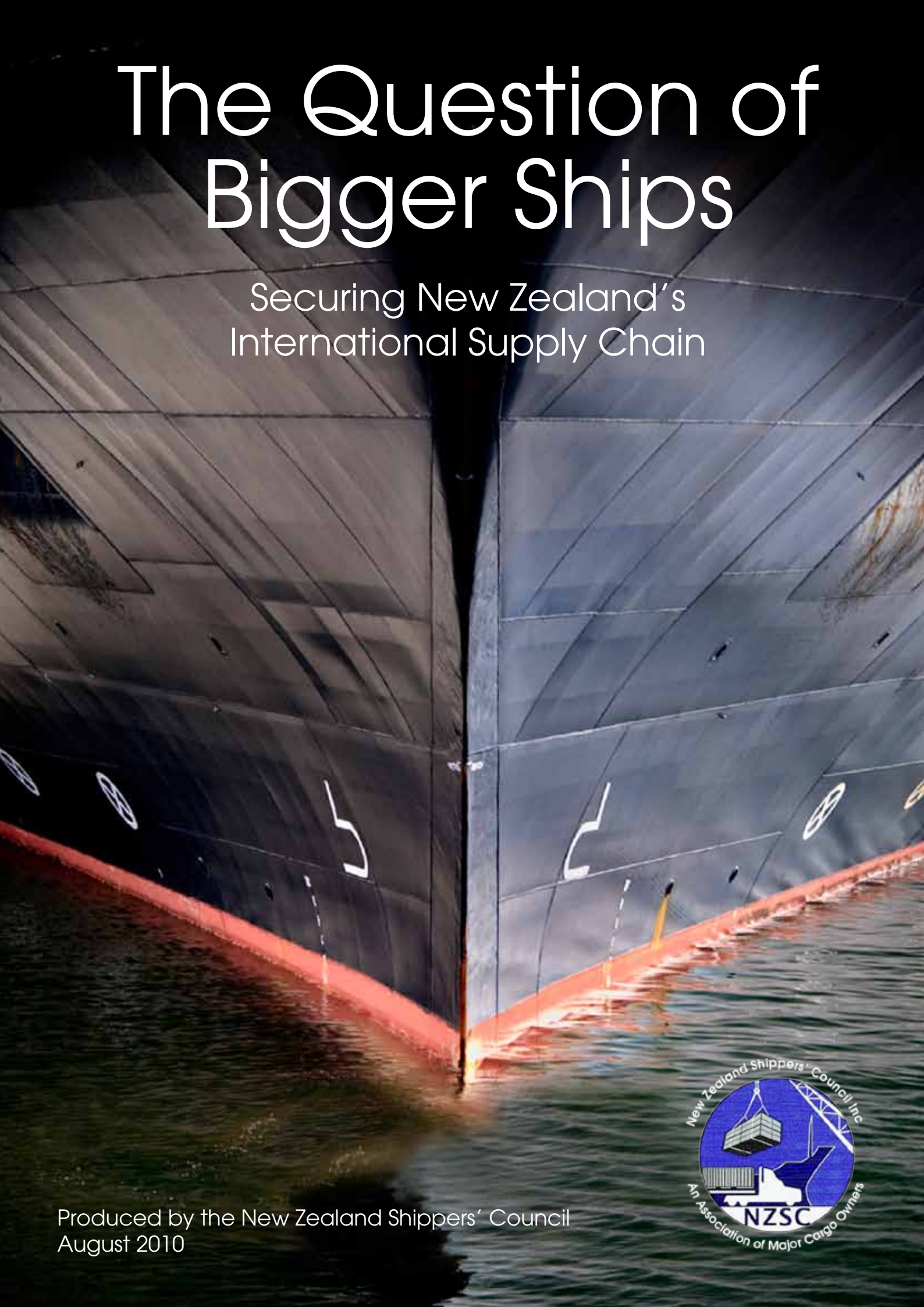
The Question of Bigger Ships

Securing New Zealand's International Supply Chain



Produced by the New Zealand Shippers' Council
August 2010

Foreword and Summaries

Foreword

The New Zealand standard of living has been built on exports. We have derived our wealth from export receipts over the course of 150 years.

The efficiency, reliability and cost-effectiveness of our international supply chains is particularly important for an island nation such as New Zealand, not only because we are geographically distant from our key trading partners, but also the economic prosperity of our country is highly dependent on the performance of our export sectors.

It is for these reasons the New Zealand Shippers' Council has undertaken a study on the potential benefits of introducing bigger container ships (5000 to 7000 TEU) on New Zealand's trade routes, or alternatively, the likely consequences of not introducing them.

For the first time, this report sets out the perspective of the cargo owners (exporters and importers) on bigger ships and covers all the important factors of cost, time to market, and above all, the reliability and predictability of transport services.

The purpose is to provide robust, impartial analysis to help key decision-makers in industry and government identify what action needs to be taken to protect and enhance the efficiency of New Zealand's export and import supply chains (including our continued direct access to key international transhipment hubs), and ultimately the international competitiveness of our exports.

This study has been undertaken by a team consisting of freight sector experts and analysts from member organisations of the New Zealand Shippers' Council.

The analysis undertaken is based on data, information and views from:

- Members of the New Zealand Shippers' Council;
- Relevant reputable publicly available publications and websites;
- Statistics New Zealand's detailed database of import and export volumes and value, by month, detailed commodity level (at 4-digit Harmonised System commodity code), location of New Zealand import or export port, and country of origin/destination;
- Interviews with more than 43 different stakeholder groups, including port companies, shipping lines, exporters, importers, freight forwarders, surface transport operators, government agencies, industry associations, and other subject matter experts; and
- Peer reviews by industry experts.

We hope this report generates interest and activity to ensure New Zealand secures the most efficient shipping services it deserves.

