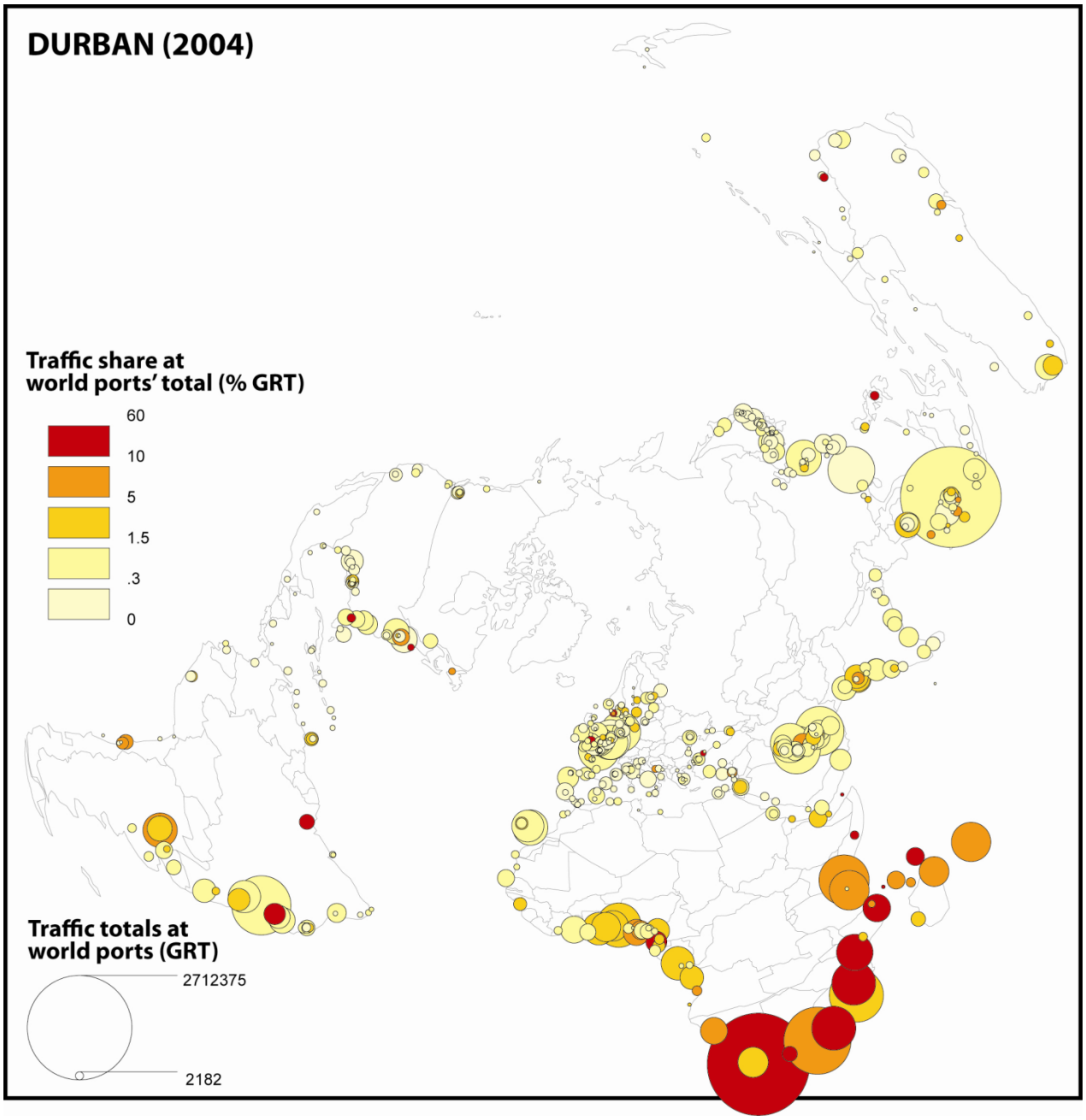
Durban's has a large variety of maritime connections. The can be concluded from its score on a maritime foreland connectivity index that we constructed for this study, which makes it possible to compare the diversity of maritime of connections of world ports. This index is applied to ports' worldwide traffic distribution at country level, and defined as the inverse of the sum of differences in shares compared with world average, applying a methodology developed in Ducruet et al. (2011). Our calculations of this index over 2011 show that Singapore has the most diverse set of maritime connections (score 100). The score of Durban was 72, with a ranking of 37th most diverse port of the world. This is a good score. In Africa, only Port Said has more diverse maritime connections, whereas other African ports, including competitor ports in South Africa and Maputo, have much less diverse maritime connections (Figure 1.6). Although some large world ports have more diverse maritime forelands, the port of Durban scores better than most of these, including large and important ports such as Rotterdam, Los Angeles and New York. The large variety of maritime foreland connections of Durban can be visually illustrated by mapping the ports connected to Durban via the vessels that move between these ports (Figures 1.7 and 1.8). These figures show many important connections with ports in all continents, although connections with ports of the US West Coast and with ports in the west of Latin America are rarer.

Figure 1.6 **Maritime foreland diversity of main African and selected world ports (2011)**



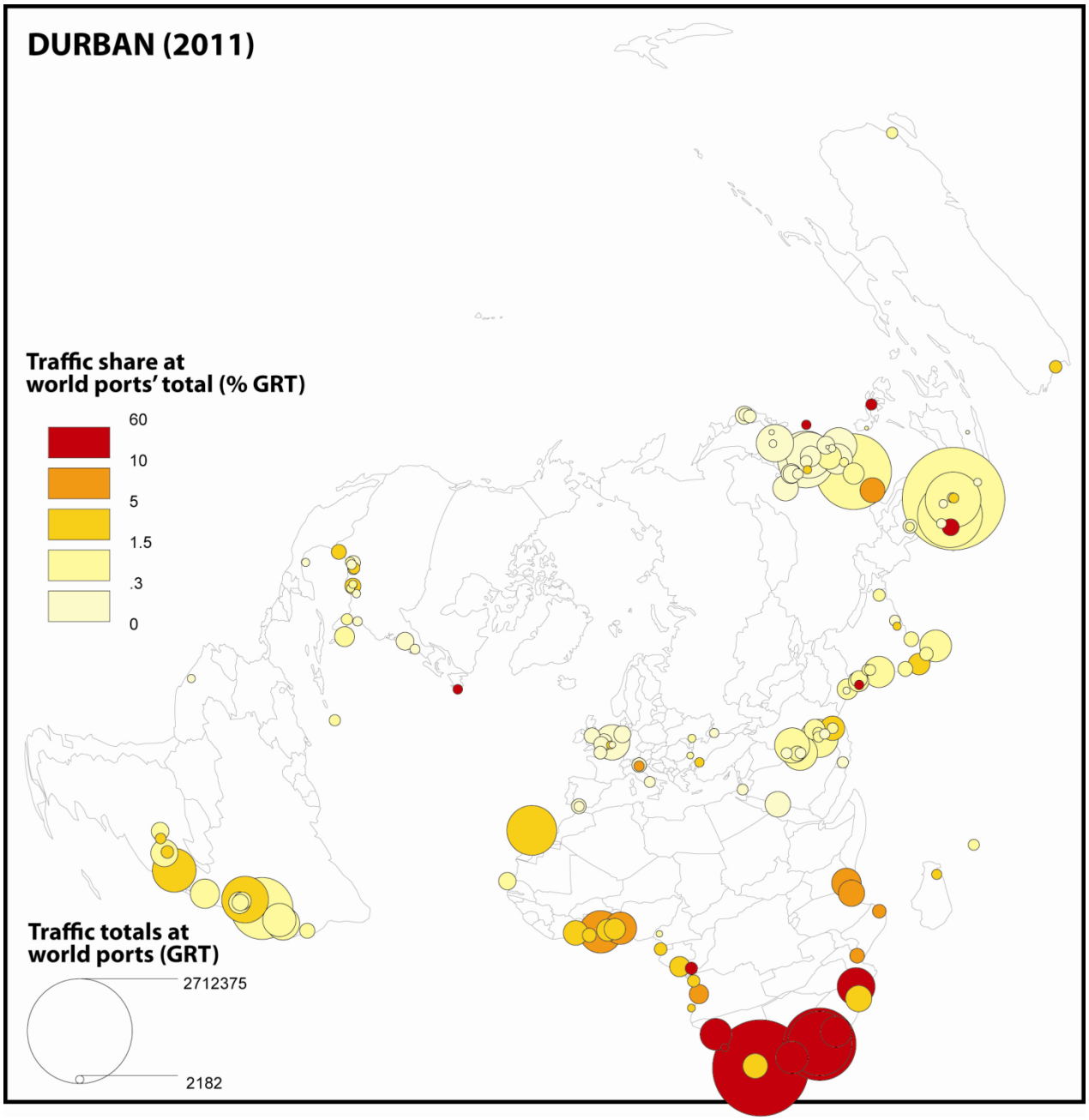
Source: calculations and elaborations of OECD secretariat based on data of Lloyd's Marine Intelligence Unit (LMIU)

Figure 1.7 **Maritime forelands of the port of Durban (2004)**



Source: calculations and elaborations of OECD secretariat based on data of Lloyd's Marine Intelligence Unit (LMIU)

Figure 1.8 **Maritime forelands of the port of Durban (2011)**



Source: calculations and elaborations of OECD secretariat based on data of Lloyd's Marine Intelligence Unit (LMIU)

Durban in the national port system

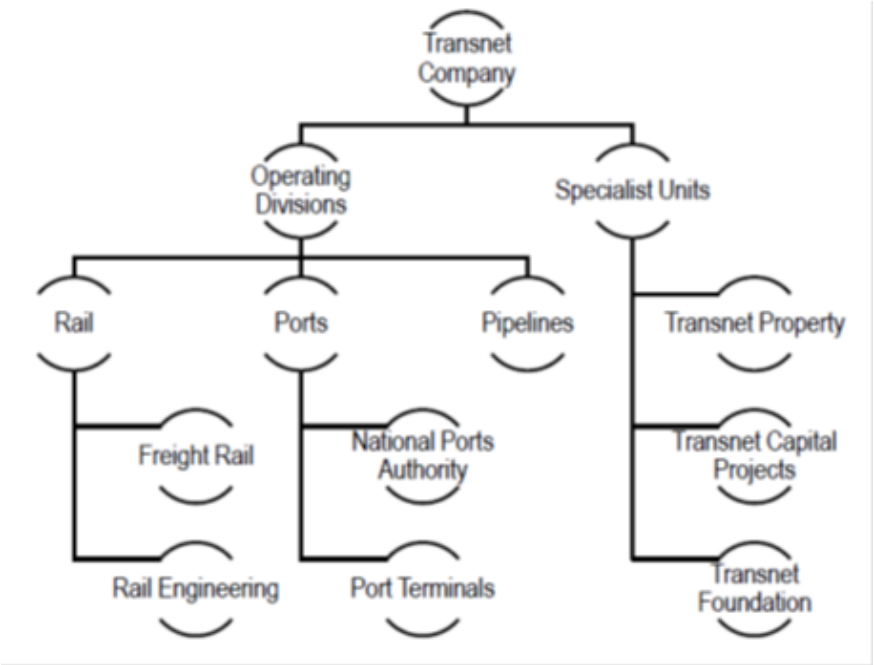
Transnet and South African ports

Transnet is a state-owned enterprise reporting to the Department of Public Enterprises. As such the strategic objectives of Transnet are multiple and beyond what is usually expected from a private enterprise :

- Reduce the total cost of logistics as a percentage of transportable GDP.
- Effect and accelerate modal shift by maximising the role of rail in the national transport system.
- Leverage the private sector in the provision of both infrastructure and operations where required.
- Integrate South Africa with the region and the rest of the continent.
- Maximize the social and economic impact of all interventions.

Transnet has five operating divisions: Freight Rail, National Ports Authority, Terminal Operations, Engineering and Pipelines, and specialist units related to real estate and project development. It essentially manages, through the National Ports Authority, the national port system as established by the Ports Act of 2005. The governance structure was in 2000 when the port division of Transnet (Portnet) was divided into a landlord port authority (Transnet National Ports Authority; TNPA) and a port operations division (Transnet Port Terminals; TPT). The fundamental issue is that the landlord and the public operator are part of the same state agency. Although this is not a unique situation (a country with a single port where the port authority is also the terminal operator), it is rarely seen at the national level of a multiport nation. For instance, in the United States there are state owned ports and operators (e.g. Georgia Ports), but not at the national level. Another important aspect of the national transport system concerns the ownership and operations of the rail system by Transnet Freight Rail, which is dividing in operating and infrastructure branches.

Figure 1.9 **Structure of Transnet**



Source: Transnet

TNPA has several functions comparable to those of standard landlord port authorities elsewhere in the world. The main responsibility, set out in Section 11 of the National Ports Act 12 of 2005, is to own, manage, control and administer ports to ensure their efficient and economic functioning. In doing so, TNPA as the landlord port authority must plan, provide, maintain and improve port infrastructure, control land use within the ports, make and apply rules to control navigation within port limits and approaches to ensure protection of the environment and ensure safety and security within port limits, ensure that port services and facilities are provided and enter into agreements or licence other parties to provide, ensure that adequate, affordable and efficient port services and facilities are provided for port users, ensure non-discriminatory, fair, transparent access to port services and facilities, advancement of previously disadvantaged people and promotion of representativeness and participation in terminal operations. As the landlord, TNPA is further responsible for the financial sustainability of the port system, as Transnet receives no financial support from the National Government, unlike various ports internationally. The first is the ownership and management of the land under its jurisdiction. The second is to provide, often through contracted parties, maritime services which include tugs, pilots, dredging, berthing, radar, lighthouses, dry-dock facilities, etc. as well as harbour master functions such as port control, vessel access and traffic and port security.

Since the dominant terminal operator (TPT) is a national public entity, there is limited competition between most terminals at the national, regional and more importantly at the port level, such as in Durban. No container terminal concessions have yet been issued at any South African port, which explains the absence of global terminal operators within South Africa, unlike several African countries where terminal operators such as APM, HPH and DPW were able to establish concessions. Still, shipping lines are able to route their traffic through the ports (and the terminals) that suit the best their strategies and their customers. Ports in South Africa are managed as part of a complementary ports system, with Transnet determining the role that the different ports and port terminals play vis-à-vis each other.

There are various perspectives to the South African institutional framework for port governance. According to some Transnet is a monopolistic entity preventing a competitive framework, according to others it has the capabilities to promote coordination among ports and to access the hinterland by rail. Each argument has its own merit, particularly in light of the social infrastructure perspective that Transnet conveys. Infrastructures tend to be more considered from their contribution to regional development. Still, there are a growing number of options that are available to service the South African hinterland. For instance, extensive hinterland of Johannesburg can also be serviced through Maputo in Mozambique. On the West Coast of Africa, Walvis Bay in Namibia has also engaged in an active corridor development strategy to access Botswana and South Africa.

Box 1.2 **Port ownership and operational models**

To better understand the unique port governance situation of South Africa, it is worth reviewing what the main port ownership and operation models are. The ownership and operation of ports usually fall into three categories, the first being a pure public port, the second is the landlord model where the port authority concessions operations to the private sector and the third is the pure private port. The governance model that is prevalent around the world thus involves a public port authority that is concessioning terminal operations to private operators. In various countries the public port authority is part of a municipal administration, or otherwise controlled by the municipal government. There are however nuances (options) that can be added to these forms of port privatization (Table 1.2):

Pure public. The public sector owns and operates the port. Although this model used to be prevalent, it has seen a decline with the concession of terminal operations to private firms. There are still a large number of ports in this situation (public port authority and public terminal operator), but the landlord model is becoming more prevalent. Some services such as pilotage, moorage and dredging can be contracted to private firms.

*Landlord. T*he public sector retains ownership of the real estate and several assets while private terminal operators, through concession agreements (port terminal privatization), lease a terminal facility and usually own the terminal equipment. Through a concession agreement, the port authority receive income with the concession is agreed and through an annual rent. In the case of large ports, several private terminal operators can be competing.

Greenfield concession. A form of port terminal privatization that concerns a new port project or a large terminal facility within an existing port where a terminal operator will finance, design, build and operate a new terminal for the duration of the concession. The landlord is usually the public port authority and at the end of the concession the terminal will revert back its control.

Brownfield concession. A form of port terminal privatization that involves existing facilities that are concessiocnned to a private operator. At the end of the concession, the terminal will revert back to the control of the port authority.

Pure private. The port is owned, operated and maintained by the private sector, with the public role limited to one of regulator. This is often the outcome of a privatization process.

Publicization. This process is the opposite of privatization where the public sector takes a stake (in whole or more often as a public-private partnership) in a port project that was entirely private. At the upmost, publicization could involve nationalization, but this is rarely the case

Table 1.2 **Forms of port privatization**

Form	Public sector role	Private sector role
Pure public	Owns and operate port	None (some services)
Landlord / Regulator	Owns port and regulate private sector	Operations
Greenfield concession (Build-operate-transfer)	Negotiation with private companies, regulation	Operations
Brownfield concession (Long-term lease of existing facilities)	Negotiation with private companies, regulation	Operations
Pure private	None (regulation)	Operations
Publicization	Owns and operates port	Operation and maintenance

Source: Adapted from Pagano, A.M, G.W.Y. Wang, O.S. Sanchez and R. Ungos (2013) "Impact of privatization on port efficiency and effectiveness: results from Panama and US ports", Maritime Policy & Management, Vol. 40, No. 2, pp. 100-115.

Note: in a landlord model, port operations need not exclusively be a private sector role, as it could also allow public sector operators.

The South African port system

The South African port system is reflective of the economic changes where policy shifted from import substitution strategies that were pursued up to the 1990s towards integration to global trade. Still, for a developing economy national economic security and infrastructure development usually precedes commercial goals of full cost recovery (Lee et al, 2012). The competitiveness of South Africa in international markets has been dependent upon the costs and efficiency of its port system, mostly for the exports of commodities and raw materials. Therefore, South Africa mainly perceives its port system as a tool for national economic development with a regional specialization in both port function and hinterland servicing. From such a perspective, the South African port system is composed of three main facades

- *Western Ports*. Atlantic range ports including Saldanha Bay, Cape Town, Mossel Bay and Port Nolloth. This hinterland is mostly linked with iron ore exports from the Northern Cape Province and the commercial hinterland of Cape Town.

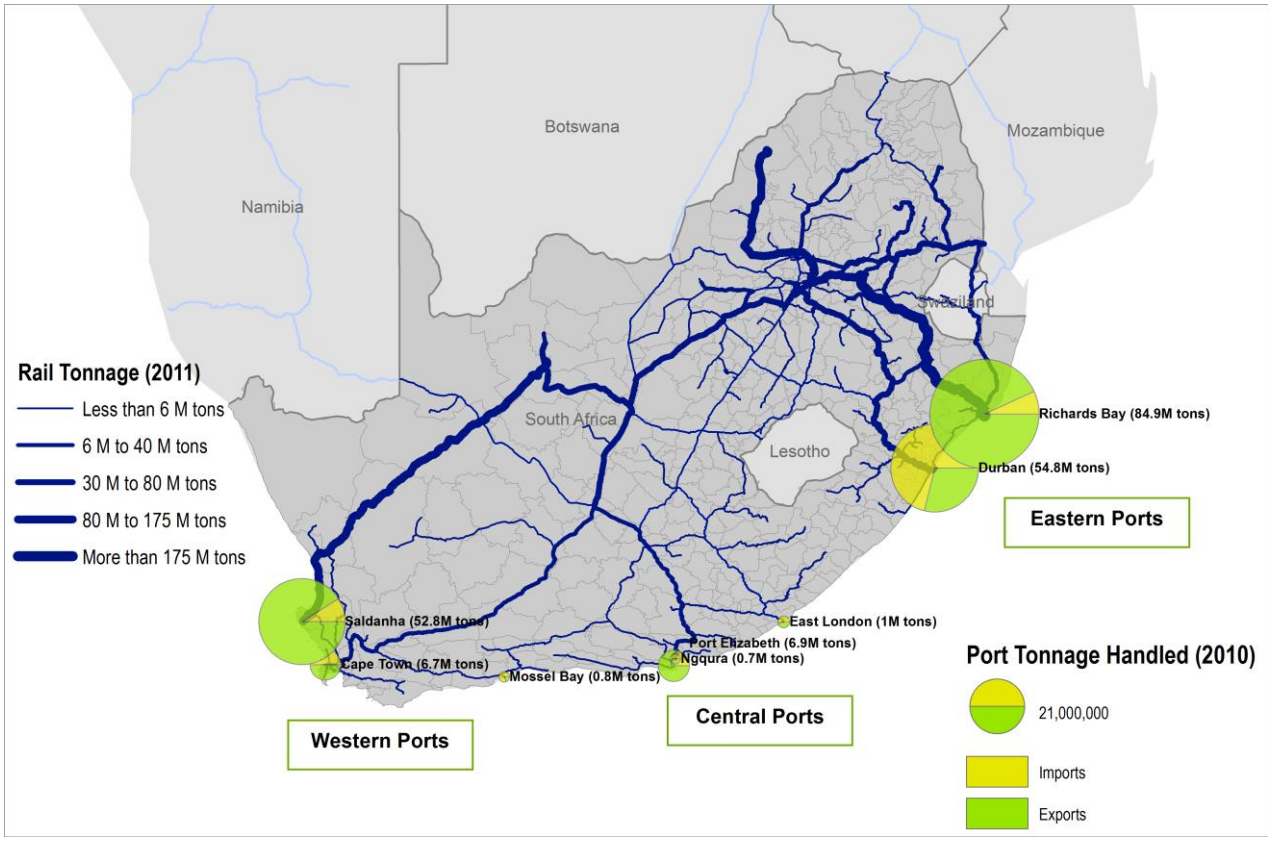
- *Central Ports*. Ports mostly servicing the local hinterland with the expectation of the growth of transhipment activities at Ngqura as a new function.

- *Eastern Ports*. Pacific range ports mostly serving KwaZulu Natal and Gauteng, which are the most economically active provinces of the country.

The older South African ports are hinterland servicing harbours (Durban, East London, Port Elizabeth and Cape Town), implying that their dynamics is directly related to the level of commercial activity of their hinterland. The more recent ports are specialized (dominantly single purpose) facilities to handle bulk export cargo such as Saldanha exporting iron ore and Richards Bay (both opened in 1976) exporting coal. Ngqura, completed in 2009, is designed to handle both dry and liquid bulk cargo as well

as handling containers, with the primary focus being that of a container transhipment hub. Port Nolloth is leased to De Beers Group Services (Pty) Ltd and used as an offshore supply base for conducting diamond prospecting activity in Namibia.

Figure 1.10 **The South African Ports System**



Source: OECD/ITF

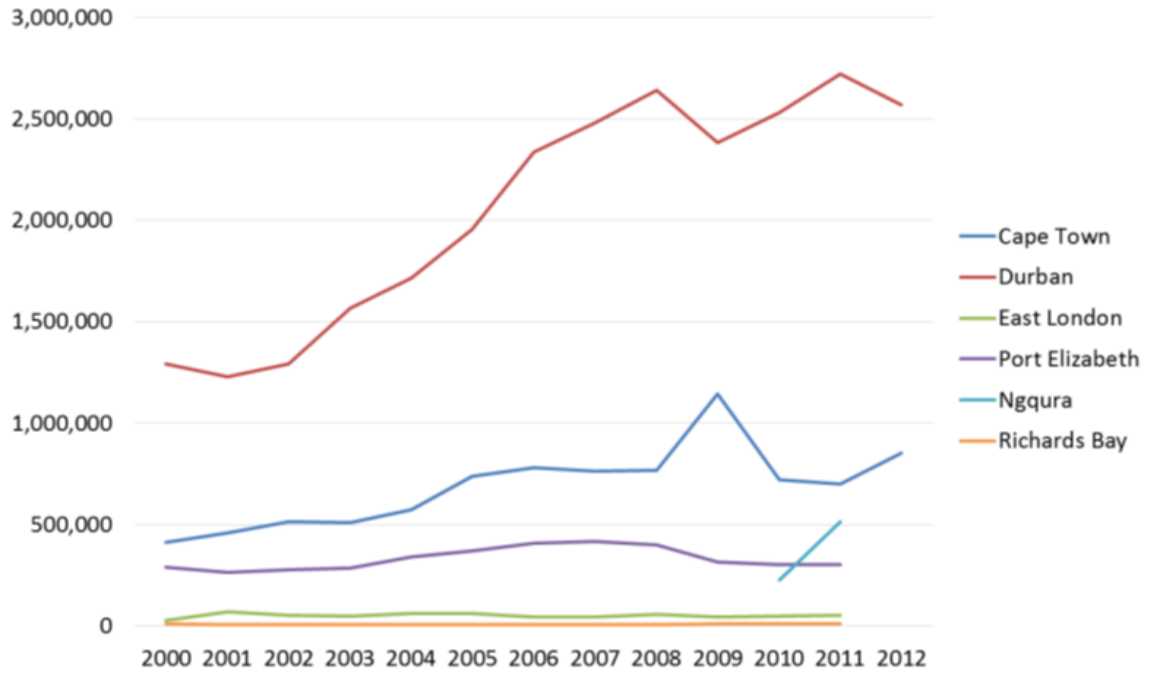
Table 1.3 **Main South African ports**

Range	Port Depth	Function
Western	Saldanha Bay (20.5 m)	Bulk export (ore)
	Cape Town (14.0 m)	Regional hinterland
	Mossel Bay (6.5 m)	Local hinterland
Central	Port Elizabeth (12.2 m)	Local hinterland
	Ngqura (16.5 m)	Bulk export and transhipment
Eastern	East London (10.4 m)	Local hinterland
	Durban (12.8 m)	Regional hinterland and transhipment
	Richards Bay (17.5 m)	Bulk export (coal)

Source: OECD/ITF

The port system reflects a level of specialization and complementarity by function and by hinterland. Each façade is serviced by a *port pair* with one port focusing on bulk cargo and the other on containerized cargo. Each port involves different logistics and hinterland accessibility; the bulk port dominantly serviced by rail and the commercial port serviced by road. Considering the economic development objectives of South Africa up to the 1990s, economies of scale of bulk shipping incited the construction of specialized export facilities that could accommodate deeper drafts (20.5 meters for Saldanha Bay and 17.5 meters for Richards Bay). Economies of scale in containerized shipping came much later with the first post-panamax ships emerging in the 1990s. Also, limited volumes in sub-Saharan Africa did not incite maritime shipping companies to allocate large ships in the region. It is only in the 2000s that with growing volumes handled by South African container ports, that pressures were felt to reassess existing terminals in terms of their capacity and operations, and particularly their hinterland connectivity. In smaller ports, containers are handled through multipurpose facilities, with no plans to convert these facilities into full-fledged container terminals without significant volume growth.

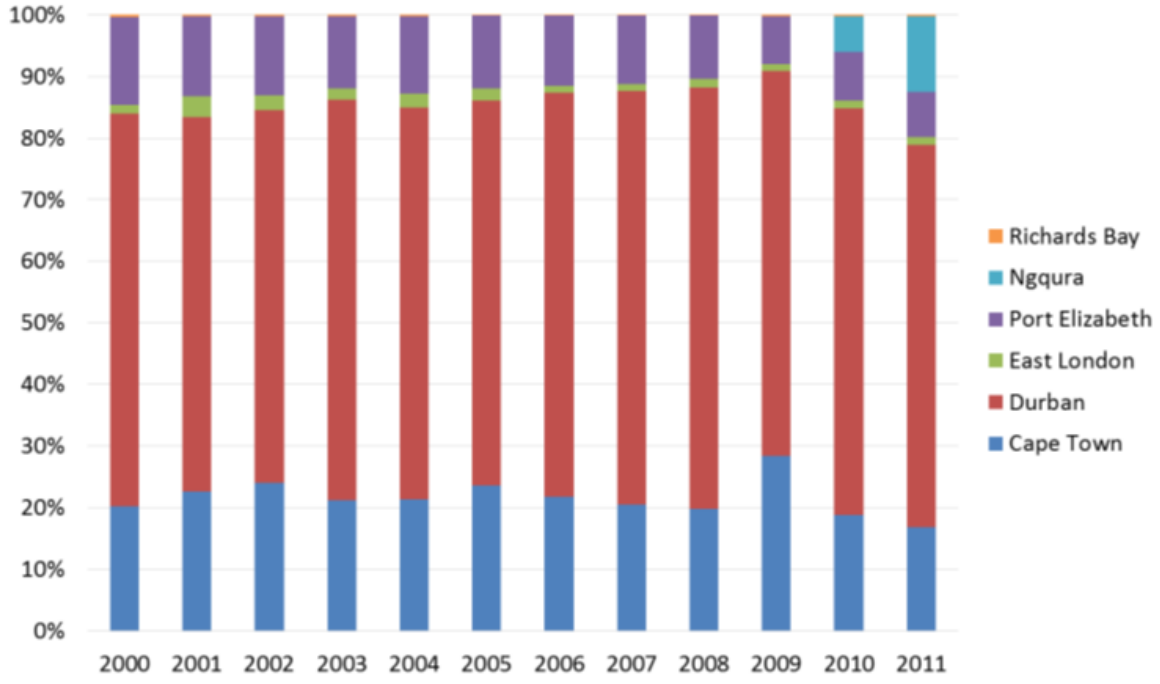
Figure 1.11 **Traffic handled by South African Container Ports, 2000-2012 (in TEUs)**



Source: OECD/ITF

The port of Durban has experienced a substantial growth during the 2000s, doubling its throughput (from 1.3 million TEUS in 2000 to 2.6 million TEUs in 2012). This growth appears to be leveling off since 2008, related to the financial crisis, capacity issues and a partial shift of transhipment to Cape Town and then to Ngqura. This trend is also reflected in the share of traffic handled by respective South African ports.

Figure 1.12 **Share of traffic handled by South African Container Ports, 2000-2011**



Source: OECD/ITF

The share of Durban has remained relatively unchanged, accounting for around 60% of the national containerized cargo. Over 4500 commercial vessels call at the port each year. However, in recent years a shift appears to be in the making with the growing share of Ngqura and a declining share of Cape Town and Port Elizabeth. It is too early to indicate if there is a shift in the relative importance of South African ports since the new capacity being made available at Ngqura will find more than a corresponding match in the expansion plans of the port of Durban. The fact remains that both the port and hinterland access efficiency of South African ports need to be improved to handle future traffic growth expectations.

Durban's position in this respect is pretty exceptional in the South African context, being both a gateway to the largest metropolitan area (Johannesburg) and being one of the largest South African metropolitan areas on its own. The Ethekwini-Mzunduzi (Durban-Pietermaritzburg) economy is indeed the largest on the South African coastline; this large consumption and production base distinguishes Durban from various other Southern African ports, such as Ngqura and Maputo. At the same time, its connections to the largest economic concentration (the Gauteng economic agglomeration which includes Johannesburg) make that the port and its urban economy are part of a larger logistics chain, with all the challenges connected to this.

Durban Port Setting and Facilities

The port of Durban is set within a protected bay (Bay of Natal), which is almost entirely occupied with terminals and other port-related facilities. This accounts for 1,850 hectares with a shoreline of 21 kilometres. This leaves limited options for future expansion outside substantially modifying the physical and environmental setting of the harbour. The entrance channel has been widened to 222 meters in 2010 with a depth of 19 meters at its entrance that goes down to 16.5 meters in the harbour. The port has 58 berths which are operated by more than 20 terminal operators and 300 km of rail tracks enabling to access the national rail network operated by Transnet (Figure 1.13). The land around the port is owned by the NPA and large sections of it are leased to independent operators for cargo terminals, ship repairs and other activities. There are also a number of private sector lessees who operate terminals such as for bulk (coal) and liquids (petroleum).

Figure 1.13 **The Port of Durban**



Source: Transnet

The port has five main terminal facilities:

- Point. A multipurpose break-bulk terminal as well as a Ro-Ro facility that handles most of the port's vehicle trade. There is also a cruise terminal with plans to build a dedicated cruise facility.
- Maydon Wharf. Multipurpose break-bulk, dry bulk and liquid bulk-terminals adjacent to warehousing facilities owned (long term lease) by several private freight forwarding companies. It is extensively used and account for a throughput of more than 6 million tons per year.
- Durban container terminals (Piers 1 and 2). The main lessee is TPT, which operates the two main container terminals; Pier 2 Container Terminal (capacity of 2.7 million TEUs) and Pier 1 Container Terminal (capacity of 700,000 TEUs). The bulk of the container handling takes place at these facilities.
- Island View. Liquid bulk terminals mostly handling petroleum products.
- The Bluff. Dry bulk terminal mostly handling export coal and manganese.

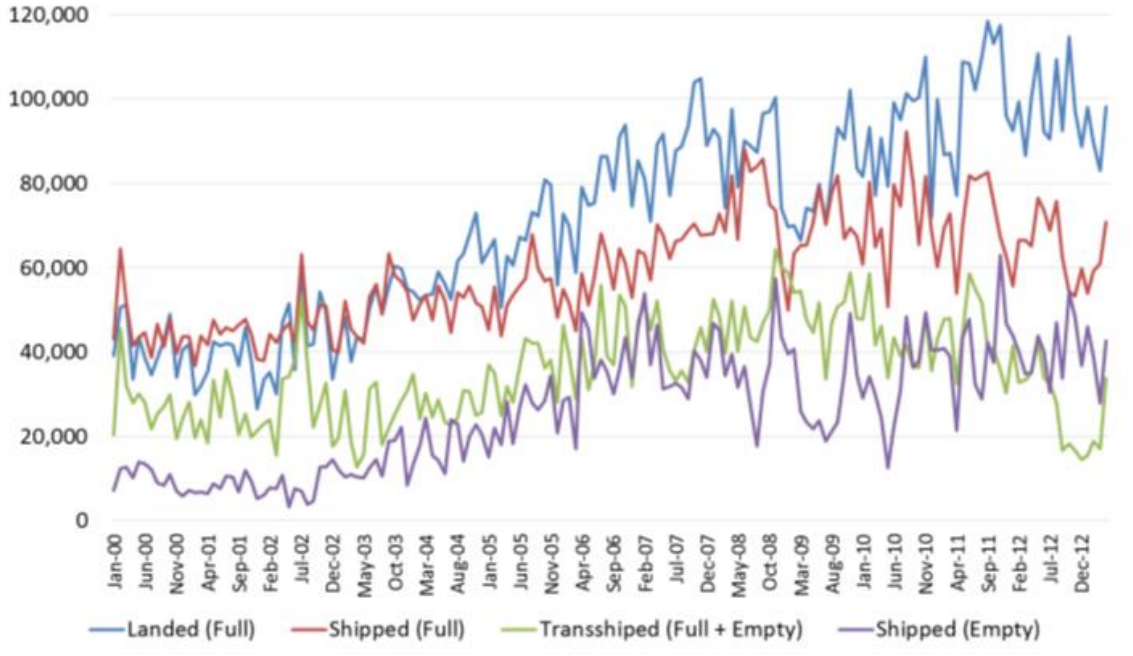
Table 1.4 **Durban Port Facilities**

Type	Terminal	Berths	Capacity	Length (m)	Depth (m)
Containers	Pier 2 (DCT)	6 (108, 200, 202 to 205)	2,300,000 TEUs	2,077	12.8
Containers	Pier 1	2 (105, 107)	720,000 TEUs	686	8.2 to 12.1
Cars	Cato Creek	3 (F, G, M/R)	330,000 FBUs	1,048	10.1 to 10.6
Dry bulk	Bluff	3 (2 to 4)	2 mt	743	8.6 to 10.3
Dry bulk	Maydon Wharf	1 (MW 1/2)	1 mt	305	9.1 to 9.6
Dry bulk	Island View	1 (IV3)	1 mt	168	10.8
Dry bulk	Maydon Wharf	1 (MW 5)	1 mt	200	9.6
Dry bulk	Maydon Wharf	1 (MW 8)	1 mt	192	9.2
Break bulk	Maydon Wharf	3 (MW 9 to 12)	1.6 mt	790	9.9 to 10.6
Break bulk	Point	4 (B,C,D,E)	0.8 mt	979	10.5 to 12.8
Break bulk	Maydon Wharf	2 (MW 6 &15)	0.8 mt	456	9.9
Dry bulk	Maydon Wharf	1 (MW 7)	1 mt	273	9.9
Dry bulk	Maydon Wharf	1 (MW 14)	1 mt	140.5	9.9
Liquid bulk	Island View	1 (IV 6)	1.65 mt	185	12.8
Break bulk	Maydon Wharf	1 (MW 13)	0.4 mt	140.5	9.9
Liquid bulk	Island View	3 (IV7 to 9)	5 mt	705	12.8
Liquid bulk	Island View	3 (IV2, 4, 5)	2.91 mt	556	10.6 to 12.8
Liquid bulk	Island View	1 (IV1)	0.4 mt	213	12.8
Liquid bulk	Maydon Wharf	1 (MW 3 & 4)	0.4 mt	300	9.9

Source: Transnet

The evolution of the traffic at the port of Durban over the last decade is indicative of a functional shift at the port concerning its gateway versus transhipment function. The transhipment function is in relative decline while the port is increasingly acting as a commercial gateway for the South African economy. While the transhipment incidence was 22.8% in 2000, this figure dropped to 13.4% in 2012. The port also shows a shift in the balance between import (landed) and export (shipped) cargo, particularly since 2003 when the balance between import and export cargo shifted to the advantage of imports. Maritime shipping companies are thus finding Durban less attractive since it imposes a lower utilization level of their containerized assets and an increasing repositioning of empty containers. Since 2011, the amount of empty containers exported from Durban has for the first time exceeded the amount of containers being transhipped.

