Seasonality

Figure 15 illustrates the extent to which UNI ports' freight weights are affected by seasonality. It shows the average monthly deviation from annual average freight weights from 2000 to 2011.

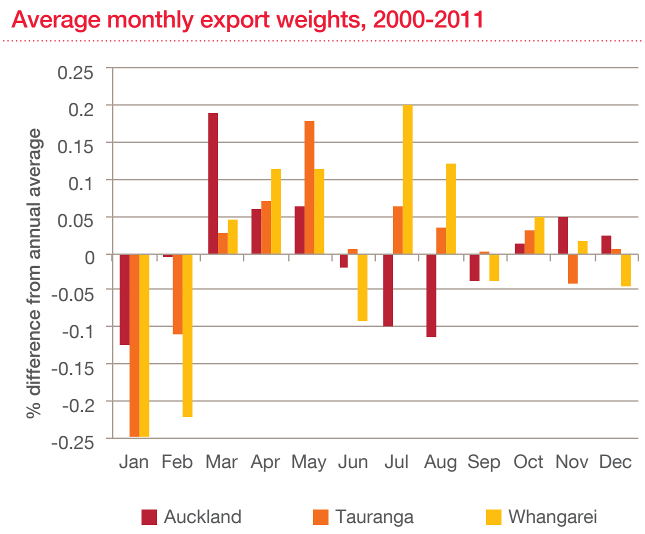
There is some degree of seasonality in import and export weights passing through Upper North Island ports. Exports from the UNI region peak between the months of March and May. This is likely to be driven by seasonal patterns in agricultural production. While there are variations between the ports, January and February tend to be trough months. Average export weights in peak months tend to be roughly 20% higher than annual average export weights.

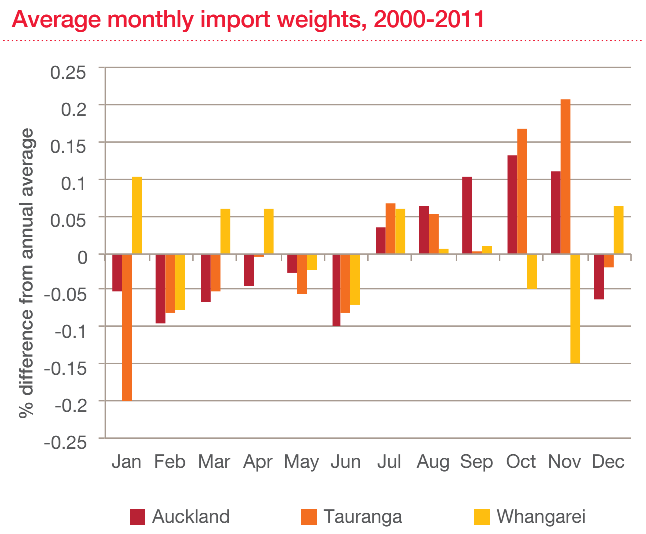
Import weights are more consistent year-round. Imports to Auckland and Tauranga peak between the months of September and November. This is likely to be driven by retail importers stocking up inventory prior to the Christmas shopping season. Imports to Whangarei have a slight peak in January, likely in response to summer demand for fuel. Troughs in monthly import weight are less pronounced.

Overall, it appears to be the case that UNI imports and exports experience some regular seasonality. In the busiest months, demand for port facilities may be as much as 20% above average in months of peak demand and 20% below average in the troughs. This is likely to affect estimates of infrastructure requirements at and inland of the UNI ports.

According to analysis from the NZ Shippers Council, New Zealand's containerised trade experiences similar seasonal variation to the UNI's overall trade[9]. Peak container export volumes during the summer months (February-April) were approximately 17% higher than the annual weekly average. Seasonality in container import volumes was less pronounced, with peaks of up to 15% higher than the annual weekly average in the months leading up to Christmas (September to November).

Figure 15: Seasonality in freight weights through Upper North Island ports





Source: Statistics NZ

9. New Zealand Shippers Council (2010), "The Question of Bigger Ships".

3.2.2 Key products

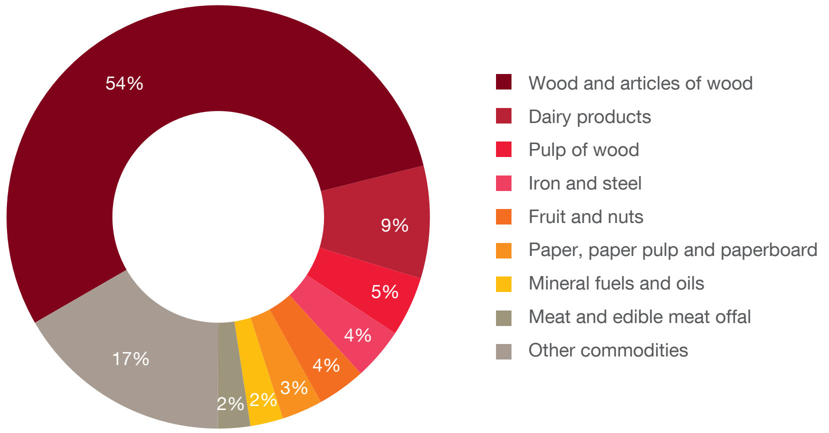
Figure 16 presents the main products exported through the UNI ports in the year to March 2012. Export weights were concentrated in a small number of product categories. The top three categories alone - wood products, dairy products, and wood pulp – accounted for more than two-thirds of the UNI's total. The top eight categories made up 83% of UNI export weights.

Wood products – largely bulk log exports – were the largest single category, with 7.9m tonnes of exports, or 54% of total UNI exports. Dairy products were the second-largest category, with a further 8.6% of exports, and wood pulp products accounted for a further 4.6% of exports.

Figure 17 shows the products imported through the UNI ports in the year to March 2012. The region's import weights are spread across a wider range of products than its exports. The top eight product categories accounted for 76% of total import weights. Mineral fuels were the single largest category, with 6.4m tonnes of imports, or 49% of total UNI import weights. Animal feed and pet food was the second-largest category, accounting for 8% of import weights (1.1m tonnes). Animal feed imports are linked with strong dairy farming growth, which has pushed up the demand for palm kernel extract feed.

Figure 16: Wood dominates export weights

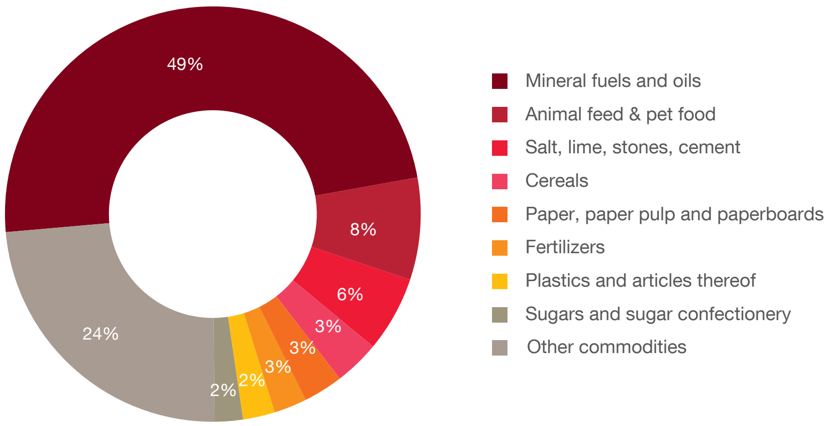
UNI Ports major export commodities 2012



Source: Statistics NZ, PwC analysis

Figure 17: Mineral fuels dominate import weights

UNI Ports major import commodities 2012



Source: Statistics NZ, PwC analysis

Major commodities by port

Figure 18 shows the major commodities exported through each of the three Upper North Island ports[10].

Dairy products provide the largest portion of exports through POA, at 21% in 2012 (473,000 tonnes), followed by wood, iron and steel, and beverages. A variety of other commodities are also exported in large quantities.

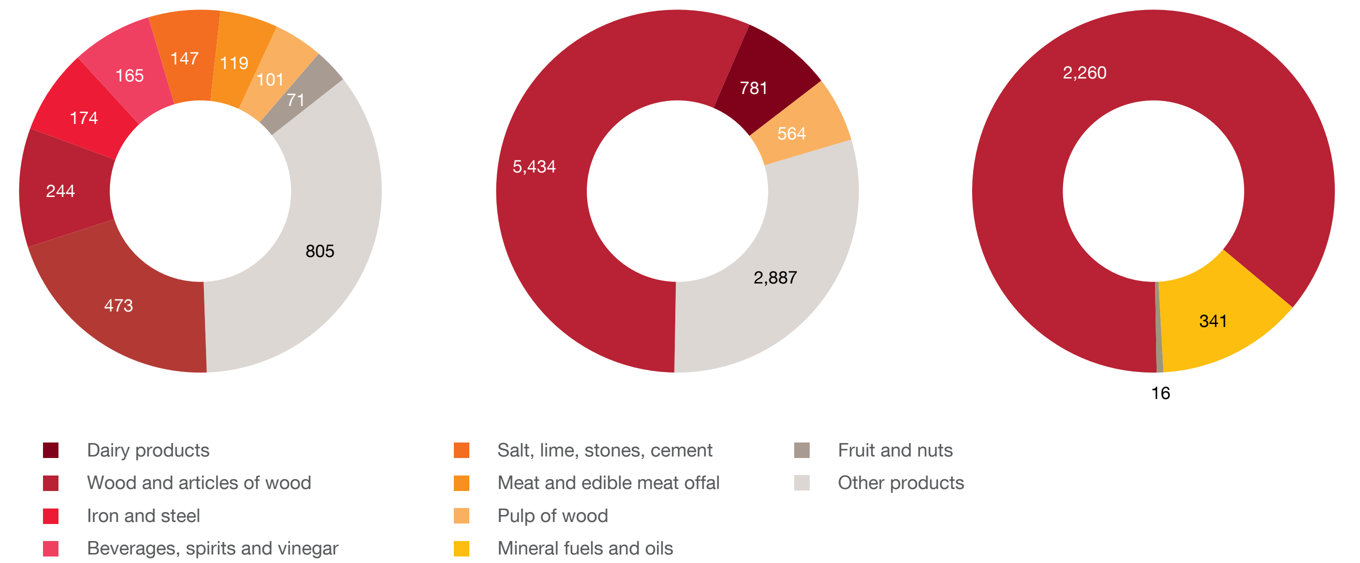
POT and the Whangarei ports, on the other hand, are dominated by a few major commodities. Nearly 90% of export weights through Whangarei (2.3m tonnes) are of wood products, along with 56% of exports through POT (5.4m tonnes). Dairy plays a far smaller role in POT, while fuel exports are also an important part of exports through Whangarei.

Figure 18: The Upper North Island ports have varied export profiles

Ports of Auckland Exports, 000 tonnes, (2012)

Ports of Tauranga Exports, 000 tonnes, (2012)

Ports of Whangarei Exports, 000 tonnes, (2012)



Source: Statistics NZ, PwC analysis

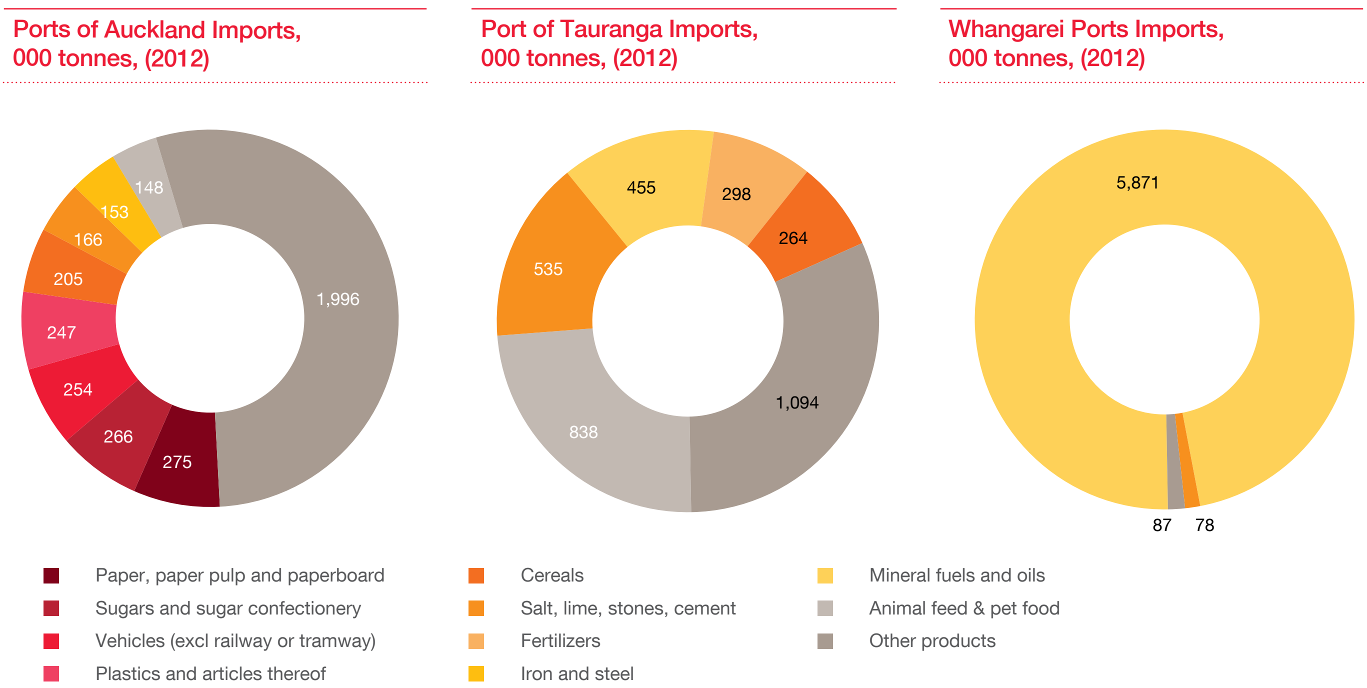
10. Note again that weights for the Whangarei ports include those passing through Portland and Marsden Point.