The New Zealand Shippers' Council
August 2010

About the New Zealand Shippers' Council

The New Zealand Shippers' Council is an association of major New Zealand-based cargo owners - both importers and exporters.

The current membership of the Council includes companies and organisations with major interests in industries such as forestry products, fruit, steel, dairy, meat, coal and cement. Collectively the Council accounts for more than 50% of New Zealand's total annual volume of exports.

At the time of publication, members of the New Zealand Shippers' Council include the companies listed below.

The objectives of the New Zealand Shippers' Council are:

- To be the national body representing large volume cargo owners;
- To be the pre-eminent group in supply chain developments particularly relating to cargo handling and movement, commerce and legislation;
- To be a major driver in supply chain and logistics training policy; and
- To protect and advance members' interests.

For more information about the New Zealand Shippers' Council, please visit: http://www.shipperscouncil.co.nz/ or contact the Chairman, Greg Steed: email: greg.steed@xtra.co.nz or ph: 0274 323 761.

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Key Contributors to the Report

Study Team

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Greg has been a member of the New Zealand Shippers' Council for more than 10 years, serving as deputy chairman for two years and chairman for the past three years. With a strong background in strategy and freight logistics, Greg's previous roles include a senior supply chain position in Carter Holt Harvey, responsible for developing and implementing strategy on all modes of transport throughout New Zealand and internationally.

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Nigel has more than 30 years' experience in the international supply chain and logistics industry, including management roles in both the shipping and port sectors. For the past 10 years, Nigel has driven Fonterra's international and domestic logistics strategies. In addition to sea-going qualifications, Nigel holds a business finance degree and an MSc in supply chain logistics.

Rob Phillips
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Rob has been involved in the New Zealand logistics and shipping industries for the past 16 years, including six years as Finance Manager for Tasman Orient Line, and nine years with Carter Holt Harvey. In Rob's current role with CHH, he manages the domestic and export logistics for the company, as well as for some external customers. Previously, Rob has worked in the retailing and electrical industries.

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Nancy has a strong background in economics and national infrastructure policy. Nancy holds a Master of Commerce in Economics (first class honours) and her previous roles include senior economic consultant at Auckland-based consultancy, Ascari Partners, and policy analyst at the Ministry of Economic Development. Nancy has played key roles in a number of transport projects of national strategic importance, including providing advice to central and regional governments.

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Mike has been involved with the New Zealand kiwifruit industry for more than 20 years, in various supply chain roles. This includes eight years working for Zespri's European operation, based in Antwerp; the last four years as Europe Operations Manager. He has been Zespri's Shipping Manager, based in Mt Maunganui, for the past eight years, where his role includes developing and implementing Zespri's global freight strategy.

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Tim's career in the export industry spans more than 30 years. He has held general management positions with meat companies on and offshore, P&O Containers NZ, and the New Zealand Meat Board, including three years in Brussels where he was responsible for Meat New Zealand's European market development and market access. Tim has been CEO of the Meat Industry Association since 2007, and holds positions on a number of boards in the food and transportation fields.

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A chartered accountant by profession, Peter is currently responsible for leading strategy development to improve long-term efficiency and effectiveness of Fonterra's logistics network, both in New Zealand and overseas. Prior to joining Fonterra, Peter was with New Zealand Rail for seven years in strategy, commercial, planning and financial roles. Peter also has experience in private accountancy practice, and the heavy engineering, construction and paper industries.

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The Shippers' Council also acknowledges the input of a number of other contributors to this report.

Peer Reviewers

Tony Boyle
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Tony is possibly the most 'hands-on' operator in New Zealand's container industry today. As a Master Mariner, Tony managed operations for the first container ship visit to this country. Following a successful career with the largest privately-owned German shipping line, Tony launched his own consulting company and for the past 15 years has worked in operational roles in many ports and terminals around the world, including strategy planning for existing and future sites.

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Flemming boasts more than 30 years' experience in the shipping industry, including as a former Managing Director of Maersk New Zealand. Flemming now runs his own consultancy company.

Contents

Conclusions and Recommendations

The following conclusions and recommendations are based on a thorough analysis of the best available information at the time of publication. As set out in the main body of the report, the results presented below are based on an analysis of various bigger ship scenarios between New Zealand and South East Asia.