Figure 1.14 **Monthly traffic, Port of Durban, 2000-2013**



Source: own evaluation based on Transnet data

Port efficiency

Maritime transport costs form a substantial share of the value of traded goods. On average, 5.1% of the imported value of manufactures can be attributed to shipping, compared with 10.9% for agricultural goods and 24.1% for industrial raw materials (Korinek, 2008). However, transport costs vary widely between various products and countries of origin and destination. Higher maritime transport costs are related to lower external trade volumes. Doubling of maritime transport costs between a given country pair is associated with a decline of 66-80% in the value of imports and a decrease in trade volume of 26-28% (Korinek and Sourdin, 2009). Large trade-transport cost elasticities (2.3-2.5) have repeatedly been found in different studies (Limao and Venables, 2001; Martinez-Zarzoso et al. 2003; Martinez-Zarzoso and Suarez-Burguet, 2005).

Port efficiency is one of the main determinants of international transport costs. It was found to be most important among six different port characteristics, including port infrastructure, private sector participation and inter-port connectivity (Wilmsmeier et al. 2006). Various studies have quantified the relation between increased port efficiency on the one hand, and decreased transport costs and increased trade volumes on the other hand, with substantial effects varying with the extent of port efficiency improvement (see Table 1.5). The important role of port efficiency for reducing costs of trade is confirmed by other studies (Sanchez et al. 2003; Nordas and Piermartini, 2004).

Table 1.5 **Link between port efficiency and trade/freight costs**

Port efficiency measure	Impact on trade	Characteristics	Source
Double port efficiency	32% increase of trade volume	Top 100 non-US and top 50 US ports; 1991-2003	Blonigen & Wilson 2008
From 75th to 25th percentile	25% increase of trade volume	59 countries, 1996-2000	Clark et al. 2004
From lowest score to highest	Decrease of freight cost by 25.9%		Wilmsmeier et al. 2006
One point rise on WEF-index	4.3% reduction in ad valorem transport costs		Abe and Wilson 2009
All ports as most efficient port	82.5% increase in export volumes	14 Brazilian ports	Haddad et al. 2010

Source: Own compilation of the sources indicated in the table

Note: The WEF-index refers to the port quality index of the World Economic Forum, ranging from 1 to 7.

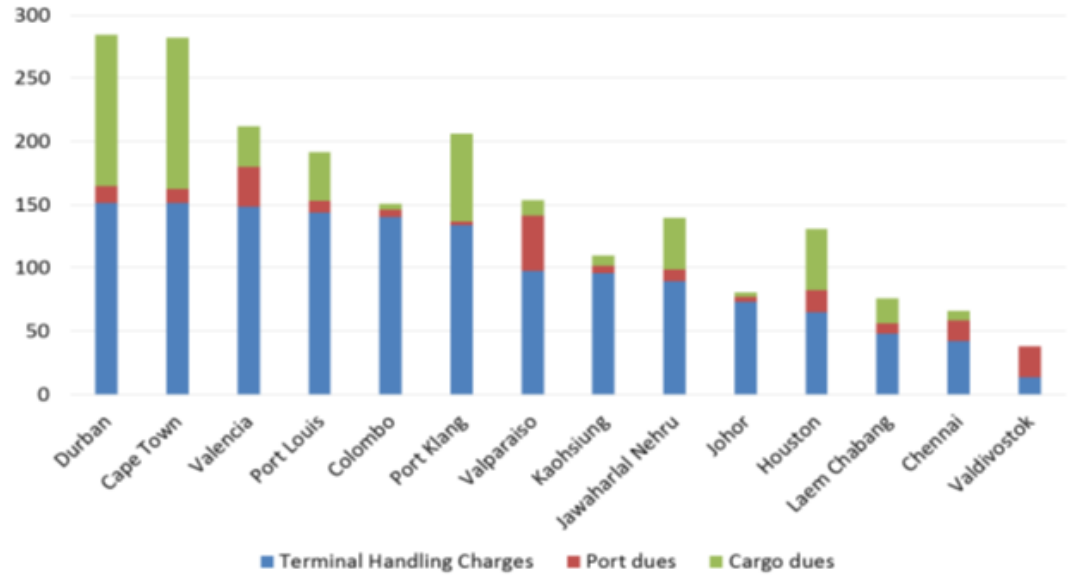
The impact of port infrastructure and efficiency differs depending on industry and the stage of economic development. Marinez-Zarzoso et al. (2008) find that a 1% improvement of infrastructure in the destination country lowers transport costs by 0.20% on average, but that infrastructure variable are not significant for high value added sectors, such as household appliances and vehicle parts, generally sold to the most developed countries that already have the highest levels of infrastructure quality. In addition, infrastructure benefits middle-income countries more than lower income countries. A one-unit improvement in port infrastructure (on the World Economic Forum's Global Competitiveness Report index for port infrastructure ranging from 1 to 7) for a lower-middle income country is associated with an estimated increase in trade of 139%; this is 236% for upper-middle income countries and 171% for high-income countries. This may be due to their ability to reap the gains of trade that trade facilitating investments offer which lower income countries may be less able to do (Korinek and Sourdin, 2011). Higher external trade can translate into higher economic growth. An overview of existing studies on the impacts of trade on economic output and growth indicates that the macroeconomic evidence provides dominant support for the positive and significant effects of trade on output and growth, although microeconomic evidence lends larger support to the exogenous effects of productivity on trade, as compared to the effects of trade on productivity (Singh, 2010). In any case, high trade costs inhibit a country from taking advantage of potential gains form specialisation and trade in order to promote economic development (Markusen and Venables, 2007).

A basic measure of port efficiency is related to the costs it implies to its users. These costs come into three categories:

- Terminal handling charges (THC). The fee collected by terminal operators from shipping lines, who in turn recover from the shippers the container terminals costs for the loading or unloading of the containers and other related costs borne by the shipping lines at the port of shipment or destination. The shippers at the origin port of shipment are responsible for paying the THC to the terminal operator at the port of loading. The consignees, or buyers of the cargo are responsible for paying the freight rate and the THC (or equivalent) to the terminal operator at the port of destination. Terminal handling charges for exports are usually collected by shipping lines while releasing the Bill of Lading after completion of export customs clearance procedures. The import terminal handling charges is collected by shipping lines at the time of issuing the delivery order to the consignee to take delivery of goods.

- Cargo Dues (also known as Wharfage): Fee levied by the port authority to the users (exporters, importers or shipping lines) for the provision and maintenance of dry infrastructure which facilitates cargo movement, i.e. quay walls, roads, railway lines, lighting and bulk services (outside terminal boundaries). This fee is generally fixed and published as an official tariff.
- Port Dues: This is a charge levied by the port to all entering ships. It is generally calculated on the gross registered tonnage of the ship as per the tonnage certificate issued and reflects the provision and maintenance of wet infrastructure, i.e. entrance channels, breakwaters, turning basins and maintenance dredging and navigational aids inside port limits.
- In addition to these, there are the costs of marine services, i.e. pilotage, berthing and tug assistance, paid for by shipping lines for compulsory marine services when entering or leaving the port, based on the size of the vessel.

Figure 1.15 **Total port pricing per TEU (USD), selected ports, 2012**

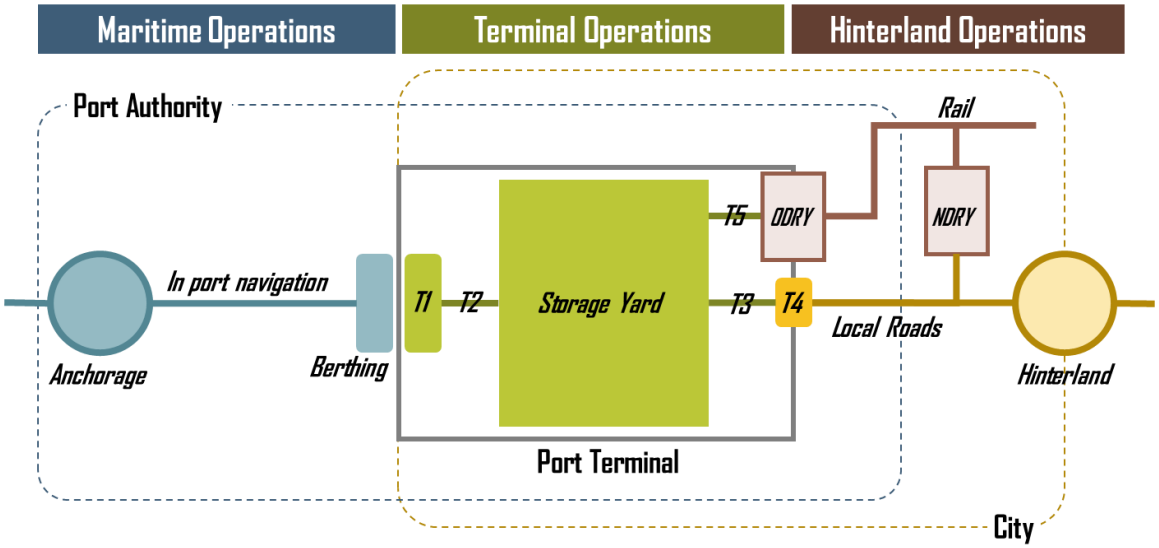


Source: Ports Regulator of South Africa Container Port Tariff Comparator Study (2012).

Cost wise, the port of Durban is one of the most expensive in the world. Although the terminal handling charges are high, they are not substantially higher than ports such as Valencia, Colombo or Port Klang. Port dues are also within the global average. This implies that maritime container shipping companies calling South Africa pay a rate per TEU that is not much higher than the rates they are facing elsewhere. It is over the cargo dues (wharfage) that are levied by the port authority where South African ports, including Durban, stand as outliers, according to Transnet officials due to the complete cost recovery necessary because of lacking national government funding for port infrastructure and maintenance. Through the cargo dues, Transnet is able to impose a uniform port cost across South Africa, essentially subsidizing less profitable ports and using surpluses to finance other activities and projects (e.g. rail infrastructure). Since Transnet is in a monopolistic situation, both as a port authority (TNPA) and as a terminal operator (TPT), it can charge high port fees without facing significant competitive feedbacks. However, its room to set port tariffs is controlled an determined by the Ports Regulator, responsible for economic regulation of South African ports, to which the TNPA has to submit its tariff application for approval. During this process port users can submit comments on the tariff application to the Ports Regulator, which could be considered a regulatory feedback to high port tariffs.

Box 1.3 **The Port Performance Continuum**

The efficiency of a port is part of a continuum that includes maritime, terminal and hinterland operations. These dimensions are interrelated since inefficiencies in one dimension are likely to impact the others. For instance, issues in terminal operations are most likely negatively impact maritime and hinterland operations with delays.



Maritime operations. The efficiency of the maritime access is a component of port performance, which includes anchorage where ships are waiting for an available berthing slot. Long waiting time at anchorage can be the outcome of a lack of berthing slots able to accommodate specific ship classes (e.g. draft and cargo type) as well as terminal productivity issues. Ports, depending on their site and configuration, can have complex in port navigation requiring pilotage and tugs through access channels and turn basins.

Terminal operations. Represent the most common performance indicator that is used to assess port efficiency. For container terminal operations this commonly involve several key operations. Crane performance (T1) is a common bottleneck in terms of the number of movements per crane per hour and the number of cranes available to service a containership. For maritime shipping companies, this is a crucial factor since it is related to the amount of time their ships is going to spend at the port. The manner which cargo (containers) is brought back and forth to the storage yard (T2) is also a component of port performance. Many container terminals use holsters or straddle carriers for such operations. Container storage yard operations involve the organization of stacking and its related stacking density, an important variable determining terminal capacity. When trucks enter the terminal to pick up or drop off cargo (T3) space and equipment is required to insure that this transloading operation (yard to truck or truck to yard) performs well. This is often a critical bottleneck for trucking companies since it dictates the amount of time they will spend at the terminal. Gate performance (T4) concerns the efficiency of tasks related to document procession and security inspections so that a truck is admitted and cleared to pick up or drop cargo at the facility. Gates used above their capacity are characterized by long truck lines waiting to be processed and enter the terminal for cargo they are already chartered to handle. For terminals having on-dock rail facilities, the performance of the rail loading / unloading equipment (T5) is an important component of the terminal's performance.

Hinterland operations. Can involve all the transport and distribution activities involved in servicing the port's customers, such as an inland port. However, for practical purposes, it generally focuses on inland operations adjacent to the port area (often labelled as back of port). The key factor in hinterland operations is the capacity of the local road network in areas adjacent to the port. Congestion and bottlenecks at street intersections impair the port's performance in many of the supply chain management strategies of the port's customers. Some ports have near-dock rail yards that must be serviced through the terminals' gates. In many gateway ports transloading

activities that are transferring the contents of maritime containers into domestic truckloads (or domestic containers), or vice-versa, are an element of the performance of hinterland operations.

Port authorities have an oversight, either directly or indirectly, of the port efficiency. While terminal operations are usually concessioned to private operators, port authorities tend to have a direct oversight of maritime operations and several elements of hinterland operations, such as local roads directly connected to the port terminals, some of which on land owned by the port. Although cities are not directly involved in port operations and commonly have limited, if any, jurisdiction on port land, they commonly provide and maintain crucial road infrastructure connecting the port with its hinterland. They also bear many of the externalities of port operations, namely local congestion. Therefore, the port authority and the city are important stakeholders in the port performance continuum.

Maritime Operations

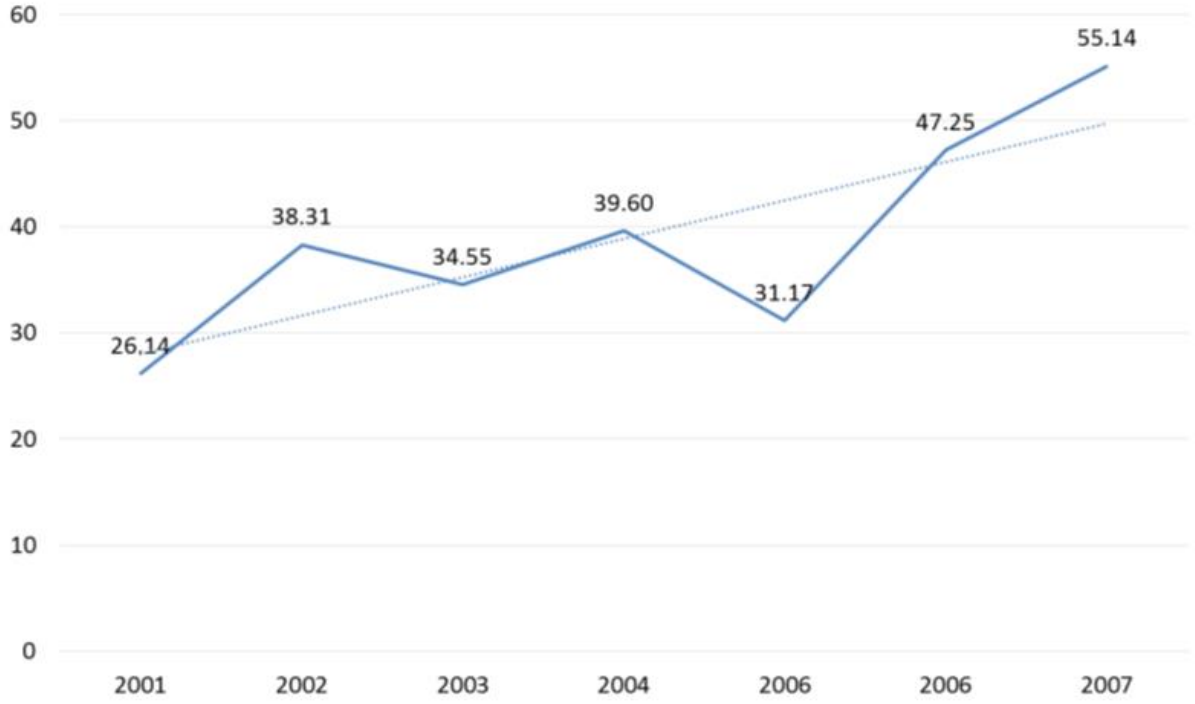
Significant constraints on land availability for container stacking, congestion at the port gate, and terminal inefficiencies have led to increased ship-waiting times as volumes handled by port of Durban have increased. Transnet National Port Authority has set operational targets for maritime operations that simply correspond to the observed anchorage and turnaround times. Figure 1.16 plots the average ship waiting hours for berths at DCT1 and DCT2 and underlines the growth of average wait times for container vessels in the port of Durban over the past years.

Table 1.6 **Maritime operations targets for the Port of Durban**

Activity	Target (2013/14)
Anchorage	46 hours
Ship Turnaround time	59 hours (Containers)
Berth Occupancy	85% (Containers)
Berth Utilisation	80% (Containers)

Source: Transnet National Port Authority

Figure 1.16 **Average ship waiting hours at Durban Container Terminals**

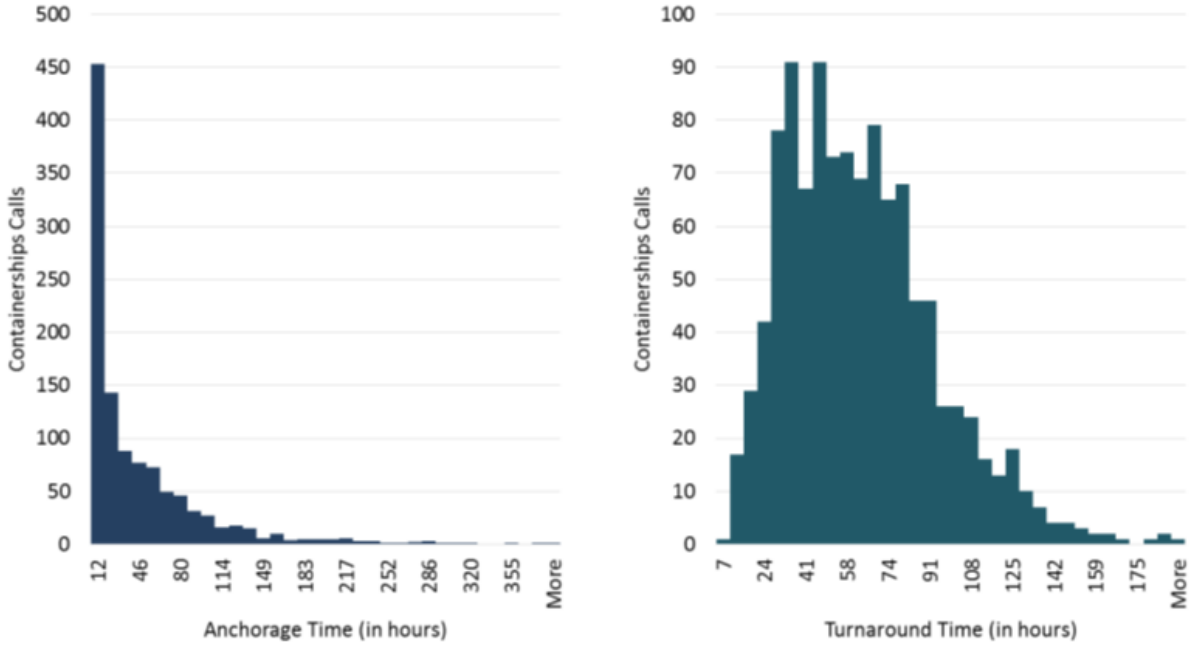


Source: Transnet Port Terminals, in Lee et al (2012), pp. 237

Higher wait times increase the costs of both imports and exports through the South African ports system and decrease its attractiveness in the global economy. These trends give rise to concerns in Durban, since they indicate that the port is operating inefficiently even though utilization levels are still nominally below capacity. Given recent trends in freight growth, this situation is not likely to improve without significant investments into Durban's throughput capacity and efficiency. There are now containerships classes calling the port that are at the maximum draft allowance (12.5 meters).

The average time to unload and clear cargo from ships is usually stated as 24-28 hours, but evidence underlines that the turnaround time for a large vessel in the port can be as high as 100 hours and for a small vessel 60 hours. As of 2012-13 the average anchorage time for containerships was 39.2 hours while the average turnaround time was 60.4 hours, accounting to close to 100 hours of total port call time. There are substantial variations in the distribution of anchorage and turnaround times. While most of the containership calls involve less than 20 yours of anchorage time, turnaround figures are much more distributed with a median value around 56 hours (standard deviation of 30 hours) with many ships having a turnaround time above 70 hours. No significant associations were found between anchorage time, turnaround time and the gross registered tonnage of the containerships calling.

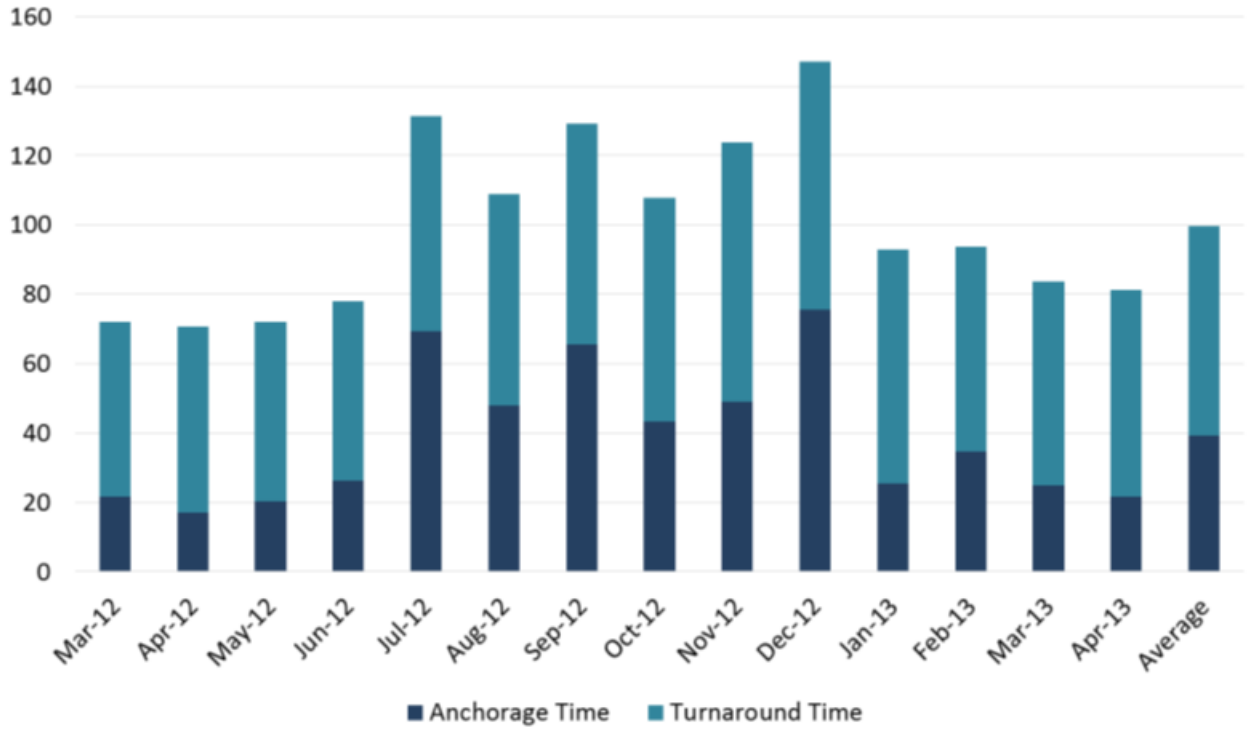
Figure 1.17 **Anchorage and Turnaround Time of Containerships calling the port of Durban between February 2012 and April 2013**



Source: Data provided by TNPA. It includes all the containerships that have called the port during the January 2012 to April 2013 time period (1096 ship calls). Ships that called more than one berth within the port (a 'switch') were removed. Anchorage time was calculated from the difference between the time a ship reaches the port's limits and the time the same ship reaches breakwater (port channel entrance). It also includes ships that transited from the port's limits to the breakwater without anchoring. Turnaround time was calculated from the time difference between a ship entered the port at breakwater and when it left the port at breakwater

Analyses of monthly maritime performance figures reveal that anchorage and turnaround time increase substantially between the months of July and December, which represents the port's peak period of activity. This does not appear to be linked with any variations in crane productivity and is thus reflective of a port operating close to capacity and being challenged to handle standard seasonality in container volumes linked with trade cycles.

Figure 1.18 **Monthly anchorage and turnaround time of containerships calling the Port of Durban (March 2012-April 2013)**



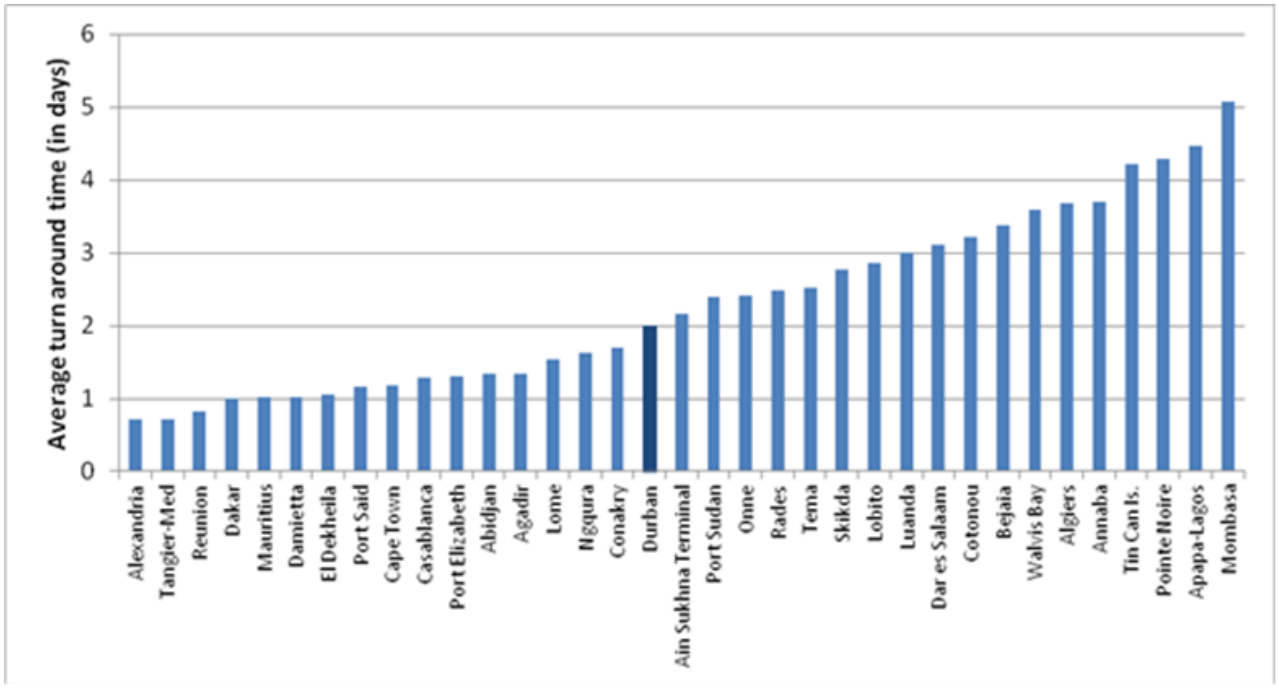
Source: OECD/ITF

Maritime operations at Durban have a performance that is somewhat degrading, which is reflective of a port running close to capacity constraints. When traffic is peaking due to seasonality, the impacts are immediately felt by surges in anchorage and turnaround times that are not reflected in terminal operations. The figures presented above are based upon total waiting time, and do not take into account that some vessels might have arrived ahead of their expected time of arrival. TNPA officials indicate that there are minimal waiting times for marine services, such as pilotage and tug assistance, but we have not been able to verify these claims with the datasets that were made available to the research team.

When compared to ports elsewhere in the world, Durban appears less time efficient than its direct competitors, let alone the large world ports in other continents. This can be concluded from an assessment of turnaround times of world ports, based on detailed vessel movement data, as collected by Lloyd's Marine Intelligence Unit (LMIU), using a methodology described in annex 1. The average turnaround time for container ships in Durban in May 2011 was approximately two days per call. This is considerably higher than the average turnaround time for other South African ports, such as Ngqura, Cape Town and Port Elizabeth, as well as other African hub and gateway ports, such as Tangier-Med, Port Said and Alexandria. At the same time, Durban's score is more favourable than other African ports including Apapa-Lagos and Mombasa (Figure 1.19). The score of Durban reflects the relatively poor score of African ports overall in comparison with ports on other continents, which generally have more favourable average turnaround times (Figure 1.20). Durban also does not score very well with regards to the average turnaround time per TEU handled in the port: on average 1.7 days per 1000 TEUs, more favourable than other South African ports, but approximately three times as high as large world ports such as Long Beach, Hong Kong, New York and Antwerp (Figure 1.21). Explanations for this lagging

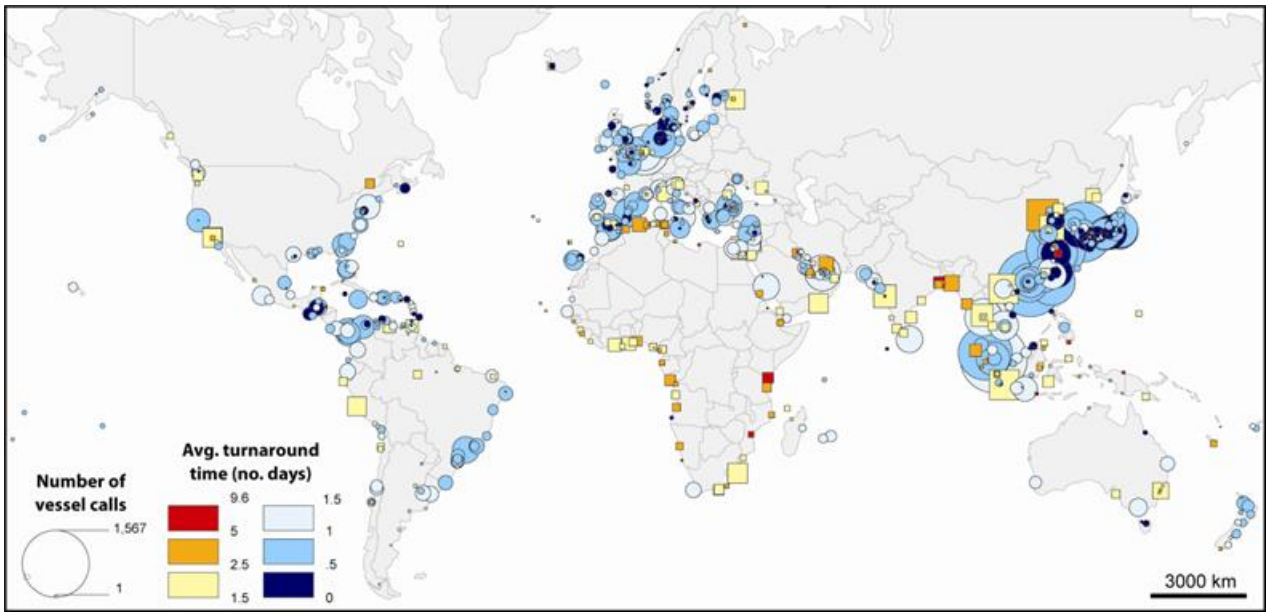
efficiency relative to ports worldwide, e.g. quantity and quality of port equipment, would require more in depth study.

Figure 1.19 **Average turnaround time per call, May 2011**



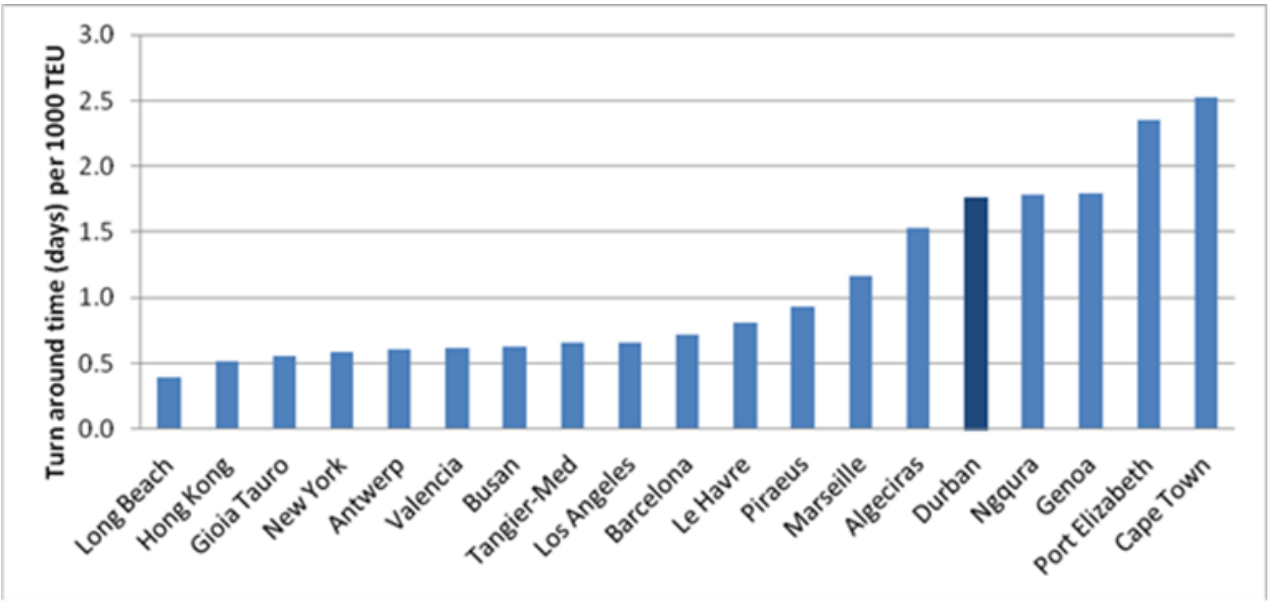
Source: calculations and elaborations of OECD secretariat based on data of Lloyd's Marine Intelligence Unit (LMIU)

Figure 1.20 **Average turnaround time (in days) of ports in the world, May 2011**



Source: Ducruet and Merk (2013)

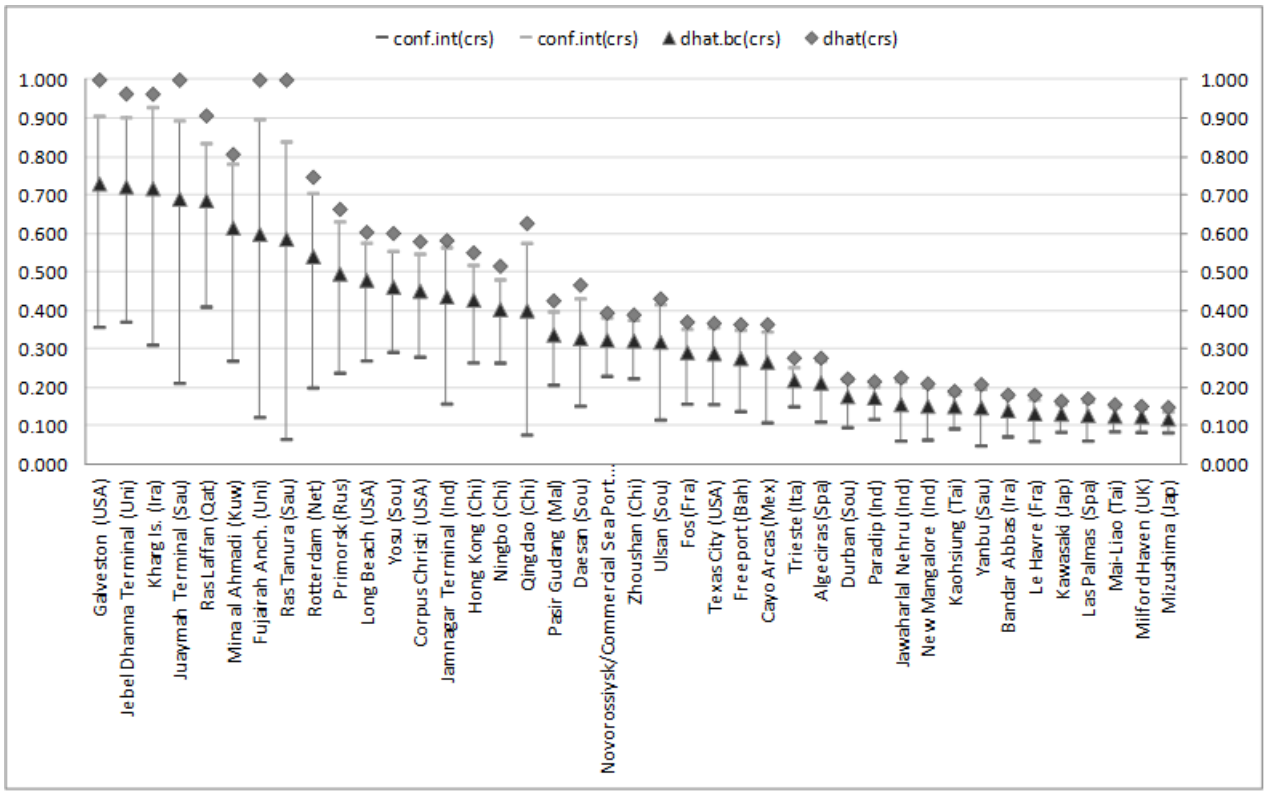
Figure 1.21 **Average container handling time (days/1000 TEU), May 2011**



Source: calculations and elaborations of OECD secretariat based on data of Lloyd's Marine Intelligence Unit (LMIU), Eurostat and port authorities.