Figure 19 shows the import profile of each of the three UNI ports in 2012.

Once again, the variety of products imported through POA is far wider than through the other ports. The eight most important import products in weight terms account for just 46% of imports at POA (1.7m tonnes). At POT, on the other hand, animal feed and pet food alone account for one-quarter of import weights (838,000 tonnes), followed by salt and building materials, fuels, fertilisers, and cereals, together weighing 1.6m tonnes.

Nearly all imports to Whangarei are mineral fuels coming through New Zealand Refining Company's Marsden Point wharf. The 5.87 million tonnes of crude oil imports handled at Marsden Point in 2012 accounted for 44% of all import weights through the UNI ports. Building materials such as gypsum shipped to Golden Bay Cement at Portland account for much of the remaining imports to Whangarei.

Figure 19: POA and POT have more varied import profiles than Northport



Source: Statistics NZ, PwC analysis

3.2.3 Key trading partners

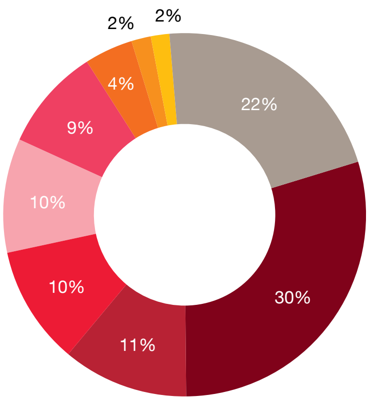
Figure 20 shows the major trading partners for UNI ports in the year to March 2012. The majority of the UNI's trade, by weight, now takes place with other countries in the Asia-Pacific region. None of our top eight import or export partners are European[11]. Although our main trade partners are now closer to us, they are still distant: only Australia is located within 3,000 kilometres.

Export trade partners, by weight, were relatively concentrated compared with import trade partners. The UNI's top five export partners accounted for 70% of export weights in the year to March 2012. China alone accounted for nearly one-third of UNI ports export weights, followed by Australia, Japan, South Korea and India.

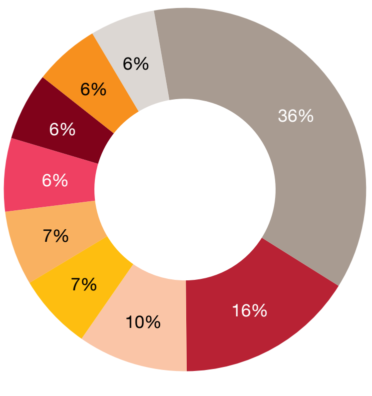
Import weights came from a considerably wider range of sources. The top five import partners accounted for 46% of import weights in the year to March 2012, and no country dominated to the same extent as China did on the exports side. Several of New Zealand's major import partners in 2012 – Russia, Brunei, Qatar and Saudi Arabia – were primarily fuel exporters to New Zealand. We do not expect these countries to remain the same from year to year, as crude oil is imported from different locations depending upon price.

Figure 20: The UNI exports to a small group of trading partners and imports from more diverse sources

UNI Ports major export partners, 2012



UNI Ports major import partners, 2012



- China
- Australia
- Japan
- South Korea
- India
- Qatar
- United States
- Russia
- Indonesia
- Malaysia
- Taiwan
- Brunei
- Saudi Arabia
- Other partners

Source: Statistics NZ, PwC analysis

11. While we import large volumes of mineral fuel from Russia, we consider it to fall within Asia.

3.2.4 Trading partner-commodity pairs

Table 2 shows the major trading partner-commodity pairs for Upper North Island port exports in 2012. The ten largest pairs are shaded orange.

Given the key role played by wood exports, it is unsurprising that several cells in the wood articles row are shaded orange. Wood exports to China account for almost one quarter of all export weights on their own. Japan, South Korea and India wood exports account for a further quarter. This suggests that growth in a large share of New Zealand's future export weights will be linked to economic growth in Asia.

Table 2: Export weights are dominated by wood products

Upper North Island Ports Exports 2012 (000 tonnes)	China	Aust -ralia	Japan	South Korea	India	United States	Indo -nesia	Taiwan	Thai-land	Other coun-tries	Grand Total
Wood and articles of wood	3,566	180	1,218	1,181	1,169	105	41	81	88	309	**7,938**
Dairy products	214	55	58	25	9	18	42	38	34	760	**1,254**
Pulp of wood	253	77	3	114	22	0	72	20	34	68	**665**
Iron and steel	9	159	23	19	16	121	19	9	2	202	**581**
Fruit and nuts	37	40	71	28	5	45	4	33	8	269	**540**
Paper, paper pulp and paperboard	54	185	0	21	8	20	7	16	9	134	**454**
Mineral fuels and oils	0	322	20	0	0	0	-	-	0	23	**365**
Meat and edible meat offal	12	4	13	25	-	122	15	14	1	153	**360**
Beverages, spirits and vinegar	3	138	2	5	0	72	0	0	0	124	**344**
NZ miscellaneous provisions	5	104	1	4	85	1	2	9	1	92	**305**
Salt, lime, stones, cement	1	17	0	6	1	4	1	2	2	228	**262**
Vegetables and certain roots (edible)	1	18	21	6	-	5	3	2	0	108	**163**
Fish & aquatic invertebrates	24	5	7	5	0	13	0	1	3	70	**127**
Animal feed & pet food	11	2	1	1	0	14	29	5	3	28	**94**
Cereals, flour, starch & milk preparations	16	32	1	2	0	0	2	5	8	23	**89**
Other products	109	299	99	39	19	91	13	5	9	357	**1,041**
Grand Total	**4,314**	**1,636**	**1,539**	**1,482**	**1,334**	**631**	**252**	**241**	**203**	**2,949**	**14,581**

Source: Statistics NZ, PwC analysis

Table 3 shows the major trading partner-commodity pairs for UNI port imports in 2012. The ten largest pairs are shaded orange.

With nearly 50% of import weights, mineral fuel-related pairings are key. As mentioned previously, there is significant fluctuation in mineral fuel import weights by country over time; oil is imported from a variety of countries based on needs, with one source easily replaceable by another. As a result, not too much should be read into the fact that Russia is currently a major import partner. As much as 99.9% of all imports from Russia are mineral fuels, which could be imported from a different trading partner in future.

Table 3: Import weights are dominated by fuel imports

Upper North Island Ports Exports 2012 (000 tonnes)	Aust -ralia	Russia	Brunei	Mala -ysia	Qatar	China	Indo -nesia	Saudi Arabia	Oman	Other coun- tries	Grand Total
Mineral fuels and oils	61	1,299	893	348	801	1	253	717	538	1,515	**6,425**
Animal feed & pet food	150	-	-	389	-	1	386	-	-	125	**1,050**
Salt, lime, stones, cement	290	-	-	2	-	41	10	1	-	435	**778**
Cereals	443	-	-	0	-	0	-	0	-	26	**470**
Paper, paper pulp and paperboard	166	0	-	8	-	52	30	-	-	152	**408**
Fertilizers	45	1	-	0	58	35	29	23	16	130	**338**
Plastics and articles thereof	55	-	-	18	4	43	4	14	-	189	**329**
Sugars and sugar confectionery	180	0	-	4	-	7	0	0	0	99	**291**
Vehicles (excl railway or tramway)	20	0	-	0	-	15	0	0	-	228	**264**
Iron and steel	61	0	-	1	-	17	6	0	-	112	**197**
NZ miscellaneous provisions	57	0	-	9	0	17	4	-	-	86	**173**
Appliances, agri & industrial machinery	9	0	-	3	-	41	1	0	-	111	**165**
Beverages, spirits and vinegar	75	0	-	1	-	3	0	0	-	79	**159**
Glass and glassware	26	-	-	1	-	30	6	5	-	82	**149**
Iron or steel articles	27	0	-	3	-	73	0	6	-	36	**146**
Other Products	444	0	0	89	0	423	42	1	0	889	**1,889**
Grand Total	**2,111**	**1,300**	**893**	**878**	**864**	**799**	**772**	**768**	**554**	**4,293**	**13,230**

Source: Statistics NZ, PwC analysis

3.3 Current port and shipping trends and their effects

In this subsection, we consider trends in international shipping and ports, including the deployment of larger ships, port hubbing, and changes to port technology.

3.3.1 How does freight move in and out?

New Zealand's international shipping market

New Zealand's overseas sea freight is heavily concentrated. As of 2009, five international shipping lines handled approximately 77 percent of total freight[12]. Maersk was the largest single shipper, moving 30% of New Zealand's trade, followed by Hamburg Sud (17%), MSC (12%), ANL/CMA CGM (10%), and Hapag Lloyd (8%).

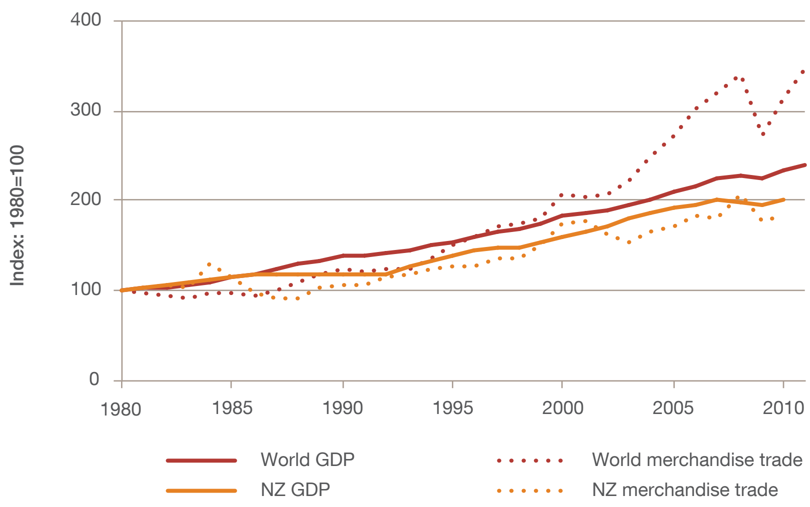
The shipping lines operate in a competitive environment and face commercial incentives to provide capacity in response to demand. While they are permitted by the Commerce Act and Shipping Act to cooperate in a limited fashion through discussion agreements and operational cooperation[13], they must compete with each other for cargo. Opportunities for collusion on price or line capacity are limited by this competition[14].

The supply of shipping is relatively inelastic, as capacity cannot be added or removed from the market without significant time and expense. As a result, small changes in global shipping demand can produce large shifts in the fortunes of shipping lines. This was illustrated in the wake of the 2008 global financial crisis.

As shown in Figure 21, global trade volumes grew rapidly in the 1990s and 2000s, outpacing global GDP growth. During this period, shipping lines aggressively invested in new capacity. However, global trade volumes fell sharply in 2008 and 2009 as a result of the global financial crisis before rebounding in subsequent years.

Figure 21: NZ and world growth in GDP and merchandise trade

NZ and world growth in GDP, merchandise trade value, 1980-2011



Source: World Bank

12. Auckland Regional Holdings, "Long-term Optimisation of the New Zealand Port Sector", October 2009
13. Discussion agreements allow shipping lines to exchange information on their current cargo capacity and prices but do not allow them to collectively set prices or capacity. The operational cooperation permitted by the Acts allows one shipping line to move cargo on a boat owned by another shipping line at market rates.
14. For a more in-depth discussion, see Productivity Commission (2012), "International freight transport services inquiry final report".