Conclusions

- The profitability and international competitiveness of exporters and importers **depends on the efficiency and cost-effectiveness** of New Zealand's international supply chains.
- In global terms, the total volume of containers handled across all New Zealand ports, represents **slightly under 1%** of annual global container throughput.
- Global shipping lines are going through a **major realignment** as they fully exploit the vessel-sharing concept.
- Whilst New Zealand will continue to receive shipping services, if New Zealand's ports are not bigger ships capable within five years, there is a risk services could become 'boutique' in nature, where only relatively small and old vessels (by international standards) with a **higher operating cost per container** can be accommodated by the ports.
- New Zealand's export trade is **already being impacted** by the consolidation of carriers.
- **Significant net supply chain benefits** could be gained with larger container ships, particularly on the South East Asia route (the subject of analysis), and using 7000 TEU ships. The introduction of bigger ships to New Zealand could also **reduce the carbon footprint** of shipping exports and imports by approx. 31%.
- New Zealand's four largest container ports (Auckland, Tauranga, Lyttelton, and Otago) can currently handle ships in the range of 4500 to 5000 TEU (nominal capacity), but **they do not have the capability** to handle ships larger than this.
- New Zealand could realise up to **NZ $144 million per year** of net supply chain benefits from 2015/16, with bigger ships operating on the South East Asia route only, and with infrastructure developments at two ports to become 7000 TEU ship capable. Competitive factors and the specific dynamics of individual supply chains will determine just how much of the potential benefit is passed to cargo owners.
- In addition to efficiency gains, the **key benefit** of being able to accommodate larger ships in New Zealand is a strategic one – **an insurance policy** that protects the efficiency of New Zealand's existing international supply chains.
- If some of New Zealand's ports are not 7000 TEU ship capable within the next five years, there is a risk shipping companies may increasingly hub through Australian ports such as Melbourne, Sydney, or Brisbane, which are all undertaking significant development to become bigger ships capable.
- This would be detrimental to New Zealand exporters and importers – increasing net supply chain costs by up to **NZ $194 million per year from 2015/16** (if only South East Asia services were affected), and increasing transit times to market.
- The real value to New Zealand of having bigger ships operate on the South East Asia route, could therefore be up to **NZ $338 million per year from 2015/16, and increasing up to NZ $391 million per year by 2020.** These estimates are direct benefits only, and exclude the significant flow-on benefits to the rest of the economy due to the economic multiplier effect.
- Bigger ships can be enabled in a number of different ways. Assuming current shipping configurations between New Zealand and South East Asia do not change, with cargo volume growth over time, New Zealand could support **5000 to 7000 TEU services within five years,** based on conservative cargo growth rates.
- Alternatively, existing services may combine capacity through vessel-sharing arrangements to **capture the economies of scale from bigger ships,** which would enable 5000 to 7000 TEU ships sooner.
- The timing of New Zealand port investments to become 7000 TEU ship capable (ie sooner rather than later), is therefore essential to ensure New Zealand ports remain competitive and capable, and thus continue to **secure shipping capacity** with direct links to key international hubs and markets.
- Although all four major container ports in New Zealand will be required over time to increase their capability to support projected cargo growth, **not all four will need to make the investment initially,** to become bigger ships capable.
- It would be logical for two ports (one in the North Island and one in the South Island) to invest to become **7000 TEU ship capable** within five years.
- The analysis and research points to the ports of **Tauranga and Lyttelton** being the logical candidates to start exploring implementation of capital plans to become 7000 TEU ship capable. It is recognised, however, any such investments are a commercial matter for the parties concerned and there may be regulatory and/or commercially sensitive factors not in the public domain, that have not been factored into the analysis.
- Under a scenario where a North Island and a South Island port become 7000 TEU ship capable, the remaining two large container ports, Auckland and Otago, would **continue to play a vital role** in servicing New Zealand exports and imports.
- Given that significant government assistance has already been committed to improving the national rail freight network, further direct government financial support should not be required to support a bigger ships future.

Recommendations

The Shippers' Council recommends that:

- Before further industry consolidation takes place, the **Government ensures the legislative framework is not a barrier to bigger ships being introduced to New Zealand,** and takes the required steps to ensure anti-competitive behaviour such as cartel pricing or capacity restrictions (whether by ports or carriers), does not result due to increased use of vessel-sharing arrangements and/or port consolidation.

- Shipping companies **consider opportunities to further combine capacity** on some of the services that currently call at New Zealand, to bring forward the timing of the scale benefits to New Zealand.

- **Two ports** (one in the North Island and one in the South Island) should invest to become 7000 TEU ship capable within the next five years.

- Under a scenario where a North Island and a South Island port become 7000 TEU ship capable, the remaining two key container ports should secure the necessary resource consents and **prepare to implement appropriate capital plans** in the future, when it becomes viable through growth in trade, for New Zealand to have two bigger ship ports on each island.

- KiwiRail should, as a priority, ensure the NZ $750 million of government funding earmarked for its turn-around plan is targeted at parts of the rail network that will support a bigger ships future.

One of the key challenges in the development of this report has been gathering accurate data on container volume throughput and flows that can be meaningfully compared across ports.

Although ports and carriers have been forthcoming with the data requested, reconciliation of the numbers with other publicly available information and shippers' experience with shipping product to/from New Zealand, has been difficult.

Whilst the Shippers' Council has taken every care to ensure the container volumes used in the analysis are as reflective of reality as possible, it is important to acknowledge they are estimates only, and a margin of error therefore exists.

However, the Shippers' Council is comfortable these estimates accurately reflect the relative size of the ports in New Zealand, and are close enough to ports' own reported full container volume throughput to provide meaningful analysis and draw valid conclusions.

The Shippers' Council recommends that:

- The Ministry of Transport, in its current work on improving the data gap, should establish a mandatory data collection regime and ensure the data collection methodology and approach developed is **robust, and consistently applied by all relevant parties.**

Executive Summary

Introduction

The international competitiveness of exporters and importers is dependent on the performance of their international supply chains in terms of cost, time to market, and above all, the reliability and predictability of transport services.

New Zealand's heavy reliance on international sea freight for the movement of imports and exports (accounting for 99.6% of trade volume in 2008), means large supply chain improvement opportunities can be leveraged off trends in the international shipping industry.

Although New Zealand has been well served by the major international container shipping lines for a country of its size, the level of service and capacity has diminished considerably in recent years, driven mainly by carrier consolidation and service rationalisation.

It is quite likely these drivers of change will continue as the global container carriers seek to improve financial returns. Therefore, at least retaining these service levels (with direct links to key international hubs) and if possible, enhancing what New Zealand already has, is strategically important to support New Zealand's international trade.

There is a risk that if New Zealand's port facilities cannot accommodate the larger ships used on other trade lanes, then New Zealand may be relegated to 'boutique' services that use relatively small and old ships (by international comparison) which have higher cost-to-serve.[1]

At present, the average-sized container ship calling at New Zealand ports has a nominal capacity of approx. 2700 TEU.[2] The largest-sized ship currently calling at New Zealand regularly, has a nominal capacity of 4100 TEU. A 5000 TEU and a 4500 TEU container vessel called at New Zealand ports in December 2009 and April 2010 respectively, but there is currently no regularly scheduled service using ships of this size.