With respect to bulk terminals, Durban is not among the most efficient world ports either. This can be concluded from an analysis that we carried out on port efficiency with regards to bulk goods, using DEA methodology and a unique database set up for this purpose (both dataset and methodology are described in Annex 2). Our findings indicate that the most efficient crude oil ports are very large specialised oil ports in the Middle East, as well as some of the very large ports, including Rotterdam and some of the Chinese ports. Durban scores in the lower middle range of our selection of port (Figure 1.22).

Figure 1.22 **Efficiency scores for a sub-sample of crude oil ports/terminals**



Source: Merk and Dang (2012).

Note: (dhat) refers to efficiency scores derived using the standard DEA methodology; (dhat.bc) indicates scores derived using the bootstrapping method and (conf.int) indicates the upper/lower bound values of the interval of confidence; (crs) is the abbreviation of constant returns to scale, assumptions used in both methodologies.

Terminal Operations

Terminal operations in the port of Durban are facing challenges, particularly when compared with international performance benchmarks. The main factors behind lower performance levels can be attributed to ship call patterns, ship type (larger ships) as well as the shape of the container terminal facilities, which is irregular compared with the standard rectangular structure. This is associated with less storage space available per hectares and longer intra-terminal movements (e.g. between pier and staking yard). Terminal expansion plans will mitigate these constraints by providing more terminal space as well as a more rectangular organization of terminal storage. Like maritime operations, TPT has set terminal operation targets that are reflective of current performance levels (Table 1.6).

Table 1.7 **Terminal operation targets for the Port of Durban**

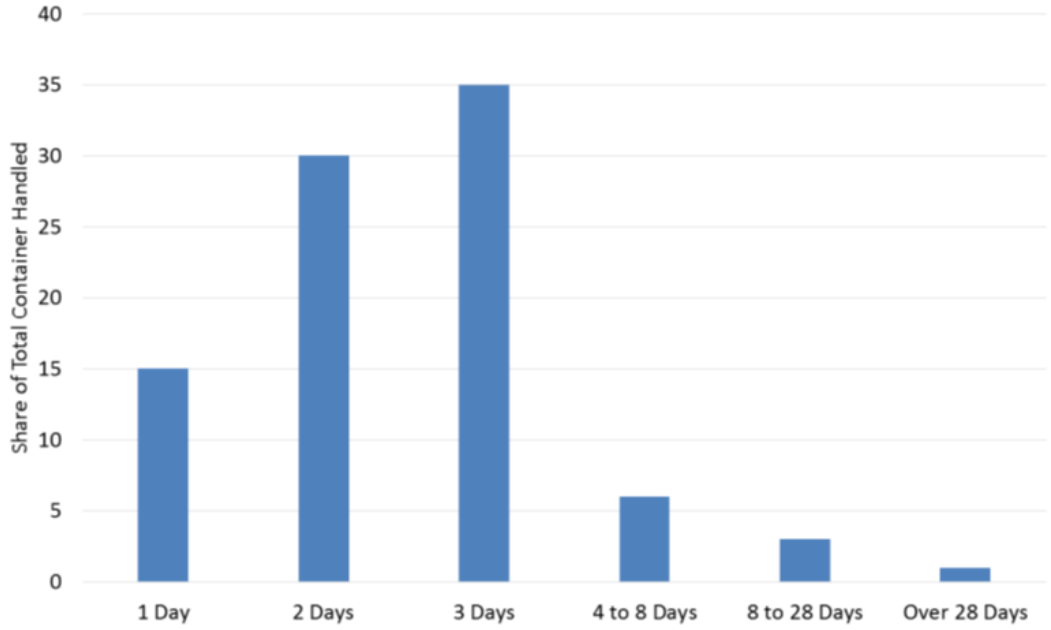
Activity	Target (2014/15)
Dwell Time	*3* days (imports), 5 days (exports), 10 days (transhipment)
Moves per gross crane hour	28 (DCT1) 30 (DCT2)
Train turnaround	6 hours
Truck turnaround	35 minutes

The observed crane performance has remained relatively constant around 20 moves per hour per crane, with figures slightly higher for full container moves than for empties. In the sub-Saharan African context these figures compare positively, but remain well below international standards around 35 to 40 moves per crane per hour. The truck turnaround time is targeted to be around 35 minutes while evidence underlines that it is usually above 60 minutes at the DCT terminal.

The performance of terminal operations is further impaired by labour issues where in the case of Durban performance incentives can have perverse effects, particularly when there are productivity premiums. For instance, rising wind velocities tend to lower the number of crane container movements. At some wind levels that do not compromise safe operation, crane operators will stop operations, because the productivity level would drop to a level where productivity bonuses could be compromised, instead of accepting lower productivity, according to representatives of the industry.

The dual role of Durban both as a gateway and a transhipment hub involves variations in the terminal dwell time depending on the type of flow. The average dwell time for all container flows is about 3.9 days, which it the most efficient in sub-Saharan Africa where most ports have easily twice as much dwell time. This is also related to the fact that free dwell time for transhipment is set at seven days instead of three days for imports and five days for exports. This is reflective of transhipment operations that require containers to wait at the transhipment hub for a longer time period while waiting to be loaded on a connecting ship. About 80% of the containers stay at the port's terminals for 3 days or less.

Figure 1.23 **Cargo dwell time frequency at the Port of Durban**



Source: Raballand, G., S. Refas, M. Beuran, and G. Isik (2012) Why Does Cargo Spend Weeks in Sub-Saharan African Ports? Lessons from Six Countries, Washington, DC: The World Bank.

The evaluation of terminal operations efficiency underlines that ship turnaround time should be the main consideration in terminal performance, even if fundamentally this measure is related to maritime operations. Measures such as moves per gross crane hours are usually good indicators of terminal performance, but tend to be skewed by performance incentives.

Hinterland Operations

The substantial growth of containerized cargo at the port of Durban has led to a growth of hinterland traffic where the "first hinterland mile" within the metropolitan area is related to a number of activities related to haulage, transloading, stuffing and empty container depots. About 1.8 million TEUs were transported in and out of the container terminals in 2012. Hinterland operations concerns activities that take place outside the port terminals and are thus related to the capacity and efficiency of regional road and rail systems. While rail used to dominate long haul hinterland access, this share has substantially declined over the last decade. A breakdown of the container haulage system reveals a specific activity system within Durban's hinterland:

- Containers being trucked to nearby warehouses to be transloaded into domestic load units (37% of containerized imports). The containers can then be brought back to an empty container depot to be stuffed and brought back to the port for exports (or brought back to the port empty). This creates a variety of local truck movements contributing to congestion.

- Direct long distance haul truck drayage to bring containers directly to customers in the hinterland (26% of containerized imports). This hinterland comprises mostly of Witwatersrand, a broad area in Gauteng that comprises the Greater Johannesburg Metropolitan Area.

- Direct rail long distance haul rail movement from the Bayhead intermodal terminal to the City Deep terminal near Johannesburg (16% of containerized imports). The City Deep Transport Logistics Hub is South Africa's largest container depot. From this terminal, containers will be brought to customers in the hinterland.

- Direct short distance haulage to customers within the Durban metropolitan area (20%). Similar to transloading, the containers are brought back to an empty depot after been emptied.

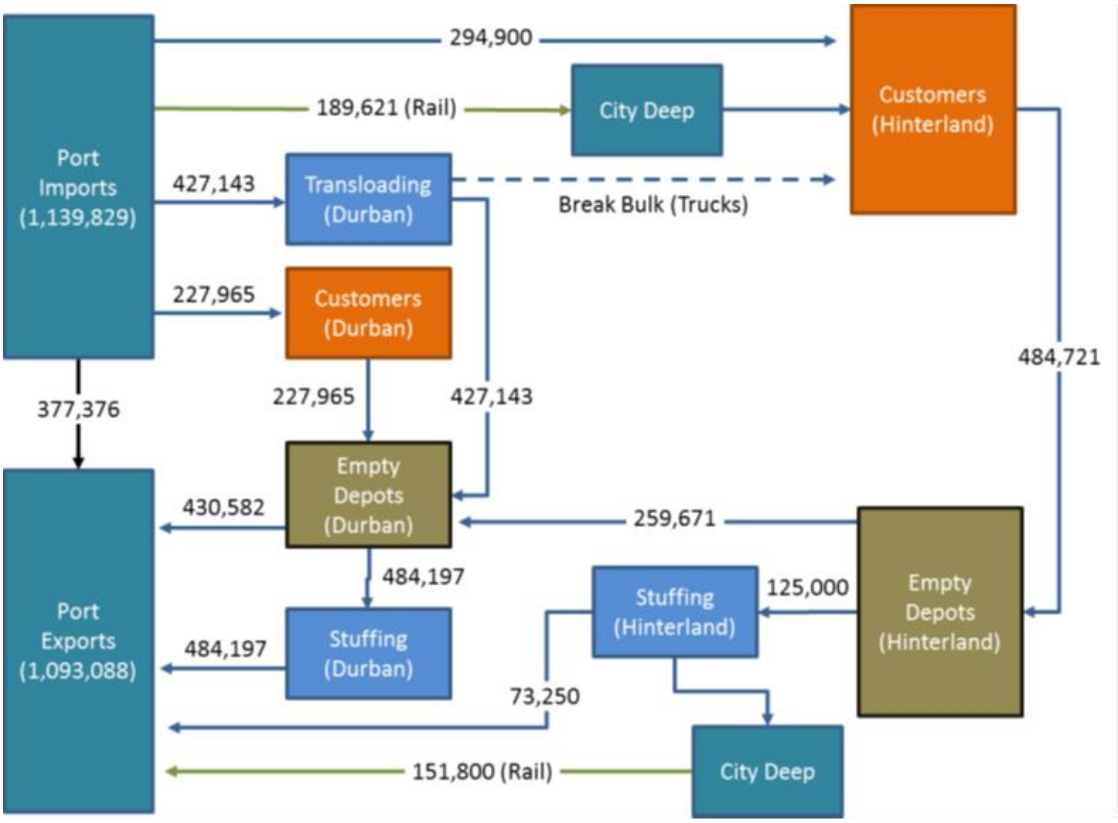
- Truck haulage from empty container depots in the Durban metropolitan area to the port for the purpose of being repositioned as empties (39% of containerized exports). These depots are also receiving short (from import-based transloading warehouses) and long hauls (from hinterland empty depots) of empty containers.

- Truck haulage from stuffing warehouses within the Durban metropolitan area (44% of containerized exports). Each container being stuffed required to be picked up at an empty depot.

- Direct long distance haul rail from the City Deep inland port to the Bayhead intermodal yard (14% of containerized exports). These containers were either brought from hinterland stuffing warehouses or empty depots.

- Direct long distance haul from a hinterland stuffing facility to the port for export (7% of containerized exports).

Figure 1.24 **Container haulage system, Port of Durban (TEUs)**



Source: Adapted from Strategic Transport Planning Department - ETA (2013) Development of an Integrated Freight and Logistics Strategic Framework and Action Plan.

Access to the container port terminal, either for pickups or drops, can be subject of delays because of local congestion and gate access. While the target of about 60 minutes of pre gate time and 45 minutes in the terminal is regularly being met, the time that trucks queue on nearby roads to access the terminal is not being measured and thus not part of performance indicators. Another concern involves the lag effect between the availability of rail services and the time such a service was ordered. For instance, it can take three to four days to order a train to pull cargo out by rail from Maydon Wharf. Such as factor plays in the prominence of road transportation for hinterland access since a lagging effect impairs the timeliness of supply chain management.

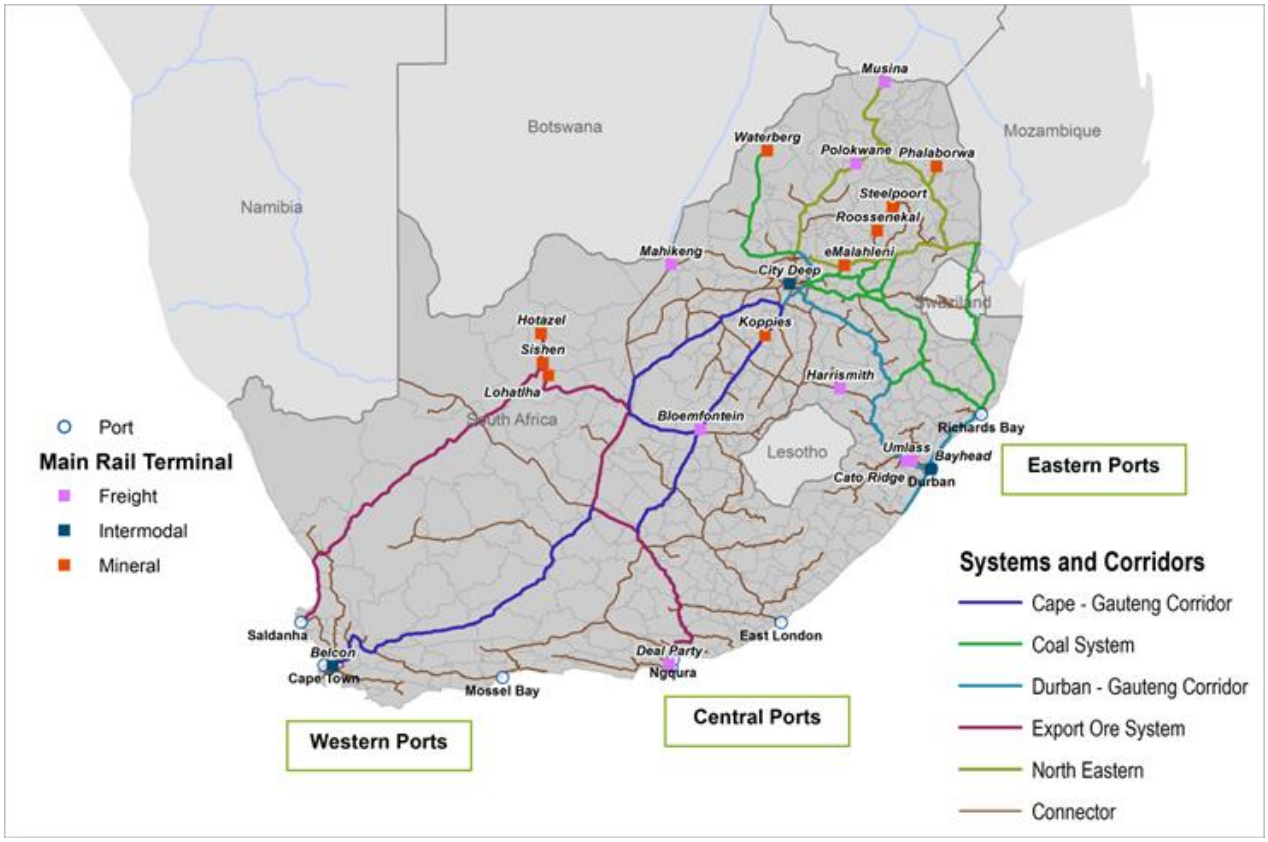
Hinterland operations is facing a situation where there is a large amount of freight entering and exiting Durban through national routes in addition to the freight circulating within the city to support a variety of port-related operations such as transloading. Because of the array of activities involved in containerized operations, there is a double or a triple handling of containers, which results in about 3 million container moves of the local roads per year. This underlines a multiplier effect of container moves in hinterland operations, ranging between 1.2 and 1.5 times the number of containers handled by the port. This multiplier is dictated by the importance of transloading activities as opposed to direct container hauls. The distance between the ports, transloading facilities and empty container depots have an important impact on local circulation and thus on hinterland operations. At this point port related road haulage is facing a lack of planning such as a shortage of truck parking and rest areas within the port area. Since transloading is likely to remain an important logistical activity supporting the role of Durban as a gateway to the South African economy the location of transloading activities is an important component of a port-centric logistics strategy.

Hinterland connectivity

Rail Corridors

Considering the nature and the geography of South Africa's hinterland, all the main ports are the head of rail corridors with different functions. These functions are particularly reflected in the nature of the rail terminals which can be categorized as freight (handling general bulk and break bulk cargo, including containers), intermodal (solely designed to handle containers) and mineral (main loading stations for ores and coal). The rail infrastructure is owned and operated by Transnet Freight Rail (TFR), including lines and terminals within the ports. The core business model of rail operations in South Africa is based on hauling heavy products (ores and coals) along clearly defined corridors. TFR usually does not carry orders of less than 10 wagons, which either requires a shipper able to generate large enough volumes on its own or a form of consolidation of loads among shippers with lower volumes.

Figure 1.25 **South African main rail systems and corridors**



Source: Transnet.

Because of the nature of the hinterland and the distribution of markets and resources rail network is structured as rail corridors handling the majority of the traffic and connectors. The most significant rail corridors are:

- The Sishen-Saldanha heavy haul line, which mostly supplies the port of Saldanha Bay with iron ore (Export ore system).
- The Cape Town-Gauteng corridor, which carries a range of general and containerized cargo. It interfaces over some segments with the export ore rail system.
- The Port Elizabeth/Ngqura-Gauteng corridor, also carrying general and containerized cargo. This corridor also branches to the port of East London.
- The Natal Corridor (Natcor) connects Durban (Bayhead) to Gauteng (City Deep) and is the main commercial artery of South Africa.
- The Waterberg-Richards Bay corridor, which is a heavy, haul line for coal exports (Coal system).

Most of the national corridors thus converge at Gauteng. There are also cross-border rail corridors servicing Namibia, Botswana, Zimbabwe and Mozambique, giving opportunities for South African ports

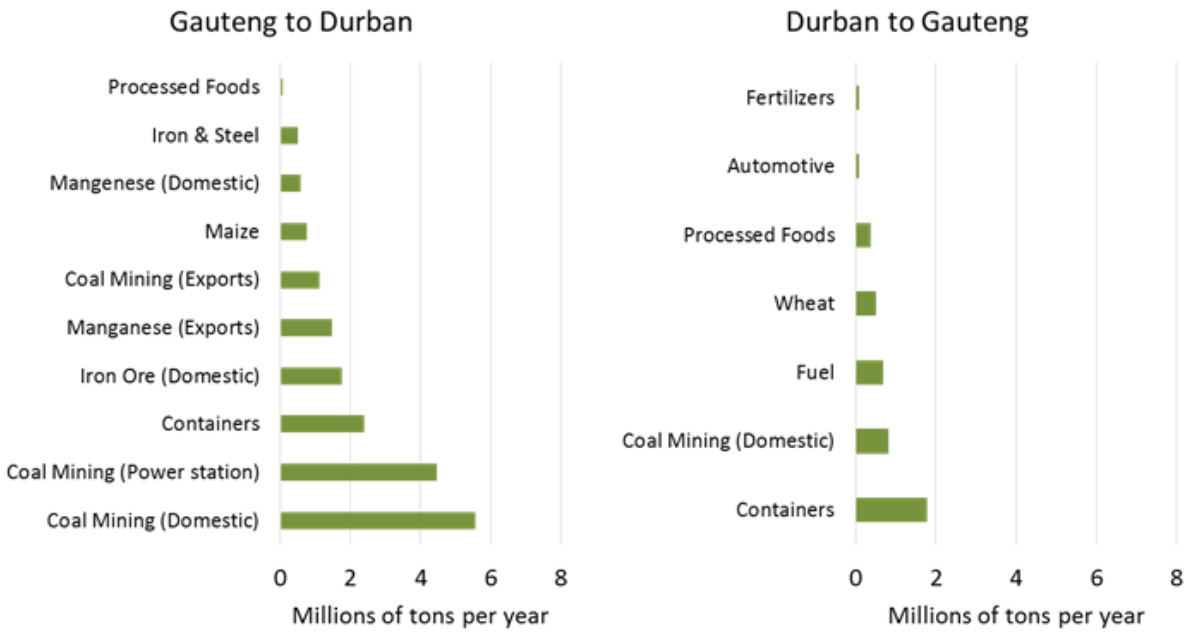
to service international hinterland markets, but also foreign ports, such as Maputo and Walvis Bay to service the South African hinterland. Parallel to most rail corridors, the national road system connects the main urban centres. The issue remains to have a more concerted approach in the planning of rail, port and road infrastructures since each is under different responsibilities and jurisdictions. This is particularly relevant for the Durban – Gauteng corridor that has a length of about 742 km, which places it within the competitive range of road transportation. As of 2013, there were about 7 daily container train services between Bayhead (Durban) and City Deep (Johannesburg). This is down from 11 to 14 trains per day in 2010, implying an erosion of the rail's market share mainly attributed to reliability and level of service issues. Unlike the rail services related to transporting heavy bulk commodities (e.g. ores and coal), there is a range of commodities for which roads has been able to capture a dominant market share along the corridor. As a strategy to cope with a declining market share of rail Transnet is trying to develop consistent rail services with a time frame of 96 hours to the City Deep terminal.

There are only three dedicated intermodal rail terminals that handle container traffic in South Africa, each with supporting sub-facilities for cargoes such as break-bulk or cars. For the Durban – Gauteng rail corridor, the inland port of City Deep represents the only consolidation and deconsolidation terminal for intermodal rail services calling from Durban. It was established in 1977 as a bonded inland container depot for containers that have transited through Durban could clear customs in Johannesburg. The terminal has a capacity of 280,000 TEUs per year with plans to expand this capacity to 400,000 TEUs per year by 2016 and 700,000 TEUs per year by 2019.

Modal Split

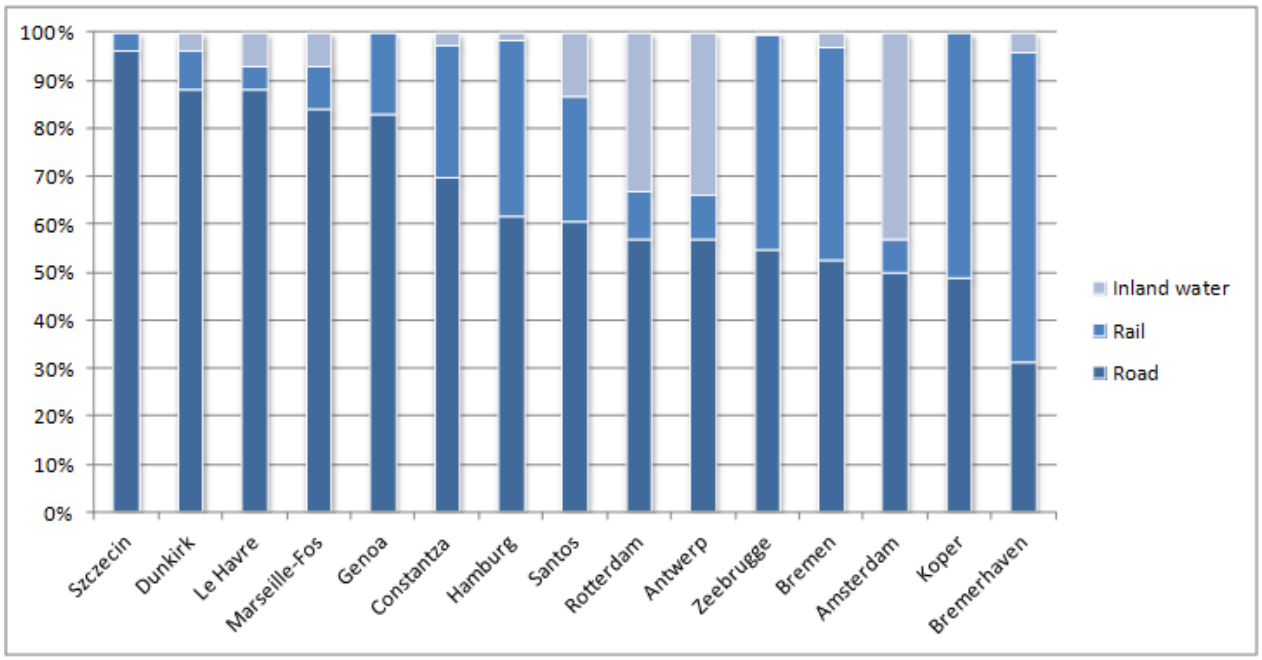
Until the 1960's South Africa's underdeveloped road network and inflexible regulatory framework made rail the sole option for inland freight transport. The Road Transport Act required road haulers to obtain permits for any transportation of goods that went beyond a locally specified limit (50km in Durban), which effectively isolated the state-owned rail company from any form of modal competition. However, the increasingly dysfunctional permitting system was finally scrapped through the repeal of the Act in 1988, and the development of road infrastructure led to a major shift towards road as the dominant mode for inland distribution. While rail accounted for almost 100% of the modal split of traffic leaving the Durban Container Terminal in the 1970s, its share declined drastically throughout the 1980's and 1990's falling to an average 16% over the period spanning 2007 to 2012 (ETA 2013: 91). Still, during the 1980s, Durban was handling less than half a million TEUs, so the volumes handled by rail were relatively small. Although the share of rail experienced occasional peaks of around 20-25% during this period, by 2010 it was back to the 15 to 18% range. Thus, 75% to 85% of the containers leaving Durban's main terminals are transported by road. Such elevated shares of trucks in the modal share are not uncommon among other ports, although various European ports have managed to reach much lower truck shares (Figure 1.27), which might be related to availability of railway capacity.

Figure 1.26 **Rail flows by direction Durban/Gauteng (2012)**



Source: Information provided by Transnet Group Planning

Figure 1.27 **Modal splits of port hinterland traffic**



Source: Merk 2013

Rail flows account for 18.5% of the tonnage between Durban and Gauteng and reveal imbalanced traffic dominantly attributed to coal flows to the port or to the metropolitan area for industrial

consumption (e.g. steel and power generation). Outside this trade, container flows dominate, particularly for exports. It underlines the role of the City Deep terminal as a logistics platform where containerized consumer goods are imported and where heavier contents, such as commodities, are exported after a cargo rotation. ETA and SANRAL statistics show that container heavy vehicle traffic on the N3 at Cato Ridge and Marian Hill comprises 20.7% and 20.6% of the total heavy vehicle traffic on these routes. Most containers are broken down in the eThekwini Municipal Area (predominantly the South Durban Basin) and the content of the container is then moved in another trucking configuration and format to the hinterland.

Chapter 2.

Port Impacts

The port of Durban is one of the key determinants of the economic, environmental and social development of the city. It contributes significantly to the metropolitan labour market and value-added in ways that can be directly and indirectly measured. Furthermore, it acts as a magnet for a host of maritime and port-related firms, which locate their businesses within the metropolitan area in order to benefit from economies of scale generated through spatial clustering. This chapter analyses some of the port's economic and spatial impacts of the city, before describing some of the less desirable social and environmental impacts that are also part and parcel of many major ports situated within dense urban cores.

Port-related employment

Direct employment

The port of Durban contributes significantly to the metropolitan labour market. This impact can be measured in two ways: using estimates of direct employment within the port (shipping, cargo handling, ship repair, customs clearing, services within the port such as security, etc.) and using those for the indirect employment in sectors that are linked to the presence of the port (such as manufacturing, inland freight transport, petrochemicals, agriculture, etc.).

Transnet is a significant employer in the port of Durban. In 2003, for example, some 1,020 full time workers were employed at the Durban Container Terminal alone (CPCS Transcom 2003: 7). As of 2012, direct employment by Transnet within the port of Durban stands at 4,000 FTEs. Looking more broadly at all of the port-ancillary firms employing workers within the port, Jones (1997) estimated that at very least, some 31,000 people were employed in directly port-related activities in 1995. On the basis of Jones' earlier work, and in addition to interviews with private actors, Coller et al. (2007) have estimated that this sector had grown to around 600 firms employing roughly 50,000 people in 2007. More recently, Maharaj (2013: 4) has calculated a further increase to some 53,000 people employed in activities directly serving the port in 2011.

Indirect employment

In terms of indirect employment impacts, Maharaj (2013) also estimates that at least 50,000 jobs in other port-dependent sectors are located in the eThekwini metropolitan area (EMA) purely to benefit from proximity to the port. Given that the EMA was host to some 150,000 jobs in the manufacturing sector,

66,000 jobs in the transport, storage and communication sectors, and 18,000 jobs in the agricultural sector in 2011,[7] and that these sectors are significant freight generators, this is a relatively conservative estimate.

Combining the two kinds of estimate yields at least 103,000 jobs in the EMA in 2011. Considering that the EMA labour market comprised around 1 million jobs in 2011, one could roughly estimate that, at very least, some 10% of Durban's total employment is most likely dependent on the presence of the port, directly or indirectly.

Employment generated by expansion

It has been suggested that expansions to Durban's capacity are significant generators of employment, both in the capital expenditure and operational phases. In 2008, for example, Conningarth Economists and the Economic Development Unit of the eThekwini municipality used the eThekwini Social Accounting Matrix to estimate employment impacts of new terminal expansions into the Bayhead area. Although plans for these expansions were eventually ruled out due to the severity of anticipated environmental impacts, the hypothetical exercise does provide some perspective on the potential role that the port can play in the eThekwini labour market. The model predicted that construction of new terminals in the Bayhead area would create an extra 9,000 annual direct employment opportunities, in addition to 3,000 indirect and induced jobs created in the construction industry. In addition to this temporary employment derived from capital expenditure, the model also predicts increases in direct and induced employment as a result of expanded operations, estimated at 19,000 and 18,000 respectively. Similar predictions have been made with regard to the construction of a new port at the site of the former Durban International Airport. One can conclude from these various estimates that the port is a significant contributor to the metropolitan labour market.

Port-related value added

As South Africa's busiest port, Durban contributes not only to the economy of the metropolitan region but also to that of the country as a whole, facilitating a considerable portion of its trade activity. Recent studies have illustrated that investments and cost reductions in the South African ports significantly increase import and export activities, contributing to the national value added. Moreover, the eThekwini Metropolitan Area (EMA) benefits from increases in demand for port cluster services, and from the port's role as magnet for high value-added industries.

National impacts

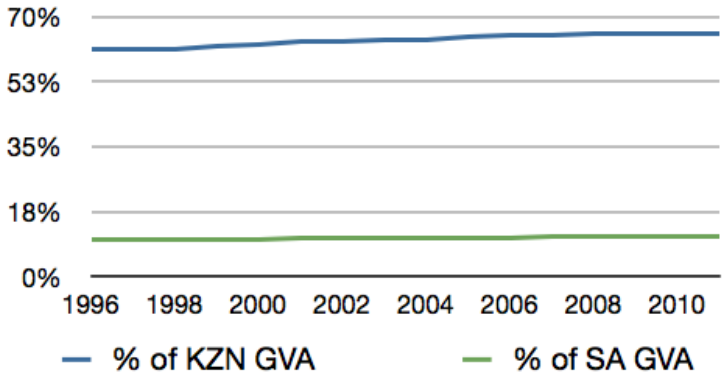
Investments into the South African ports sector have been estimated to produce significant increases in national value-added. Lee et al. (2012) have used a Computed General Equilibrium (GCE) model to analyse the economy-wide impacts of port development in South Africa. According to their analysis, which employs base data from 2002 integrated into the Global Trade Analysis Project, investments into the port industry significantly increase the output of at least five port-related branches of the economy. A four billion rand investment is found to generate additional value-added by a factor of 0.91% in the maritime transport sector, 0.65% for firms selling transport equipment, 0.58% for the construction sector, and 0.22% for both transport service and trade (Lee et al. 2012: 241).

Improvements to the South African ports' KPIs are also found to contribute significantly to the national value-added. Basing their calculations on the ports of Durban and Cape Town, Lee et al. (2012) have further estimated that, by inducing significant reductions in freight costs, a 10-hour reduction in the

7. Estimates are derived from the Quantec database figures quoted in in ETA (2013), and include figures for both formal and informal employment.

wait time per ship in the South African ports system would increase real GDP by 0.20%, and value-added by 0.10%. Their model further predicts an increase in the total value of trade by 0.32%, the majority of which is felt in South Africa's export-related sectors. The eThekwini Municipal Area is one of the key contributors to the regional and national economy. While it was home to only 6.6% of the national population in 2011, since at least the mid-1990s the EMA has contributed around 10% of South Africa's total GVA, and around 65% of the KwaZulu-Natal regional GVA.

Figure 2.1 **Contribution of the eThekwini municipal area to the national and regional gross value added**



Source: KZN treasury reported in ETA (2013)

Table 2.1 **Sectoral breakdown of GVA in South Africa and eThekwini municipal area in 2011 (R '000)**

Constant 2005 prices	SA	%	EMA	%
Agriculture	41,552,990	2.5	2,048,139	1.1
Mining	99,415,001	5.9	255,257	0.1
Manufacturing	289,015,002	17.1	39,471,812	21.7
Electricity	34,749,000	2.1	4,078,338	2.2
Construction	58,241,000	3.4	5,921,786	3.2
Trade	234,630,001	13.9	30,006,334	16.5
Transport	172,733,001	10.2	28,742,462	15.8
Finance	400,382,002	23.7	40,683,730	22.3
Community services	362,006,002	21.4	31,016,888	17
Total	1,692,723,999		182,224,746	

Source: KZN treasury reported in ETA (2013)

Metropolitan Impacts of the Durban Maritime Cluster

Much of this value-added contribution is derived from economic activities linked to the port. By virtue of its large manufacturing sector, whose 21.7% share in the metropolitan GVA was 4.6 percentage points greater than the national average in 2011, the eThekwini economy has developed a number of backwards linkages with the port. The automotive and petro-chemical sub-sectors in particular constitute major freight generating clusters within the EMA manufacturing park. The area of Prospection, to the south of the former Durban International Airport, is host to the Toyota South Africa manufacturing facility, South Africa's largest automobile assembly plant. At 79-hectares, the plant alone employs some 8,500 workers directly, and is the main client of over fifty automobile component suppliers in the KZN region (KZN 2012). This strong manufacturing base, combined with high freight-generation from firms in the agriculture, forestry, and mining sectors, has given rise to a diversified and thriving maritime cluster,

which comprised around 2000 firms in 2007 (Van Coller et al. 2007). Table 2.2 represents the number of firms in the eThekwini maritime cluster by sector and sub-sector.