Shipping lines were adversely affected by the crash in trade volumes and have since undertaken consolidations and restructuring of shipping capacity in order to restore profitability. Shipping lines appear to have responded relatively quickly to the challenges posed by the global financial crisis. This is especially apparent in comparison with the shipping industry's slow response to a similar fall in trade volumes in the early 1970s[15]. Shipping lines have rationalised via mergers, decommissioning of older, smaller, and more expensive ships, slow steaming to increase utilisation and cut costs. This has led to a quick return to profitability – after losing US$19.5bn worldwide in 2009, shipping lines earned US$17bn in 2010 and an estimated US$8bn in 2011[16]. In spite of this, the full effects will take a number of years to be felt.

Although shipping lines are currently cutting smaller container ships, such as those currently serving New Zealand trade routes, in favour of larger, more cost-effective ships, this does not mean that New Zealand will lose cargo capacity. If one shipping company cuts services, others are likely to add capacity in response to the commercial opportunity. These effects are discussed more below.

The trend toward larger ships

Shipping lines will deploy larger ships on New Zealand trade routes if and when demand warrants it. As container volumes are expected to continue growing strongly, this is likely to occur in the short to medium term. At this point, ports will need to invest in order to accommodate larger ships.

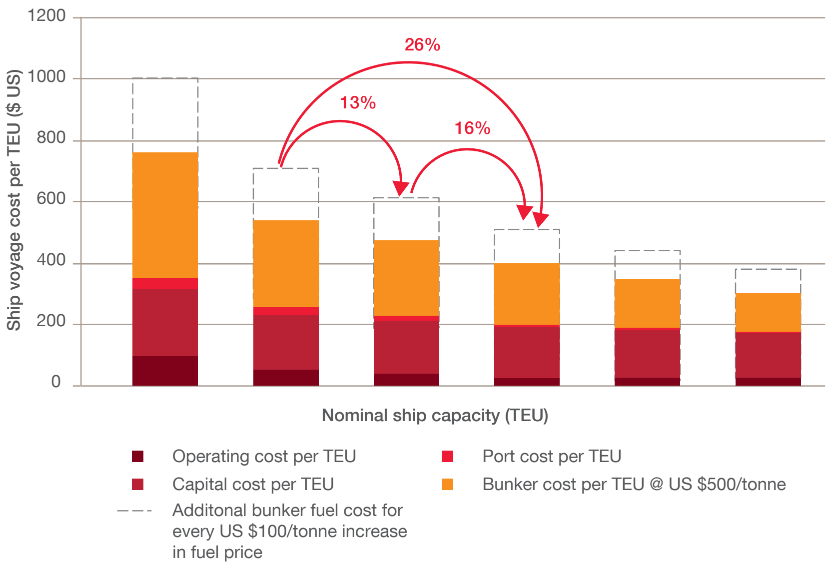
Conversely, however, shipping lines are expected to continue serving NZ directly with smaller ships in the interim. As long as there is strong demand from New Zealand importers and exporters – which will continue to be the case – there will be a commercial rationale for direct services. As a result, NZ importers and exporters do not face any significant risks associated with the timing of ports' investment in larger ships.

15. See NZIER (2010), "Freight futures" for a more in-depth discussion of long-term trends in the shipping market.
16. United Nations Conference on Trade and Development (2011), "Review of Maritime Transport".

Background to projections continued

Figure 22: Cost reductions form larger ships

Ship voyage cost per TEU for various ship sizes for a weekly New Zealand to Singapore services



Analysis based on:

- Average sailing speed of 20 knots for all ship sizes except the 1200 TEU ship (which is assumed to sail at its maximum design speed of 18.3 knots
- Current bunker fuel price of approximately US $500 per tonner;
- Shipping companies owning their own ships, rather than chartering ships; and
- Average inbound ship utilisation (based on full payig containers) of 60%, and outbound utilisation of 86%

Source: NZ Shippers' Council

There is an international trend towards larger container ships due to the cost efficiencies they offer. Larger ships can move containers more cheaply and more efficiently (as measured by fuel consumption per tonne-kilometre) than smaller vessels. Adopting larger ships can result in a decrease in vessel operating costs of up to 26% from size and efficient fuel consumption[17].

As shown by Figure 23, the size of container ships has been steadily increasing since their introduction. This trend is likely to continue, as Post-Panamax container ships with a capacity of 8,000 TEUs or more account for the overwhelming majority of current container ship orders[18]. At present, the largest container ships currently in service on Europe-Southeast Asia routes have a capacity of 14-18,000 TEU. By comparison, the largest ships regularly serving the New Zealand market can carry 4,100 TEU.

Increases to maximum ship size on major sea routes appear to be having a 'cascade effect' on other routes. In short, the small (and more costly) ships that currently serve minor routes are being gradually displaced by larger ships that are no longer required on major routes. As discussed above, shipping line rationalisation since the global financial crisis has accelerated this trend.

It is likely that larger ships will be deployed on New Zealand routes in the medium term future, although the timing may be affected by demand growth for international freight, developments in the shipping market, and infrastructure decisions made in New Zealand. As discussed in more depth in Section 5, the UNI ports will need to invest in order to accommodate larger ships, or manage them through restricted tidal windows.

There is a clear consensus that New Zealand will need infrastructure capacity to manage 6,000 TEU ships in the short to medium term, and perhaps 8,000 TEU ships in the medium to longer term. In the process, 3 or 4 hub ports will emerge, with regional ports acting as feeders. However, there is no consensus about the optimal timing for the necessary investments.

17. The New Zealand Shippers Council (2010), "The Question of Bigger Ships"
18. There are some physical limits to ship sizes as a result of the size of canals and maritime channels. Vessel size on routes between the Atlantic and Pacific Oceans is constrained by the locks in the Panama Canal – a 'Panamax' ship has a draft of 12m and carries no more than 5,000 TEU. Most of the new ships being commissioned today are Post-Panamax, or larger than 5,000 TEU. However, there is considerable room for container ship size growth on most other routes. (And the Panama Canal is currently being expanded.)

Figure 23: Container ship sizes and current order book

Container ship order book as % of existing fleet			Length	Draft	TEU
P-P 8K+ TEU 92.4%	First (1956-1970)	Converted cargo vessel	135m	<9m	500
		Converted tanker	200m	< 30ft	800
P-P 3-8K TEU 26.3%	Second (1970-1980)	Cellular containership	215m	10m 33ft	1,000-2,500
Panamax 6.3%	Third (1980-1988)	Panamax class	250m	11-12m 36-40ft	3,000
			290m		4,000
Sub-Panmax 5.1%	Fourth (1988- 2000)	Post Panamax	275m-305m	11-13m 43-45m	4,000-5,000
Handy 6.6%	Fifth (2000-2005)	Post Panamax Plus	335m	13m-14m 43-45ft	5,000-8,000
Feeder/Max 3.4%	Sixth (2006-)	New Panamax	397m	15.5m 50ft	11,000-14,500

Source: Clarksons Research, cited in internal PwC report, "Shipping Industry Developments H1 2011"

It is likely that demand from the UNI will be sufficient to require 7,000 TEU ships in the short-to-medium term. Analysis by the NZ Shippers Council[19] suggests that volumes on the Southeast Asia trade routes are large enough at present to be served by 7,000 TEU ships. However, shipping lines may be unwilling to deploy larger ships at present, as it would require them to consolidate their capacity and, in the process, reduce the operational independence of individual shipping lines.

Discussions with importers, exporters, and others within the port and shipping industry suggest that New Zealand is unlikely to be adversely affected by the trend towards larger container ships. Some commentary has focused on the risk of New Zealand's trade being transhipped through Australian ports, potentially adding cost and delays for importers and exporters[20]. However, this risk is likely to be overstated for two reasons.

First, Australian ports also lack the capacity to handle larger ships at present, although Brisbane and Sydney are addressing this shortfall. In addition, container volumes and cargo handling infrastructure at Australian ports are not significantly larger than those in the UNI region. Consequently, UNI trade could not be routed through Australian ports without considerable investment by those ports.

In the short term, the competitiveness of the shipping market means that New Zealand is likely to be served directly by smaller ships unless transhipment through Australia offers significant cost savings.

Second, shipping lines operate in a competitive market and as a result face a commercial incentive to add capacity to serve demand. This has been demonstrated in recent years. For example, after shipping lines Maersk and Hamburg Sud ceased services to Timaru's PrimePort in July 2012, MSC began a (smaller) container service to pick up demand from that area[21]. Similarly, when Maersk shifted its UNI container services from Tauranga to Auckland in 2006, Hamburg Sud and CMA CGM reorganised their schedules to make Tauranga their main port of call[22]. In other words, loss of capacity as a result of decisions made by an individual shipping line are likely to be offset by a market response from other lines.

In the short term, the competitiveness of the shipping market means that New Zealand is likely to be served directly by smaller ships unless transhipment through Australia offers significant cost savings. In the medium and long term, it means that shipping lines will seek to add larger ships if and when demand grows to a sufficient level. The main implication of this is that the key to handling larger ships is not necessarily for ports to invest as soon as possible but for them to avoid foreclosing on that possibility and be prepared to invest when it makes commercial sense.

19. The New Zealand Shippers Council (2010)
20. See for example Otago Daily Times (2010), "Aust ports could become hubs for NZ: industry leader", http://www.odt.co.nz/news/business/90100/aust-ports-could-become-hubs-nz-industry-leader; Stuff (2012), "Potential threat to ports' future ", http://www.stuff.co.nz/auckland/local-news/7281596/Potential-threat-to-ports-future.
21. http://www.stuff.co.nz/timaru-herald/features/7840116/Global-storm-buffets-port
22. NZIER (2010).

Oil price increases will drive increases to shipping costs

Fuel costs account for the largest single share of shipping lines' operating costs and as a consequence will have a significant impact on the shipping markets. Over the last decade, oil prices have risen considerably, although not without some major fluctuations in price related to global economic conditions. They are likely to continue rising throughout the study period.

Price increases will raise costs for importers and exporters unless increased shipping efficiency offsets it. This is likely to affect overseas trade demand. While the expected effects of oil price increases on shipping demand are likely to be priced into our projections, high oil price scenarios pose a downside risk for port demand growth.

Fuel oil is the largest single cost for ocean shipping; according to the United Nations Conference on Trade and Development (UNCTAD) (2011:26) it makes up roughly 60% of the operating costs for a containership. Increases in oil prices, driven by constrained supply and growing demand from rapidly-growing developing countries (eg China, India), are therefore likely to be the most significant factor pushing up the cost of ocean shipping. This may in turn reduce demand for shipping unless ship efficiency increases enough to offset any increases in cost.

The impact of higher oil prices may be partly mitigated by other decisions, such as:

- continued use of slow-steaming to conserve fuel (however, this costs time and may be resisted by importers and exporters)
- development and use of alternative fuels (eg biofuels)
- increased use of larger ships, which are more fuel-efficient per tonne-kilometre.

There may be a significant downside risk that is not captured within the consensus estimates reported here, as they indicate that oil prices will rise considerably more slowly in real terms than they have done over the last decade. Higher increases will tend to have a greater impact on demand for imports and exports.

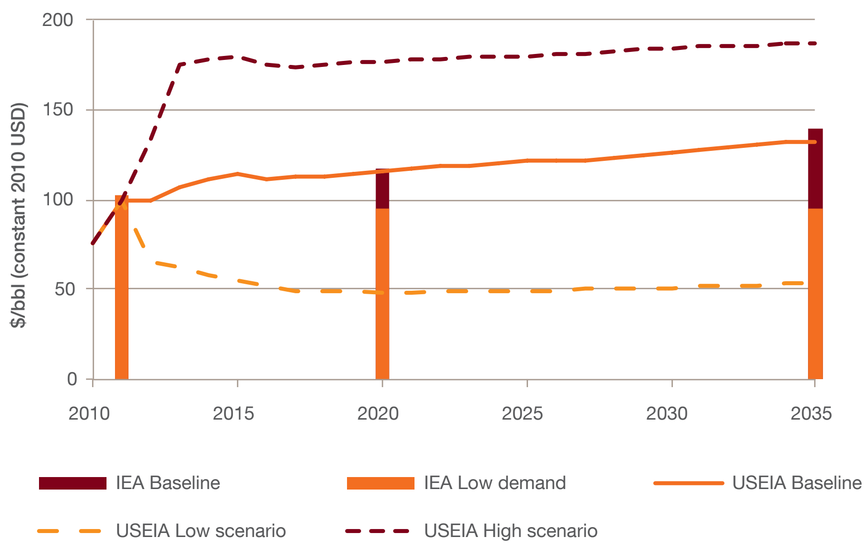
Background to projections continued

Base case oil price forecasts for the study period, compiled from several forecasting agencies, suggest that oil prices will rise in real terms over the upcoming decades. The International Energy Agency (IEA) and United States Energy Information Agency (USEIA) project that real oil prices will rise 16% by 2020 and 33% to 37% by 2035[23]. These agencies baseline forecasts are summarised in Figure 24. Forecasts provided by New Zealand's Ministry of Business, Innovation, and Employment (MBIE)[24] suggest that retail diesel prices will increase more rapidly within New Zealand, possibly as a result of exchange rate movements or refining and transport costs.