It is anticipated more vessels with capacities in the range of 4000 to 7000 TEU will be redirected from major international trading lanes to smaller lanes such as New Zealand, as major trading lanes become serviced by larger and larger ships (up to 14,000 TEU). There is an opportunity for New Zealand to increase the efficiency, reliability, and cost-effectiveness of its supply chain infrastructure through the introduction of larger container ships (ie 5000 to 7000 TEU).

This report presents the New Zealand Shippers' Council's findings on the value that can be realised through the introduction of bigger ships.

Wherever the term 'big', 'bigger', or 'larger' ships is used in this report, it refers to 5000 to 7000 TEU ships.

[1] *Boyle (2010) refers.*
[2] *TEU stands for 'twenty-foot equivalent unit'. It is a standard measure of container volume. One twenty-foot container is equivalent to one TEU. One forty-foot container equals two TEU.*

Approach

This report focuses on bigger ship services between New Zealand and South East Asia as a case study, as it is the most likely route for a bigger ship service to operate between New Zealand and major international transhipment hubs initially. (Ships larger than 7,000 TEU already operate beyond these hubs.) Over time, other routes may also use bigger ships, as volumes on those lanes grow.

Benefits of Bigger Ships

- Direct bigger ship services between New Zealand and international transhipment hubs like South East Asia would deliver benefits to New Zealand's international supply chains through:
  - Lower voyage operating costs per slot as a result of the economies of scale bigger ships deliver;
  - Reduced exposure to volatility in oil prices; and
  - Reduced carbon footprint.

- New Zealand's export and import cargo owners should realise some of these benefits through:
  - A reduction in the fuel component of their ocean freight charges through the bunker adjustment factor (BAF) and/or the fuel component of base rates; and either
  - A reduction in ocean freight base rates reflecting lower overall operating costs; or
  - Enabling shipping companies to maintain sustainable returns without increasing ocean freight rates.

- Furthermore, at a strategic level, a key benefit of bigger ships is they can assist in protecting and enhancing the efficiency of shipping services between New Zealand and key international hubs, by reducing the risk of New Zealand being relegated to 'boutique' services that use relatively small and old ships with higher cost-to-serve.

- In particular, there is a risk that if New Zealand's ports are not bigger ships capable within the next five years, shipping companies may hub through an Australian port such as Melbourne, Sydney or Brisbane, all of which are undertaking significant investment to become 7000 TEU ship capable. This would be detrimental to New Zealand's trade performance.

- If shipping companies hub through Australia, there is a risk they would be unwilling to reconfigure their services to reincorporate New Zealand port calls, if and when New Zealand ports become bigger ships capable.

- The timing of New Zealand port investments (ie sooner rather than later) is essential to ensure New Zealand ports remain efficient, competitive and capable, and are able to continue to secure shipping capacity with direct links to key international hubs.

Costs of Bigger Ships

Some of the benefits identified previously may be offset by a potential increase in the following costs (depending on the configuration of future shipping services):

- A potential increase in some transport costs if cargo was required to be redirected from one port to another due to bigger ships calling at fewer ports;
- A potential increase in time-related costs of shipping (particularly for shippers of perishable goods), if bigger ships increase shipment time to market. Conversely, reduced shipment time to market would reduce time costs; and
- A potential increase in port and surface transport infrastructure costs as ports and transport operators seek to recover the cost of any investment required.

These costs and benefits are quantified in **Section 5**.

Does New Zealand have Sufficient Cargo Volumes?

- Even with the seasonal pattern of New Zealand's exports and imports, New Zealand currently has sufficient volume to efficiently use larger container ships (including 7000 TEU ships), servicing the South East Asia route. This volume could be further increased by routing a greater proportion of Chinese and North Asian cargo via South East Asia.
- Dedicated container services between New Zealand and South East Asia are currently provided by one weekly 4100 TEU ship service, and two weekly 2700 TEU ship services. This same capacity can be provided by other configurations that utilise larger ships – eg one weekly 7000 TEU service and one weekly 2700 TEU service, or two weekly 5000 TEU services. This can be enabled by combining the capacity of some existing South East Asia services through vessel-sharing arrangements.
- It is important to note that whilst vessel-sharing arrangements may reduce the number of shipping options available for some shippers at some ports, such arrangements do not fundamentally reduce competition, as the number of shipping companies competing against each other remains the same. Nevertheless, whilst vessel-sharing already exists between a number of shipping companies operating in New Zealand, before further consolidation takes place, protection is required to ensure anti-competitive behaviour such as cartel pricing or capacity restrictions does not result.
- Even without combining capacity on some services, with cargo volume growth over time, New Zealand could support 5000 to 7000 TEU ship services within five years, even under conservative growth assumptions.

Impact of Bigger Ships on Ports

All four of New Zealand's largest container ports by volume (Auckland, Tauranga, Lyttelton and Otago), are likely to continue to receive direct South East Asia service calls in the future, even with the introduction of bigger ships. It is likely some of these ports will be served by ships larger than 5000 TEU, and the others will continue to be served by ships up to 5000 TEU.

Depending on future shipping configurations, smaller regional ports currently served by a South East Asia service (eg Napier, Wellington, and Bluff), could in the short to medium term also continue to be directly served by ships similar in size to those deployed today.