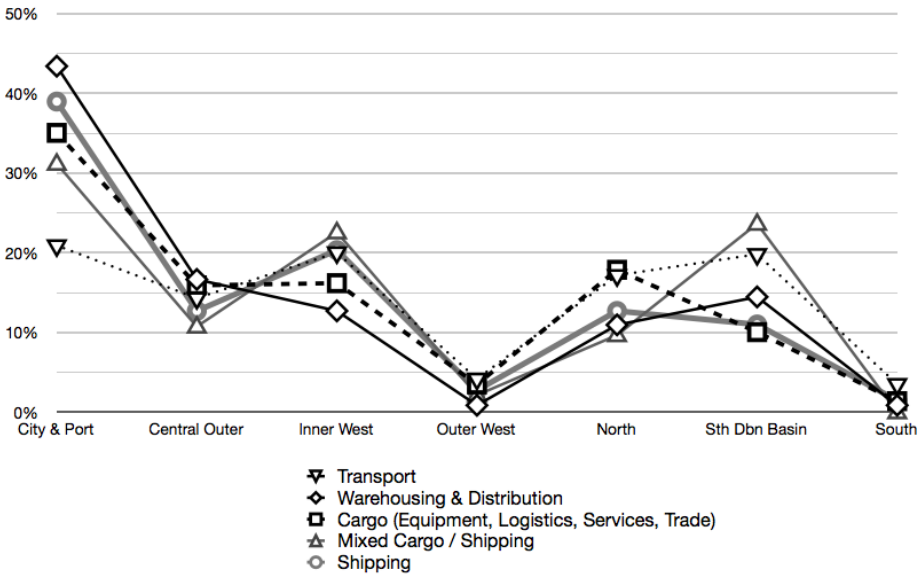
Table 2.2 **Firms in the eThekwini maritime cluster by sector and sub-sector, 2007**

BUSINESS CATEGORY	TOTAL	%
1. CARGO / LOGISTICS		
- Transport	454	23%
- Cargo Handling Equipment	106	5%
- Cargo Logistics	86	4%
- Cargo Services	248	13%
- Cargo Trade	276	14%
- Warehousing & Distribution	228	12%
Sub-Total	1398	71%
2. MIXED CARGO/SHIPPING		
- Harbours, Ports & Railways	8	0%
- Marine Services & Supplies	85	4%
Sub-Total	93	5%
3. SHIPPING		
- Shipping Companies & Operators	116	6%
- Boating & Fishing	110	6%
- Ship Engineering & Repairs	120	6%
- Shipping Services	126	6%
Sub-Total	472	24%
GRAND TOTAL	**1963**	100%

Source: Van Coller et al. 2007. Estimates are based on the Brabys database of South African enterprises, which is thought to cover 75-80% of firms.

The majority of firms in the EMA maritime cluster are involved in transport and various aspects of cargo distribution, including warehousing. The study cited above further describes spread of activities for some of the more important sub-sectors of the maritime cluster. The transport and logistics sub-sector, for example, is occupied primarily with logistics services, cartage contracting and clearing / forwarding activities (21.7%, 21.7% and 20.0% respectively), with a significant number of firms working in long distance carrying (16.7%) and as cargo agents (16.%). The spatial distribution of the eThekwini maritime cluster is as follows (Figure 2.2).

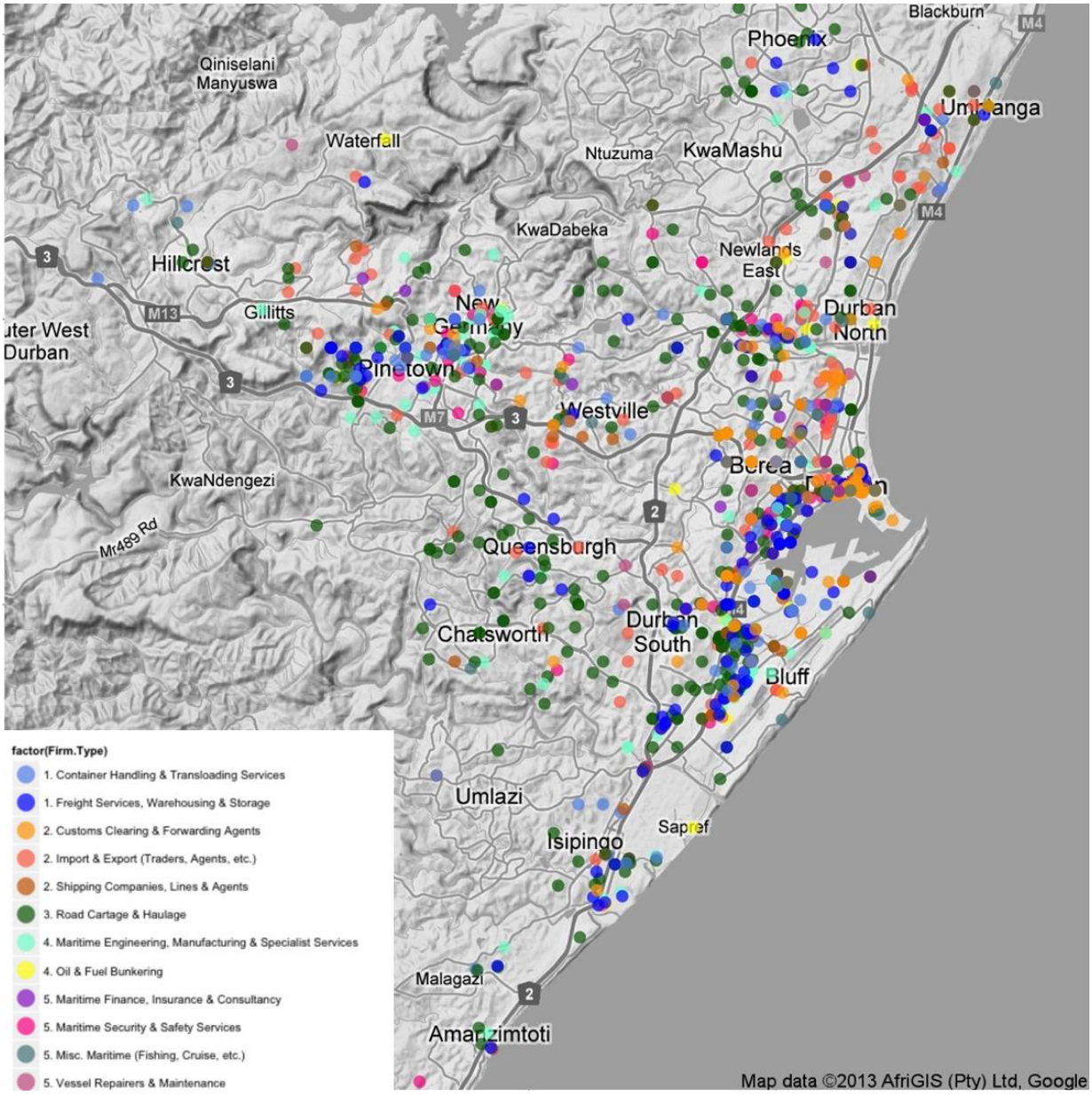
Figure 2.2 **The spatial concentration of the EMA maritime cluster by sector**



Source: Brabys data reported in Van Coller et al. 2007.

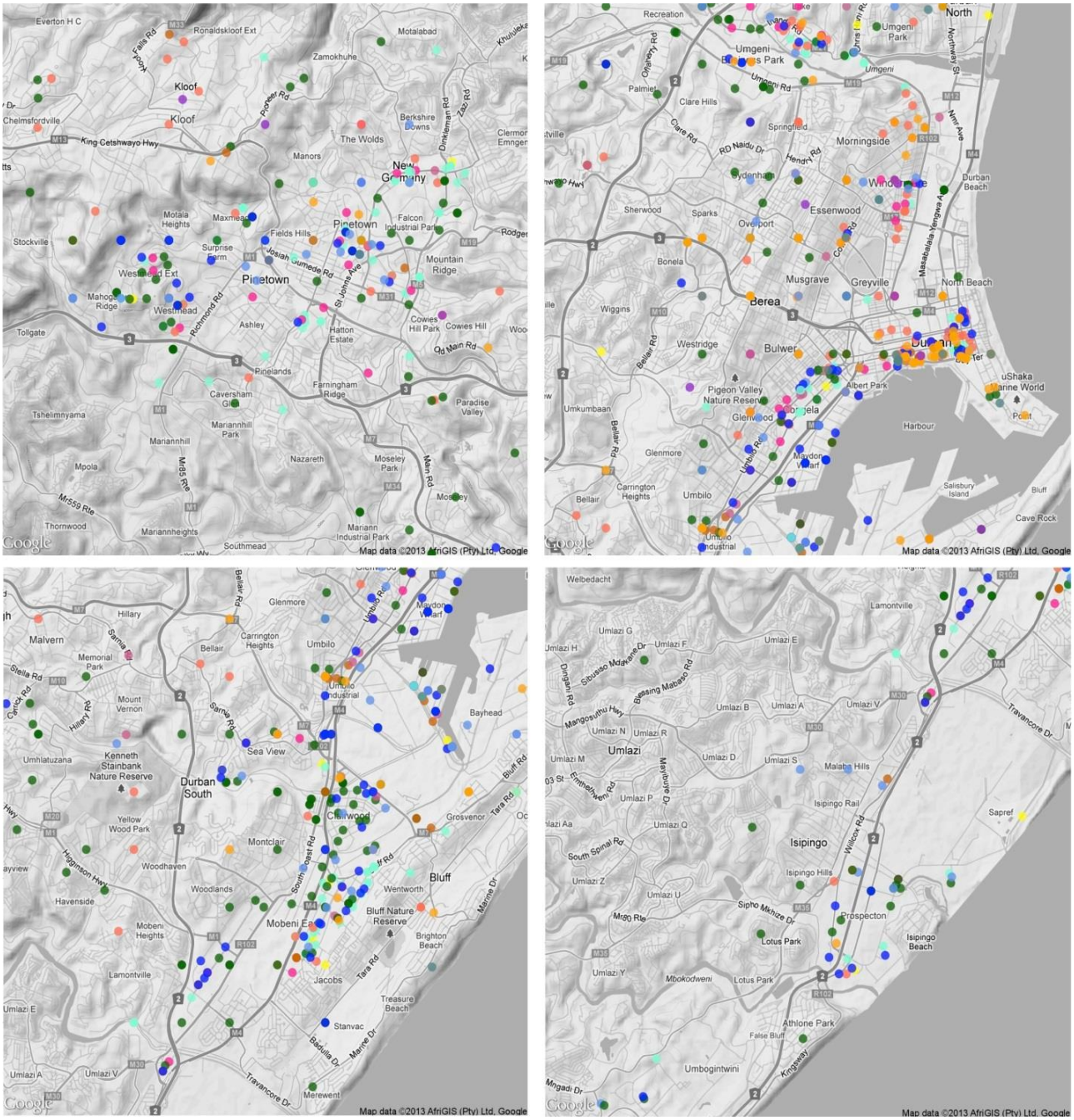
As illustrated on Figure 2.3, with the exception of the transport firms, the majority of the EMA maritime cluster is concentrated in the city-centre and port areas, in which almost half of all EMA warehouse and distribution companies are located. The centripetal pressures of the port thus appear to concentrate significant port-related value-added activity within the central areas of the EMA. Further, it is also worth noting that the South Durban Basin is a major manufacturing zone and well-connected to the port due to its location directly behind the main container terminals, and that this potential for backward and forward linking appears to have resulted in significant clustering of maritime firms in this area. The following spatial analysis (Figure 2.4) provides a more fine-grained picture of clustering effects among port-related firms in the Durban metropolitan economy.

Figure 2.3 **Port-related economic clusters in the eThekwini metropolitan area (2007)**



Source: Brabys 2007 and Google 2013. N: 1588.

Figure 2.4 **Port-related economic clusters in (clockwise) North-West Durban, the CBD, Isipingo industrial area, and the back of port (South Durban Basin) 2007**



Source: Brabys 2007 and Google 2013. N: 1588

As illustrated, a co-dependent spatial economy of port-related firms thrives within the eThekwini metropolitan area. The back of port area concentrates mainly transloading and road haulage firms, probably with the highest concentrations in all of Durban. As a general rule, warehouse and road haulage firms tend to cluster together, which is reflective of the economies of scale generated through spatial proximity. However, this analysis also illustrates the decentralisation of the eThekwini hinterland freight transport system: many road haulage firms are dispersed along the arterial corridors, often where land is in lower demand. The point and CBD areas are home to the majority of customs and clearing services, while also exhibiting significant concentrations of freight services, shippers and import and export firms. It is also worth noting that significant clusters of port-related manufacturing (cranes, forklifts, etc.) are located in the in the New Germany and Pinetown areas, which also seem to have attracted ex-urban warehouse and road haulage firms, constituting a small decentralised distribution hub at the limits of the metropolitan area. Finally, the Umgeni business park seems to host a mix of port services, including a number of import-export agents.

The impact of the port on local spending

The presence of the port provides for significant injections of capital into the local economy. By providing an approximate measure of annual direct expenditure within the port, the spending profiles presented below help to further understand its contribution to the metropolitan economy. They describe average expenditure for three kinds of port call: an average container vessel that moves 900-1000 TEUs; a multi-purpose cargo ship that handles 12-15,000 tons of break bulk; and an average bunker call. Expenditure is calculated on the base of 2006 rates for container and bulk, 2005 estimates for bunker calls, and interviews conducted by Transnet and eThekwini municipality with actors in port-ancillary services.[8] These estimates of expenditure are not exhaustive: because they are restricted to port-ancillary services and are conservatively estimated, they most probably underestimate the average expenditure per vessel in the port. They do not include multiplier effects, or the spending of Ro-Ro and liquid bulk vessels.

8. All estimates calculated herein are based on data presented in GMA 2009: 48-50 and Van Coller et al. 2007: 14.

Table 2.3 **Expenditure per vessel call in Durban (2005-2006)**

	Container vessel		*Multi-Purpose / Break-Bulk*			*Bunker caller*	
Item/Service	**Expenditure - Rands**	**%**	**Expenditure - Rands**	**%**	**Item/service**	**Expenditure - Rands**	**% total**
DoT – SAMSA	-	-	4,000	0.2	**Port dues**	7,569	0.6
Ships Agency	33,000	1.3	13,265	0.8	**Light dues**	7,600	0.6
Ship Chandlers	45,000	1.8	45,000	2.6	**SAMSA levy**	3,699	0.3
Ship repair services	77,000	3.2	77,000	4.4	**Vessel Tracking (VTS) charges**	4,509	0.4
Clearing & Forwarding	165,000	6.6	78,000	4.5	**Pilotage**	13,977	1.1
Stevedoring & Tallying	13,300	0.5	96,500	5.5	**Tugs & towage**	30,378	2.4
NPA marine infrastructure & services	135,000	5.4	99,550	5.7	**Other NPA marine services**	5,766	0.4
Road haulage	350,000	14.1	525,000	29.9	**(Total NPA/DoT)**	*(73498)*	*(5.8)*
Bunkers & fuel	772,000	31	772,000	44	**Ships agency fees**	10,040	0.8
Terminal charges (SAPO)*	675,000	27.1	*(150,000)*	*(8.1)*	**Crew transfers**	2,148	0.2
Terminal charges (Private leasehold)	-	-	*(42,000)*	*(2.4)*	**Medical**	536	-
Rail charges	100,000	4	-	-	**Communications expenses**	2,110	0.2
Container depots, logistics etc	125,000	5	-	-	**Miscellaneous vessel husbandry3**	934	0.1
					Banking & finance	415	-
					Ship chandlers	56,250	4.4
					Ship repairs	-	-
					Bunkers & fuel	1,133,382	88.5
Total expenditure per call at private leasehold Terminal	-	-	*1,752,315*	100	**Total Private Port Ancillary**	(1205815)	(94.2)
Total expenditure per call at SAPO* terminal	2,490,300	100	*1,860,315*	100	**Total Expenditure**	1279313	100

Source: Jones 2005 Transnet & eThekwini municipality (TEMPI) quoted in GMA 2009: 48-50. * South African Port Operations, renamed Transnet Port Terminals (TPT) in 2009.

Multiplying these three spending by the number of calls made in a given year by their respective type provides a rough estimate of direct first round spending in the port cluster. This can be further expanded by a 'local economy multiplier', which attempts to calculate the indirect and induced spending in the EMA economy by wage earners in the port cluster. This type of multiplier should not be confused with a regional output multiplier, which describes the ratio of extra output that is required from producers across all sectors of an economy if demand increases in one specific sector.[9]

Jones (1997; 2005) provided some of the most broadly cited multipliers that calculate the indirect spending generated by direct spending in the port of Durban. His calculations do not rely on the typical use of input-output tables, but are instead calculated by constructing a local-economy multiplier whose contribution is increased by the marginal propensity to consume (MPC) of wage-earners in the port and by the estimated proportion of re-spending that is contained within the Durban area; it is decreased by the taxation rate.[10] On the basis of Jones' calculations, a conservative estimate for the Durban port's local economy multiplier would be equivalent to 1.7. More recently (2005) he has claimed that the local economy multiplier could in fact be as high as 2.4. Table 2.4 provides a measure for first round and indirect spending in the EMA produced by vessel calls into the port of Durban. With an estimated total direct and indirect spending proportional to 8.2%-13.7% of the EMA total gross value added for 2005, it is safe to conclude that the port is a significant contributor to the EMA economy.

Table 2.4 **Direct and indirect spending in the Durban port cluster**

Vessel type	Number of calls (A)	Average expenditure per call (B)	First round port cluster expenditure (A x B = C)	Multiplied expenditure (C x D, C x E)	
				Low-Range (Jones 1997): 1.7 (D)	High-Range (Jones 2005): 2.4 (E)
General Cargo & Bulk* (2005)	1,850	1,806,315	3,341,682,750	5,680,860,675	8,020,038,600
Container (2005)	1,214	2,490,300	3,023,224,200	5,139,481,140	7,255,738,080
Bunker caller (2004)	601	1,279,313	768,867,113	1,307,074,092.1	1,845,281,071.2
Total	4,551	5,575,928	7,133,774,063	12,127,415,907.1	17,121,057,751.2

Transloading

Transloading – not to be confused with *transhipment* – describes the act of transferring a shipment from one mode of transport to another, and is commonly referred to as 'stuffing/destuffing' and 'stripping' when describing the handling of goods transported in containers. As a gateway to the South African economy, the Durban metropolitan area plays host to a diverse and active range of transloading activities clustered around the port. Their presence within the city constitutes an important mechanism for capturing the port-generated value-added and retaining it within the eThekwini metropolitan area. Table 2.5 illustrates some of the key transloading activities taking place in the eThekwini metropolitan area.

9. Applied to ports, this kind of multiplier thus estimates the extra output that is required from sectors of the economy linked to the port through backward linkages. If the multiplier of a given port is 1.5, for example, this means that every rand of extra demand in the port will generate .5 rand supply in sectors linked to the port

10. Local-economy multiplier = $\frac{1}{1-c(1-t)r}$ Jones assumes a relatively high MPC of 0.85 (85% of the port-related wage-earner's income is used for consumption), and an average tax rate of 17% (which is relatively low), and estimates that some 60-70% of spending takes place within the EMA.

Table 2.5 **The main uses of container transloading**

Cause	Outcome
Consolidation	Transferring the contents of containers into domestic load units.
Weight compliance	Transferring the contents of heavy containers into loads meeting national or regional road weight limits. Remove the weight of the container (2.4 tons for a 20 TEU box and 4.3 tons for a 40 TEU box) and shift to a lighter load unit.
Palletizing	Placing loose (floor loaded) containerized cargo unto pallets. Adapting to local palletized load units.
Demurrage	Handing back containers to owner (maritime shipping or leasing company) by transferring its contents into another load unit.
Equipment availability	Making maritime containers available for exports and domestic containers available for imports.
Supply chain management	Terminal and transloading facility as a consolidation buffer. Delay decision to route freight to better fulfil regional demands. Perform some added value activities (packaging, labelling, final assembly, etc.)

A total of 2,698,656 TEUs were handled in the port of Durban in 2012, of which 497,285 were transhipped. This means that the majority of the remaining 2,201,371 TEUs were transported to and from the port's container terminals and between various depots and distribution centres in the hinterland. Because the current share of rail in the modal split of containers leaving the port of Durban is very low, at around 16% (averaging for the period 2007-12), and 30% for long-haul inland movements, it is likely that around 1,850,000 TEUs were moved through the immediate hinterland by truck in 2012. However, due to Durban's extensive cluster of transloading services, the number of hinterland moves should in fact be significantly multiplied.

The majority of goods landed in the port of Durban are de-stuffed through transloading activities located within the EMA, and the goods are then usually transported inland to customers in Johannesburg. This allows for the return of the containers to the shipping lines' empty container depots. Equipment availability is thereby enhanced, in that the empty maritime containers are ready to be filled for export or shipped out again as empties. There are around 36 empty container stacking sites in Durban, most of which are tightly clustered into the mainly industrial areas located directly behind the port between Maydon Wharf and Jacobs (ETA 2013). Most shipping lines pay a preferential rate for the timely demurrage of empties, which constitutes an incentive to repatriate containers as soon as possible and further helps to retain transloading activities within the eThekwini municipal area (as opposed to sending them to inland depots to customers or for transloading).

As indicated above, many incoming maritime containers are sent to depots both within Durban and inland, before being delivered to customers. This intermediary step helps to cut down on costly wait times in the stacks located within the port. It is also noteworthy that, instead of waiting for the containers to be restuffed, many distributors are now sending a significant number of empty maritime containers back to Durban from inland destinations. This is a relatively novel trend (ETA 2013), and is reflective of the growing demand for empty containers in Durban, driven by the concentration of transloading activities there.

Durban's high concentration of transloading activities, coupled with the weak share of rail in the modal split, has thus born a significant influence on container flows through the hinterland. Most maritime containers leaving the port are not directly delivered to customers, but repacked within the Durban metropolitan area. This is a significant source of value-added employment in the area. Furthermore, when one takes into account the increasing volume of empties sent from the inland to be handed in at Durban's

depots for transloading, it becomes apparent that non-transhipment maritime containers landed at the port are double or triple-handled within the Durban metropolitan area. As a result, the back of port area might indeed be handling as many as 1.2-1.5 times the volume of containers handled within the port itself (ETA 2013).

While this constitutes an important means for the city to recuperate some of the value-added activities linked to the flow of containers through the city, it is also important to note that the road infrastructure is not entirely equipped to deal with such pressures, and is frequently degraded. The intensifying logistical activity within Durban is also a significant source of congestion. Port impacts in the form of transloading activities are thus double-edged: while they undeniably constitute an important source of revenue and employment, it is important that the city effectively coordinates and plans for this intensified activity in order that the negative impacts do not outweigh the economic benefits.

Environmental and social impacts

Durban's port operations and port-related industries are generative of many of the environmental externalities typically associated with major ports around the world: transformation of local eco-systems; pollution and risk from heavy industries; emission of greenhouse gases; traffic congestion. South Africa features relatively stringent policy frameworks and instruments to mitigate such impacts. In addition to typical environmental externalities, however, Durban's truck-dependent modal split creates social and environmental problems that appear particularly elevated compared to port-cities with a greater share of rail.

Impacts Resulting from Road-Dependent Modal Split

The declining share of rail in the modal split of inland transport has not been mitigated by the institutional context. Freight logistics in Durban have historically been planned and coordinated by actors at different levels of government (national, regional and local), who work independently from one another and whose interests sometimes diverge. As the port has expanded, a lack of coordinated planning has arguably hindered development of a flexible and modern hinterland rail network, leaving the expanding use of heavy vehicles to distribute freight to continue unchecked.

By extrapolating data from 33 days of observation to a 330-day year, the eThekwini Transport Authority has estimated that some 692 million tons of goods are transported on the major road freight routes of the metropolitan area (ETA 2013: 126). It is thus unsurprising that the heavy vehicle industry is a significant source of employment and activity in the regional economy, whose growth has been spurred by the availability of low-cost trucks that have lowered barriers to entry. By providing an easy-entry, entrepreneurial form of employment, this industry can be seen to contribute positively to the lives of those living in the eThekwini metropolitan area.

However, the over reliance on the trucking industry has produced several negative impacts. The eThekwini Transport Authority has claimed, for example, that "the effects of this very extensive road freight activity on the roads of eThekwini are visible in the form of congestion, pollution, delays to commuter traffic and road damage due to lack of control of overloading" (ETA 2013: 153). Furthermore, by enabling a polycentric localization of distribution activities in various locations around the port, the trucking industry has contributed to the fragmentation of Durban's logistics cluster, to be dealt with in policies (see Chapter 3).

Coupled with Durban's 'T' shaped corridor structure, this fragmentation has led to serious congestion. Durban's metropolitan spatial development was characterized by the clustering of economic activity around the North-West corridor running parallel to the coast, and the East-West corridor that connects the

industrial basin and the port to Durban's main hinterland areas in Gauteng. On the one hand, heavy centripetal pressures from the port have centralized high-employment areas in the CBD and South Durban Basin. On the other hand, however, the legacy of apartheid planning and uneven spatial development in the north and south of the city have located cheap housing for mid- to low-skilled workers far from their places of employment in the city centre. As a result of these trends, Durban exhibits a radial transport structure that is heavily centralized, with commuter and industrial traffic competing for scarce space on the arterial corridors.

The competing sets of flows generated by such mismatches lead to significant stress on the key intersections and corridors that facilitate movement from north to south and from east to west. The mix of commuting and freight circulation creates extensive negative multiplying effects on road congestion in which each section impedes the efficiency of the others. According to analyses of Durban's back of port area conducted in 2009, significant portions of the southern coastal corridor frequently operate beyond their capacity, and consequently require expensive upkeep investments (GMA 2011a). Road damage is further exacerbated by non-compliance with heavy vehicle regulations. The eThekwini Transport Authority reported in 2013 that, due to the non-strategic location of Durban's four weighbridges (including the closure of the Durban Metro Bayhead Road weighbridge in 2010), overloading is a phenomenon that carries on with little surveillance and even less enforcement. In addition to the operation of heavy vehicles in residential areas whose roads have not been designed to support the weight of even a normally loaded truck, damage to roads and underground infrastructure is extensive.

Competing and Incompatible Land Use Patterns

Freight distributors in Durban compete for and obtain land that was originally intended for commercial and residential purposes. In residential areas into which trucking activities have infiltrated, accidents have become common. The eThekwini Transport Authority reported that heavy vehicles caused some 7,379 accidents in 2011, of which 72 resulted in fatalities and 210 in serious injuries. This presents a substantial cost on the economy, in terms of loss of skills, loss of income, medical expenses, and lost time due to resulting congestion. Perhaps the most poignant example of this issue is the residential Clairwood district, which is a residentially-zoned area located directly behind the port and surrounded on all sides by areas zoned for industrial activity. The Clairwood neighbourhood was originally founded by once-indentured Indian labourers, and was a thriving community, featuring around 60,000 residents in the 1960's (Scott & Sutherland 2009). Already in the 1950's, however, pressure from the port-related industries informally setting up activities in the area began to drive people away, and the population had already slipped to 6,000 in the 1970's, and to just over 5,000 according to the 2001 census. In response to these pressures, the Durban council had already attempted to rezone the area as an industrial zone in the 1940's, which lead to the creation of the Clairwood Ratepayer's Association in 1946. The group, which still meets on a weekly basis, successfully challenged the rezoning efforts made back then, and continues to block interface projects to this day. Just in 2007 the association successfully blocked a proposed link road from the Durban port to the DIADP site (Scott & Sutherland 2009: 52). A closer look at the zoning framework reveals the issue quite clearly. *De jure*, Clairwood is a residential area comprising some 3,500 inhabitants, but which in fact has been partially transformed into a port-centric logistics area.

Figure 2. 5 **Empirical analysis of non-residential land-use in Clairwood, 2009**



Source: GMA 2009: 31. Land use compiled by Graham Muller Associates through site-by-site visits in the area.

The areas in yellow represent properties that, whilst technically zoned for residential purposes, have since been transformed into sites for various logistics and industrial activities. Although (at the date of publication) the Clairwood district is still zoned for residential land-use purposes, its proximity to the port has made of it a prime target informal transloading, logistics and storage activities facilitated and encouraged by the road-dependent modal split. As volumes continue to grow at the port of Durban, pressures to further expand and formalize land use for logistics in Clairwood will increase. A complete or partial rezoning decision will eventually need to be reached, particularly since the function of the neighbourhood has substantially changed and the quality of life degraded.

Transformation of eco-systems

Over the past thirty years, the port of Durban has undergone several phases of development, requiring infilling, the widening and deepening of entrance channels into the port to allow for post-panamax vessels, the expansion of container terminals, and various berth upgrades. This process has left little of the Durban's Bay of Natal original geological or ecological structure intact: around 70% of the approximately 264km^2 catchment area in the Bay of Natal is industrialized. According to recent studies conducted by the municipality, port expansions have led to dramatic declines in the local biodiversity, most notably with regard to the water birds that depend on the particular habitat located in estuarine bays, but several mass fish kills have also taken place due to water pollution and the hydraulic dynamics induced by the harbour infrastructure[11], most recently in 2007 (Forbes & Demetriades 2009).This study has classified the natural habitat in Durban Bay as "severely degraded".

11. "Unfortunately the development of harbour infrastructure in Durban Bay has produced a configuration which results in poor circulation and limited water exchange along the length of the silt canal. Thus, any polluted or contaminated water brought into the bay via the aManzimnyama and uMhlatuzana canals

Nevertheless, as one of South Africa's few estuarine bays, the Bay of Durban is continues to play host to one of the only sheltered, permanently tidal sandbanks in South Africa, which is home to a diverse array of flora and fauna. The sandbar, which separates the container from the bulk cargo terminals, houses a major fish nursery that plays an important role in replenishing the stocks of local fisheries. Furthermore, some 20 hectares of mangrove forest and coastal grassland, wedged tightly between the container terminals of the port, compose the Bayhead Natural Heritage Site, which is protected under Transnet's sustainability policies.

Durban Bay is one of only three South African estuaries that into the "Estuarine Bay" category, two of which contain ports. The strong marine influence, diversity of habitats, and relatively stable abiotic conditions result in this system supporting more species than almost any other estuary in South Africa. Given the strong degree of connectivity that occurs in the aquatic environment, a change to one of these areas can have far reaching regional consequences. Allan et al. (1999) have shown that relative to pristine conditions 57% of Durban bay has been in-filled. In terms of available habitat, a mere 4% of the natural shoreline area, 14% of the tidal flat area, and 3% of the mangrove areas remain. This attrition is reportedly almost entirely a consequence of port development. These factors ultimately lead the Bay of Natal: Estuary Management Plan Situation Report (ERM/MER, 2012) to conclude that the "Bay is at a tipping point and could be thrown off balance by a relatively minor 'push' in which, significantly, the loss to the ecosystem's functioning would be disproportionate to the negative impact (ERM/MER, 2012).

Environmental impacts are a considerable source of tension in the port, constituting a major operational constraint for Transnet and generating opposition to expansions amongst certain civil society groups that represent the residents of the city. Even relatively minor infrastructural expansions that are strategically necessary from a safety point of view are intensely constrained by potential impacts on these eco-systems and subject to contest. For example, the TNPA plans to undertake dredging projects at pier two in order to expand several of its berths (203-205). This is not only seen as advantageous from an economic point of view (increase in capacity and efficiency), but is necessary to the safety of workers in the port, due to present structural weaknesses in the quay wall that pose a risk of collapse (Nemai 2012). However, because the expansion of berth 205 would encroach onto the central sandbank area, which is zoned for preservation, South African regulation requires that subsequent expansions are offset by net gains in the size of the sandbank. Environmental impacts associated with the expansion of the port were in the past dealt with in a comprehensive Integrated Environmental Management process that culminated in the 1999 Record of Decision. This Record of Decision, issued by the national Department of Environmental Affairs, acknowledges the regional ecological importance of the remaining sandbanks, and requires that successful habitat recreation should be demonstrated prior to the consideration of any further development in this area. Reportedly there is little evidence to date of attempts to comply with this Record of Decision, which constrains further port development.

Greenhouse Gas Emissions

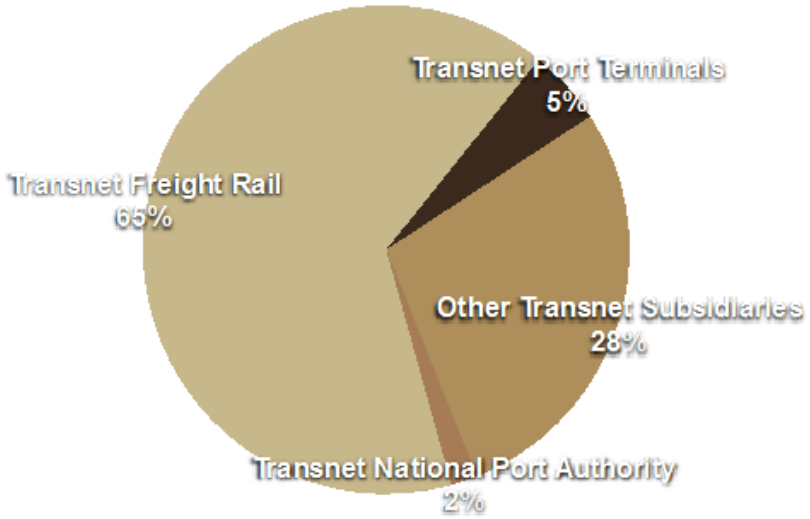
Estimating the GHG inventory of a given port is a complicated task: it requires taking into account both stationary emissions (fuel and energy consumption for cargo handling) and mobile emissions (ship arrivals and departures, hotelling and manoeuvring), in addition to the establishment of an adequate spatial scale for analysis that accounts for the various land- and sea-based in- and out-flows, including port approaches in vessel traffic service zones (Vilalba & Gemechu 2010). Such figures are not presently available for the port of Durban, and it is thus difficult to gain a clear picture of its specific contribution to

accumulates in this area and is only dissipated gradually over a number of tidal cycles." (Forbes & Demetriades 2009: 80)

greenhouse gas emissions. However, seen in a national context, it is possible to form a general idea as to the likely impact of port operations in the city of Durban.

South Africa is a major contributor to greenhouse gases, ranking 10th in the world behind South Korea in 2009 according to data compiled by the CDIAC of the US Department of Energy. In early 2012, following the publication of the National Climate Change Response White Paper by the South African Government some months earlier, the Department of Public Enterprises required the various state-owned enterprises to develop strategies for 'green growth', focusing on low-carbon trajectories. As part of such strategies, Transnet undertook carbon footprint studies in 2011 and 2012. These studies revealed that Transnet is the tenth largest emitter of greenhouse gases in South Africa, contributing 4.3 million tons of CO2 equivalent gases in 2011/12 (roughly equivalent to the total emissions of countries such as Kenya or Sri Lanka in 2009).

Figure 2.6 **Transnet direct and indirect GHG emissions 2011/12**



Source: Transnet Sustainability Report 2012. Note: Direct GHG emissions are mostly diesel-related, while indirect GHG emissions derive from grid electricity consumption, air travel and car hire.

As illustrated by figure 2.6 above, a major portion of Transnet's emissions derive from its rail operations (3.2 million tons), while some 7% (338 thousand tons) result from activities taking place within South Africa's ports. Given the importance of Durban within the South African port system (69% of all container traffic), it is reasonable to believe that its climate emissions account for a significant portion of TNPA and TPT's total. Furthermore, it is important to note that these figures do not include the mobile emissions of shipping flows, nor the emissions generated by privately-owned terminal operators (in the liquid and break-bulk sectors).

Chapter 3

Policies and Governance

The Port of Durban is at the core of the urban spatial structure and generates both positive and negative impacts for the city. In this respect, Durban is much like many other port-cities around the world facing simultaneous growth in freight traffic and in population, coupled with strong constraints on land availability around the port. In such contexts, local decision makers must seek to provide an institutional environment that is conducive to tradeoffs between port and city. Strong institutions and comprehensive policies ensure that both port and city may grow and develop in a complementary manner, optimizing the positive impacts while mitigating the negative.