Note, however, that there is considerable uncertainty in these forecasts (as shown by the large range between high and low demand scenarios). While demand growth is currently forecast to outpace supply, new technologies may allow access to unconventional oil resources. While increased supply would moderate oil price increases, it would not necessarily reduce prices due to the high cost of extracting new resources.

Figure 24: IEA and USEIA crude oil import price forecasts

Crude oil import price forecasts to 2035



Source: IEA, USEIA

23. International Energy Agency (2011), "World Energy Outlook 2011"; United States Energy Information Administration (2012), "Annual Energy Outlook 2012, with Projections to 2035".
24. Ministry of Economic Development (2011), "New Zealand's Energy Outlook 2011", http://www.med.govt.nz/sectors-industries/energy/energy-modelling/modelling/new-zealands-energy-outlook.

3.3.2 Port hubbing

New Zealand is in the process of developing a domestic 'hub and spoke' model in which overseas cargo is predominantly routed through main ports before moving to regional ports on feeder services. This trend is related to the movement towards larger container ships. However, the same pattern is not likely to emerge on an international level – ie there is little risk of New Zealand trade being hubbed through Australian ports – due to the fact that container volumes to and from New Zealand are sufficient to justify direct services.

Port hubbing will have a material impact on projections of port demand. On the one hand, domestic port hubbing has led to significant increases in import and export transhipments through the UNI ports in recent years – a trend that we expect to continue. On the other hand, international transhipments through UNI ports have also grown rapidly, and we expect this to continue in the short to medium term. This will tend to increase growth in port throughput.

The main rationale for port hubbing is to improve economies of scale in the shipping market. In a 'hub and spoke' model, shipping lines consolidate direct routes through larger ports and serve smaller markets with feeder services. This enables larger ships to be deployed, decreasing operating costs, and port investment to be concentrated in the largest ports rather than duplicated across many locations.

While port hubbing will decrease costs for many importers and exporters, it could potentially have a negative effect on regions without a hub port. It is likely to increase the time to market for importers and exporters – a potential concern for New Zealand exporters of perishable agricultural products. However, costs would not necessarily increase as greater economies of scale could offset any increases related to feeder services and double handling of cargo at the hub port.

Port hubbing will have a material impact on projections of port demand.

Port hubbing on a national level

New Zealand's overseas container trade is increasingly being consolidated through the largest domestic ports – POA, POT, Christchurch and Dunedin. While New Zealand still has a relatively large number of container ports for its size, regional ports such as Timaru and Wellington are losing traffic to their larger competitors. This trend is related to a reduction in the average number of port calls made in New Zealand by international lines and to a recent increase in import and export transhipment.

The average number of port calls that an overseas container ship makes in New Zealand is declining and is likely to continue doing so in the near future. Rather than running services that stop at each regional port, shipping lines are providing overlapping services, each of which serves only a few ports. Because not all ports have direct service to all overseas trade partners, this trend will increase the share of cargo from regional ports that must be transhipped through the main ports.

Data from POA and POT suggests that transhipment of import and export cargo has risen substantially over the last half-decade. We expect developments in the shipping market, including the deployment of larger ships on New Zealand routes, to strengthen this trend and increase the relative importance of the UNI container ports to overall New Zealand trade. Although transhipment volumes in the UNI are still relatively small compared with overseas cargo volumes, it is likely that they will grow at a faster rate during the study period.

Port hubbing on an international level

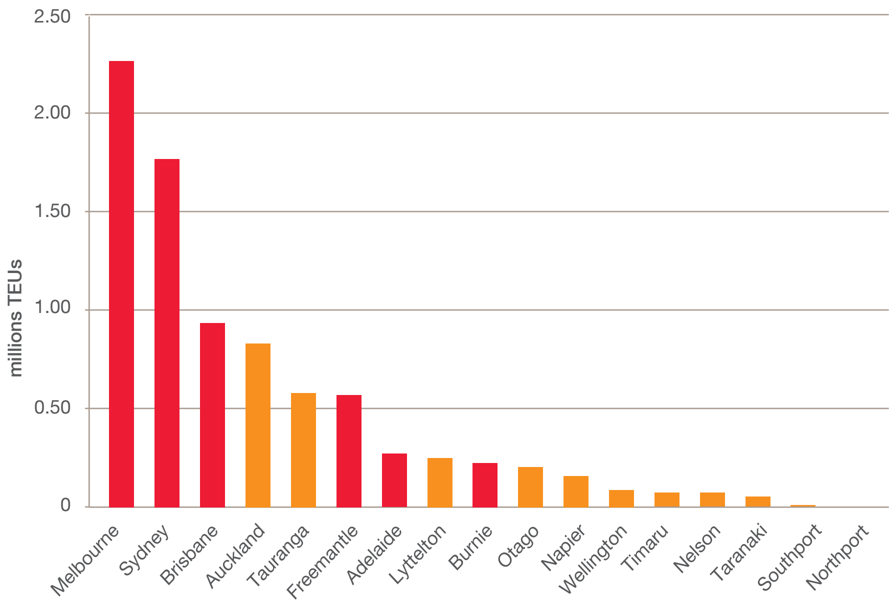
In our view, there is a clear trend towards port hubbing at a national level, but a similar pattern is not likely to emerge at an international level[25]. While some of New Zealand's international cargo will be transhipped through Australian ports, it is likely that this will take place on an opportunistic basis where cost advantages or travel time savings can be made. Conversely, some trade between Australia and the United States will be transhipped through the UNI ports. Most of New Zealand's international cargo will continue to travel on direct routes.

There are several factors that reduce the likelihood of New Zealand ports being relegated to 'spoke' status.

First and foremost, New Zealand has and will continue to have large enough trade volumes to justify direct routes with reasonably large ships. For example, analysis by the NZ Shippers Council found that container volumes between the UNI and Southeast Asia were, in theory, large enough to justify increasing ship size on these routes[26].

Figure 25: Australian port capacity and expansion plans

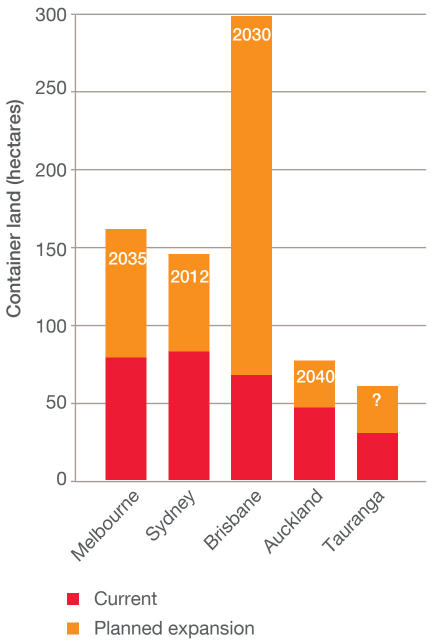
2008 Australian container port volumes (TEUs)



Source: Australian Competition and Consumer Comission (ACCC), Container Stevedoring Monitoring Report (October 2008), Ports of Auckland Limited

Australasian port infrastructure - current and planned expansion

Major australasian container ports - container land (hectares)



25. With the caveat that much of New Zealand's trade with Asia and Europe passes through Singapore, which serves as a regional transhipment hub.
26. NZ Shippers Council (2010).

The container shipping market is reasonably competitive. If one shipping line diverted container freight through an Australian port, resulting in increased costs or time to market for New Zealand importers and exporters, it is likely that another line would provide direct services instead. In other words, if port hubbing would raise New Zealand's supply chain costs, it would provoke a countervailing market response. Similarly, shipping lines are unlikely to drop direct services to New Zealand as a result of the trend towards larger ships.

Second, the largest Australian ports handle greater volumes than any New Zealand ports, but they do not have sufficient capacity to handle all New Zealand freight without considerable investment. This limits the scope for them to tranship more than a small share of UNI trade.

As shown in Figure 25, three of Australia's six large container ports – Melbourne, Sydney and Brisbane – handle larger container volumes than Auckland and Tauranga. According to ARH[27], each port is planning to invest in capacity to enable them to handle between four and seven million TEUs each by around 2030–2035.

The Australian ports' container traffic is not as large as could be expected given the population and size of economy in the areas that they serve. For example, POA handles almost as many containers as Brisbane, in spite of the fact that Brisbane's population is roughly 50% larger than Auckland's. Australia's economy is less trade-intensive than New Zealand's as measured by their ratio of trade to GDP. Furthermore, Australian exports are heavily concentrated in bulk minerals that don't move by container.

The largest Australian ports handle greater volumes than any New Zealand ports, but they do not have sufficient capacity to handle all New Zealand freight without considerable investment.

27. Auckland Regional Holdings (2009).

3.3.3 Port technology

New Zealand ports, including the UNI ports, are not at the forefront of technology or efficiency. On a number of measures of port efficiency, they lag behind international comparators, including Australian ports. (However, they move containers at a relatively low price compared with Australian ports.) This suggests that the UNI ports have scope to manage demand growth by increasing efficiency rather than increasing in size or undertaking expensive infrastructure upgrades. We discuss these options in more detail in later sections of the report.

Port technology has improved incrementally since the development and widespread adoption of containerised shipping in the 1960s and 1970s. Since then, larger ships and improvements to cranes and container stacking systems have driven increased port productivity. While port technology is unlikely to undergo a further transformational technology change along the lines of containerisation, there are a number of areas in which significant investments can be made. They include upgrading harbours and berths to accommodate larger ships, deploying automated container stacking (ACS) systems to increase container yard capacity, and developing inland ports to allow cargo to be consolidated and cleared through customs at a cheaper location. (We discuss inland ports more fully below.)