In the longer term however, these ports are likely to be impacted by the trend towards bigger ships – even those within the current range of sizes calling New Zealand.

a) Future port capability requirements

- At least four ports (Auckland, Tauranga, Lyttelton and Otago) have long term plans to invest in capital to handle ships larger than 5000 TEU in size.
- The amount of capital investment required for each port to become 7000 TEU ship capable is in the range of NZ $40 million to $200 million per port. However, the annualised cost of this investment (taking into account the cost of capital and any depreciation on assets) is more modest, at between NZ $5 to $23 million per port per year. None of the four key container ports has indicated financial assistance from government is required to undertake this development.
- All four ports will be required to increase capacity over the longer term to cater for cargo volume growth.
- In the shorter term however (ie within five years), not all four ports would need to make this capital investment initially, for New Zealand to attract larger ships. In fact, having all four ports investing simultaneously to become 7000 TEU ship capable within five years would deliver sub-optimal outcomes for New Zealand.
- It is clear any bigger ship service would be required to call at a North Island port, due to the large North Island export and import volumes, and a South Island port, for growing export volumes, including refrigerated export cargo.
- Under a scenario where a North Island and a South Island port become bigger ships capable, the remaining two key container ports would continue to play a vital role in servicing New Zealand's exports and imports.
- Given the lead time required to obtain resource consents and undertake infrastructure build (at least two to three years), it is imperative work commences as soon as practicable at one North Island and one South Island port to become 7000 TEU ship capable. Undue delays will harm New Zealand's international supply chains and the security of its direct services to key international transhipment hubs such as South East Asia.

b) Which ports should invest first?

- The Shippers' Council is comfortable either the port of Auckland or Tauranga in the North Island, and either the port of Lyttelton or Otago in the South Island, are capable of supporting bigger ships with investment in their long term assets.

- The analysis and research points to the ports of Tauranga and Lyttelton being the logical ports to start exploring implementation of capital plans with a view to becoming bigger ships capable within the next five years.

- In the case of the North Island ports, whilst Ports of Auckland is the natural location for the North Island's initial bigger ship port based on cargo volumes alone (particularly imports), the Shippers' Council does not have confidence the port is able to become 7000 TEU ship capable within five years.

- On the other hand, analysis of capital expenditure requirements and other qualitative factors, suggests the Port of Tauranga is in a more advanced state of investment readiness than Auckland, can undertake the investment at a lower cost, and can therefore enable the realisation of bigger ship benefits sooner.

- The key reasons for this are:

  - Port of Tauranga has already costed capital plans to become 7000 TEU ship capable. The information provided by Ports of Auckland to date suggests it only has plans to accommodate 6000 TEU ships in the foreseeable future.

  - The investment required at Port of Tauranga to become 7000 TEU ship capable is significantly lower than at Ports of Auckland (ie NZ $50 to $80 million, compared with NZ $200 million for Auckland to have comparable capability).

  - Ports of Auckland's current ownership structure (ie 100% ownership by Auckland local government, through Auckland Regional Holdings) means decision-making associated with the port is highly political. The timeliness of port investment decisions is likely to be stalled by a number of highly political issues, including:

    . The current uncertainties and debate surrounding the establishment of the Auckland Super City governance and organisational structures, and the new policies and funding arrangements associated with this. [3]

    . The ongoing debate about whether port operations (or expanded port operations) on prime central Auckland waterfront real estate is the best use of the waterfront space.

    . Concerns that creeping urbanisation near the rail corridor and port in central Auckland (in particular, current plans to develop multi-storey apartments on Auckland's Orakei Peninsula), may compromise plans by KiwiRail and Ports of Auckland to significantly increase rail freight movements to and from the port.

    . It is clear all of these issues will need to be resolved before Ports of Auckland can undertake any major capital works.

  - Port of Tauranga is in a more advanced state in its resource consent application to dredge its harbour to accommodate ships with 14.5 metres draught at both high and low tides. The Hearing Panel has recommended the Minister of Conservation grants Port of Tauranga resource consent to dredge and widen the channel, whereas Ports of Auckland has yet to apply for the required resource consent to dredge its channel further.

  - Whilst a significant proportion of North Island imports are destined for the Auckland region, Port of Tauranga provides an efficient alternative to the Ports of Auckland for these imports, as it is directly linked to its inland port in South Auckland (MetroPort) via efficient rail services.

- In the case of the South Island, both the ports of Lyttelton and Otago appear to be at a similar level of investment readiness. However, analysis suggests Lyttelton Port is the logical first port to become bigger ship capable because:

  - It is the largest container port in the South Island in terms of both import and export throughput volumes; and

  - Preliminary costings undertaken by both ports suggest development at Lyttelton Port to accommodate 7000 TEU ships is lower than at Port Otago (ie approx. NZ $40 to $80 million, compared with NZ $100 million at Port Otago).

- Furthermore, because Tauranga and Lyttelton are also the largest bulk ports in New Zealand, there is an opportunity for these cargo owners to leverage off investments at these ports.

[3] *New Zealand Herald (8 March 2010) - 'The Lockout of Auckland'. http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10630595&pnum=2*

Road, Rail and Coastal Shipping

- Road, rail, and coastal shipping will all have a role to play in supporting New Zealand's bigger ship capability in the future, regardless of which ports become initial bigger ship ports.

- Road offers advantages over rail and coastal shipping for shippers over short distances and for smaller consignments, as it provides greater reliability, scheduling flexibility, and faster speed of delivery. The competitiveness of road transport has also been enhanced since 1 May 2010, with heavier trucks being allowed on the road network.

- Rail and coastal shipping are better able to compete with road for longer distance movements and large consolidated volumes, particularly where delivery time is not as important, because the cost and environmental advantages of these modes outweigh service disadvantages.

- For longer distance journeys or for large consolidated volumes (ie the more relevant surface transport journey types associated with bigger ships), rail is likely to play a greater role than coastal shipping for aggregating cargo, particularly for intra-island movements. Whilst coastal shipping will have a role to play, the role is more limited than rail because of relatively short transit times, high cargo exchange costs and infrequent service (ie weekly or bi-weekly services, compared with multi-day services for rail). These factors combine to detract from coastal shipping's competitive position compared to rail.

a) Investment requirements

- KiwiRail has advised the current rail network has sufficient track capacity to move larger volumes of freight to and from New Zealand's ports if required – even under the most extreme cargo aggregation scenario (eg where large volumes of cargo are redirected between Auckland and Tauranga, and Lyttelton and Otago).