The main stakeholders in Durban have initiated a process aimed at overcoming some of the port-city interface conflicts that inhibited port-city synergies in the past (centred mainly on land use and congestion), and have supported policies fostering a more cohesive governance of the port-city interface. However, certain issues stemming from the internal organization of the city (eThekwini municipality) and the port authority (Transnet National Port Authority – TNPA) impede further progress on some fronts. This is generally not helped by the broader regulatory context, in spite of the creation of new multi-stakeholder fora for port governance. Within this setting, future plans for expansion in the port of Durban, including the creation of an entirely new port at the site of the former Durban International Airport, might provide a window of opportunity for improving the institutional parameters of a port-city interface that remains at times dysfunctional.

Governance of the port-city interface

The historical absence of coordinated attempts by Transnet and the eThekwini municipality to strategically plan the provision of infrastructure has helped create a sub-optimal spatial allocation of the various links in Durban's logistical chain. The Ro-Ro facility, for example, is in the far north of the port, while the main manufacturing basin that contains the Toyota plant is in the far South of the city, requiring intensive usage of the North-South arterial by shippers in the automotive sector.

Concerning freight issues, the interactions between TNPA (formerly Portnet) and the municipality of eThekwini can be traced back about 20 years. Such relations were initially strained. While the port tended to have a perspective relying on specific infrastructure improvements, the city elected a strategy (zoning, corridor development, waterfront redevelopment) that was on more than one occasion at odds with the objectives of port. Conflicting interests would most often become apparent when the port or the city attempted to implement projects that crossed one another's jurisdictions. For instance, the municipality would use statutory mechanisms such as urban zoning regulations to constrict Transnet's plans for truck movements around the port, thereby using such regulations to force certain concessions regarding land-

uses adjacent to the port. Some port-city interface issues have proved intractable. For example, the road running the length of the port perimeter from the Ro-Ro terminal to the Maydon Wharf terminals is severely degraded through intensive truck use. Currently owned by the city, Transnet would like to acquire the specified road reserve in Maydon Wharf, however, due to the road being in poor condition, Transnet claims that heavy repairs will be necessary in order to make the sale viable, and that these are the responsibility of the city as the lawful owner of the roads. The eThekwini municipality, however, considers road damage to be the fault of Transnet's activities and refuses to undertake the necessary investments on such grounds. In the meantime, the service quality for those using the port perimeter road continues to degrade.

Towards a Coordinated Port-City Interface

Such tensions provided growing momentum for a new approach to port-city relations. Coupled with a change in leadership, this impetus was institutionalized through the signature of a Memorandum of Understanding (MOU) between Transnet and eThekwini municipality in 2003, which gave rise to what is now known as the Transnet and eThekwini Municipality Planning Initiative (TEMPI). The MOU[12] establishes a 'Port-City Forum', whose purpose is to "develop a sustainable and pro-active planning and co-operative framework between the National Ports Authority (Port of Durban) and the eThekwini Municipality." The MOU intends for the forum to foster constructive engagement concerning matters that collectively affect the port and the city, and attempts to overcome previous information asymmetries by stressing the need to "identify and disclose planning initiatives and development projects of mutual interest between the Port and the City".

The Port Forum comprises three sub-committees that fulfil separate joint-steering functions. The Strategic Leadership Committee, chaired by the eThekwini Mayor, meets once a year with national and provincial stakeholders to deliberate on a host of priority matters, including the sharing of strategic information, the creation and review of joint investment plans, the identification of key projects, and the scheduling of the annual programme. The Management Committee is chaired jointly by the City Manager and the Port Manager, and meets on a quarterly basis to deliberate on resource allocation for projects and the implementation of programmes and plans drawn up by the Strategic Leadership Committee. Finally, the projects Committee, chaired jointly by the Manager of the TNPA Planning and Development division and the Head of the eThekwini Economic Development and Facilitation division meets on a monthly basis. Its purpose is to manage projects, set up work teams, and generally implement any other task assigned by the Management Committee.

A further stage of cooperation started when, in 2005, the Transnet National Ports Authority shared its Port Development Framework with the city as a preliminary basis for discussions. Many points were raised, including discussion of congestion, city planning requirements, and the possibility of waterfront redevelopment in the Point precinct. This laid the groundwork for the first phase of the TEMPI project, later in 2005. Throughout the first decade of the 2000's, as Durban increasingly faced throughput inefficiencies related to congestion inside and outside of the port perimeter, it became increasingly clear to Transnet that massive increases in capacity would be necessary to keep the port competitive. This of course meant that land would have to be provided from somewhere within the eThekwini metropolitan area, and that an appropriate spatial framework for the hinterland would have to be planned. Furthermore, as the Department of Transport began to seriously discuss the attribution of investment capital for expansion projects in Richards Bay over Durban, the reality that Durban might one day lose its status as South Africa's central container port, and with it, a significant portion of the economic activity concentrated in

12. Signed by the Durban City Manager, Michael Sutcliffe, and Basil Ndlovu, a Transnet National Ports Authority representative.

the EMA, gradually became clearer to the city (e.g. the Ngqura transhipment port project). These processes helped to heighten the awareness of the port and city's interdependence.

The first phase of the TEMPI thus gave rise to some of the first joint positions adopted by both the Port and the City. Among these positions were the assertions that: the port should expand sustainably in such a way as to harmonize national and local interests; expansion was a necessary corollary of keeping the port of Durban South Africa's premier port; expansion should run ahead of demand; containers will be the key commodity to be fostered, although diversity of port activities should be retained; and Environmental Impact Assessment (EIA) was to be used to plan future port layouts, and should include economic, social and environmental dimensions. A final point of accord to arise from this phase of the TEMPI negotiations concerned the Durban International Airport, where operations were to be discontinued in 2010 in favour of the new King Shaka International Airport to coincide with the FIFA World Cup. This constituted a major window of opportunity for the Port and the City, as it freed up a substantial amount of land in an area that was prime for brownfield development. Pressure from speculative developers constituted a catalyst for more joint action under the TEMPI framework, and in 2010 eThekwini and Transnet published their ambitious 2050 Vision for a long-term development of the Durban to Gauteng Freight Corridor. In acknowledgement of the looming 2019 deadline for peak capacity in the port of Durban, the 2050 Vision sets out an integrated framework for the development of a new digout port at the former Durban International Airport site, and the provision of an extensive road and rail corridor between Durban and the Gauteng area (these projects are described in detail below). As such, these projects form in a certain way the expression to factor in economic priorities of key metropolitan areas as fundamental to the national economic agenda, as ways to increase global connectivity and production.

Multiple Stakeholder Port Governance Instruments

In addition to the partnership mechanisms put into place by the port (TNPA) and the city (eThekwini), several multi-actor governance mechanisms have been set up by various actors to ensure that the interests of different stakeholders in the port of Durban are properly represented in decisions and plans affecting the entire port community. Some of these are statutory, others are ad hoc or project-based. Initiatives for better governing the port of Durban have cropped up at local and national levels of government, and originate from both the private and public sectors.

The National Ports Act of 2005 establishes two main mechanisms for stakeholder representation related to port planning and development: the port consultative committees (PCCs) and the national port consultative committee (NPCC). Each port in South Africa has its own PCC, whose outlines were set out in section 81 of the act, and further substantiated two years later by the Minister of Transport. The two main purposes of the port-level PCCs are "to provide a forum for the exchange of views between the Authority and other interested parties", on the one hand, and to "advise the Minister" of Transport on important matters related to the given port, on the other (NPA 2005). Over and above these two founding principles, the port-level PCCs play several roles as key fora for coordinating interests at the local level. They have come to play such a role mainly due to their organizational rules. For example, the port authority (TNPA) must consult any major development plans through the PCC before proceeding to implementation. This is inevitably a complicated process, as the ministerial regulations set out in 2007 require that comments to the minister and any major decisions be approved through plenary consensus. All members of the PCC (Table 3.1) thus constitute veto players in port development decisions.

Table 3.1 **The composition of Port Consultative Committees (PCCs) in South Africa**

	# of votes					
	TNPA (representative + harbour master)	Port Users	Provincial Government (KZN)	Local Government (eThekwini)	Organized Labour	Maritime safety authority
2005 Ports Act	3	3	2	2	2	1
2007 DoT reform	2	2	1	1	1	1

Before any major development in the port of Durban can take place, TNPA must consult with the members of the local PCC, a quorum composed of government bodies from local and regional levels, labour, and the private port-user community (all of whom are appointed by the Minister of Transport). The role and function of the PCC is defined by the National Port Act (2005), which is "to provide a forum for the exchange of views between the Port Authority and any other interested parties and to advise the Minister of Transport or duly appointed representative". In cases of deadlock on views to the Port Authority, any other interested party and advising the Minister of Transport, the deciding vote resides with the chairperson of the PCC. According to the stakeholders interviewed for this study, the PCCs are often used as a forum for airing disputes between actors. The advantage of this process is that disputes between major stakeholders can be resolved within the institutional forum of the PCC, thus avoiding the need for litigation or drawn-out industrial disputes (PR 2012: 40). However, the functioning of certain PCCs appears sometimes to be jeopardized by this informal role as dispute resolution mechanism. This is less the case for PCCs such as Ngqura, which works relatively smoothly due to the low constraints on land availability and the broad coalition of interests around the attraction of container flows. In Durban, however, it would appear that the PCC is an expression of the more adversarial relations. The National Port Consultative Committee (NPCC) plays a similar role to the PCCs, in that it acts both as a relay between the minister and key port stakeholders. As its composition indicates, however its role is to coordinate interests at a higher, national level (Table 14).

Table 3.2 **The composition of National Port Consultative Committee (NPCC) in South Africa**

	Representatives of PCCs	Representatives of national government departments	National Port Users Forum	Organized labour	TNPA
2005 Ports Act	9	4	1	1	2

Because the NPCC represents interests at a national level, it is a key mechanism for oversight over major issues in the ports sector such as tariffs. When the TNPA applied for an increase of its tariffs by a factor of 18.06% in 2012, for example, the NPCC functioned as a forum for the stakeholder engagement process that was taken into account by the Ports Regulator in its process of tariff approval. As a result of this process, the TNPA was awarded only 2.76% by the Ports Regulator, and only on the condition of a rebate to manufacturing exporters in the port. This stakeholder engagement process included input not only from those who operate from within the ports sector, but also from representatives of the national departments likewise affected by Transnet's tariff decisions (PR 2012; Transnet 2012b).

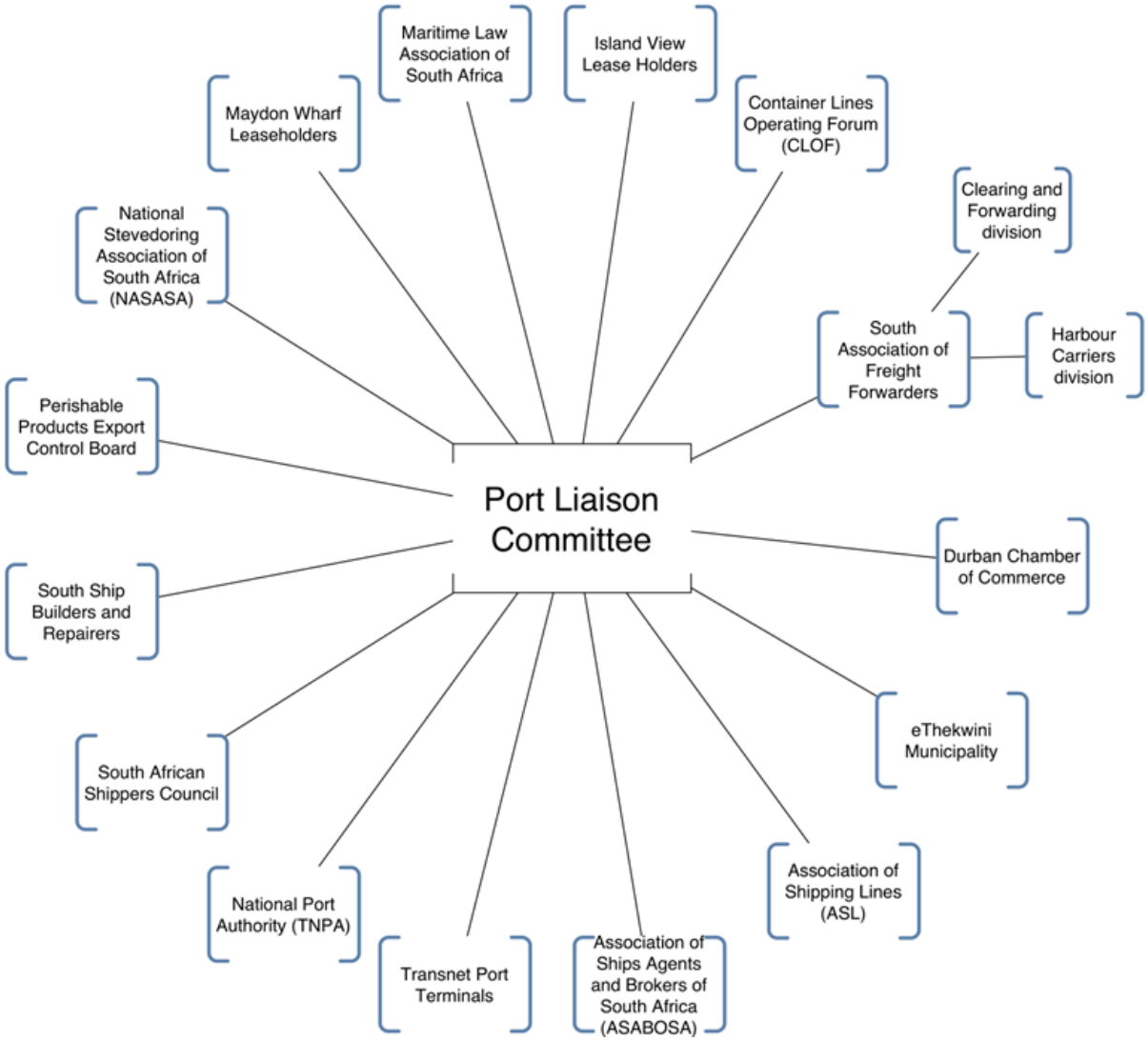
Generally the NPCC / PCC structure of consultation appears to work well as a mechanism for incorporating stakeholder interests into major decisions, for sharing information amongst ports, and as a first venue for non-legal dispute resolution between stakeholders. Complaints brought against it usually centre on the procedures in place for informing the Minister of a given issue that arises in the PCC. The

PCC constitutes the only avenue for direct representation of public interests at the ministerial level, but it is one that requires consensus amongst actors that are often at odds with one another. As a result, not all complaints reach higher levels of authority. In the eyes of certain local stakeholders in the port of Durban, the PCC thus does not function well as a tool for representing the interests of those who do not have direct ministerial access.

Private led port governance mechanisms

In addition to these statutory mechanisms for improving stakeholder engagement in the South African ports sector, various local level forms of representation and consultation exist in Durban. In 2005, the Durban Chamber of Commerce created the Durban Port Liaison Committee (DPLC). The DPLC brings together top-level representatives from the main industry groups involved in the South African ports sector, including public and private actors. Unlike the PCC, it does not hold any executive functions. This, however, allows it to represent a much broader spectrum of interests in the local port community (Figure 3.1)

Figure 3.1 .**Actors involved in the Durban Port Liaison Committee**



Source: OECD/ITF

The three main functions of the DPLC involve the resolution of operational issues within the port, liaison with the port authorities, and acting as interface between local commerce and industry (DCC 2005). Furthermore, the DPLC is reputed to have played a significant role in providing input into the TEMPI framework during the formulation of proposals and plans for the Gauteng corridor and 2050 vision. While the committee was very active in its early phases, having succeeded in addressing a number of port issues through regular monthly meetings (van Coller et al. 2007), current committee members report that it has lost some of its initial momentum. Of particular concern is the repeated absence of Transnet representatives, according to private stakeholders interviewed for this study.

More generally, private port users in the city of Durban have highlighted several recurring concerns. These include frequent delays with incoming shipments, serious spatial constraints, a lack of investment into basic infrastructure in privately-owned terminals, serious issues with cranes and wind, inaccurately operated weighbridges, the presence of corruption, slow turnaround times by container trucks, and various other issues (reported in this study and ETA 2013). In areas of the port where privately-held leases are more prevalent, the DPLC and PCC structures have not been sufficient to resolve many of these issues. As a way of better resolving some of them, the private leaseholders of the Maydon Wharf terminals have proposed a form of private-led port management. The key idea is to set up a form of tenant-driven governance structure within the confines of the terminal complex as a way of improving security, infrastructure and operational efficiency. The proposed governance structure would involve a joint company created by Maydon wharf operators, composed of a board of directors (one per tenant), an elected CEO and independent chairperson, and a TNPA representative with veto powers concerning certain matters. Votes would be allotted in proportion to occupied land areas, and special levies would be exercised as a way of funding capital expenditure projects. While such private-led governance projects may provide a temporary solution to some of the direct operational issues confronting the port community in Durban, it would appear that ad hoc and private-led initiatives will not be sufficient to resolve some of the underlying issues that structure interactions between the various stakeholders in the South African ports sector.

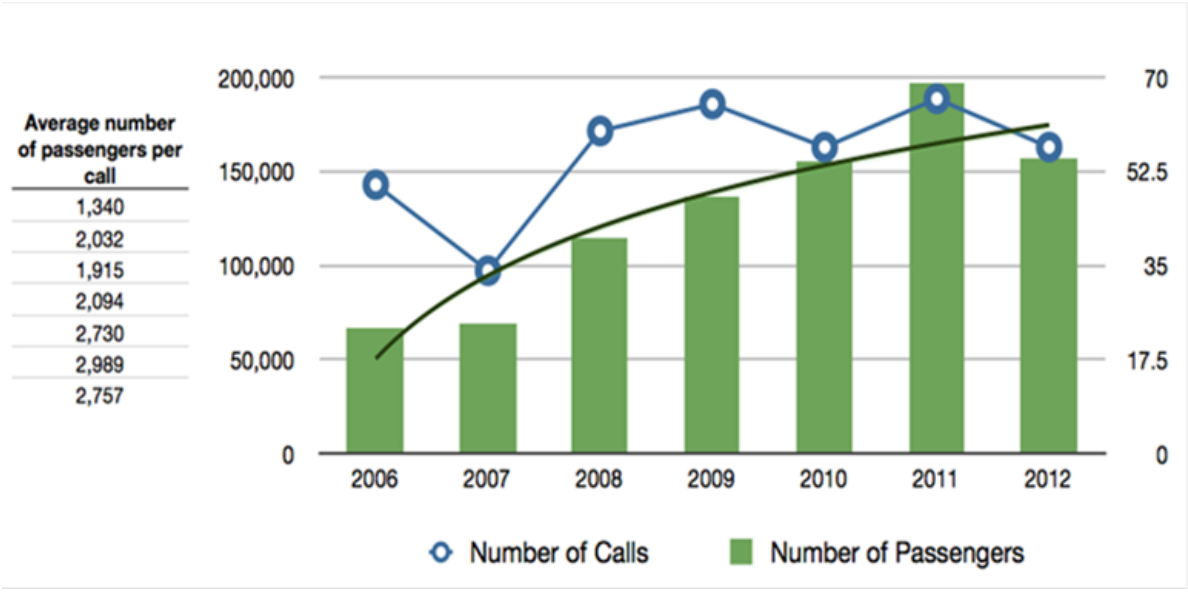
Through the TEMPI framework and the institutional mechanisms set in place by the MOU signed in 2003, the eThekwini municipality and Transnet have been able to make lasting and significant steps towards a more harmonious and coordinated approach to governance of the port-city interface. Moreover, several statutory and ad hoc fora exist within the port of Durban institutional context in order to ensure that interests are represented and policies aligned. Nevertheless, numerous issues linger. Most of these can be traced to the two main actors in the Durban port-city system: the port authority and the city. Box 4 illustrates, for example, how the conflicting visions for land use in waterfront areas held by these two actors continue to impede a potential source of tradeoffs.

Box 3.1 **The Potential for Waterfront Trade-offs to Resolve Land Use Conflicts**

Although its port is set squarely within the urban fabric, Durban presently has no real portside waterfront to speak of, in the sense of an accessible area of the harbor used for recreational, residential or retail activities, which is functionally integrated with the rest of the city. Many cities faced with impacts induced by proximity to a working port similar to the impacts presently faced by Durban have been able to reach trade-offs with their respective port-authorities: in exchange for expansion or relocation of the port activities to more amenable areas, often made available by the city, active or formerly active sections of the port are converted into mixed-use urban areas (examples range from Baltimore, to Kobe, Auckland and Barcelona. See: Breen & Rigby 1994; Bruttomesso 2001; Hoyle 1997). While the eThekwini municipality has expressed the desire to pursue the development of a portside waterfront (in addition to present seaside developments), available evidence casts doubt on the mechanism of waterfront tradeoff as a way of improving interface synergies in the city of Durban.

In Durban, the key area that is perceived to hold potential for waterfront revitalization by the eThekwini municipality is in the Point area. In the city's view, three factors should make the berths surrounding the cruise

terminal ripe for private or municipal developments that are open to the public. First of all, the areas to the northwest feature several degraded and abandoned heritage buildings that are prime candidates for high value-added revitalization. Already some R1.8 billion has been committed to mixed-use developments in the Point area by Lauresco Developments, a private development company affiliated with the eThekwini municipality through the public-private partnerships set up by the Durban Investment and promotion Agency. Secondly, the point area features a cruise terminal: the role of cruise terminals in driving urban development, particularly through public private partnerships, has been illustrated in many port cities around the world since the 1990's (Mcarthy & Romein 2012). The number of cruise passengers has noticeably increased in Durban in recent years. Thirdly and finally, the phasing of the digout port project includes the relocation of the RORO terminal from its present location in the point area to the new location in the digout port (see figure below). The city sees this as an opportunity to obtain the land previously used for the automobile terminal from the port, which would help to provide the urban access to the harbor that is presently lacking.

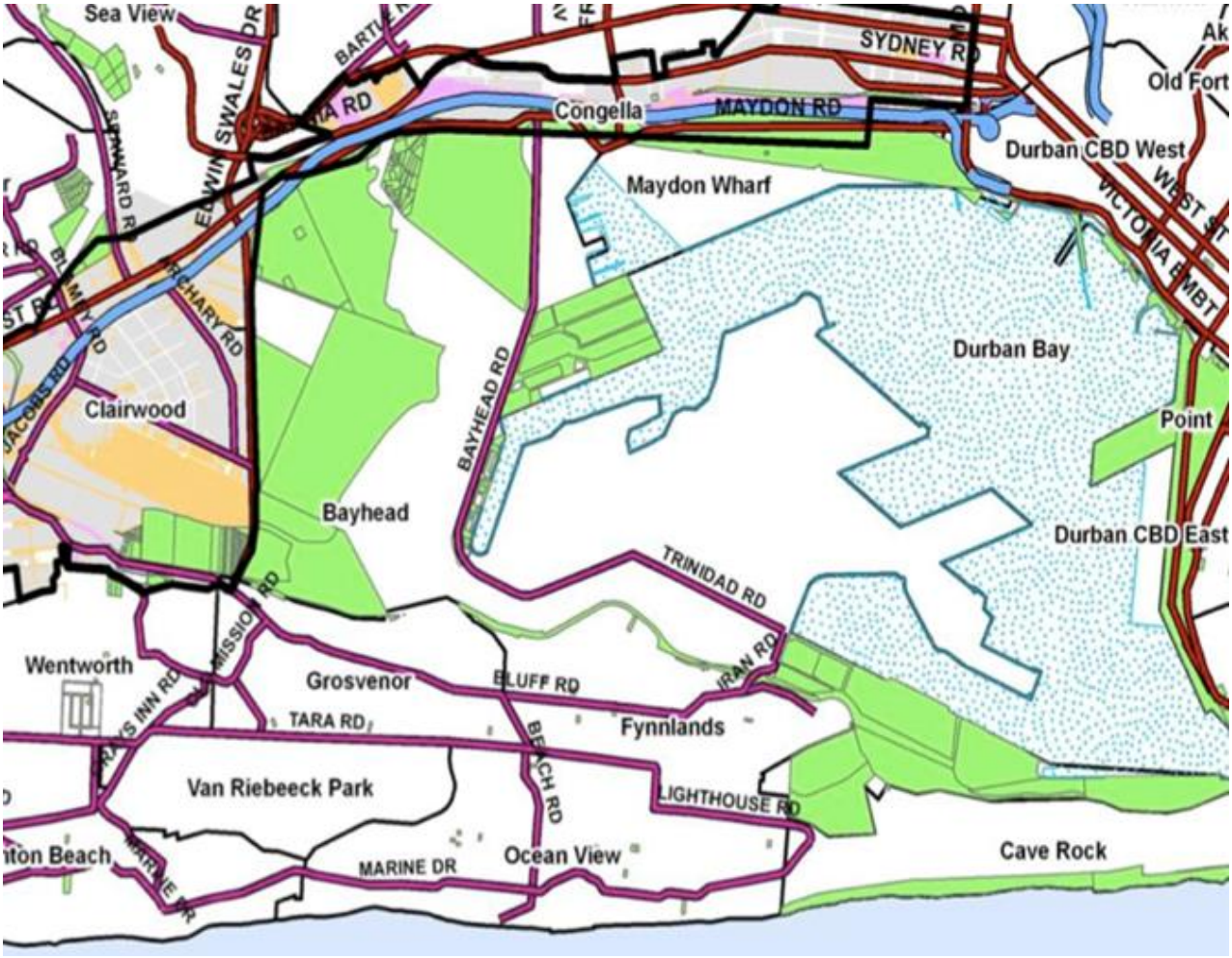


Note: Number of calls plotted on right, number of passengers on left. *Source: TNPA 2013*

A municipally piloted redevelopment project integrating harbor-side land might arguably bring certain benefits: increased revenues to the local retail and hospitality sectors from cruise passengers and local harbor-goers; increase in property values in the Point area, with the revenues for Transnet that would follow from the asset sales; improved access to the harbor increasing Durbanites' inclusion in and support for the activities of the port, etc. Such developments might thus contribute to ameliorating what is presently a relatively disjointed port-city interface.

Durban, however, presently lacks at least three factors that have driven waterfront tradeoffs in other port-cities of the world: port / city interest alignment; low-value areas owned by the port; areas of high-value to the port owned by the city. First of all, given that the port authorities are not municipally owned to any extent, TNPA considers economic and social benefits that accrue to the city as external. Secondly, Transnet has recently invested into the berth infrastructure and terminal superstructure of the Point area, raising the issue of recent sunken costs. Estimates by Transnet staff interviewed for the present report put the likely replacement costs of the Point area berths somewhere in the vicinity of R25,000 per square meter, which would situate the cost of any potential acquisition by municipal or private developers into a prohibitively expensive range. Lastly, the city does own a fairly limited amount of non-port land that it could trade for waterfront areas: most of the strategically located land is already owned by TNPA or by another subsidiary of Transnet. Transnet owns a controlling stake in Point Waterfront Realty Ltd., for example, a major real estate owner in the Point area (Transnet 2012b). On the other hand, the city owns land of the Clairwood Bulk Market, which might be of interest to Transnet, and has also leverage on urban land use via its back-of-port-plan. All in all however, the financial interests of the city are not completely aligned with those of the port authority in matters concerning the port-city interface.

Another fundamental element preventing reconversion if the site constraint of the port itself. Durban is a protected bay which is almost entirely occupied by port activities. Until the digout port is built, there are no other nearby suitable sites for the expansion port activities. This is different from many ports around the world that abandoned old terminal sites less suitable for port activities towards new peripheral sites providing more real estate and better road infrastructure. With the expectations of ongoing growth in port traffic and the uncertainties of the digout project, it is reasonable to expect that the port authority wishes to keep all the available real estate under its control. This gives the option of further intensification of terminal activities or their redevelopment to other port uses. Any transfer of port land to urban uses can thus be considered as a risk in the expansion of port trade in Durban and this represents a national strategic commercial issue.



Notes: Green areas owned by Transnet, pink by other state-owned companies, and orange by eThekwini municipality. Transnet owns most land within the port perimeter. Source: GMA & Lyer 2011a: 83.

Waterfront tradeoffs have usually taken place in port-cities where either: the Port Authority exhibits a degree of municipal ownership, meaning that waterfront development gains accrue to both sets of stakeholders; the port areas in question have lost their productive value due to inactivity or lack of upkeep; or, the city owns land that is coveted by the port, which it can 'exchange'. In such contexts, waterfront tradeoffs are much easier to negotiate, whereas in Durban, port-land gained by the city is viewed exclusively as a net loss for the PA. Durban's institutional, geographic and economic specificities mean that port-city synergies are unlikely to be achieved through waterfront tradeoffs, at least in the short to medium term. On the long term, the opening of the digout port and the further expansion of cruise activities are two salient factors that may play in favor of such a reconversion. The city's interest in stimulating public access to the waterfront is not restricted to the Point areas, described above, but could also include the Victoria Embankment (Margaret Mncadi) area, at the interface of the port and the central business district. In the view of the

city, this area could possibly be dedicated to publicly accessible waterfront developments once the digout port would have been developed and the current automotive terminal would have moved there.

At a deeper level, many of the issues that make for suboptimal governance of the port-city interface in Durban can be linked to deficiencies internal to both the port and city's organizational structures, as will be illustrated in the sections below.

Improving internal alignment within the municipality

At present, several different branches of the municipal organizational structure are involved in discussions with the relevant Transnet stakeholders. Informal discussions with both parties indicate that working relationships operate more smoothly between certain departments of the municipality than with others. The nature of such relationships does not appear to be purely determined by whether or not negative externalities exist for the department concerned. Thus, despite the clear problems of infrastructure and road damage caused by congestion and overloading of port-bound trucks, eThekwini-Transnet relationships reportedly work best between the transport and engineering departments of the city (which fall within the Human Settlements and Infrastructure cluster). Both parties report that the most tenuous relationships reside with the Development Planning, Environmental and Management Unit, in the Economic Development and Planning cluster of the municipal administration.

Such tensions usually revolve around the co-operative governance of port development framework plans formulated by Transnet. Before circulation among the broader stakeholder network (which takes place through the PCCs as described above), the TNPA must put its development plans for the port through a lengthy internal approval process, which often includes many different entities from within the broader Transnet structure. Although such review processes are seen by some as unnecessarily lengthy and complex, they do have the merit of producing alignment within Transnet with regard to its external policy positions, and thus transmit clear priorities to project partners. Such review processes do not appear to be active or effective within the municipality: it might happen that a given aspect of Transnet's plan is given approval upstream by one department of the municipality, only to be later rejected by a different department further downstream. Further, given the strong statutory mechanisms at their disposal, the Planning and Environmental departments of the municipality have a certain oversight over certain aspects of Transnet's activities within the harbour and outside of the port perimeter, along with other stakeholders, including estuarine experts, in Integrated Environmental Management processes.

The net effect of these divergences regarding Transnet's plans within the administrative structure of the eThekwini municipality is to create an incoherent and unstable environment for strategic decision-making around the port-city interface. Municipal actors also complain of a lack of 'freight expertise' on their side: much of South Africa's human capital expertise in freight and logistics is 'locked' within the Transnet structure. In recognition of these two problems in their dealings with the port (internal misalignment and knowledge asymmetry), eThekwini has recently undertaken to create a dedicated branch of its organizational structure that is devoted to relations with the port. However, it has chosen to create this structure under the aegis of the eThekwini Transport Authority (ETA). Thus, policy positions adopted by this structure would not necessarily represent those of the Environmental and Planning departments, who, as mentioned, are often engaged in the most contentious interactions with the port authorities. In order to truly resolve the issue of internal misalignment, it would thus appear necessary to create a port-specific body within the municipal administrative structure that encompasses all of the relevant departments within the municipality, and whose decisions will be binding in this regard, taking into consideration the statutory requirements and legislated processes related to other spheres of government.

Improving internal alignment within Transnet

Port / city relations are also impeded by the functional structure of the Transnet organization, which is a large state-owned agency that is composed of several branches. Transnet is subject to frequent organizational reshuffles of lower- and middle-level management, implying changes in administrators and competencies, and the need for the city, private operators and other stakeholders to rebuild frequently working relationships with local-level interlocutors. It has a commercial logic related to its operational functions. However, as a publicly owned and mandated company, it must also respond to political imperatives in assuming its role of providing economic development opportunities for South Africa. This double role is sometimes conceived by municipal actors as ambiguous.

Various stakeholders are dependent on the decisions that a Port Authority makes with regard to investment and planning within the port. For this reason, it is important that the PA is able to act efficiently and quickly to make binding decisions that send clear messages to stakeholders. The current internal organisation of TNPA within the broader Transnet structure appears to act as a hindrance to this requirement: decisions that would be made without too much delay by institutionally autonomous port authorities in other contexts are slowed down by lengthy procedures of approval that range through several different levels and departments of the Transnet structure.

To the difference of many other port authorities around the world, which usually operate according to the principles of a board-directed company with regard to investment decisions, the Transnet National Port Authority is not able to raise its own capital, neither through bond issuance nor off its own balance sheet. Rather, TNPA's turnover is recorded as part of Transnet's turnover and Transnet is subject to payment on profits; any remaining profits are transferred to its single shareholder, the Department of Public Enterprises. Transnet's and TNPA's infrastructure investments are aligned to national government policy objectives, such as those contained in the National Development Plan 2030. Funding for capital expenditure must then be approved by the shareholder and redistributed to the TNPA through phased front-end loading project planning. This means, for example, that the port authority cannot directly purchase property. Instead, plans for property acquisition must be submitted to Transnet's property acquisition unit, who will purchase the property on behalf of the TNPA. Furthermore, for investment projects in excess of 1.8 billion rand, TNPA must seek approval from the shareholder.

Stakeholders both within and without Transnet see both positive and negative aspects to this situation in which the port authority's decision-making procedures are embedded within and determined by a much broader and multi-sectoral structure. On the positive side, this ensures a relatively strong degree of policy alignment and information sharing with other policy sectors incorporated into the Transnet structure such as rail, allowing for the coordination of these two key sectors (this is less true for the road network, which is planned and developed by SANRAL, an agency exterior to Transnet). As described above, it also means that a port authority in South Africa can go above and beyond the role that a port authority would usually play, in order to align port policies with regional social and economic development policies. Finally, the lengthy processes of internal review have the added benefit of producing clear and non-contradictory external policy positions. As described above, this is decidedly not the case for the municipality, whose decision-making outcomes emanate from several independent divisions within the organisational structure, sometimes producing discordant positions.

On the other hand, stakeholders point to negative aspects of the TNPA's placement within a broader national structure. Private operators in Durban claim that the lack of delegation of decision-making to local-level actors means that they are 'afraid to stick their head out' with regard to large decisions. Instead, local-level TNPA officials are said to delay decision-making in order to avoid responsibility; because most consequential decisions require approval from the highest levels, considerable delays ensue. Furthermore, as one of the most profitable divisions of Transnet, TNPA helps to finance capital expenditure in less-

profitable divisions. While this is undoubtedly an important source of subsidy for certain strategic sectors of the South African economy, it also means that the TNPA (and TPT, for that matter) does not directly benefit from improvements in its performance. It is likely that this constitutes a disincentive to improve efficiency and invest in infrastructure. This issue of cross-subsidy has often been a strong rationale for deregulation and privatization in ports around the world.

Finally, Transnet's omnipresence within the various aspects of South African port governance arguably engenders tensions relating to its discrepant role as both operator and authority. On the one hand, Transnet is the parent company for the TNPA, whose roles include acting as landlord (port development, land lease and use management), navigation controller (regulation of rules for navigation and of security and environmental standards), and service provider of last resort (ensuring provision of all necessary facilities and services, licensing out of said services to third parties) (TNPA 2013). On the other hand, however, Transnet is also the parent company of Transnet Port Terminals, a separate operating division that is a client of the TNPA for the handling of containers, mineral bulk, automobiles, and various kinds of break bulk within South Africa's main ports. TPT is a major operator in South Africa. In the port of Durban, for example, the TPT handles 100% of the Ro-Ro moves and some 92% of container moves in the port. Thus, in South Africa, the regulatory role played by the ports authority (TNPA) is ostensibly separate from the operational role of the main ports operator (TPT), despite the fact that both their balance sheet and major decision-making processes are united within the same parent structure (Transnet). To better understand this situation, it is necessary to broaden the analytical lens to take into account the institutional environment of the South African ports system as a whole.