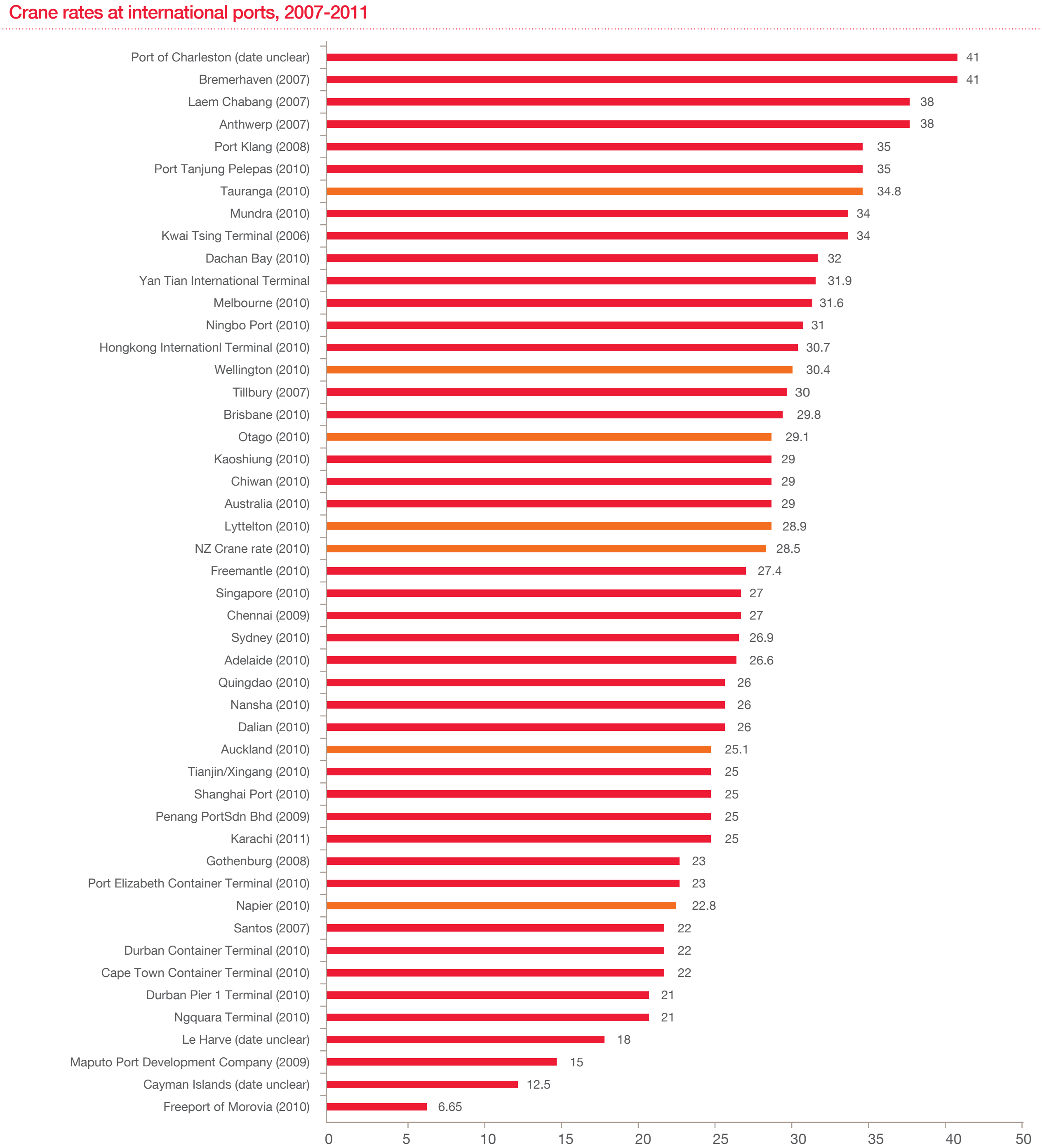
New Zealand ports are fully capable of handling containerised shipping but have not yet invested in all of the newest port technologies, such as ACS systems. Because New Zealand ports are behind the global 'technology frontier', there is scope for progressive upgrades to port equipment and productivity. POT performs better on most measures of port efficiency and productivity than POA. For example its crane rates are comparable with all but the most efficient international ports, as shown in Figure 26, while POA's performance is significantly lower. On other measures, such as yard utilisation, both ports are significantly below the best performing international ports.

Two common measures of container port efficiency are yard utilisation, defined as annual container throughput per hectare of storage area, and berth utilisation, defined as annual container throughput per metre of berth length[28]. Bulk cargo efficiency tends to be more difficult to measure due to considerable differences between various types of bulk cargo. (In other words, loading or discharging bulk liquids is a very different process than loading or unloading logs or cars.)

Another common, more comparable measure of container port efficiency is the crane rate, or number of containers moved per crane per hour. Figure 26 summarises available data on crane rates at international and New Zealand (in red) ports. It indicates that POT is the only New Zealand port in the upper tier of efficiency, while POA is below the New Zealand average.

28. Note, however, that both of these measures are affected by demand for port facilities. In other words, two ports may have similar technical capabilities, but higher demand at one port would mean that it had higher yard and berth utilisation figures in spite of the fact that it was not intrinsically any more efficient.

Figure 26: Crane rates at international ports, 2007-2011



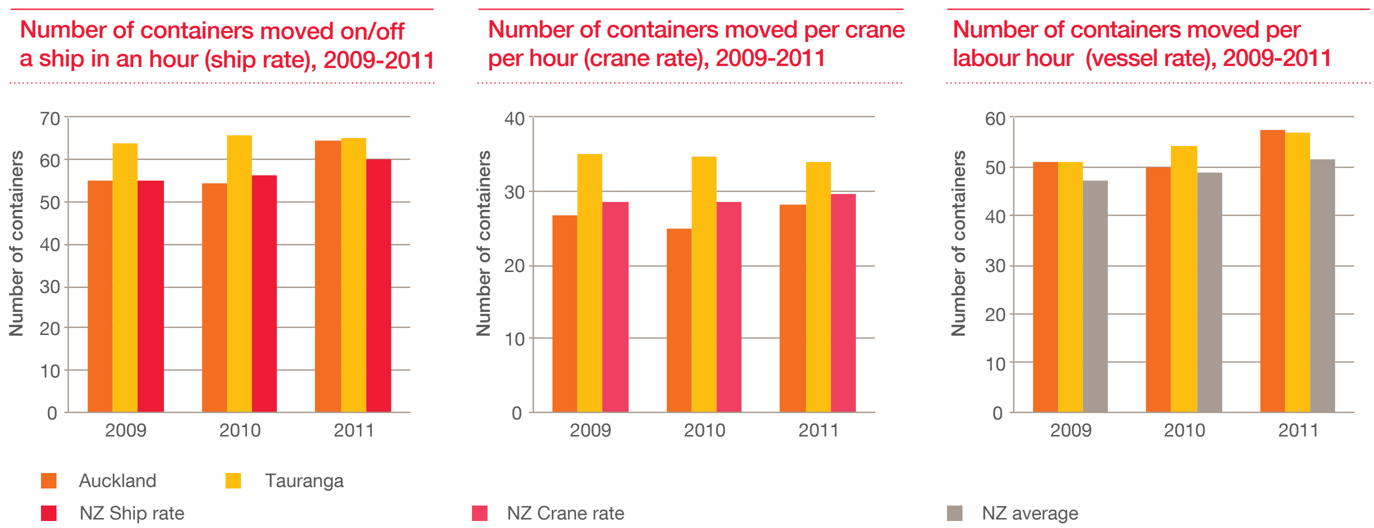
Source:Minitstry of Transport (2011), "Container Productivity at New Zealand Ports"

Background to projections continued

In addition, measures of port productivity compiled by the Ministry of Transport[29] suggest that POT is more efficient than POA in terms of moving containers. However, as shown in Figure 27, the gap between the ports has recently narrowed. POT remains New Zealand's best-performing port on most measures.

Increasing port efficiency may require significant investment in larger cranes, container stacking equipment – eg a computerised ACS system or larger straddle-carriers. (Currently, POA can stack three full containers or seven empty ones.) According to ARH[30], adopting automated stacking cranes could approximately double the capacity per hectare of POA and POT's container terminal by enabling increased stack heights.

Figure 27: Ministry of Transport measures of port efficiency, 2009-2011



Source: MoT

29. Available online at: http://www.transport.govt.nz/ourwork/TMIF/Pages/FT021.aspx.
30. Auckland Regional Holdings (2009).

3.3.4 How does freight move around?

(Distribution networks)

The UNI ports play a central role in national and international supply chains. Cargo entering through the ports must be transported to its ultimate destination, or vice versa. Consequently, it's necessary to consider the availability of transport and storage infrastructure and the efficiency of broader domestic distribution networks.

Here, we consider several features of New Zealand's domestic supply chains:

- the cost of shipping freight in and around New Zealand
- the role that coastal shipping plays in freight distribution
- the role that inland ports and distribution centres play in the Upper North Island, with a specific focus on the Auckland market
- potential changes to supply chain management that may impact on port demand or management.

Domestic freight costs

The cost of moving freight within New Zealand is high as a share of overall supply chain costs. Freight costs vary between different types of freight modes, reflecting the different advantages and limitations of each mode. Road freight provides greater speed and flexibility at a higher cost, while rail and coastal shipping are better suited for bulk goods, long-distance freight, and less time-sensitive shipments.

In many cases, it is cheaper to move freight between Auckland and Southeast Asia than it is to move it between locations within New Zealand. While this does not affect our demand forecasts, we expect it to influence decisions about future infrastructure investment or changes to the UNI port system. High domestic freight costs place a premium on having ports located close to population centres and export production locations. This constrains options to make system changes or consolidate cargo at a single port, as doing so may entail prohibitive increases to freight costs.

We estimated domestic transport costs, port costs, and overseas cargo costs using data from several sources[31]. The basis for these estimates is discussed in detail in Appendix B, "Domestic freight costs". Table 4 summarises the cost to ship a container to or from Singapore, via Auckland, for various New Zealand cities. It can be used to calculate the breakdown of transport costs for New Zealand regions[32]. Tables for other shipping routes (between Shanghai and POA and Long Beach and POA) are presented in Appendix B. While data on the cost to ship a dry container to and from POT is not readily available, it is likely to be similar to the cost of shipping through POA.

31. Ministry of Transport (2011), Productivity Commission (2012), Castalia Advisors (2010), "Ruakura Intermodal Terminal". While MoT and the Productivity Commission have previously presented similar figures, they have not consolidated them and discussed the implications for proposals to route increasing amounts of freight through the UNI ports.
32. Domestic freight costs are estimates based on data compiled by the Ministry of Transport for road and coastal freight, and KiwiRail's stated prices for 'walk-up' customers. We would expect a shipper with significant volumes or a consolidated customer such as an inland port to be able to negotiate significantly lower costs, especially for rail. These prices reflect the direct cost to freight customers, rather than the indirect costs to society resulting from road maintenance costs, vehicle emissions, etc. However, some of these costs are 'internalised' through mechanisms such as fuel taxes, road user charges, and the emissions trading scheme.

Background to projections continued

Table 4: Supply chain analysis – Singapore-Auckland route

		Importing			Exporting	
International freight costs						
Shipping line costs		$1,373			$1,520	
Port, customs, and biosecurity costs		$456			$407	
Domestic freight costs						
Origin/destination	**Road**	**Rail**	**Coastal**	**Road**	**Rail**	**Coastal**
Whangarei	$581	$602	NA	$581	$602	NA
Auckland	$210			$210		
Hamilton	$463	$400	NA	$463	$400	NA
Mt Maunganui	$746	$602	$699	$746	$602	$669
New Plymouth	$1,319	$1,151	$1,376	$1,319	$907	$1,260
Palmerston North	$1,889	$1,272	NA	$1,889	$1,144	NA
Napier	$1,529	$1,334	$1,139	$1,529	$1,090	$1,054
Wellington	$2,363	$1,394	$1,469	$2,363	$1,278	$1,341
Blenheim	$2,815	$1,413	$1,598	$2,815	$1,685	$1,454
Christchurch	$3,954	$1,618	$1,703	$3,954	$1,820	$1,515
Dunedin	$5,252	$1,887	$1,981	$5,252	$2,089	$1,789
Container cartage		**$210**			**$210**	

Source: Productivity Commission, Ministry of Transport, PwC calculations

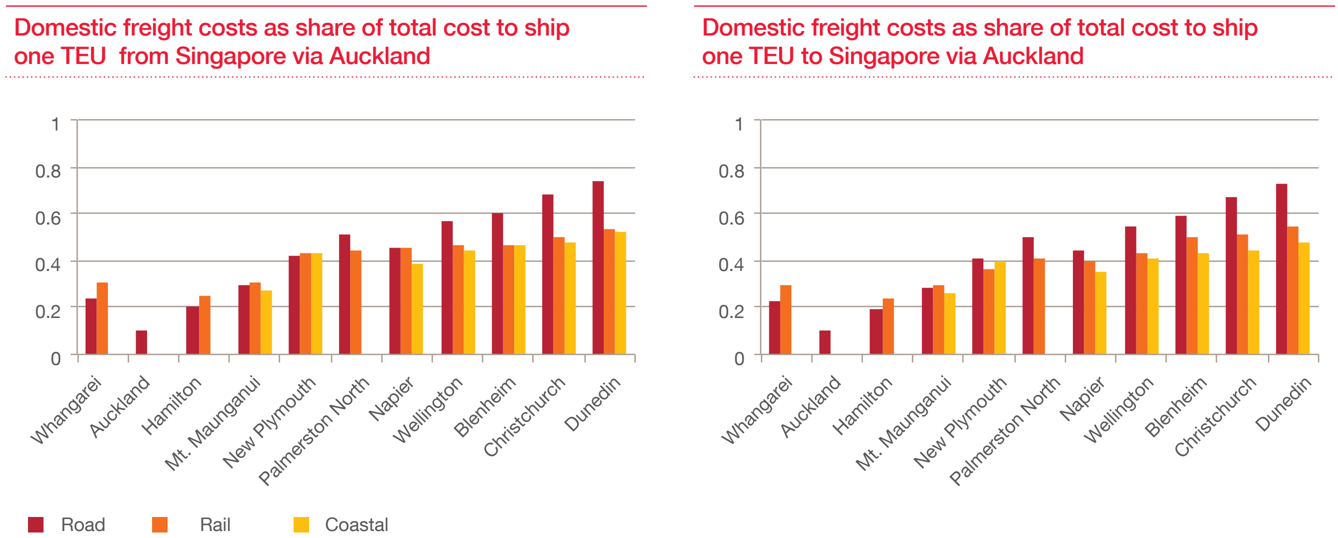
These calculations suggest that for many imports and exports, a large share of total supply chain costs are incurred within New Zealand rather than for sea freight.