- However, the movement of larger volumes of cargo between some regions and ports in the future may require investment in:

  - Above-rail capacity (locomotives and wagons) over and above that currently committed to; and

  - Capability improvements at ports to increase train handling productivity and turn-around times.

- There may also be challenges for daytime rail freight movement in metro areas in key urban centres such as Auckland (due to planned expansion of urban passenger rail networks), that need addressing.

- The Government recently committed NZ $750 million over the next three years to support KiwiRail's 'Turn-around Plan' – a targeted investment programme which aims to turn KiwiRail into a sustainable rail business within 10 years. Key features of the plan include targeted investment on key routes, and adding new locomotives and wagons to the fleet. KiwiRail should, as a priority, ensure the funding is targeted at parts of the rail network that will support a bigger ships future.

Introduction

1.1 The Importance of Effective Supply Chains

The ability of exporters and importers to effectively connect with international markets depends partly on the performance of the entire supply chain in terms of cost, time, and above all, reliability and predictability.

The economic benefits of facilitating trade and reducing trade barriers (including creating effective connections with international markets, reducing transit times, and improving the efficiency of gateways such as ports), is well recognised. The World Economic Forum (2009) cites research suggesting the world's annual income could increase by US $1,514 billion with a 3% reduction in trade transaction costs.

The efficiency, reliability and cost-effectiveness of the international supply chain is particularly important for a country such as New Zealand, because not only is it geographically distant from its key trading partners, but its economic prosperity is highly dependent on the performance of its export sectors. Djankov et al (2006) finds that each additional day a product is delayed is equivalent to a country distancing itself from its trading partners by 1%.

Reports published by international organisations, such as the World Bank and World Economic Forum, show New Zealand's trade performance is being let down by the performance of its physical logistics infrastructure.

In 2010, New Zealand was ranked 6th out of 125 countries in the World Economic Forum's (2010) Global Enabling Trade Index – a measure of the effectiveness of the institutions, policies and services that facilitate the freeflow of goods over borders and to final destinations.

New Zealand performed well in the border administration (5th) and business environment (11th) categories, but was let down by scores in transport and communication infrastructure (26th – down from 22nd in 2009).

In particular, New Zealand was ranked 25th in the world for the availability and quality of transport infrastructure (down from 20th in 2009), and 39th for the availability and quality of transport services (down from 31st in 2009).

This latter category takes into account the quantity of services provided by shipping companies, the ability to track and trace international shipments, the timeliness of shipments in reaching destinations, and the overall competence of the local logistics industry. World Economic Forum research suggests a 1% increase in a country's Enabling Trade Index is associated with a 1.7% increase in exports, and a 2.3% increase in imports.

There is an opportunity for New Zealand to lift trade performance by taking proactive steps to increase the efficiency, reliability and cost-effectiveness of its supply chain infrastructure. The introduction of larger container ships (5000 to 7000 TEU) to New Zealand presents one such opportunity.

1.2 Why Bigger Ships?

New Zealand's heavy reliance on international sea freight for the movement of imports and exports to and from key overseas trading partners, means large supply chain improvement opportunities can be leveraged off trends in the international shipping industry – particularly in container shipping.[4]

According to Statistics New Zealand, approx. 99.6% of New Zealand's trade volume in 2008 was carried by sea to and from overseas markets. Further details about New Zealand's trade sector are set out in **Appendix 2**.

Internationally, there is a major trend for the shipping industry to move towards the use of larger and larger container vessels. As shown in **Table 1**, approx. 28% of the current global fleet of container ships is larger than 4000 TEU in nominal capacity.

[4] *Although most of New Zealand's export and import cargo by volume is shipped in bulk and break-bulk form, containerised cargo represents a significant proportion of trade. Approx. 39% of import and export cargo by volume respectively, was shipped in containers in 2008 (Statistics New Zealand).*

Table 1: Global Container Ship Fleet and Existing Orders as at March 2010

		Current fleet (as at March 2010)			Ships on order (to 2014)		
Can NZ ports handle these ships fully laden?	**Nominal ship capacity (TEU)**	**Number of ships**	**TEU of capacity**	**% of total capacity**	**Number of ships**	**TEU of capacity**	**% increase in TEU fleet capacity**
YES	0-499	361	117,570	1%	5	800	0%
	500-999	806	599,989	5%	58	49,303	1%
	1000-1999	1,249	1,769,461	13%	116	175,925	4%
	2000-2999	714	1,810,536	14%	61	159,279	4%
	3000-3999	310	1,063,870	8%	40	140,409	3%
	4000-4999	546	2,402,924	18%	141	618,654	14%
NO	5000-5999	300	1,646,910	12%	26	139,195	3%
	6000-6999	174	1,134,181	9%	49	320,834	7%
	7000-7999	31	226,866	2%	22	161,740	4%
	Over 8000	270	2,440,926	18%	237	2,692,285	60%
	Total	**4,761**	**13,213,233**	**100%**	**755**	**4,458,424**	**100%**

Source: Containerisation International, p9 (May 2010)

Together, these ships account for 59% of total fleet capacity. However accounting for ships currently on order, by 2014 the total number of ships exceeding a nominal capacity of 4000 TEU will increase to 33% of the world fleet, and 67% of total fleet capacity. These larger ships are forecast to account for 80% of total fleet capacity by 2030 (Rockpoint, 2009a).

This trend is driven by the economies of scale associated with the higher fuel efficiency of larger ships, and the fact larger ships can spread costs over the higher volume of containers they can carry (thereby reducing the average cost of transporting each container).

Furthermore, the potential combining of service capacity through vessel-sharing arrangements (from multiple small ship services, to fewer bigger ship services), reduces the number of ships required to service any given route at any given frequency and sailing speed.

This reduces the overall cost to serve, because fewer ships are required to carry the same overall volume of cargo. These benefits are discussed in more detail in **Section 3.1**.