Broader port sector regulatory framework

Regulator and operator; two sides of the same coin

The atypical situation in which Transnet is both operator and regulator took its current form in the year 2000. Until that point, regulatory functions of the authority and freight handling functions of the terminal operator had been carried out conjointly by Portnet, which was subsequently separated into SAPO and National Port Authority (TPT and TNPA respectively). Citing concerns that Portnet, the most profitable division of Transnet, was "underspending on capital owing to its need to cross-subsidise" less profitable divisions, the Department of Public Enterprises hailed the division of the company as a move that would "improve service levels […] separate the landlord function from the operation of the ports" and create a situation in which "private operators of different port services will be better able to focus on the needs of the customers and offer them a more efficient and effective service" (DPE 2000: 138, 140). The 12th National Ports Act, introduced in 2005, was seen as a crucial way of institutionalizing progress towards this goal of a more competitive and high-performing ports sector. A closer look at the present situation, however, shows that progress towards this new state of affairs has been varied.

The National Ports Act of 2005 cements the division between operator and authority, and allows for the concessioning and privatization of various services that fall within the authority's remit as 'operator of last resort' (§11(4)). Concessions take place through two main avenues. Either, in respect of section 56, the TNPA enters into an 'agreement' with a third party operator, or, in respect of section 57, TNPA 'licenses' a third party operator (SA 2005). These two modes of concession apply to different kinds of services and facilities and involve slightly different contractual regimes.

The main difference between them resides in the issue of leasing out land and infrastructure. Section 56 agreements include temporary land and infrastructure leases with operating rights for a given facility or terminal (referred to as 'incorporated leases'). Further, under the terms of subsection 56(4), agreements can allow for the full outsourcing of any service provided by the port. The Ports Act does not stipulate exactly

which services should be subject to such agreements: it simply states the authority's responsibilities and the mechanisms that can be used by the authority in the performance of said responsibilities.

TNPA applies §56(1) concession agreements for the operation of terminals, including cargo handling and storage, ship repair, the construction of off-shore facilities for cargo-handling, and the building and operation of dedicated passenger terminals, whereas §56(4) outsourcing agreements are only to be used for security, waste disposal, and ad hoc dredging (TNPA 2008: 13-4). In this manner, the authority's current compliance with the Ports Act stops short of allowing for the full privatization of terminal operations, instead limiting this option to a select number of services auxiliary to the port's central functions. Section 57 licenses, on the other hand, do not allow for full outsourcing, and do not constitute leases; so-called 'complementary leases' must be negotiated separately to the license. Licensing, as per the terms set out in §57 of the Ports Act, is used by TNPA to cover stevedoring, waste disposal, cargo storage and private floating crane services (TNPA 2008: 14).

When the TPT responds to calls for expressions of interest alongside private operators, it is essentially competing in a process that its own parent structure has set up. The National Ports Act attempted to ensure the competitiveness of this process by requiring the TNPA to follow "a procedure that is fair, equitable, transparent, competitive and cost-effective", but it left the substantive definition of what would constitute such a procedure to the TNPA. It is also worth noting that §79 of the NPA allows for such public application processes to bypassed entirely, if the Minister of Transport deems it necessary for Transnet to perform a given service in order "to safeguard the national security of the Republic, to promote the national, strategic or economic interests of the Republic, or to discharge an international obligation of the Republic".

The port governance structure in South Africa could be considered an international exception. This institutional setting is characterised by combining regulation and port operations within one organisation at the national level that is also responsible for railway operations, with operating divisions with a different focus in place for each of these different responsibilities. A similar situation existed in Turkey where the Turkish railway corporation was also responsible for ports and their operations, but this has changed over the last decade, in which railway and port functions were separated and most of the public ports privatised. In most developed countries in which the national government is in charge of the ports sector, port operations are privatised. If this is not the case, such as for the state-owned ports in Chile that sometimes have publicly operated terminals next to private terminals, this can be considered a temporary situation as the state does not have the legal right to invest in terminal infrastructure. The institutional port governance model in developed countries that comes closest to the South African model is the one in Slovenia; here the national government has the majority of shares of Luka Koper, a company that is both port authority, port operator and railway operator. In contrast to South Africa, Slovenia has only one port (Koper), so does not practice cross-subsidisation among ports.

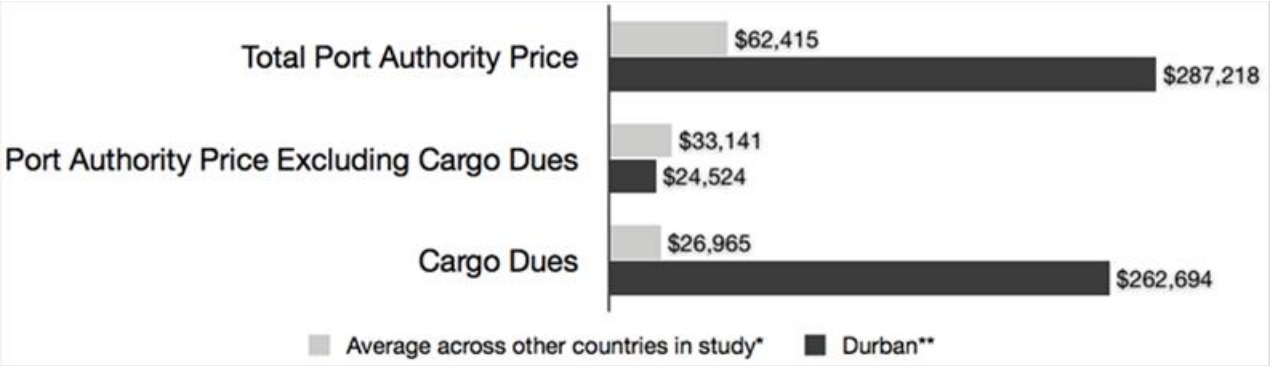
It is easy to understand that private investors might feel at risk of unfair treatment in competing with Transnet subsidiaries for licensing accorded by Transnet. One mechanism for countering this potential disincentive to private sector participation in the South African ports sector is contained in §47 of the NPA, according to which any party can lodge a complaint with the Ports Regulator on the grounds that "a) access to ports and port facilities are not provided in a non-discriminatory, fair and transparent manner" or, if they feel that "c) Transnet is treated more favourably and that it derives an unfair advantage over other transport companies." Such complaints are heard through the Ports Regulator Tribunal. Having failed to obtain a terminal operating license in 2010, for example, Siyakhuphuka Investment brought a complaint against the NPA focusing on "the status of the NPA in decision making with respect to operators other than Transnet." At the date of publication, this matter has yet to be settled, but complaints of this nature appear relatively frequent.

Finally, private operators maintain that the current regulatory framework for leases in the port of Durban acts as a disincentive for investment. As stated above, the lack of substantive direction in the National Ports Act regarding procedures for leasing meant that licenses to operate accorded under the terms of section 57 could essentially be 'decoupled' from leases. Cargo handlers claim that this fact, combined with numerous changes to the rules governing leases and sub-leasing in the port, has led to significant uncertainty among lessees. Many of the warehouses on Maiden Wharf date back to the 1940's and are in bad need of rehabilitation; certain design features (low roof, etc.) make them suboptimal to contemporary freight distribution. However, lessees do not subsequently make the investments that would be necessary in order to increase productivity. TPT, on the other hand, benefits from tenure leases, and is subsequently one of the largest investors in Durban port.

Tariffs and Cross-Subsidization

Because Transnet holds a quasi-monopoly over the South African ports system, it is able to propose to the Ports Regulator uniform tariffs across the board, meaning that, if approved, less-performing ports are cross-subsidized by high-performing ports. Essentially, its unique geographical position has enabled Durban to play this role. Durban's geographical monopoly power is reflected in its atypically high tariffs. Although the prices imposed by TNPA are in fact 26% lower than the global average if cargo dues are not considered, Durban was found to charge nearly nine times (874%) the global average price in cargo dues to those using the port (Figure 35).

Figure 3.2 **The price imposed by port authorities for a standardized vessel call in US$ for containers of all types as of 01/04/2012**



Source: Ports Regulator of South Africa, GPPCS 2013.

Note: *Ports included in average price: Melbourne; Klang Northport Terminal; Houston; Valencia; Valparaiso; Jawaharlal Nehru; Port Louis; New York/New Jersey; London; Karachi; Laem Chabang; Constantza; Rotterdam; Chennai; Vladivostok; Nagoya; Antwerp; Kaohsiung; Colombo; Johor; Singapore. **Durban prices do not take into account the 2012/2013 rebates.

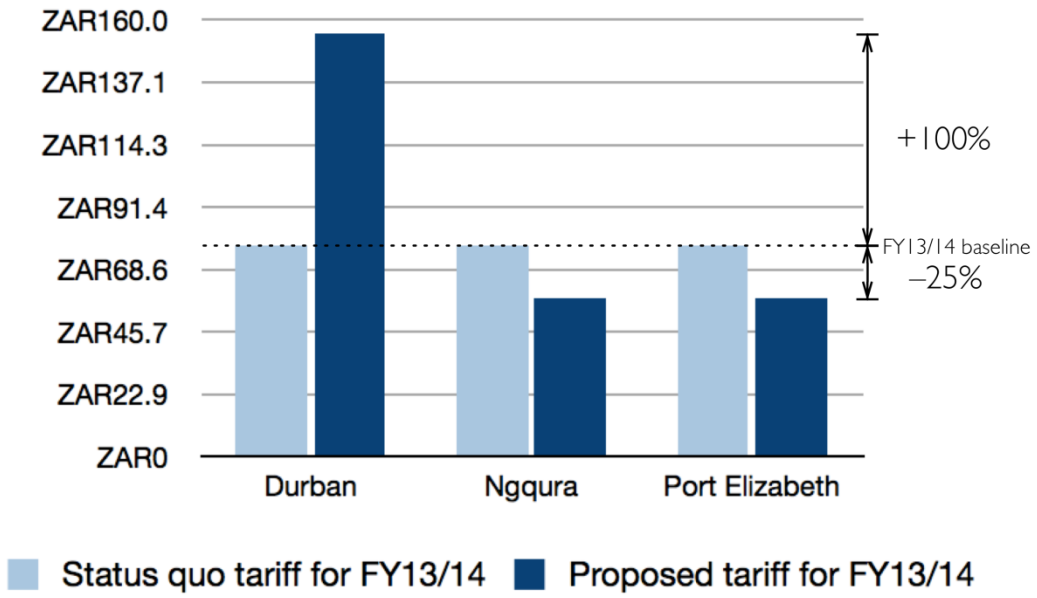
Unlike privately-operated and –owned port systems, in which fierce inter-port competition is the rule of the game, state-ownership of ports in South Africa means that the port system is thought of as a functioning whole, which should be coordinated strategically, and which should also reinforce political mandates related to economic and social development that are not necessarily high on other ports' agendas (such as the socio-economic development of large, poorly-connected hinterland areas).

The issue of cross-subsidization through non-competitive pricing by Transnet frequently raises tensions. In 2010, for example, a stainless steel company, Columbus Ltd., appealed against the cargo dues applied by the TNPA for the breakbulk export of carbon steel (a low value-added iron commodity) versus those applied to stainless steel (a high value-added iron commodity). In effect, TNPA had been charging four times the rate in cargo dues for breakbulk stainless steel as for breakbulk carbon steel, although the

two kinds of goods use the infrastructure in exactly the same manner (PR 2011). In this way, the higher job creation industry (stainless steel) was subsidizing the lower job creation industry, much as happens on an inter-port level. Thus, practices of cross-subsidization seem prevalent both between and within South African ports. In response to such trends, the regulator has pushed for an activity-based approach to pricing of cargo dues, that would be more reflective of the TNPA's actual cost structure, and has rejected tariff increases proposed by Transnet in early 2013 on these grounds (amongst others).

Increasingly, Transnet's monopoly over the South African port system is not only used to cross-subsidize investment in underperforming ports or to support low-value added industries; it also serves to impose patterns of usage on shipping lines. In late 2012, for example, it had become apparent that shippers were not using the Ngqura port as the transhipment hub that it was intended to be, with Durban controlling 62% of the transhipment market share compared to Ngqura's 11% or Cape Town's 18% (TNPA 2012a). Indeed, despite significant congestion in the port of Durban (around 60 hour delays per vessel in 2012), shippers increasingly chose the port over Ngqura due to its superior hinterland connections and the economies of scale associated with using the port both as a gateway and as hub for major feeder lines. MSC, for example, suspended its East and West Africa services to Ngqura at the beginning of the financial year, before fully reinstating the East Africa link and partially reviving the West Africa service with a pendulum structure. In order to recapture these transhipment flows while avoiding congestion in Durban that would come at the expense of more valuable inland flows, the TNPA proposed to finance relatively strong discounts in Port Elizabeth and Ngqura by doubling the tariffs on full transhipment containers in the port of Durban (Figure 36). This is a significant break with the usual practice of cross-subsidising through the application of uniform tariffs.

Figure 3.3 **Amendment to tariffs on loaded transhipment containers proposed by TNPA for the financial year 2013/14**



Source: TNPA 2012b

It is worth noting that this inter-port pricing discrepancy for the same good is yet larger with empties destined for transhipment: it is proposed that Ngqura and Port Elizabeth have their tariffs halved in order to

incentivize the transport of empty transhipment containers to these ports.[13] This is seen as a way of ensuring that inland container flows, which foster the South African GDP through facilitation of import / export activities, are not jeopardized at Durban by empty transhipment flows whose contribution from a national perspective is relatively marginal. It is thus reflective, once again, of the national economic development priorities that factor into the port authority's decision making in South Africa.

The port governance system in South Africa is difficult to change, considering the vested interests in it. Powerful unions are strongly against privatisation of TPT, or heaving off parts of it. Government actors are interested in keeping TNPA and not separating it from Transnet because it serves as a cash cow that helps financing the generally unprofitable rail operations. And finally, the other ports within the Transnet structure benefit from the cross-subsidisation from Durban's profits, so would not be happy with letting this go. So there are many institutional interests aligned against the convergence of South African ports towards the nowadays common landlord model, in which port authority functions are separated from port operations, which are performed by private terminal operator having contracts with the public port authority.

Corridor development

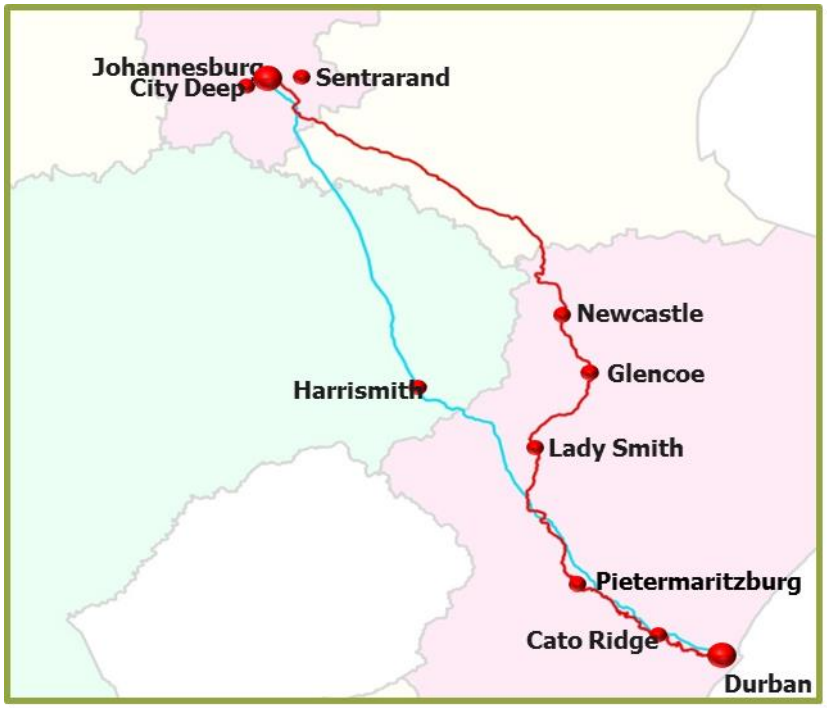
Modal shift

An overview of the existing hinterland access modal distribution has underlined that rail covers about 18.5% of the tonnage along the Durban and Gauteng corridor. The unreliability of intermodal rail and supply chain management consideration have incited a substantial shift of the corridor traffic towards road services. This shift and the externalities it creates (e.g. congestion) have come to the attention of government authorities with modal shift strategies towards rail being put at the forefront. Coupled with future capacity concerns, a national strategy of infrastructure and corridor development aiming at improving the capacity and performance of key national infrastructure has been developed. Among the 17 Strategic Integrated Projects (SIPs) that have been identified, SIP 2 (Durban- Free State-Gauteng Logistics and Industrial Corridor) is a top priority (Figure 37). Among its goals is the reinforcement of the infrastructure and logistics capabilities between the main commercial hubs of South Africa. It also includes regional development goals through a better integration level of adjacent transport and logistics activities as well as rural production (for national consumption and exports).

13. Furthermore, while the increased tariff on full transhipment containers in Durban should provide an extra 77.53 rand per unit, the subsidy to both Ngqura and Port Elizabeth only comes at a combined cost of 38.76 rand per container. It is unclear where the remaining 38.77 rand generated by the Durban markup will be used or the purpose it serves (if not only to disincentivize transhipment activities in the port as much as possible).

Figure 3.4 **Main Nodes of the Durban- Free State– Gauteng Logistics and Industrial Corridor**

(N3 highway in blue and main rail line in red)



The corridor project underlines that there is a level of alignment within government agencies in regard to the role of the corridor in national economic development, its infrastructure components and the investment timeframe. However, there is the potential for divergence due to the multiplicity of the involved actors as well as the vertical (between jurisdiction levels) and horizontal (between modes) complexity of the project.

An issue concerns the divergence of the road and rail corridors along separate paths, which leads not just to a functional separation of cargoes according to rail or road, but also to a geographical separation since they will be circulating along different locations for the most part. This may require different strategies (road versus rail-based) and potential misalignments between the Free State and Kwazulu-Natal provinces in which separate components of the corridor go through. As each province would like to capture as much economic development opportunities as possible from the SIP 2, this may lead to a duplication of infrastructure. On the positive side, Transnet as the rail infrastructure and operator is in a good position to coordinate the setting of rail related investment projects, such as inland ports. However, the rail yards along the corridor (e.g. Lady Smith, Grencoe and Newcastle) are standard freight yards that do not show a clear potential to be transformed into intermodal facilities.

Inland ports

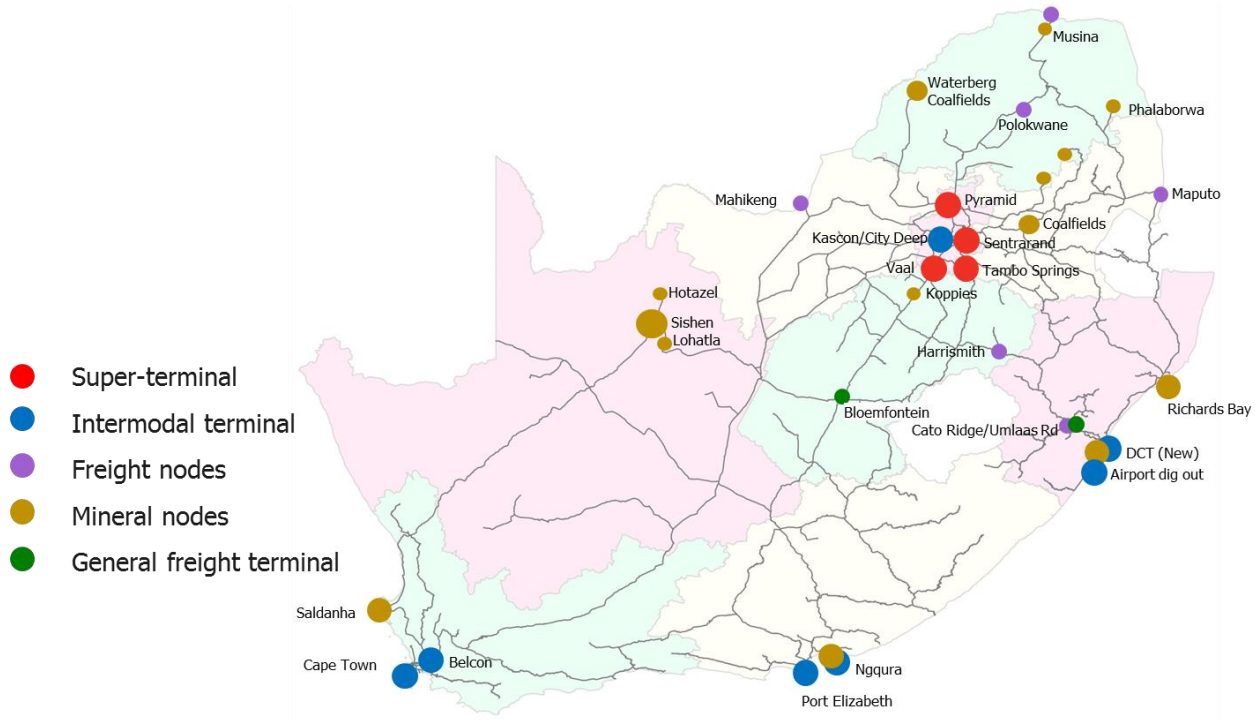
Governance of port cities is increasingly influenced by the process of developing trade corridors. The goal is to integrate the port system in a multimodal transportation network in order to improve market access, fluidity of trade and the integration in an industrial network. In this context, a port must have interfaces between major oceanic maritime trade and economic activities of ports and inland terminals that provide intermodal structures and connections between the forelands and hinterlands (Notteboom and Rodrigue, 2005). Obviously, business transactions require an adaptation to hinterland means. Conversely, the amplification capacity of transport modes may allow the expansion of trade. These bonds of mutual

causality are now present in the traffic of port cities. The quality and capacity of hinterland modalities, roads and relays are essential to any expansion of trade.

In addition to these measures, regional approaches towards freight transport, e.g. distribution centres and extended gates, might be needed to create enough critical mass for non-truck transportation. Trucks generally have a competitive advantage for shorter distance transport; only as distances are longer does freight transport by train generally become a competitive transport mode. Large economies of scale can be reaped, but a certain logistical organisation is required for this in the form of distribution centres in which large amounts of containers and cargo can be grouped before being dispatched to individual destinations. Such a system of selective dry ports or distribution centres has made it possible for relatively small container ports such as Gothenburg to achieve high railway shares in total hinterland traffic. A related approach is that of extended gates, which basically re-located part of the port closer to the hinterland, by displacing cargo handling, customs and other procedures towards an inland port, allowing for a de-congestion of the port. Such a concept is well-developed by the port of Antwerp that has engaged in a large set of partnerships creating a network of inland extended gates. Ports have generally become more aware of the need to be better linked to hinterlands, with various ports taking stakes in inland terminals and distribution centres, creating dry ports, merging with inland ports and facilitating part of the hinterland transportation.

The development of inland ports in South Africa is facing several challenges, the main being of the distances concerned and the density of the hinterland. Durban and Johannesburg are separated by about 550 km of road distance, usually considered the threshold distance where rail becomes overly competitive over road transport. An inland port located at a location which is halfway would thus be facing even steeper competition. Additionally, the density of the commercial hinterland between Durban and Johannesburg is rather limited since economic activities are either concentrated in the Durban metropolitan area or around Gauteng. In this context, the propensity is to set any new inland port development as additional facilities complementing and expanding the existing City Deep inland port. With a capacity to handle around 300,000 TEUs per year, the inland port of City Deep is reaching capacity and projected to be expanded 400,000 TEUs by 2016. Reflecting this commercial reality of the South African hinterland, most of the infrastructure projects along the corridor are either focusing around Gauteng or Durban (Figure 3.5).

Figure 3.5 **Major Rail Freight Nodes and Development Projects in South Africa**



Source: Transnet, SIP 2 Planning & Infrastructure Workshop

Some key projects include:

- *Cato Ridge*. This is a satellite terminal project next to the N3 highway and located 50 kilometer away from the port of Durban. With container and bulk cargo brought by rail to and from the port through a dedicated shuttle service the goal is to reinforce the logistics cluster in the area and avoid congestion on urban streets near the port. As a satellite terminal, Cato Ridge would have the same customs clearing jurisdiction than the port. This would necessitate the development of new transloading facilities.

- *Tambo Springs Inland Port and Logistics Gateway*. The inland port project is being planned by the Gauteng Department of Roads and Transport in collaboration with Tambo Springs Development Company on a greenfield site along the N3, 25 km southeast of Johannesburg. The 1,000 hectares project would represent the largest inland port on the African continent and is expected to handle more than half a million TEUs. The goal of the project is to double the rail-centric logistical capacity of Gauteng.

- *Harrismith Logistical Hub*. This road-centric inland port project is being spearheaded by the Free State Development Corporation (FDC), and agency of the Free State provincial government. It is located at the intersection of the N3 (Johannesburg / Durban) and the N5 (Durban / Cape Town) highways. The goal is to establish a multimodal facility, even combining air cargo services, but at this point the cluster acts as an intermediary location for road traffic between Durban and Gauteng. Because of its location halfway between Durban and Gauteng, the usage of rail is problematic and the hub is thus most likely to be a catalyst for the development of regional manufacturing, mostly in the agribusiness sector. Still, limited private investments have yet been secured.

Port digout project

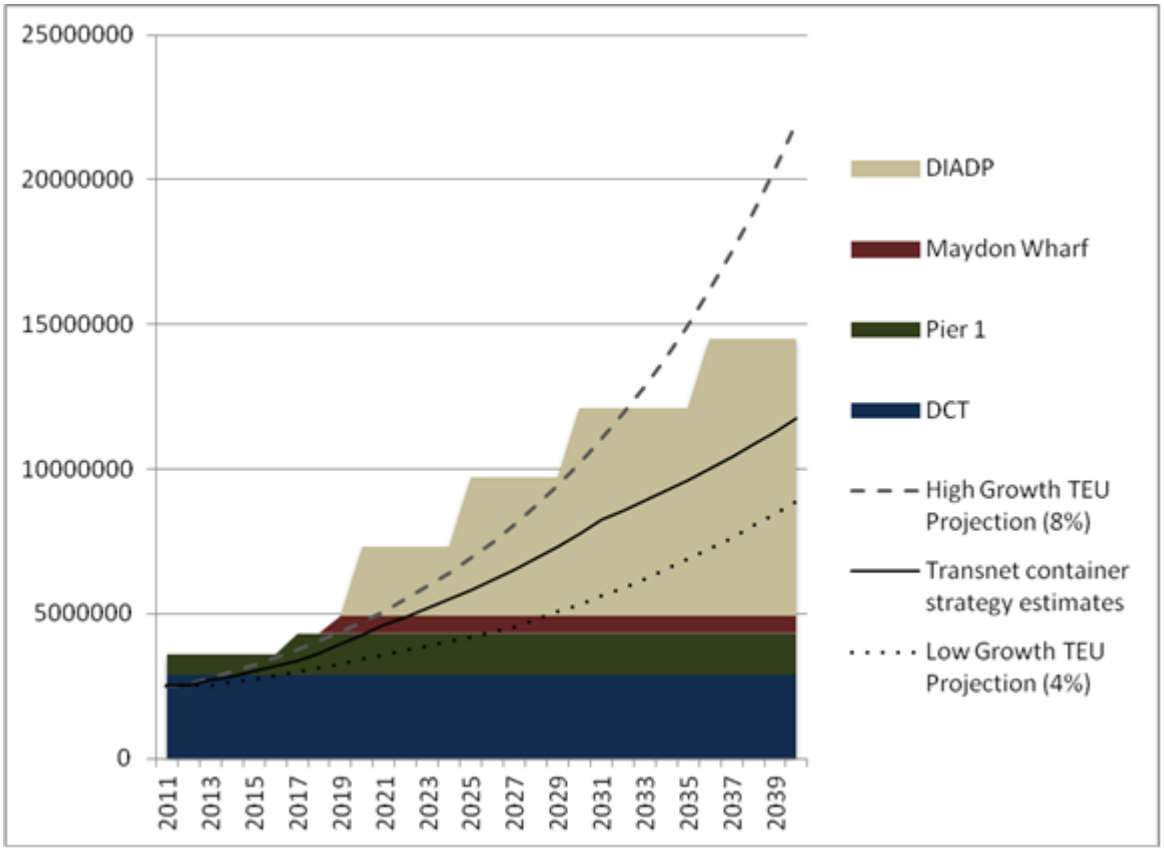
Expanding Durban port

Recent congestion in the Durban port coupled with freight growth forecasts indicate the need to drastically increase capacity in order to meet demand and to keep South African trade competitive in the global economy. A number of port development projects are thus being planned to increase Durban's capacity, the most consequential of which is the construction of an entirely new port at the site of the former Durban International Airport (DIA). By dredging out some 75 million cubic meters of earth and building a 1.2 km breakwater out into the Indian Ocean, the Durban International Airport Digout Port (DIADP) should, if it is completed as planned in 2040, eventually play host to three vehicle berths, four liquid-bulk berths, and 16 container berths, which will add a total per annum capacity of 9.6 million TEU to the South African port system. While the project faces numerous risks related to planning, funding and environmental review, its alignment with the interests of key stakeholders in the South African ports sector appears to have generated a level of consensus that is uncommon for an infrastructural project of such magnitude.

Transnet's current Market Demand Strategy, which plans capital expenditure in the port system as a whole based on growth forecasts, has projected a 76% growth in container volumes over the 2011-2018 period, from 4.3 million to 7.6 million TEUs across all ports. To meet this demand, Transnet plans to provide capacity ahead of expected demand from the current 5.2 MTEUs nationally to 8.9 MTEUs in 2019, which it plans to operate at 86% utilization. As South Africa's main port, Durban is projected to experience significant growth in volumes over this period, especially in containers, and will therefore play a major part in Transnet's capacity increase strategies.

Over the past decade, the capacity for TEUs in the port of Durban has increased by 77%, expanding from approximately 1.3 MTEUs in 2000 to the present-day capacity of 3 MTEU. However, container volumes through Durban are expected to grow from 2.7 MTEU in 2012 to 4 MTEU by 2019, thus exceeding present capacity. In line with the Market Demand Strategy, the deepening of quays at Pier 2 and expansion of Pier 1 (including the proposed lease of the Salisbury Island area from the Department of Public Works and its conversion into a container terminal) should provide an additional 4 million TEU capacity and significantly increase operational efficiencies in the port, providing an alternative to growth constraints on the short- to medium-term. Past the 2019 mark, however, environmental and land availability constraints are expected to foreclose any possibility for further significant capacity increases within the port of Durban, though demand is forecasted by Transnet to grow substantially over this period (Figure 3.6).

Figure 3.6 **.Projected demand vs. projected capacity for TEU throughput in the port of Durban 2011-2040**

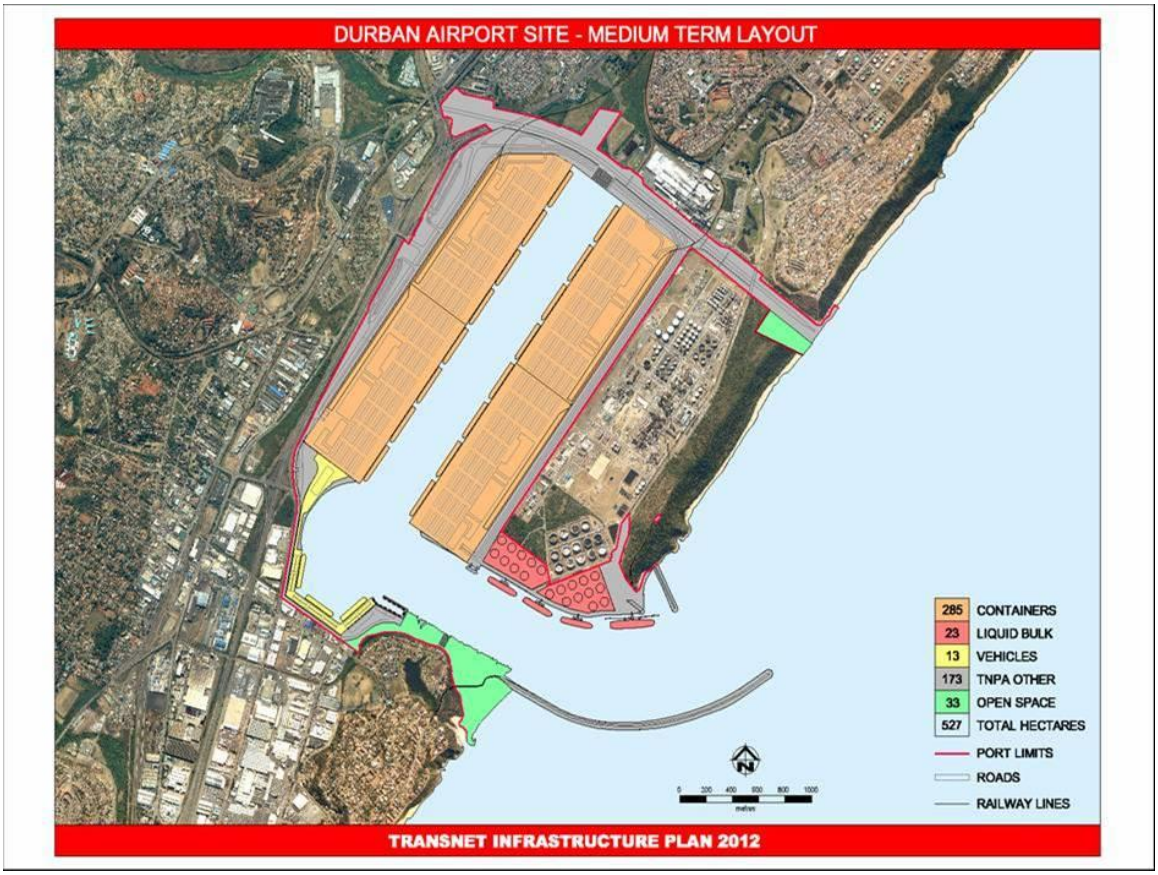


Source: Durban capacity estimates from TEMPI 2010; DIADP capacity increase estimates and 'Transnet Container Strategy' demand growth estimates from Port Development Framework for DIADP (Transnet 2011); Low growth TEU demand curve from Transnet Freight (2013).

In response to the challenges that operating beyond capacity would pose to South African trade and the eThekwini municipality's most significant economic asset, Transnet and the municipality have developed a shared vision for expansions to the port of Durban that stretches to 2050. This vision includes the creation of an entirely new port in the south Durban basin, at the former site of the Durban International Airport. The port's primary function will be that of a gateway for container traffic flowing into and out of the Greater Durban area and the Gauteng Industrial Complex, with transhipment functions increasing gradually as a secondary role.

Transnet successfully acquired the land necessary for the construction of the DIADP through a 1.8 billion Rand deal with the Airports Company South Africa, in April of 2012, with the official property transfer taking place in December of the same year. Adjoining land parcels still need to be acquired for full built out of the port. The construction of the port is expected to generate significant positive impacts for the surrounding region, including an estimated 64,000 construction jobs and 28,000 operational jobs once the port is completed (Transnet 2011a). The layout for the port, selected from a range of at least six scenarios according to technical, economic, environmental and legal criteria (Figure 40).