For example, a company exporting a container from Napier to Singapore via Auckland would spend:

- $1,520 on shipping line costs
- $407 on fixed costs at POA (including container loading, customs duties, etc)
- $1,529 on road freight from Napier to Auckland, $1,090 on rail freight plus an estimated $210 for container cartage to the rail depot, or $1,054 on coastal freight
- Estimated coastal shipping costs are similar to rail freight costs, reflecting the fact that both modes compete in the long-distance, bulk cargo market.

In other words, depending upon the domestic freight mode chosen, between 35% and 44% of the total cost of shipping from Napier would be spent on domestic transport alone. Estimates for other New Zealand cities are summarised in Figure 28. They suggest that domestic freight costs will increase considerably as the distance to the port of export/import grows.

Figure 28: Domestic freight costs as a share of total supply chain costs



Source: PwC analysis

There is relatively little comparable international evidence on shipping costs along the supply chain, but given the quality of New Zealand's transport infrastructure it is likely that New Zealand's domestic freight sector is relatively high-cost. Because domestic freight costs are large relative to sea freight costs, changes to the New Zealand port sector that require increased domestic cargo movements may have a large impact on importers and exporters from more distant regions.

These estimates of domestic freight costs suggest several implications for our analysis of options for meeting future port demand. First, transport costs from Whangarei to Auckland and other UNI locations are likely to make it uneconomic to develop Northport to handle containerised cargo unless significant investments were made in land transport infrastructure and inland ports. Second, they suggest that current port locations in Auckland and Tauranga are efficient in terms of meeting freight demand from those regions.

One important caveat to this analysis is that consolidating freight volumes on rail may increase the cost-effectiveness of moving freight domestically. Rail provides increasing returns to scale for large volumes of freight. For example, Castalia (2010)[33a] estimated that two-way container traffic of 35,000 TEUs per year would reduce per-container rail costs by almost 70% relative to the prices for a single container quoted here. Consequently, inland ports or other means of consolidating freight from high-volume shippers may reduce the costs to distance significantly. This is apparent in the case of Metroport, which, as we discuss below, has enabled POT to compete for freight in the Auckland market.

33a. Castalia (2010), "Ruakura Intermodal Terminal", Report to Tainui Group Holdings.

Transport costs between Whangarei and other UNI locations

Developing Northport as a container terminal is likely to be uneconomic due to the additional cost of shipping containers between Whangarei and other UNI locations. Auckland and Tauranga are located much closer to main population centres and export-producing regions, meaning that any additional costs at the port (eg higher land prices) are more than offset by lower domestic freight costs.

Based on our estimates of road and rail freight prices, shipping one TEU between Whangarei and Auckland would cost $602 by overnight rail service, or $581 by road. Shipping one TEU between Whangarei and Tauranga would cost $786 for next-day rail service or $1,323 by road. (The short distances involved mean that coastal shipping is not likely to be cost-effective.) These freight costs are higher than current per-container port, customs and biosecurity costs at POA, meaning that diverting freight from POA to Northport would increase total supply chain costs. (It would, however, significantly reduce costs for Northland importers and exporters, although the small size of Northland's economy and population relative to Auckland means that the local benefits would not outweigh the additional costs to the whole UNI.)

Road and rail costs may fall significantly as a result of investment in infrastructure upgrades, including inland ports in other parts of the UNI. However, their magnitude compared with port and sea freight costs means that significant efficiencies and cost reductions would be needed across the board before a container port at Whangarei would make economic sense for importers and exporters.

Inland ports

Inland ports are cargo-handling facilities designed to serve some port functions, such as the agglomeration of cargo and some customs and biosecurity clearance functions, at a location away from the port itself. They are generally located on cheaper land with better access to manufacturing and distribution facilities and linked to ports by a rail line.

Inland ports are intended to exploit the cost advantages of cargo handling at an inland location. They can potentially serve two purposes. First, they can reduce dwell times at the port by allowing customs clearance (etc) for containers to be completed at an inland location. This can reduce the total cost of port operations if the difference between land prices at the port and inland locations is large enough to offset any double handling.

Second, and more importantly, inland ports can lower costs for importers and exporters by exploiting the cost efficiencies available when moving large volumes of containers by rail. The basic idea is to allow importers and exporters to avoid the costs of road freight (and, in particular, congestion in Auckland's road network) by consolidating freight at a closer location and moving it by rail to a port. This is typically the main rationale for developing inland ports (see eg Castalia's business case for Ruakura Inland Port[33b]) and as a consequence will be our main focus when considering the role of inland ports.

In addition, inland ports can affect importers' and exporters' choice of ports. POT developed Metroport in order to enable it to compete for a share of Auckland's international trade. As a result, POT has become a viable substitute for POA for many categories of cargo. A recent econometric study found that the development of Metroport enabled some exporters to route cargo through POT, although most continued using POA as well[34].

The proposed development of a freight hub at Ruakura in Hamilton may have a similar effect within that region. As a result, inland ports (and similar improvements to domestic freight and distribution networks) will increase the scope to manage UNI freight demand across the system rather than at individual ports.

It is likely that the primary impacts of inland ports will be on demand for different freight modes and on the efficiency of distribution networks. First, the successful development of inland ports is likely to result in a mode shift in traffic to and from the port – away from road freight and towards rail freight. Due to the capacity of inland ports, this is likely to be an incremental change. Second, inland ports could have an effect on the ports through which overseas cargo enters and exits the country. For example, the development of MetroPort in Auckland has made it easier for South Auckland manufacturers to export through Tauranga. This will, not, however, affect the growth of cargo moving through the UNI ports.

Key success factors for inland ports

Inland ports succeed or fail as commercial propositions. A 2012 report to the Waikato Regional Council lays out some factors affecting inland ports' effectiveness:

1. size of catchment area
2. location within a freight precinct or industrial centre
3. reliable road and rail access links
4. ability to operate 24/7
5. efficient design to maximise reliability of vehicle and container movements
6. appropriate types of container handling equipment
7. on-site Customs and Biosecurity services
8. storage and repositioning of empty containers

Source: Draft Aurecon report (2012)

33b. Castalia (2010), "Ruakura Intermodal Terminal", Report to Tainui Group Holdings.
34. Fabling, Grimes and Sanderson (2011), "Any port in a storm? The impact of new port infrastructure on exporter behaviour".

Current inland port facilities and utilisation

Metroport was the first inland port facility in New Zealand. It was established in 1999 by POT (in conjunction with the future KiwiRail) to allow POT to compete for business from Auckland-based importers and exporters. It has a direct rail connection to the North Island Main Trunk (NIMT) and an area of five hectares, with an additional eight hectares at the adjacent MetroBox facility. Metroport is located in Penrose, close to much of Auckland's manufacturing capacity and many of its warehouses and distribution centres.

Metroport's annual throughput increased from 32,000 TEUs in its first year of operation to 138,000 TEUs in the year ending June 2011[35]. This represents 55 percent capacity utilisation. 23 percent of POT's container throughput is currently routed through Metroport.

Wiri Inland Port was developed by the POA in 2005 as a road-only terminal; a rail link to the NIMT was opened early in 2010. There are currently four rail services a week between POA and Wiri Inland Port. It has an area of 15 hectares. Wiri Inland Port is located 25 kilometres from the port, reportedly within a ten kilometre radius of the origin or destination of about 70 percent of POA's container trade[36]. (Note, however, that locations ten kilometres north of Wiri Inland Port are almost as close to the port as they are to Wiri, reducing the rationale for consolidating freight at that location.) The area around Wiri contains some manufacturing and distribution facilities but is considerably less developed than the area around Metroport.

In the year ended 2010, Wiri handled 30,000 TEU, or 20 percent of its capacity[37]. Only three percent of POA's total container throughput was routed through Wiri; this share would have to increase substantially in order for the inland port to reach capacity during the study period.

The Ruakura Intermodal Terminal is a proposed inland port located approximately three kilometres east of Hamilton City. It is currently under study by landowners Tainui Group Holdings and Chedworth Park Ltd. It would be situated on a planned 500 hectare commercial and industrial development with links to the East Coast Main Trunk (ECMT) rail line and the proposed Waikato Expressway.

The Ruakura Intermodal Terminal is a proposal for an inland port located approximately three kilometres east of Hamilton City. It is currently under study by landowners Tainui Group Holdings and Chedworth Park Ltd. It would be situated on a planned 500 hectare commercial and industrial development with links to the East Coast Main Trunk (ECMT) rail line and the proposed Waikato Expressway.

The potential volume of freight routed through Ruakura has not been modelled and is likely to depend upon a number of factors, including the scope of development in the surrounding area. However, a 2010 Castalia business case estimates that an annual throughput of approximately 12,000 TEU per year between Ruakura and Auckland would be required for the inland port to provide a cost advantage over direct road freight[38]. This is roughly equivalent to ten percent of the existing contestable domestic freight task in the region. This would reflect a change in freight movement patterns and modes rather than an increase in the region's freight task.

In addition, Fonterra has developed a freight hub at Te Rapa, Hamilton. This facility includes a cool store and direct access to the road and rail networks. Fonterra uses this site to consolidate manufactured dairy products from across the UNI region before shipping them by rail to the port.

35. Port of Tauranga 2011 Annual Report, cited in Castalia (2011), "Cost Benefit Analysis of the Waikato Expressway: Incorporating the Impact of the Ruakura Hub", Report to Tainui Group Holdings.
36. Cited in Castalia (2011).
37. Ports of Auckland Limited (December 2010), Interconnect – The Magazine for our Customers, cited in Castalia (2011).
38. Castalia (2010).

Inland ports and land use

Inland ports are primarily a commercial proposition and should be evaluated as such. However, they do have some public policy implications for land-use and infrastructure planning. If inland ports provide a commercially viable proposition to shippers – ie if they reduce supply chain costs by consolidating sufficient volumes of freight and moving it to and from a seaport by rail – they may have an impact on land uses in the surrounding area. For example, they may strengthen incentives for production or distribution facilities to locate close to the inland port.

The effects may not necessarily be immediate. The experiences of Metroport and Wiri Inland Port suggest that inland ports will be slow to reach capacity – Metroport reached 55 percent utilisation in 2011, more than a decade after opening, while Wiri was at 20 percent of capacity in its first year of rail operation and has not achieved significantly higher volumes since then. Consequently, it is likely that their effects on land use and distribution network capacity will occur only in the medium term or beyond. This should be taken into account when assessing future inland port developments.

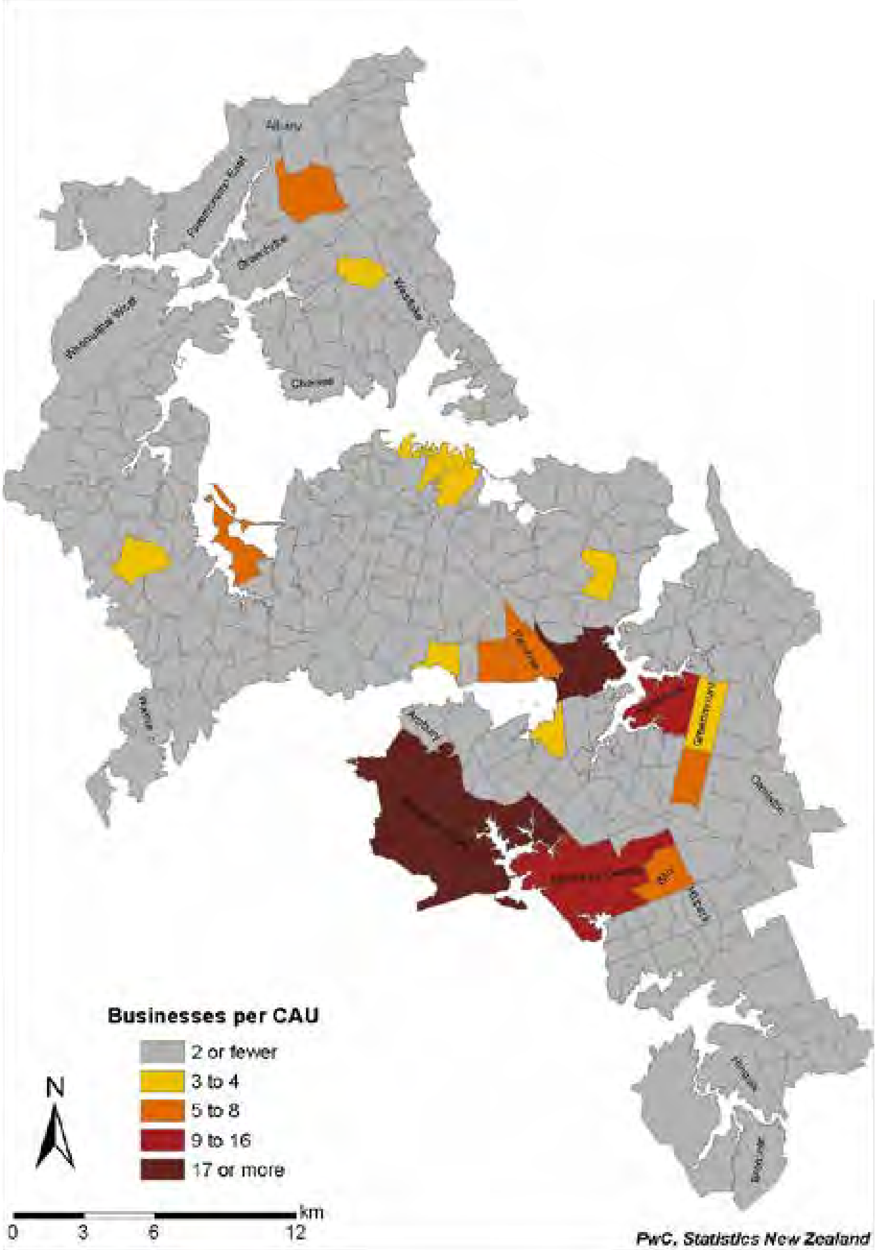
Location of warehousing, wholesaling, and road transport businesses in Auckland