The trend for shipping companies to use larger and larger container ships is not new. As shown in **Figure 1**, over time shipping companies have gradually increased the size of the vessels they use, to capture scale benefits.

However, the high and volatile fuel prices observed in the past decade, as well as a growing global focus on mitigating the risks and impact of climate change, have accelerated the trend for using larger ships because they are more fuel and carbon efficient per TEU of cargo carried, compared with smaller ships.

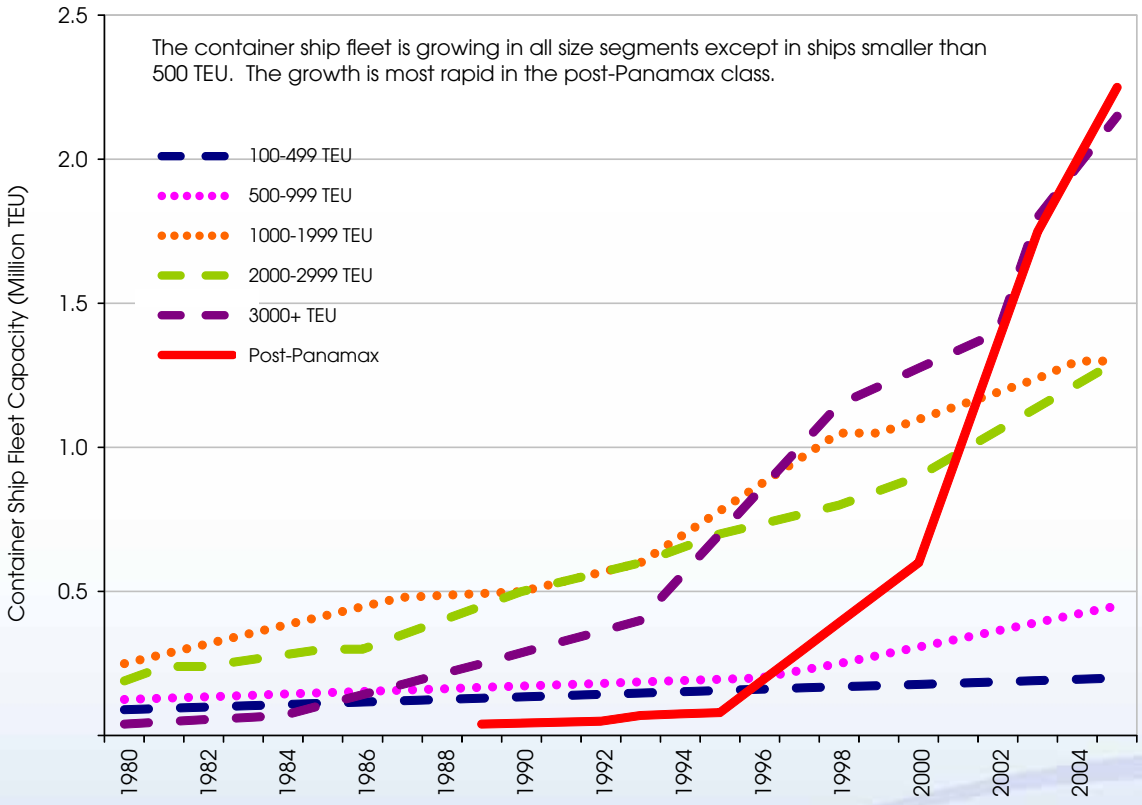
Although New Zealand has been reasonably well served by the major international container shipping lines for a country of its size, the level of service and capacity has diminished considerably in recent years, driven mainly by carrier consolidation and service rationalisation.

It is likely these drivers of change will continue as global container carriers seek to improve financial returns. Therefore, retaining these service levels and, if possible, enhancing them, is strategically important to support New Zealand's international trade.

At present, the average-sized container ship calling at New Zealand ports has a nominal capacity of approx. 2700 TEU. The largest ship that currently calls at New Zealand on a regular basis has a nominal capacity of approx. 4100 TEU.

The maximum-sized container ship some New Zealand ports can currently accommodate has a nominal capacity in the range of 4500 to 5000 TEU when fully loaded. This was evidenced by the recent arrival of the 5000 TEU Maersk Detroit (not fully laden either inbound or outbound), and the 4500 TEU OOCL New Zealand, in December 2009 and April 2010 respectively.

Figure 1: Change in Container Ship Fleet Capacity and Ship Size (1980 - 2005)



Source: Clarkson Research (cited in Stopford, 2009)

Whilst vessels larger than 7000 TEU are not expected to service New Zealand trades in the foreseeable future, it is anticipated more vessels with nominal capacities in the range of 4000 to 7000 TEU will be repositioned from larger trade lanes to smaller ones such as New Zealand.

It is acknowledged there is no single view across the industry on when larger ships will start to call at New Zealand, what routes they will operate on, and which New Zealand ports they will call at.

A number of stakeholders, including the Ports of Auckland (2008), consider it likely that 6000 to 7000 TEU ships could be introduced to New Zealand trade routes in the next five years.

However, Maersk has been reported saying the chances of larger ships visiting New Zealand in the near future are relatively small.[5] Maersk has also intimated there is a long term possibility that New Zealand may lose all direct international calls and accede to a feeder role via Australia.[6]

The comparatively small volume of containers handled in New Zealand by global comparison (less than 1% of annual global container throughput), means deployment of larger ships to New Zealand is not a given, and New Zealand needs to compete with other trade lanes for bigger ships.

New Zealand ports need to be ready to handle larger ships to ensure shipping lines are not impeded in their fleet deployment planning.

As highlighted by Boyle (2010), "the risk for New Zealand is that if its port facilities are not able to accommodate larger ships that have the flexibility to be employed on other trades, then the shipping lines will reflect this in their rates on the basis that New Zealand, already an expensive destination, requires a boutique service with smaller and therefore older ships."