Figure 3.7 **Proposed Layout for the Durban Digout Port**

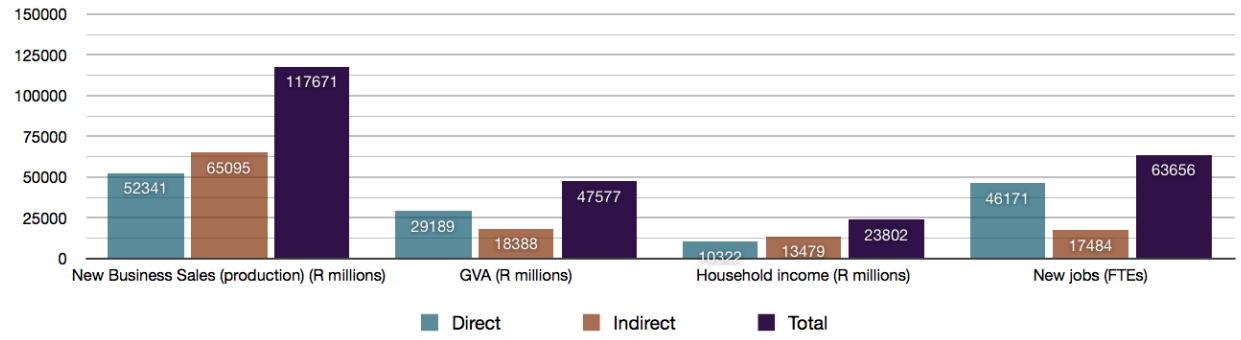


Source: TNPA 2013

At a conceptual planning level, sixteen container berths can be accommodated at the proposed Durban Digout Port and this could add a total capacity of 9.6 MTEU per annum by the completion of the project, assuming that growth in throughput can be facilitated well into 2040. The new automobile terminal should replace the terminal in the north of Durban at the present port, providing a much more convenient access to automobile manufacturers and suppliers located in the industrial zones of the South Durban Basin (SDB). Its liquid bulk berths should facilitate 2% growth over the next thirty years, which will be shared between the DIADP terminals, the Reunion Single Buoy Mooring, and the current liquid-bulk terminals within the port.

In addition to the job creation potential cited above, input-output analysis conducted by Transnet (2011a) suggests that the DIADP should generate significant direct and indirect economic impacts. Multiplier effects calculated for South Africa as a whole and for the KwaZulu-Natal region suggest that investment in the new port should yield positive effects for the regional economy.

Figure 3.8 Impacts of the digout port development on the KZN economy



Source: Transnet 2011a

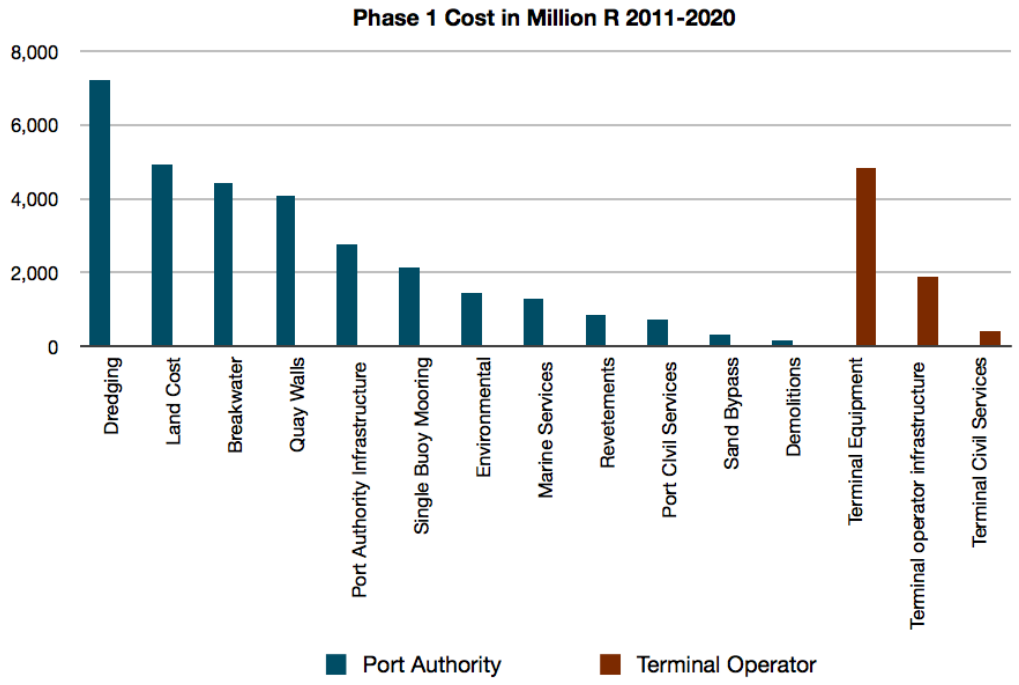
Capital expenditure will positively impact the South African construction industry and its suppliers, as demand for various inputs is increased by construction in the port, contributing an estimated 117.7 billion rand to the economy in extra sales over the thirty-year period under analysis. Furthermore, the model suggests that construction should significantly impact economic output, increasing direct gross value-added by a total of 47.6 billion rand. Finally, Transnet's model indicates that onsite employment should directly increase the KZN region's wage bill by 10.3 billion rand, in addition to an extra 13.5 billion rand generated through induced effects. Transnet has also calculated the on-going benefits of the DIADP deriving from operational expenditure: it has estimated that, once constructed, each terminal will produce significant ongoing positive direct and induced impacts as a result of higher container flows through the port. The model predicts, for example, that at full utilization of the 9.2 million TEU capacity in 2040, the port should contribute some 62.4 billion Rand annually to the South African economy.

Even considering that economic impact analysis usually overestimate the consequences of a project, due to its size the potential economic impacts of DIADP project are therefore considerable and complex to assess. Moreover, it has the potential to significantly transform the spatial dynamics of the Durban metropolitan area, but it might also bear significant institutional consequences for the South African ports sector as a whole. This section will describe the present project planning and attempt to highlight its potential consequences for Durban and for the South African ports sector.

Funding model

The DIADP will be built in four phases funded by the Port Authority. Investigations to determine the most appropriate funding model are currently in process. External sources of capital, possibly provided by a terminal operator in a build-operate-transfer (BOT) style concession, are being investigated by Transnet. The first phase will last nine years (2011-2020), and subsequent phases will last seven years each (2019-2026, 2024-2031 and 2029-2036). In 2011, Transnet estimated that the costs of investments for the project would total 75 billion rand by completion, with a total of 47 billion incumbent on the Port Authority and 28.4 billion on the terminal operator (most likely a private Global Terminal Operator, due to public funding constraints discussed below). These estimates were based on quantities derived from concept plans for the new port, multiplied by market rates as of February 2011 (estimated through comparison with similar project prices, prices obtained from specialist suppliers, etc.). Constant foreign exchange rates for the same period were used, and various allowances were made (preliminary and general costs, import duties and taxes, design risks, professional services, EIA, EMP, etc.). Seen in this light, the main capital expenditure burden at first appears placed on the Port Authority (and thus, on Transnet).

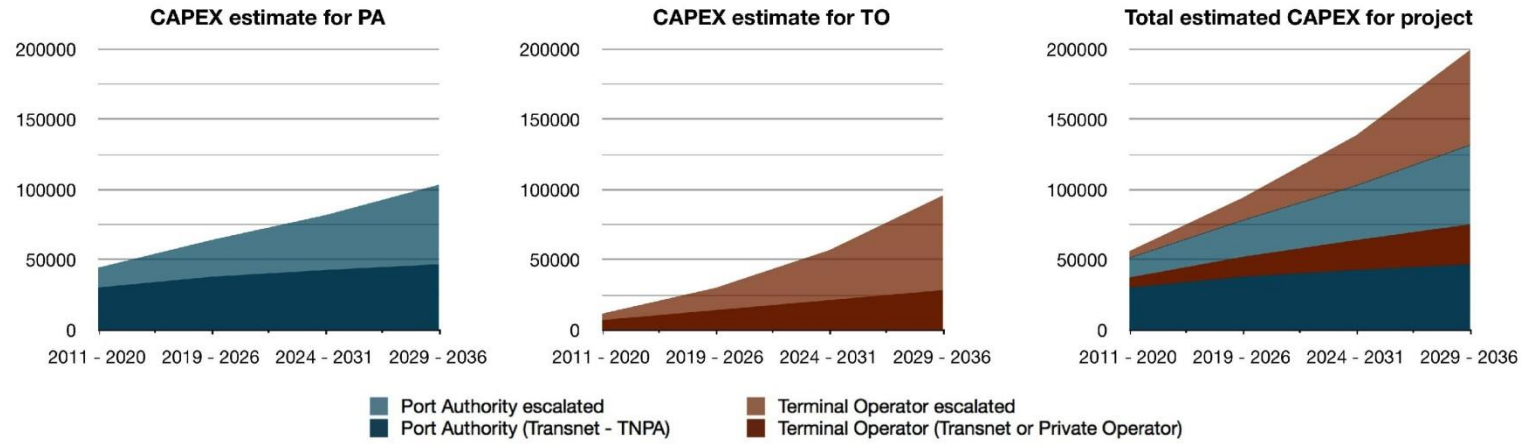
Figure 3.9 **Capital expenditure for phase 1 of DIADP in Rand millions**



Source: Transnet 2011a

However, when costs are escalated to account for projected trends in the commodities markets, the burden sharing of investments appears somewhat different. Using the BER MFA Building Cost Index, Transnet has calculated CAPEX for DIADP to take into account increases in the commodity prices that comprise construction costs. The escalation is based on market forecasts made in 2010, and does not include any allowance for foreign exchange fluctuations. Figure 43 presents the difference that such escalation makes for the calculation of the total and distributed CAPEX. If such trends hold true, the total capital expenditure on the DIADP project could in fact reach somewhere in the vicinity of 200 billion rand, instead of 75 billion. Moreover, this would drastically increase costs for the terminal operator, particularly in the final phases of the project. In addition to these costs, there are the costs related to hinterland transport, including expanding the railway and road capacity between Durban and Johannesburg that would need to be tackled.

Figure 3.10 Cumulative capital expenditure estimates for DIADP in Rand millions 2011-2036



Source: Transnet 2011a

According to interviews conducted for this study, constraints on Transnet's budget and the potential for capital-raising elsewhere render unlikely any scenario in which the entire project is publicly funded. The current market demand strategy for all South African ports has programmed some 300 billion Rand for development, none of which is attributed to the new port. Significant capital expenditure burdens placed on the Authority in early phases of the project suggest the need for some degree of concessioning and sub-contracting in order to provide basic infrastructure, and the burdens placed on the terminal operator in latter phases of development suggest that the participation of private operators will be necessary. Bearing in mind that each phase of development will involve the creation of a new container terminal, several scenarios are possible. These shall be addressed in a final section, however, it is useful to firstly consider the metropolitan impacts of the DIADP.

Metropolitan Strategies in light of the DIADP

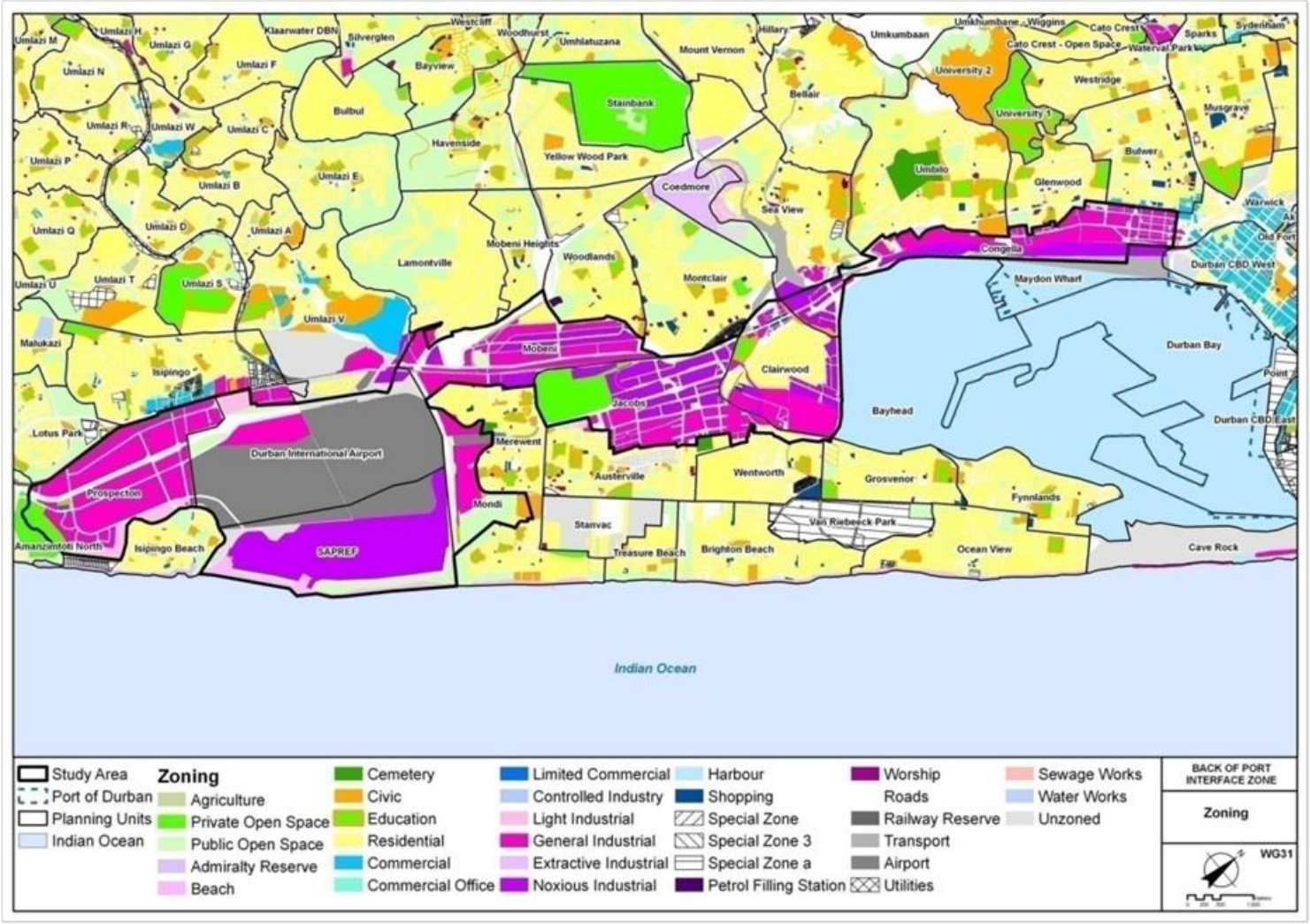
If the new digout port at the former Durban International Airport (DIA) site is completed as per the plans presented above, it will entail significant ramifications for Durban's residential, economic and logistical systems. The location of the new port, along with the likely port-to-port flows that it is liable to generate, and the present corridor plans, suggest that the most severe impacts are likely to be felt in the areas to the south of the present port, in what is known as the South Durban Basin.

The South Durban Basin comprises a large zone running roughly 20km from the port down the coast to the town of Umbogintwini. It includes the districts of Congella, Umbilo, Rossburgh, Clairwood, Jacobs and Mobeni, which are mentioned here as those most likely to be affected by future expansions to the port. These districts currently play host to a wide range of land uses, ranging from heavy and light industry to residential and commercial. The area is one of Durban's main employment zones, providing both low- and high-skilled employment in sectors related directly and indirectly to the port. Of the 247 firms located in the areas directly adjacent to the port (Maydon Wharf, Bayhead, Island View), some 119 (48%) are logistics firms. These logistics clusters, to be found in most commercial ports around the world, are located right next to a large and diversified economic basin. No less than 37% of the 1031 firms located in Mobeni, Clairwood and Jacobs alone are in the manufacturing sector, while some 178 industrial and 112 wholesale firms are located in these same areas (GMA & Iyer 2011a: 77-80). Furthermore, the area of prospection, to the south of the DIA, is host to the Toyota South Africa manufacturing facility, South Africa's largest automobile assembly plant. At 79-hectares, the plant alone employs some 8,500 workers directly, and is the main client of over fifty automobile component suppliers in the KZN region (KZN 2012).

This intense concentration of value-added activities in the manufacturing, logistics, and other industrial sectors make of the South Durban Basin a strategic zone that is key to the economic wellbeing of the eThekwini and KZN region. In spite of its immense importance, several inefficiencies currently imperil the South Durban Basin's function as an urban zone dependent on the port and upon which the port itself depends. In recognition of these inefficiencies the city has recently undertaken new initiatives to rethink and rationalize land-use planning in this area. This should serve to better anticipate future developments in the port(s) of Durban and ensure their coherence with the development of the city going forward.

The current land-use framework in the back of port area is broadly dichotomized into two zones: those used for residential purposes, and those used for heavy and noxious industrial purposes. It is worth noting the absence of buffer zones composed of 'light industrial' uses or green spaces: with the exception of prospection to the south of the former International Airport, many of the general and noxious industrial land-use is zoned in the direct vicinity of residential living areas. This is attributable to a lack of strategic vision in early land-use frameworks, which have had to play 'catch-up' with empirical trends: industrial areas were zoned in the once-peripheral areas of the city, which at the time were not built-up, but which now find themselves crowded-in by subsequent sprawl from townships such as Umlazi, or from neighbourhoods that have grown significantly since 1994, such as Montclair.

Figure 3.11 **Current zoning framework for the back of port interface**



Source: GMA & Iyer 2011a: 72 Notes: Durban International Airport and SAPREF are located in site for new digout port.

It is also to be noted that logistics and other port-dependent activities are not specifically planned for in the city's current land-use framework. A given industrial area might feature any mix of land-use rules for: transport and freight firms; storage facilities and wholesaling; chemical refinery; retail distribution; manufacturing, etc. This is problematic for the port-city interface, in that a zoning framework that is not attentive to the specific needs of the industries located therein can inadvertently generate inefficiencies. For example, container trucks typically require large bays for turning and for loading dock access. Thus, warehouses set up for container trucks usually have to compromise on floor space, in order to provide the room necessary for trucks to unload without impairing local traffic. In industrial areas of Durban that are increasingly being used for logistics activities such as transloading, however, the local construction rules do not require provisions for turning bays or for diagonally oriented loading docks which are more easily accessible for trucks. This means that in some areas where buildings were previously used for manufacturing or storage of non-containerized goods, trucks are frequently stretched across several lanes in order to gain perpendicular access to the loading docks, blocking certain streets of Durban's high-traffic industrial areas. The discussion of the Clairwood neighbourhood in previous sections illustrates some of the negative social impacts that such activities engender.

The city's new back of port strategy, driven in response to plans for the new DIADP, thus does not only represent an opportunity to steer land use patterns and planning of infrastructural provision in a way that is coherent with the new traffic flows to be generated by future port developments. It also provides an opportunity to remedy some of the earlier inefficiencies in this interface area.

The consequences of the dig out port for the Durban and South African Ports System

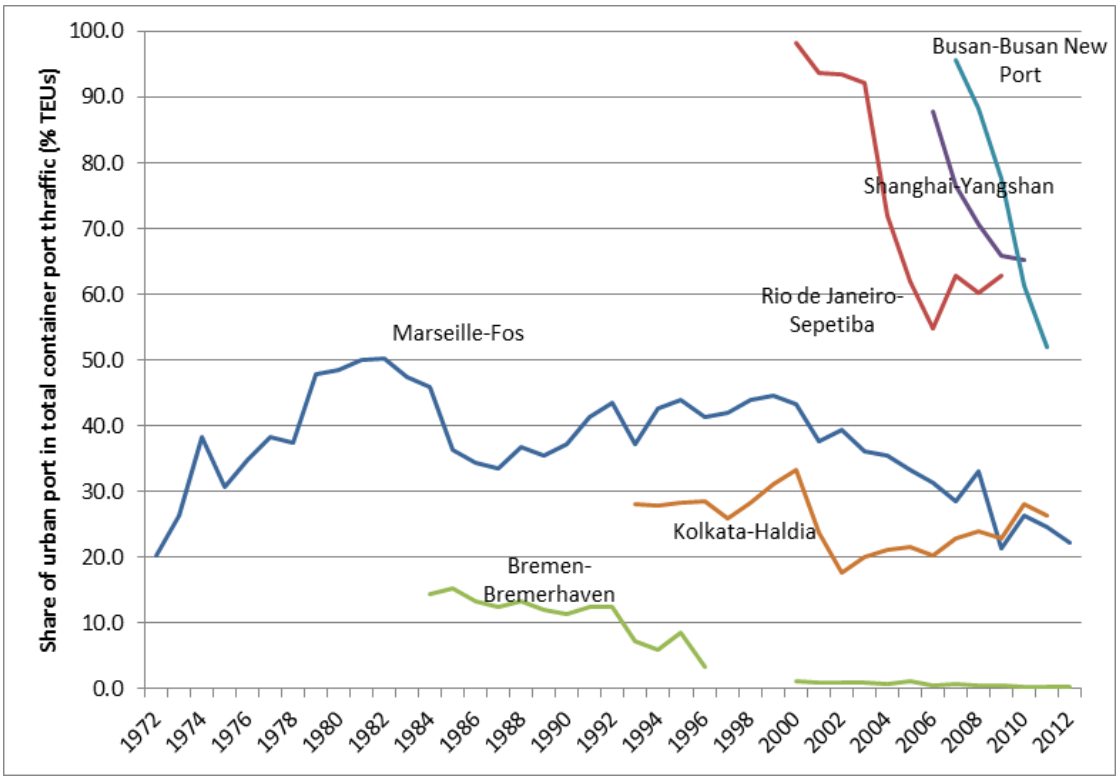
The way in which the DIA digout port is financed, built and operated will have significant impacts on the Durban port system. Inevitably it will entail some degree of private sector involvement, which will increase inter-port competition and force public operations to become more efficient. This will most likely entail difficult negotiations with labour. Depending on the share of TEU capacity that is eventually put into private hands, these dynamics will differ considerably. This entails not only significant differences in economic competition, but also in the governance of the Durban port system and the port-city interface.

In all of its plans for the DIA digout port, Transnet has reaffirmed the possibility that one or many different operators could operate each of the four container terminals publicly or privately. As illustrated above, present funding models virtually guarantee some degree of private sector involvement, most likely through a Build-Operate-Transfer style concession. This scenario sets the stage for a host of governance arrangements that would be unprecedented in the South African ports sector. For as long as South African ports have handled containers, Transnet's public terminal operating companies have been sheltered from serious domestic competition by a virtual monopoly over the South African container sector. This situation might be greatly altered by the completion of the digout port, if not in the first phase, then most likely in subsequent phases. This raises a variety of challenges, related to port traffic development, level playing field and pricing, and port-city relations, which will all discussed below.

It is possible that there will be a shift from the current port to the new dig out port. The new port will have a favourable lay out, state-of-the art equipment and well connected to main rail and road corridors, without being spatially constrained in the same way as the current port of Durban is. There are many examples of urban ports with new non-urban port sites where the share of the urban port site has lost ground to the new port site, also if the new site forms part of the same port authority (Figure 45). Along the same lines, urban ports have lost traffic shares to new ports that do not fall under the same port authority (Figure 46). In many cases, the old urban ports undergo a change in character with

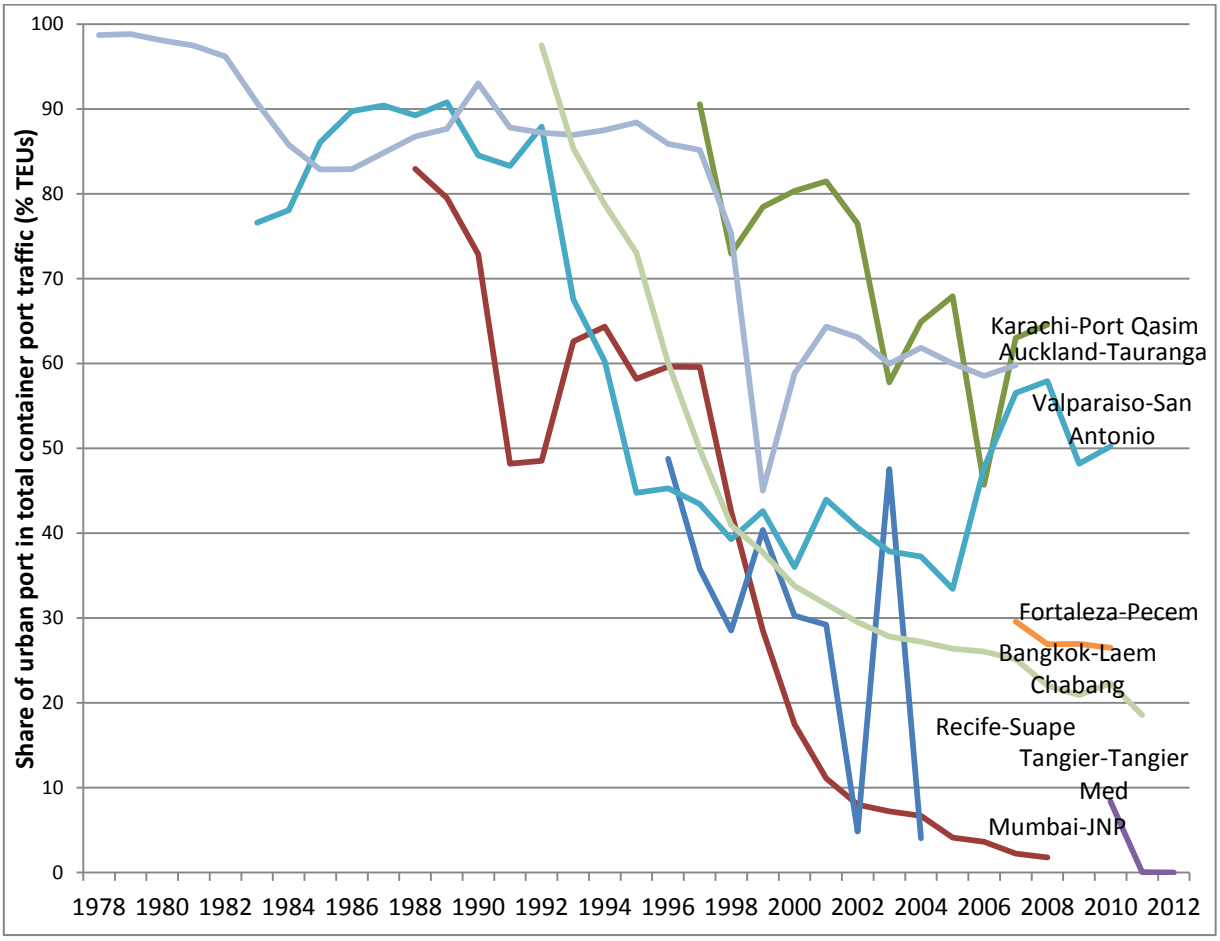
a larger port-city interface, more public access to port sites and an increased focus on port activities that align to tourism, recreation and other activities. A similar decline of traffic shares of the urban port, specified in more detail in Annex 3, could take place in Durban.

Figure 3.12 **Traffic developments in multi-site ports**



Source: calculations and elaborations of OECD secretariat based on data of port authorities

Figure 3.13 **Traffic developments in new ports neighbouring urban ports**



Source: calculations and elaborations of OECD secretariat based on data of Lloyd's Marine Intelligence Unit (LMIU).

With the dig out port will also emerge the challenge of organising a level playing field. A private operator would not want to be obliged to charge tariffs that are used to cross-subsidise ports in which it is not involved. As this would make it more competitive in comparison with the publicly operated terminals, the government might be obliged to reduce or abandon cross-subsidisation, or offer to privatise the port authority functions of the dig out port. Concerns about the combination of the regulatory and operational roles of Transnet will come to the forefront in all prominence, especially if the idea would come up that the position of TPT would need to be protected if one or more private operators would dispose of terminals that are considered to have more favourable characteristics. Port-city interfaces might also drastically change within a new institutional setting provoked by the dig out port. Private terminal operators have the primary goals of making profits, so they might need incentives to generate net positive socio-economic impacts. These incentives could consist of integrating socio-economic indicators in the concession criteria, e.g. along the lines of the concession process for the Maasvlakte 2 for the Rotterdam port. In the assessment criteria for the concession bids, 20 points of the maximum 100 points were reserved for sustainability criteria, including environmental criteria (EMS, air quality and CO_2 emissions), use of hinterland modes and security. With respect to the hinterland modal split, targets were formulated that would reduce the share of road transport from 57% in 2010 to 35% in 2035. Transnet, in its investigations for a future funding model, should take the above considerations in to account.

Annex 1: Time efficiency of ports

Time efficiency of ports is here defined as the average time that a vessel stays in a port before departing to another port. Port time can be known through detailed vessel movement data. Port time can be considered a proxy for time efficiency, as the large majority of port calls will be connected to loading or unloading. Very brief port stays could be connected to re-fuelling, whereas very long port stays could be connected to repairs or other reasons. Both very brief (less than an hour) and very long port stays (more than 10 days) will be excluded in order to increase the probability that the data reflect time efficiency and not something else.

The data used are vessel movements, as collected by Lloyd's Maritime Intelligence Unit (LMIU) for 2011. The data are limited to the month of May; this month is considered to be a representative month by Lloyd's Maritime Intelligence Unit. The dataset contains for most vessels precise arrival and departure times (in hours and minutes). From the port calls of fully cellular container vessels (larger than 100 gt), the observations were excluded where arrival, or departure data, or both were missing, and some observations were excluded because they were considered to be extreme values that would skew the results; these are the vessel calls with a stay in one port of less than one hour or more than 10 days. Canals and strategic passages, as well as "non-port" locations (e.g. countries, straits, continents, seas, etc.) were excluded from the dataset and some paired terminals/ports were aggregated (e.g. Port Botany and Sydney).

In order to derive the total time that vessels stayed in a specific port, some less precise measurements (in days, not in hours and minutes) were incorporated for ports with missing values in the dataset. This is necessary, because for some ports only a very limited set of precise time observations was available, so taking exclusively these and extrapolate these would risk to be inaccurate. For these missing values, it is assumed that the port time for vessels arriving and leaving the same day is 12 hours, leaving the next day is equivalent to 36 hours, with a port stay of 2 days equivalent to 50 hours etc.

The main output indicator that is used is the average difference between "arrival date" and "sailing date" by port and all vessels (in number of days). The average is calculated here by dividing the total time that vessels spent in one port by the TEU throughput volume in that port in May 2011, as reported by the respective port authorities.

Annex 2: Efficiency of oil ports

In this report the efficiency of oil ports is analysed using the data envelopment analysis (DEA) technique. This empirical methodology derives efficiency scores for each decision-making unit (DMU) involved in a homogeneous production process such as firms or seaports. An efficient port is defined as one maximising output level for the same level of inputs across all observed ports (efficient output-oriented DMU) or minimising quantity of inputs for a given level of output (efficient input-oriented DMU). The efficient production frontier is delineated by a set of efficient DMUs referred to as the benchmark of most performing seaports. The potential gains for less efficient ports (*e.g.* located below the efficient production frontier) are measured by their distance, both from an output- or input-oriented approach, relative to the efficiency frontier. This methodology has been widely used in the most recent mainstream literature [14].[15](Cheon, *et al.*, 2010; Wu and Goh, 2010; Martinez-Budria, *et al.*, 1999; Wang and Cullinane, 2006; Al-Eraqui, *et al.*, 2007; Tongzon, 2001).

The DEA approach has advantages as well as limitations. Among its positive characteristics, DEA does not impose any functional form to the production function or on the shape of returns to scale (*i.e.* non-parametric), such as when adopting a Cobb Douglas production function. For seaports, in particular, it is very difficult to guess or impose whether returns to scale should be increasing or decreasing. Dealing with multiple output processes is another useful property of DEA, especially when addressing port multi-activities and when a certain degree of homogeneity in the production process is observable across ports. DEA also has some negative characteristics, including its deterministic property, which does not allow random noises or measurement errors to be isolated from the measure of pure inefficiency[16]. However, use of the Bonilla (2000) and Barros (2007) bootstrapping[17] technique can help limit this effect.

This sampling technique enables generation of a stochastic distribution and intervals of confidence around the estimators (Simar and Wildon, 2000). The efficiency estimates derived from using this technique are often lower compared to DEA estimates derived from a standard sample. In addition, atypical efficient ports (characterised by low density of observations in the region of the frontier) are characterised by higher degrees of uncertainty. However, because efficiency is a relative measure, depending on observable seaports and inputs considered, any omission may affect the results. A sample excluding potentially efficient seaports or including outliers would respectively shift downward/upward on the efficient production frontier and affect (upward/downward) the relative efficiency scores. To the same extent, omitting input factors or including them with non-documented values (zero or not available [n.a.]) may yield higher efficiency scores for ports that are using high quantities of the omitted input factor or those producing output with "no" input.

14. However, according to the review by Trujillo and Gonzales (2008) there are about an equal number of studies exploring efficiency via estimating a stochastic frontier production with a predefined functional form, suggesting the absence of consensus vis-à-vis the best approach to be used.

15. Cheon, *et al.*, 2010; Wu and Goh, 2010; Martinez-Budria, *et al.*, 2009; Wang and Cullinane, 2006; Al-Eraqui, *et al.*, 2007; Tongzon, 2001

16. This mainly legitimates stochastic frontiers and econometrics approaches though they impose a functional form to the production.

17. This mainly legitimates stochastic frontiers and econometrics approaches though they impose a functional form to the production.

There are three different types of efficiency that can be distinguished: *i)* overall efficiency, *ii)* technical efficiency, and *iii)* scale efficiency.

i) **Overall efficiency**. This general indicator, derived from a model assuming constant returns to scale (CRS), provides a measure of overall port efficiency. This DEA-CCR indicator, developed by Charnes, Coopers and Rhodes (1978), assumes that all observed production combinations could be scaled up and down proportionally. Varying production sizes or scales are considered to have no effect on efficiency scoring, which means that small or large ports can equally operate in an efficient way. Efficient ports are both technically and scale efficient. Conversely, inefficiencies (efficiency gap measured in per cent of most efficient port scores) reflect both technical and scale inefficiencies.

ii) **Technical efficiency.** Pure technical efficiency is estimated by relaxing the constraint on scale efficiency, allowing output to vary unproportionally more or less with a marginal increase in inputs. This DEA-BCC indicator, developed by Banker, Charnes and Cooper (1984), is derived from a model assuming varying returns to scale (VRS), and recognises that smaller ports may face disadvantages caused by production scale effects (Cheon, 2008). By taking into account and neutralising scale inefficiencies, relative gaps in efficiency between ports would thus only reflect differences in operational inefficiency, so-called pure technical inefficiency.

iii) **Scale inefficiencies.** Scale inefficiencies arise when the scale of production is inappropriate, being above or below optimal levels and generating production wastes. Formally, they are identified when a difference appears between efficiency achieved at technical and overall levels, as measured by the following ratio (Cooper, *et al.*, 2000; see also Fare, *et al.*, 1994).[1]

SE=CRS/VRS and where SE<1

In the equation, CRS and VRS are the efficiency estimates derived from respectively assuming constant and varying returns to scale. When SE<1, ports face scale inefficiency, driving higher overall inefficiency compared to pure technical inefficiency. By contrast, when SE=1, ports are operating at efficient scales, producing at the optimal level for which they were designed. However, the appropriate direction in scale adjustments can be identified only with the nature of returns to scale, that is, increasing (IRS) or decreasing (DRS). For ports operating at IRS (output rises proportionally more than the increase in inputs), production level should be expanded. This is usually the case for ports operating below optimal levels as long as current business traffic, while building up gradually, remains below the optimal capacity of port infrastructure. By contrast, when ports operate at DRS (output rises proportionally less than the increase in inputs) they should scale down their production toward lower optimal levels to limit inefficiencies lead, for example, by bottlenecks.

In a long-run perspective, however, the alternative of raising the optimal level of production through investing in higher port infrastructure capacity should also be considered.

Defining and identifying appropriate output and input variables for port production function is crucial. The input/output variables must reflect the main objectives of a port, which in this study is about maximising cargo throughput and productivity while efficiently using infrastructure and equipment. Along the economic theory, output as measured by handling cargo throughput (loaded/unloaded) depends to the same extent on labour and capital inputs. In port literature, labour input is known as the most challenging issue due to lack of data reliability and comparability. One of the main reasons is that port labour organisation is particularly complex, consisting of different types of full- and part-time contracts and contracts partly managed by private, public and port authorities, which make it difficult to collect complete and consistent data. Proxies are often used along the argument that labour is usually closely and negatively correlated to handling equipment: equipment is

thus considered to be a proxy for labour. As such, for this study the number of loading/unloading equipment from ship-to-quay and quay-to-shore is collected per port for crude oil terminals. Capital inputs, on the other hand, are more readily available as long as they concern land and infrastructure. Such inputs mainly include terminal surface, quay length or storage capacity.