Auckland plays an important role in distributing imported goods throughout the country. POA handles the largest share of New Zealand's non-oil imports and a wider variety of import commodities than any other New Zealand port. These goods are often moved to warehouses or wholesalers in Auckland before being distributed to other parts of the country.

Warehousing and distribution businesses within Auckland require access to the ports – either directly or via inland ports – and to land transport networks. Consequently, their location will influence the ports and transport modes that they choose to use.

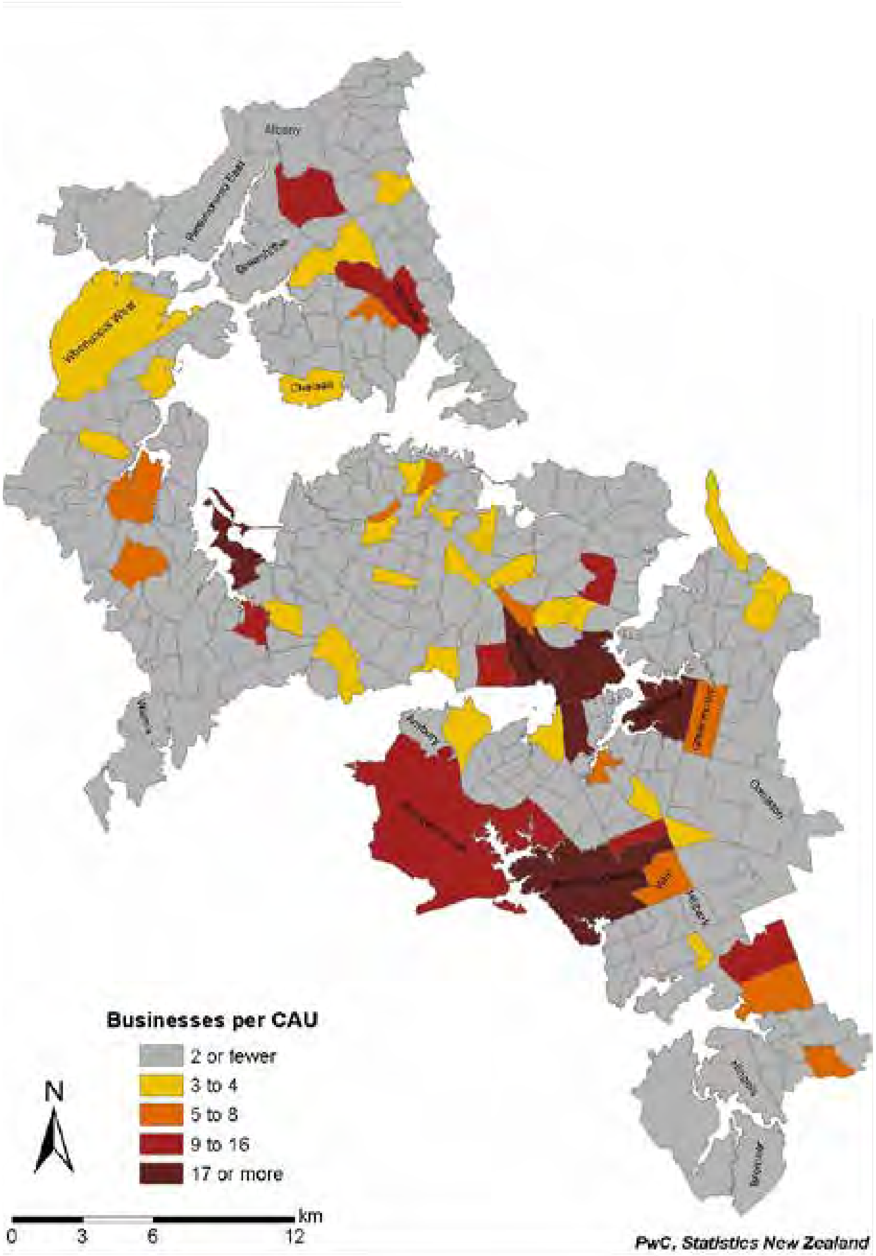
As shown in Figure 29, a large share of warehousing and storage business units in Auckland are concentrated in South Auckland suburbs – in particular, the Mount Wellington-Penrose and Mangere areas. There is also a significant concentration further south, in the area around Auckland Airport and Wiri. Auckland's warehousing businesses are heavily concentrated in a few areas - 47% of the regional total are located in the top ten area units. The concentration of these businesses in South Auckland, and in particular in Mount Wellington-Penrose, suggests that they will be able to access both POA and POT (through Metroport) relatively easily. Future traffic congestion in Auckland may affect access to POA, although warehousing businesses closer to the Wiri inland port may be able to mitigate the effects by routing freight by rail.

Figure 29: Location of warehousing and storage businesses in Auckland, 2011



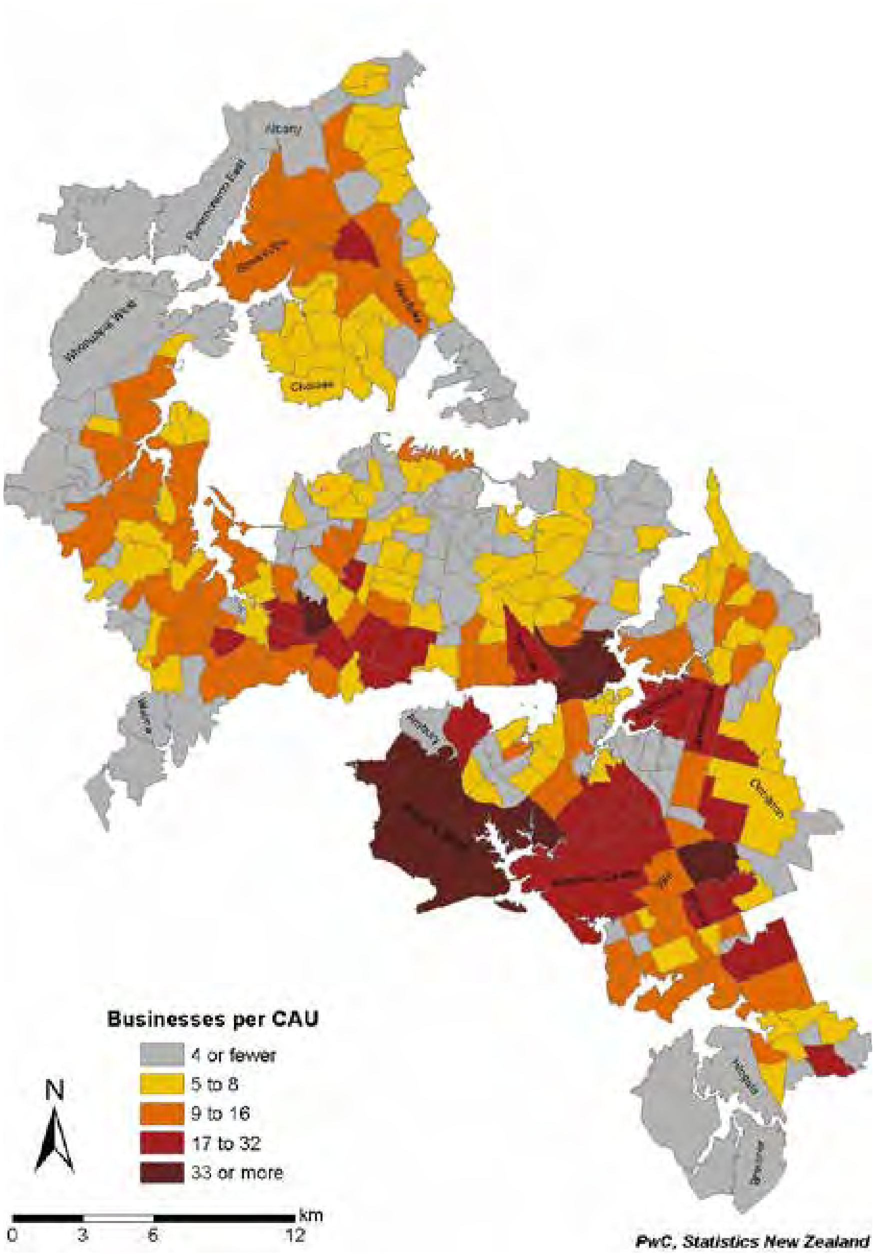
A similar pattern is apparent in the motor vehicle and motor vehicle parts wholesaling industry. A majority of the country's cars are imported through POA and received by Auckland-based wholesalers before distribution throughout the country. As shown in Figure 30, motor vehicle wholesaling businesses in Auckland are concentrated in South Auckland suburbs – in particular, the Mount Wellington-Penrose area. 31% of Auckland's motor vehicle wholesalers are concentrated in the top ten area units. At present, imported cars are moved by road freight, placing a premium on road network access between POA and these Auckland suburbs.

Figure 30: Location of motor vehicle wholesaling businesses in Auckland, 2011



Finally, Auckland's road transport businesses are also concentrated in south Auckland, and in particular around Auckland Airport and to the east of it. While road transport business units are more dispersed, and more numerous, than warehousing or motor vehicle wholesalers, there is still a definite pattern to their locations. It is likely that they have located in this area to take advantage of proximity to the main freight origins and destinations in the Auckland region. Figure 31 illustrates this pattern.

Figure 31: Location of road transport businesses in Auckland, 2011



Coastal shipping

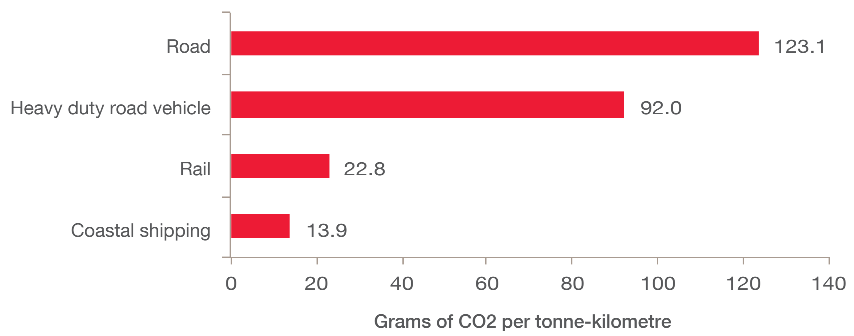
Coastal shipping accounted for 15% of total freight tonne-kilometres in New Zealand in 2006/07, and a smaller share of tonne-kilometres of general (containerised) cargo[39]. It also makes up a relatively small share of the overall port task.

However, it is important to understand the coastal shipping market. It is unique, compared with other domestic freight options, as its primary impact is on port facilities rather than land transport infrastructure. Moreover, coastal shipping offers a relatively cheap option for moving freight around the country. Depending upon trends in domestic freight costs and oil price increases, its current role may increase. We have accounted for this possibility in our high growth scenario for domestic coastal freight.