This study uses a new output dataset, based on a volume output measure: aggregated ship volume in deadweight tonnes (dwt) calling each port. These data can be derived from existing comprehensive databases of vessel movements, which include detailed information on ship types (including volume), as well as arrival and departure times at the different ports. This approach assumes that the volume of a ship calling a port is correlated with the number of metric tonnes loaded or unloaded from that ship. This assumption will hold especially for cargo categories with point-to-point deliveries, such as crude oil. The availability of information on different ship types in the database, including crude oil tankers, makes it possible to estimate the aggregated ship volume per port for crude oil. While "total dwt calling the port" (output measure) is not perfectly correlated with actual throughput, it is no more imperfect than throughput as reported in metric tonnes.

For the purpose of this study, a database was built to analyse port efficiency across worldwide ports at aggregated and disaggregated activity levels, gathering data for the most recent available year (2011). Most of the input data are drawn from Lloyd's Port of the World 2011 Yearbook, whereas the Lloyd's Marine Intelligence Unit's (for May 2011) comprehensive database of vessel movements was used to derive output data. Given limitations in the data and the DEA methodology, a number of aggregations/approximations were performed in order to ensure estimate reliability.

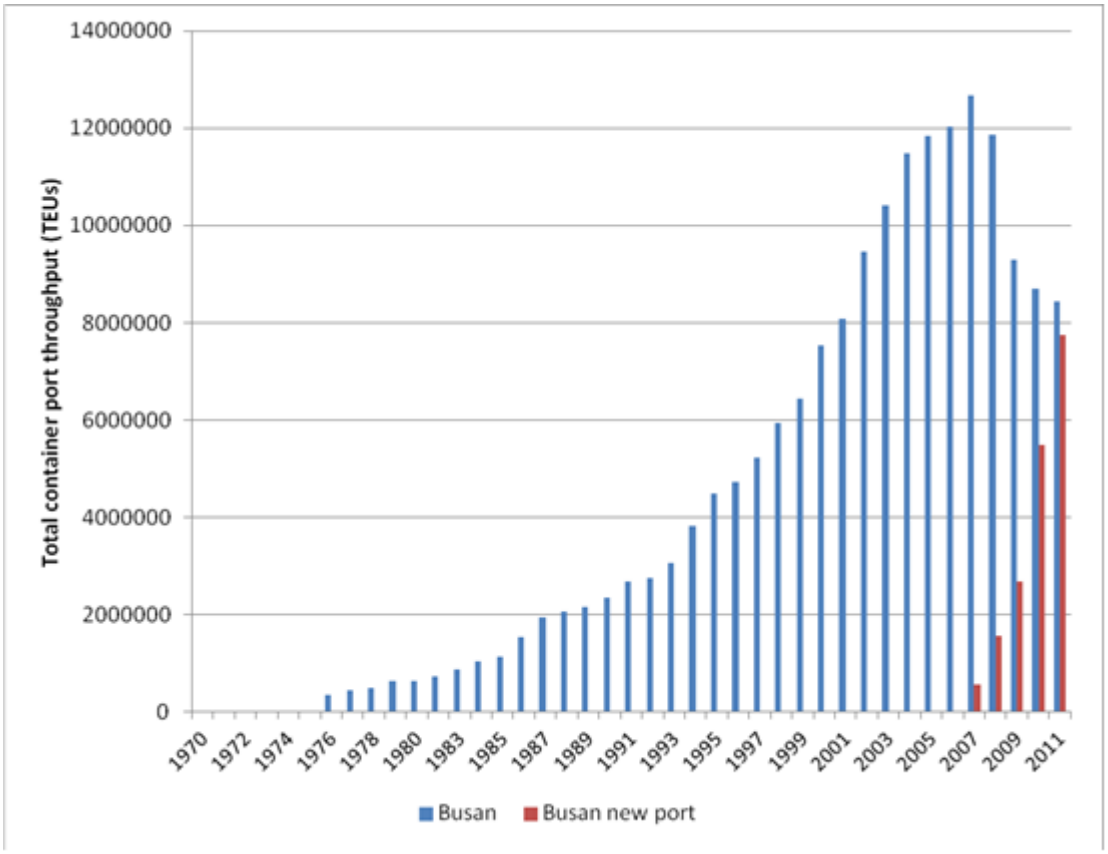
The sample includes 71 major worldwide ports. The regional pattern reflects a noticeable imbalance in the distribution of terminals across the world. About two-thirds of the sample oil ports are concentrated in Asia (with 34% in the East/Southeast and 24% in the western/southern), while the remaining ports are located in Europe and North America (respectively accounting for 24% and 10% of the total sample). Table x shows the input variables specific to the sample oil ports. Capital inputs are proxied by the capacity of terminal reception of oil tankers, such as quay/jetty lengths, maximum vessel capacity, canal draught/depth and tank storage capacity. Labour input is proxied by the loading capacity of equipment as measured by their discharge rates (tonne/hour) and pipeline/loading arm capacity (diameter in mm).

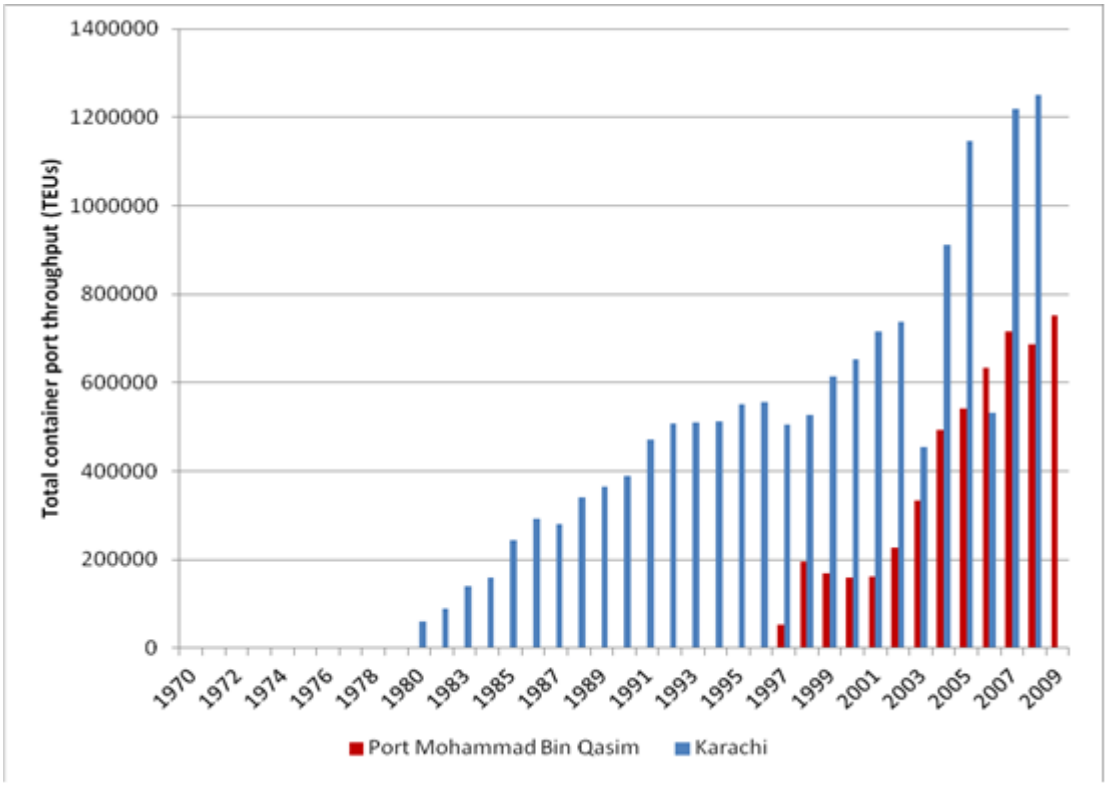
Table 3.3. **Descriptive statistics of input/output variables of the crude oil port sample**

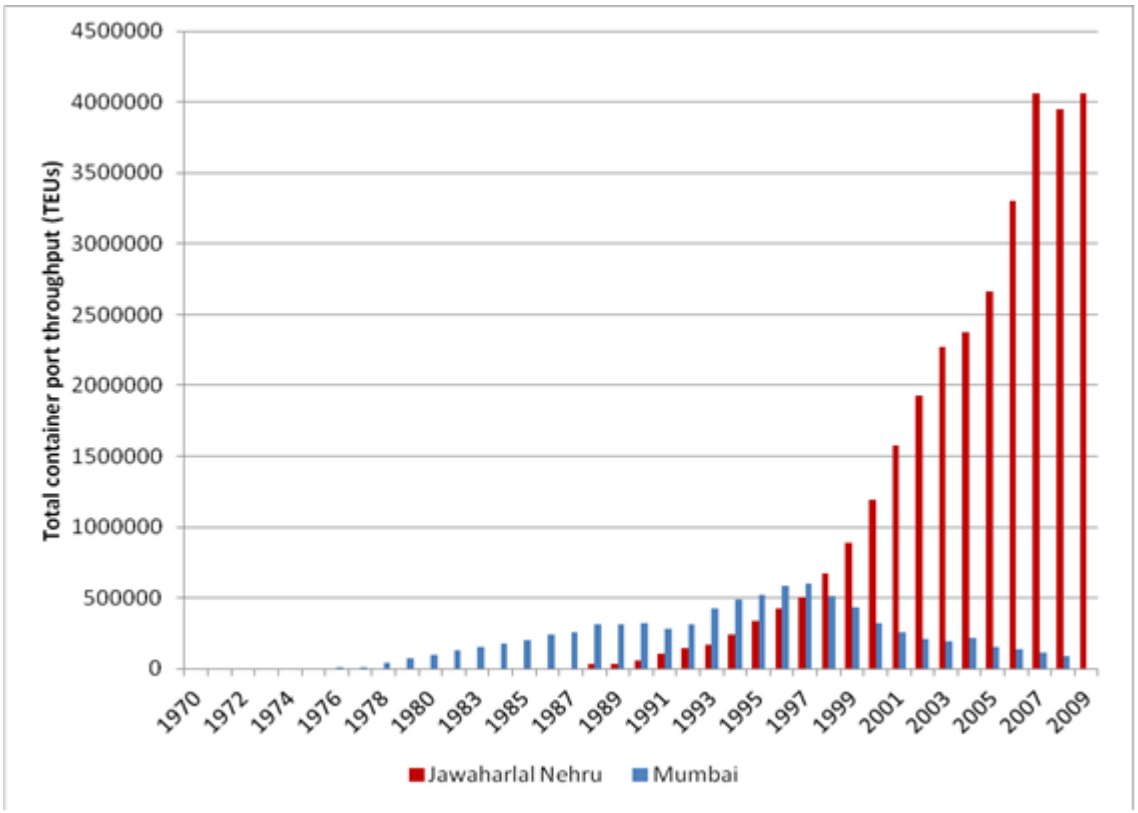
Oil terminal sample	Output May 2011	Quay length	Max vessel capacity (dwt)	Max draught/depth	Tank storage capacity	Discharge rate (t/h)	Pipeline/loading arm capacity
Average	**2,665,512**	**1,833**	**250,346**	**19**	**2,300,030**	**32,016**	**9,623**
Max	33,557,799	16,222	750,000	50	7,092,000	112,000	25,245
Min	2,247	100	2,000	5	123,211	382	2,040
Normalised standard deviation	1.98	1.40	0.66	0.44	1.04	1.13	0.85
N (non missing)	71	52	47	66	9	11	12

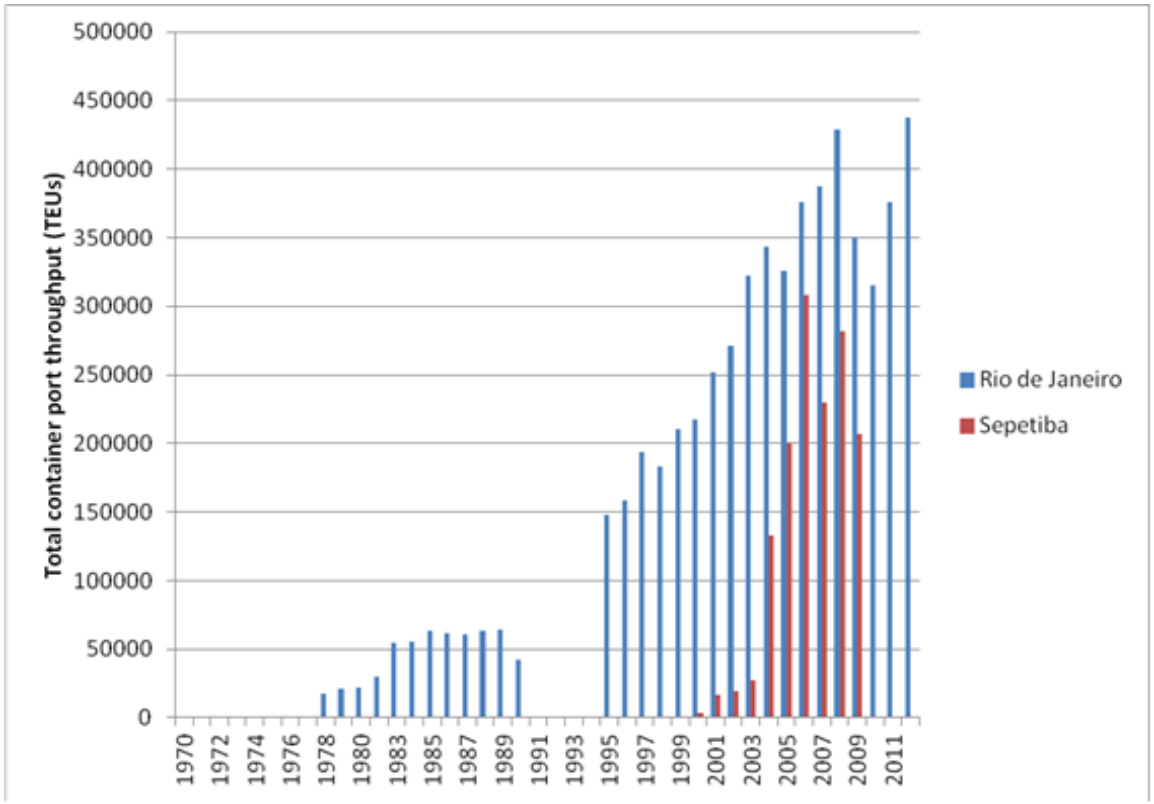
Source: OECD database.

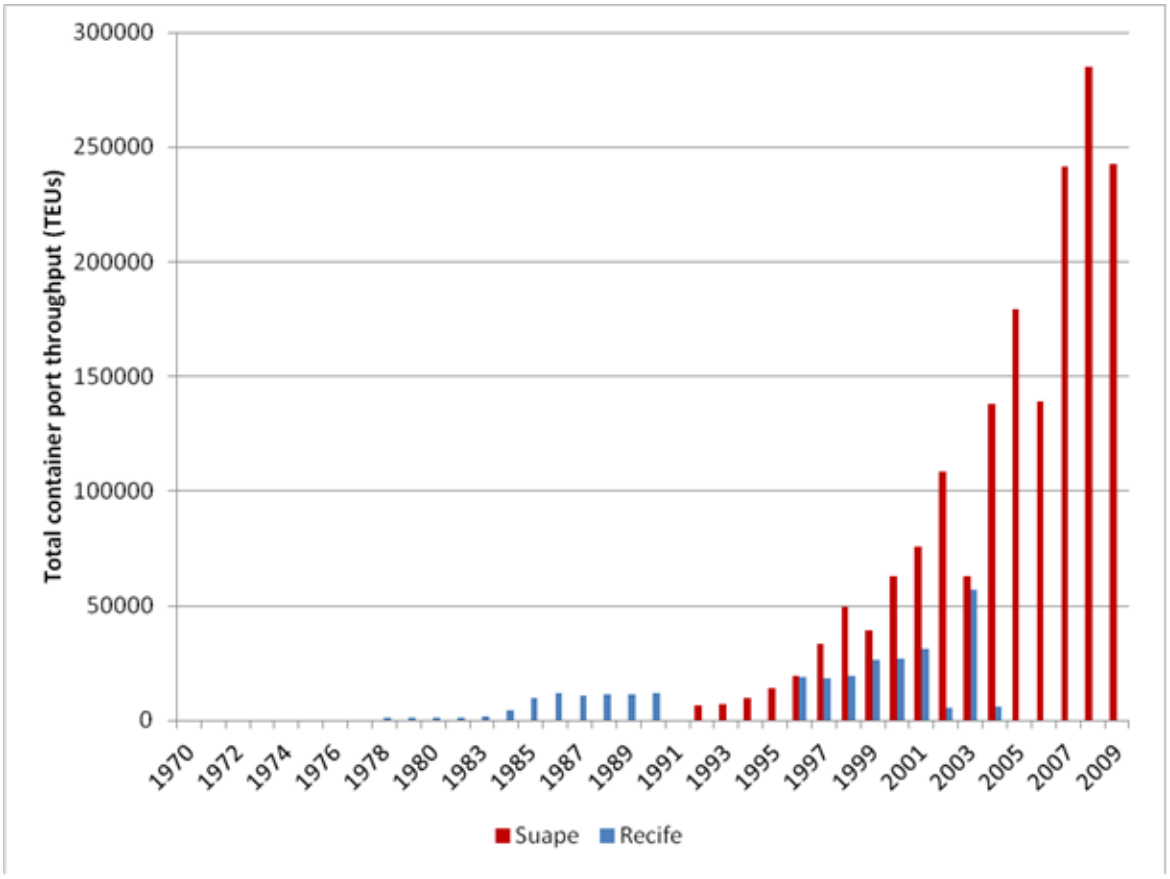
Annex 3: Multisite port evolution in large port cities

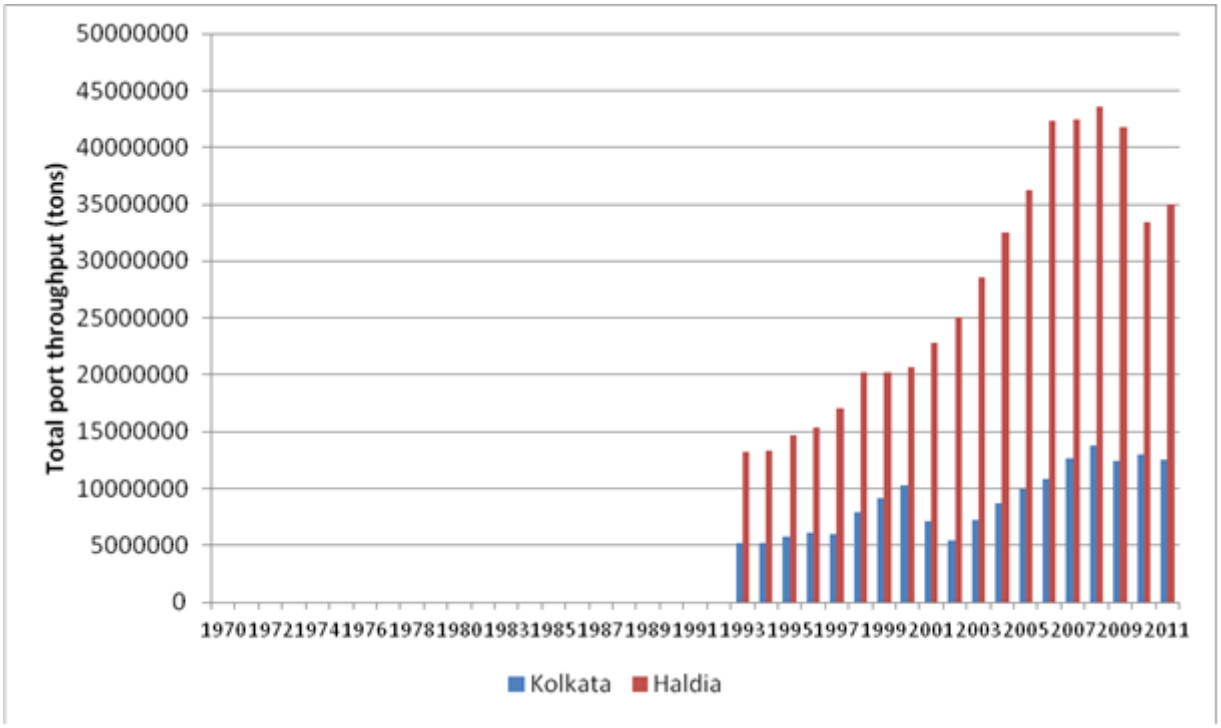


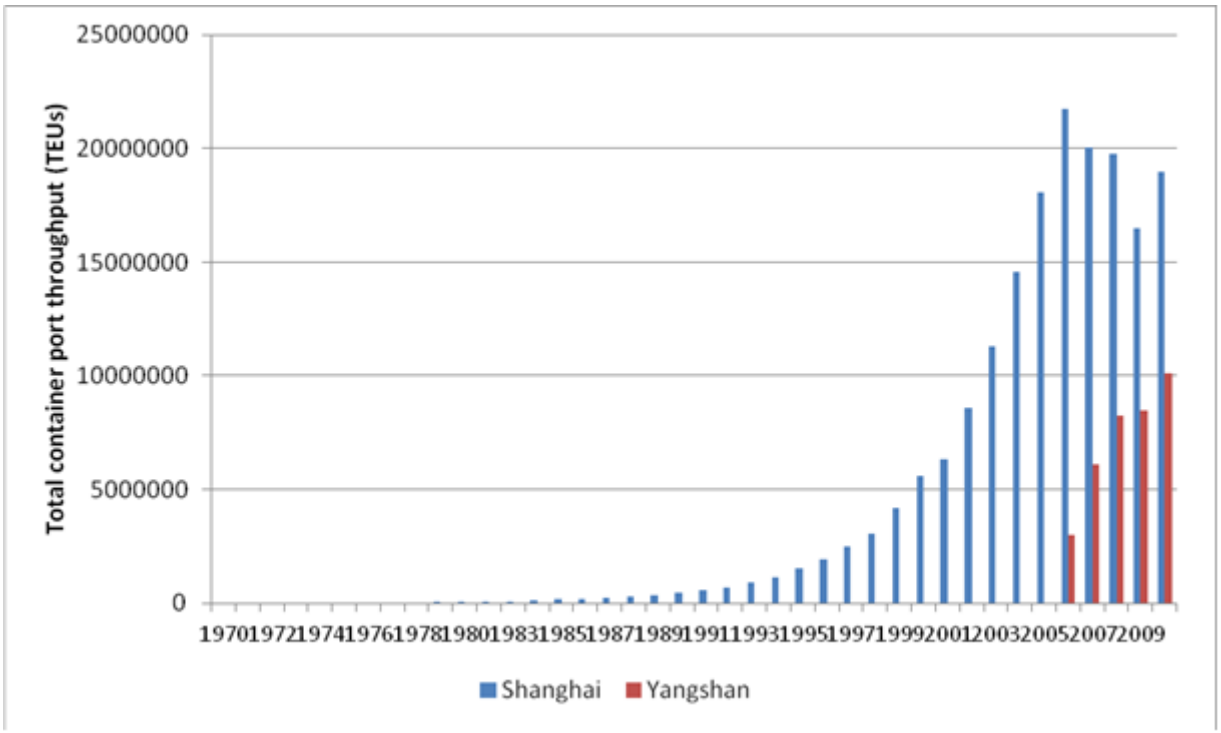

1400000
1200000
1000000
800000
600000
400000
200000
0
Total container port throughput (TEUs)
1970
1972
1974
1976
1978
1980
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Port Mohammad Bin Qasim
Karachi

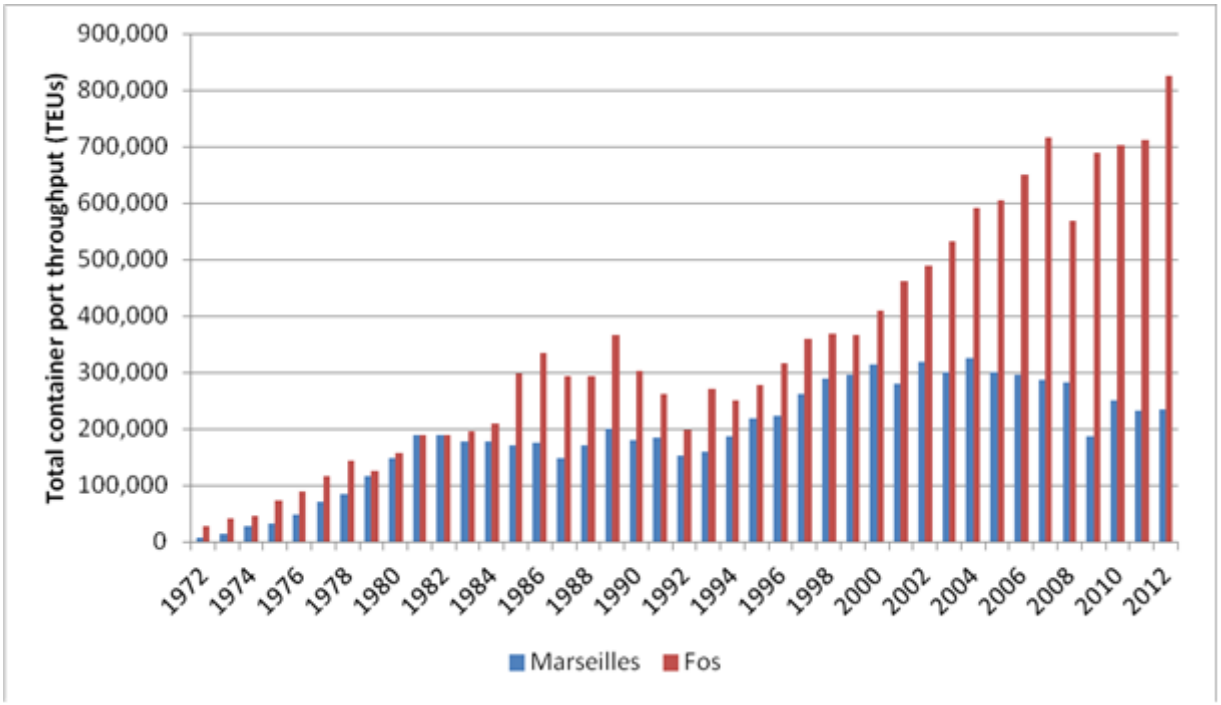

4500000
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
Total container port throughput (TEUs)
1970
1972
1974
1976
1978
1980
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Jawaharlal Nehru
Mumbai

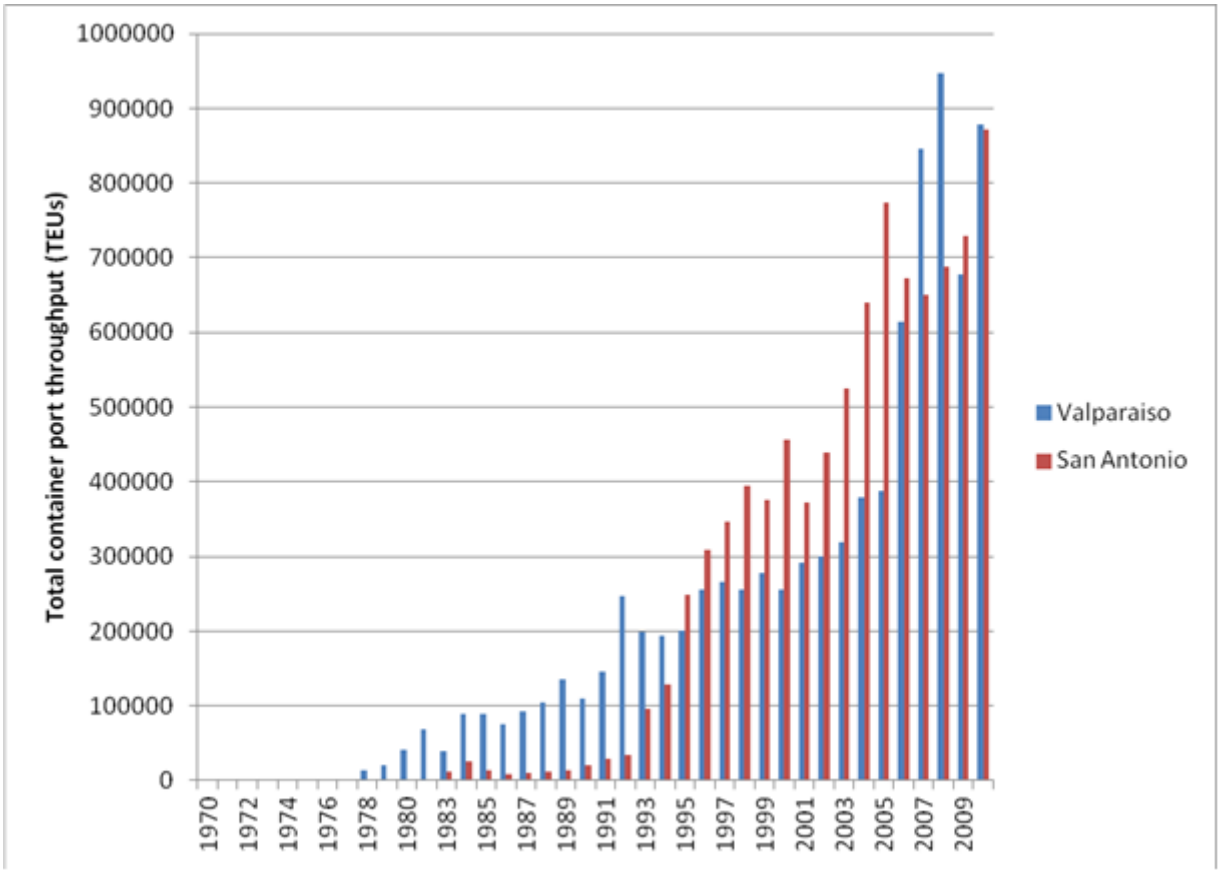

Total container port throughput (TEUs)
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
1970
1972
1974
1976
1978
1980
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Rio de Janeiro
Sepetiba

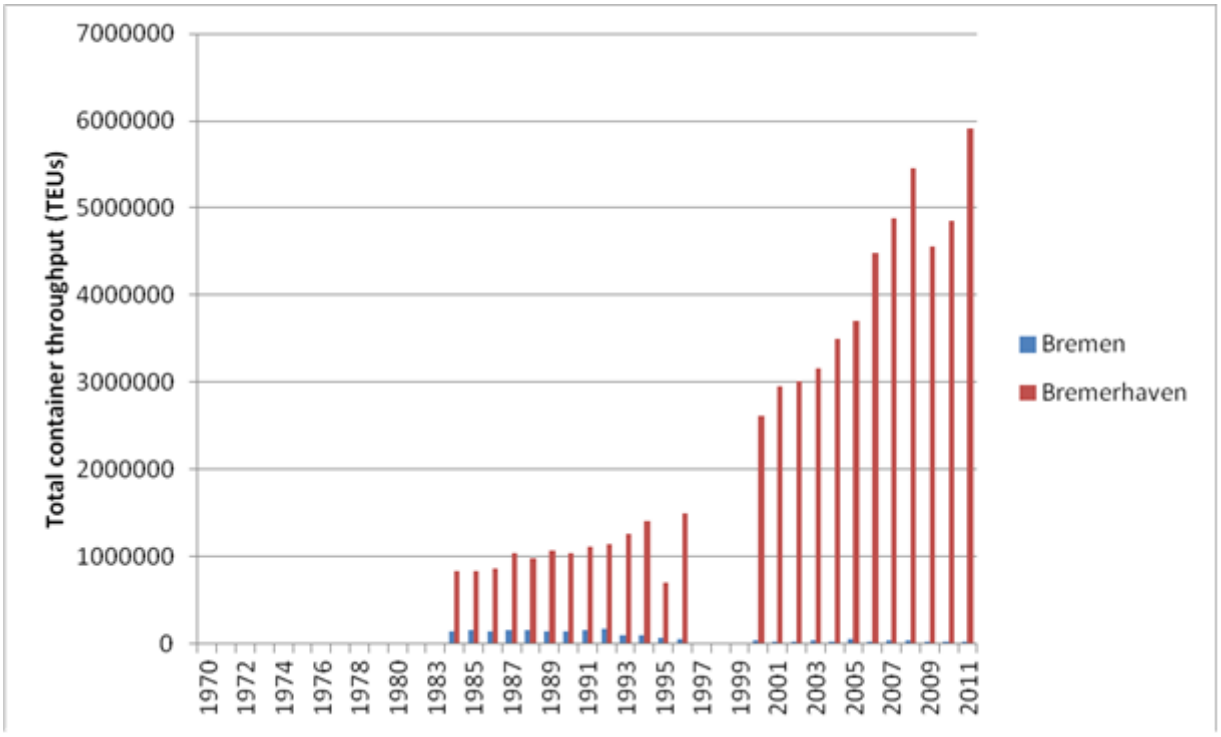

Total container port throughput (TEUs)
300000
250000
200000
150000
100000
50000
0
1970
1972
1974
1976
1978
1980
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Suape
Recife

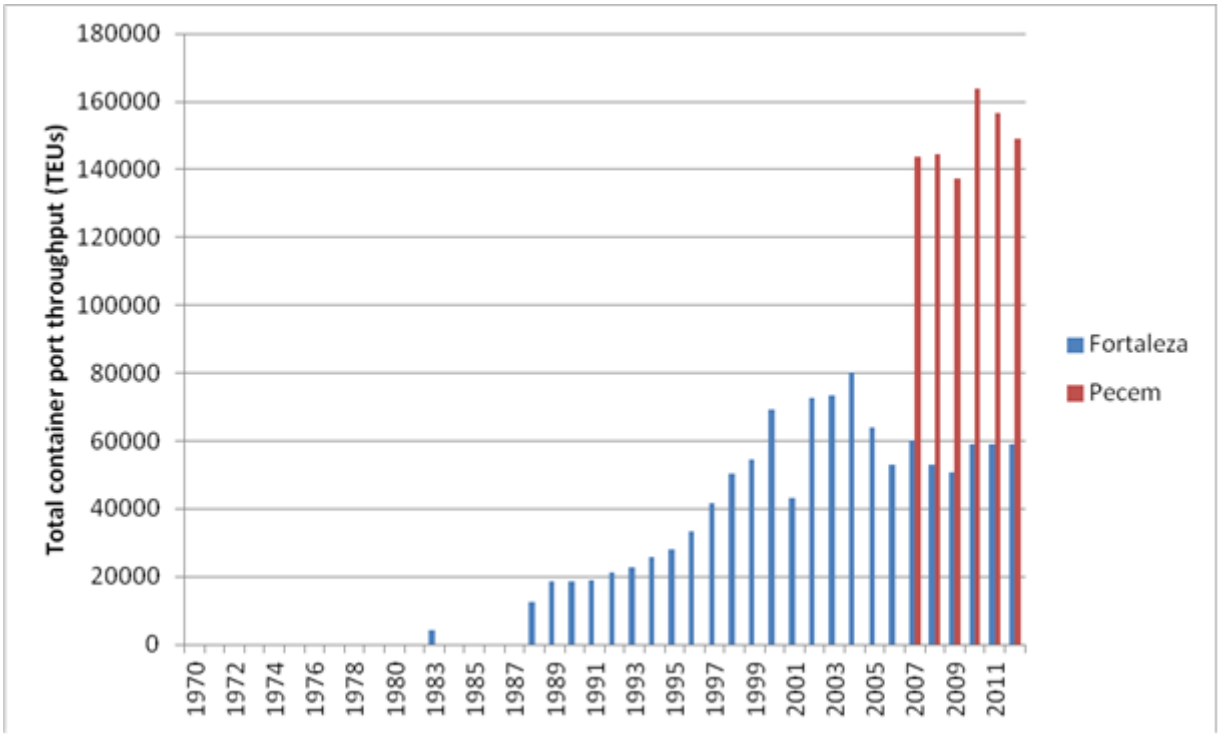

Total port throughput (tons)
50000000
45000000
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
1970 1972 1974 1976 1978 1980 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011
Kolkata
Haldia


Total container port throughput (TEUs)
25000000
20000000
15000000
10000000
5000000
0
1970 1972 1974 1976 1978 1980 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
Shanghai
Yangshan


Total container port throughput (TEUs)
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Marseilles
Fos


Total container port throughput (TEUs)
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
1970
1972
1974
1976
1978
1980
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Valparaiso
San Antonio


Total container throughput (TEUs)
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
1970
1972
1974
1976
1978
1980
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Bremen
Bremerhaven


Total container port throughput (TEUs)
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1970
1972
1974
1976
1978
1980
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Fortaleza
Pecem

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