Coastal shipping tends to serve the bulk, long-distance market, competing, to a certain extent, with rail freight but less against road freight, which is more suited to shorter, more time-dependent routes. Future demand for coastal shipping is likely to depend upon government policy decisions, such as investments in alternative freight modes and carbon pricing decisions. Increasing fuel prices may also increase demand for coastal shipping as coastal shipping is more fuel efficient than land transport. Figure 29 displays this difference in terms of carbon emissions per tonne-kilometre, a measure which is closely related to consumption of fuel.

Figure 32: Carbon intensiveness of different freight modes

Carbon emissions of different freight modes



Source: MoT (2008) "Sea Change"

39. National Freight Demand Study (2008).

Background to projections continued

The 2008 National Freight Demand Study (NFDS) estimated, based on 2006/07 data, that bulk petroleum products from Marsden Point refinery and cement moved from the Portland cement plant in Whangarei accounted for 2.5 million tonnes out of the 4.3 million tonnes moved nationally. A smaller amount of coastal freight movements originated in Auckland (460,000 tonnes) and the Bay of Plenty/Tauranga (170,000 tonnes).

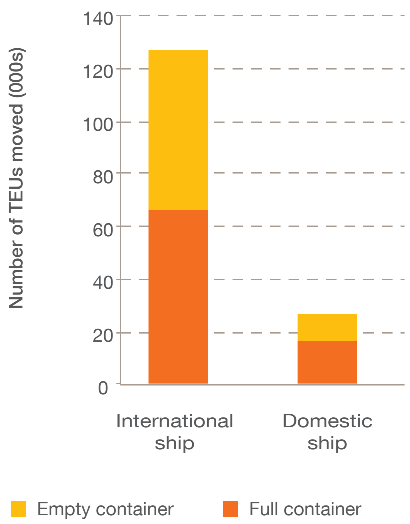
The bulk coastal freight market is unlikely to undergo any predictable changes due to the fact that many of the main routes are fairly stable and anchored by population concentrations and the location of major bulk product producers – the Marsden Point refinery and two cement plants in Whangarei and Westport. Containerised cargo has more potential for growth, albeit from a low base. Data from POA suggests that coastal shipping of containerised general cargo has grown significantly in recent years. Our projections for the coastal freight market reflect the dynamics and base demand estimated by the NFDS.

Growth in coastal shipping of containers will be affected by developments in the international shipping market. As shown in Figure 33, the majority of coastal shipping container capacity is provided by international shipping lines. The dominance of international shippers in the coastal market is likely to reflect the fact that they can move freight at relatively low marginal costs while making scheduled calls at multiple NZ ports. Pacifica Shipping is the only domestic firm in the market; it provides coastal shipping of containers on five routes[40]. Pacifica owns two coastal containerships with a combined capacity to move 1,500 full TEUs each week[41].

Coastal shipping of the main bulk products is generally provided by specialised ships either owned by the manufacturers of bulk products or exclusively supplied under contract. Bulk petroleum products, which make up a large share of coastal freight bulk tonnage, are moved exclusively by Silver Fern Shipping via two tankers. Another ship, the Awanuia, is used to supply bunker fuel directly to docked ships. Both cement manufacturers own and operate their own coastal ships to move their product around the country. Golden Bay Cement in Whangarei owns a barge and supply ship[42], while Holcim Cement in Westport owns two ships[43]. Cement is moved to specialised silos at ports.

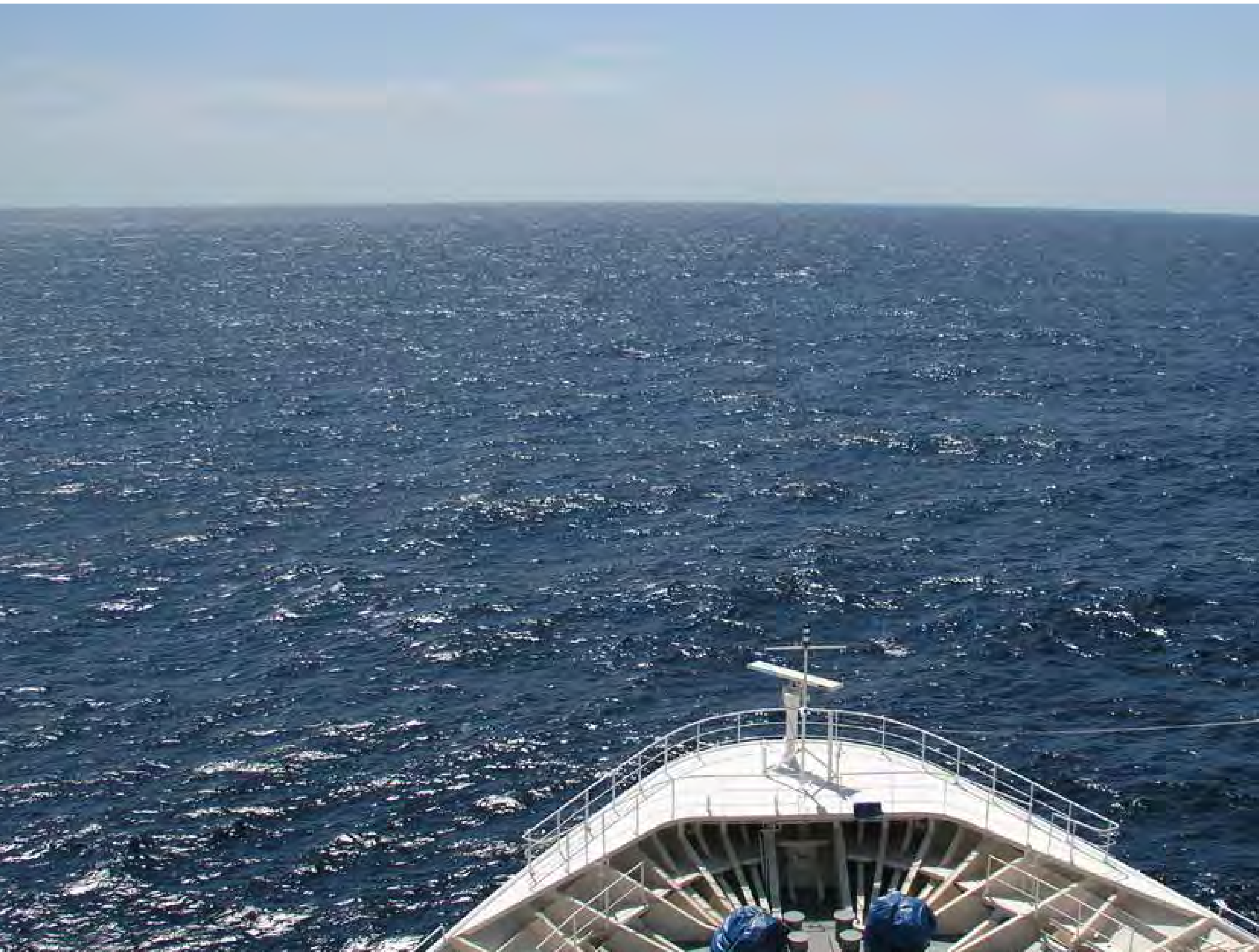
Figure 33: Coastal shipping movement, January-June 2012

Coastal movements : January-June 2012



Source: MoT FIGS

40. Check figure – may have reduced.
41. Reference Pacifica's company profile, available online.
42. http://www.goldenbay.co.nz/mainmenu30/page71/Company+Profile.html.
43. http://www.holcim.co.nz/fileadmin/templates/NZ/doc/Weston/Newsletters/Sept_2008_Newsletter.pdf.



4

The future Upper North Island port task – our projections

The future Upper North Island port task – our projections

This section summarises our projections for port demand to 2041. As discussed in Section 3, we have developed projections of individual components of the port task that will allow us to examine separately the impact on the ports themselves and the impacts on the region's land transport infrastructure. In addition, we have considered what these projections may imply for demand at the individual ports in the region as well as for the system as a whole.

4.1 Revisiting definitions

Not all cargo movements will have the same impact on port and port-related infrastructure. In Section 3.1, we defined three broad categories of cargo movements:

- ***Outside-port cargo*** moves into the port from sea and out by land, or vice versa. It is the weight of goods that have final origins or destinations inland of the port. This category includes imports, exports, and domestic coastal entering or exiting the port.
- ***Cargo exchanges*** enter and exit the port by sea. They transit through the port without leaving the port gate. This category includes import and export transhipments and international transhipments (or re-exports).
- ***Throughput*** includes both outside-port cargo and exchanges. It measures the total amount of cargo that is loaded or discharged at a port. This category includes ***all*** types of cargo movement.

These categories of cargo movement and their impacts on port and land transport infrastructure are summarised in Table 5. The four categories of outside-port cargo are highlighted in light orange.

4.2 Summary of our projections

Overall trade and throughput

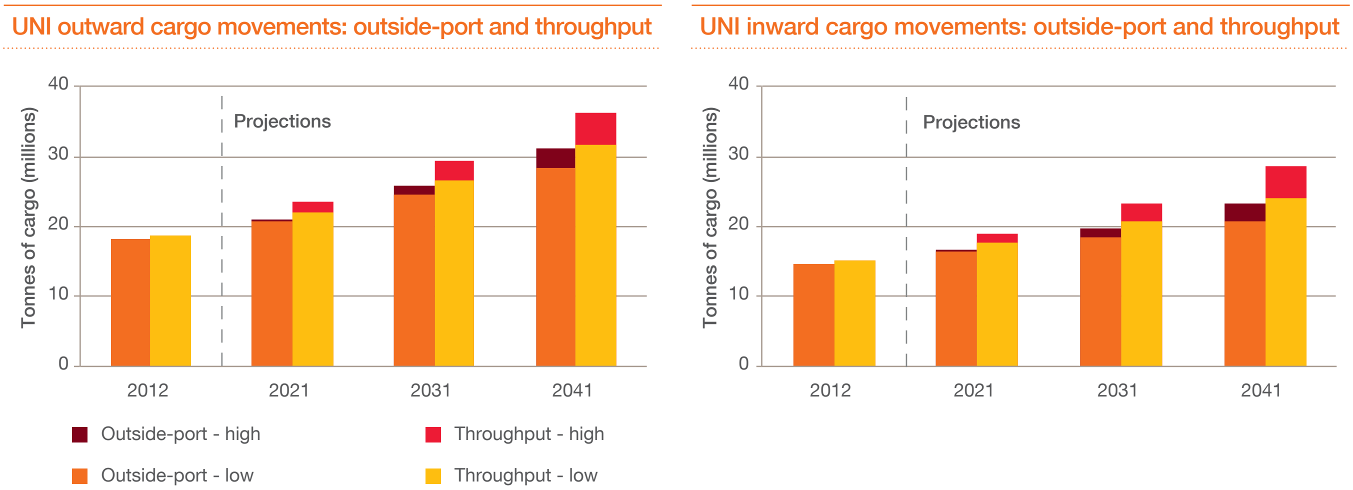
We have constructed long-term projections of future freight through the UNI ports. They include high and low scenarios that provide a range of potential outcomes. Our projections to 2041 indicate significant growth in both trade and throughput. Throughput is expected to grow faster on the back of increased transhipment and domestic coastal freight, as summarised in Figure 34 and Table 6.

Table 5: Infrastructure requirements of different cargo movements

Inward	Outward	Infrastructure
Imports	Exports	Port and land transport
Domestic coastal inward	Domestic coastal outward	Port and land transport
Import tranships	Export tranships	Port only
Domestic leg of export tranships	Domestic leg of import tranships	Port only
International tranships	International tranships	Port only

- Throughput growth of 1.7% to 2.3% per annum, or an additional 22m-31m tonnes
- Trade growth of 1.4% to 1.8% per annum, or an additional 16m-22m tonnes
- These estimates are subject to revision, particularly with respect to port cargo exchanges, due to the need to check some assumptions against the upcoming release of the Ministry of Transport's Quarterly Container Information Report for the June 2012 quarter.

Figure 34: Summary of outside port and throughout growth projections for the UNI



Source: PwC analysis

Table 6: Infrastructure requirements of different cargo movements Overall growth projections for the UNI

	Throughput	Outside-port
2012	34m tonnes	33m tonnes
2021	40m to 42m tonnes	37m to 38m tonnes
2031	47m to 53m tonnes	43m to 46m tonnes
2041	56m to 65m tonnes	49m to 54m tonnes
Absolute increase 2012-2041	22m to 31m tonnes	16m to 22m tonnes
% increase 2012-2041	64% to 91% over period	50% to 67% over period
CAGR 2012-2041	1.7% to 2.3% pa	1.4% to 1.8% pa

Source: PwC calculations