To date, a range of parties have talked about and partly explored the potential benefits of introducing larger container ships to New Zealand, the capability of New Zealand's ports to handle such ships, and the risk of these larger ships hubbing through Australia if New Zealand ports do not make timely investments to become bigger ships capable.

Comments made to date have largely been qualitative in nature, and have tended to focus on individual nodes in the supply chain, rather than looking at the whole supply chain. Little quantitative research has been undertaken on the impact of larger ships on the New Zealand supply chain.

[5] *New Zealand Transport Intelligence Briefing (11 June 2009), cited in National Infrastructure Plan (2010) (page 91).*

[6] *PortStrategy.com (29 May 2010). http://www.portstrategy.com/news101/australasia/nz-ports-future-under-scrutiny*

Consequently, there is still a lack of clarity on:

- The likely physical characteristics of bigger ships in the future, in terms of length, width and draught. It is important to acknowledge ship designers are constantly looking to minimise the draught of ships as draught is a major constraint on larger ships' ability to travel through the Panama Canal and Torres Strait (between Australia and Indonesia);
- The quantum of benefits bigger ships would deliver when considered in the context of the wider supply chain;
- Whether New Zealand's current and future cargo volumes can support at least one bigger ship service;
- Which ports in New Zealand can accommodate bigger ships;
- What combination of ports would deliver optimal value for New Zealand (and how it would impact on the role of the other ports);
- What changes would have to be made to the supporting infrastructure (eg ports, road, rail, coastal shipping), and how much it would cost;
- The state of readiness ports are in to fund and implement infrastructure expansion plans required to accommodate larger ships; and
- What supply chain exposure and risks New Zealand will face if its infrastructure is not bigger ships capable within the next five years.

In light of the significant investments Australian ports such as Melbourne, Sydney and Brisbane are currently making to attract larger container ships (and the potential significant negative impact any decision by shipping companies to increasingly hub through Australia may have on the New Zealand import and export supply chains), it is important to have greater clarity on the above questions to determine what action is required to protect New Zealand's direct access to key overseas transhipment hubs (eg in South East Asia).

In particular, the competitiveness of New Zealand's exports will be at risk if loss of direct access to key overseas transhipment hubs results in increased shipment time and costs, and reduces the reliability of shipment times to market.

This report sets out the New Zealand Shippers' Council's considered views on the above issues. The report aims to provide greater clarity on these questions by taking a view of the whole supply chain, and through balancing evidence-based quantitative analysis with a real world assessment of the varied and complex issues, where it is meaningful to do so.

1.3 Objectives and Scope

As a case study to answer the questions outlined previously, this report focuses on bigger ship services between New Zealand and South East Asia.

The analysis assesses whether there are benefits to New Zealand from having bigger ship services between New Zealand and South East Asia, and whether New Zealand's current and future cargo volumes are sufficient to support a bigger ship service on this route.

The main reason for choosing a South East Asia trading lane as the case study, is because it is the most likely route for a bigger ship service to operate between New Zealand and overseas – at least initially.

South East Asia is New Zealand's largest shipping route, accounting for approx. 48% of New Zealand's containerised export trade, and 41% of containerised import trade.[7] It is also the route on which the largest vessels calling New Zealand (ie 4100 TEU) currently operate.

Whereas the scenarios modelled in this report assume cargo would tranship through South East Asia, in practice, a South East Asia port call could be part of a wider service between New Zealand and North Asia, or New Zealand and the west coast of North America for example, and could therefore attract higher volumes of cargo than modelled in this report.

The benefits and timing of bigger ship service calls to New Zealand could potentially be sooner than suggested in this report.

The following are outside the scope of analysis:

- How a bigger ship scenario will be implemented or commercialised;
- Which mix of shipping lines will be involved;
- What contractual arrangements between, for example, carriers and ports, and carriers and shippers, might look like; and
- How any infrastructure improvements required would be funded, and who would fund them.

Wherever possible, a market-based approach in addressing these issues is the most appropriate way to proceed. Commercial matters are best left to the market to ensure sustainable, efficient, and non-distorting solutions are found.

[7] *Section 4 refers.*

However, government involvement may be required to facilitate certain outcomes. For example, government may be required to:

- Set the policy direction for freight infrastructure investments; and
- Ensure efficient and optimal port infrastructure investments are made in a timely manner.

1.4 Approach

This report has been developed by a team consisting of freight sector experts and analysts from member organisations of the New Zealand Shippers' Council.

A number of external stakeholder organisations, including Mainfreight, Oceanbridge, and Foodstuffs, have also provided guidance and sector-specific expertise in the development of this report, to ensure the findings are as robust as possible. A list of all stakeholders engaged is contained in **Appendix 3**.

This report has also been peer reviewed by independent industry experts. The Shippers' Council would like to thank these external freight sector experts and the peer reviewers for their contributions.

One of the biggest challenges faced in the development of this report has been gathering accurate data on container volume throughput and flows that can be meaningfully compared across ports.

Even though ports and carriers have been forthcoming with providing the data requested, reconciliation of the numbers with other publicly available information and shippers' experience with shipping product to and from New Zealand, has been difficult.

There is currently no mandatory data collection for container movements in New Zealand.[8] Whilst Statistics New Zealand currently collects detailed data (volume, value, and origin/destination) on export and import movements to and from New Zealand in terms of metric tonnes, this data does not provide any insight on the corresponding container export and import volumes.

[8] *Whilst all ports collect data on the throughput at their own ports, the different data collection and recording methods across ports (including how transhipment, domestic, and empty container volumes are recorded), means that ports' volume data cannot be compared in any meaningful way. In particular, the potential counting of the same transhipment volume at both the transhipment port and the origin or destination port means that if aggregated, ports' volume data will inflate the overall picture due to double counting.*

To date, the most comprehensive set of publicly available international container volume data at New Zealand ports (excluding transhipment and domestic coastal feeder volumes) is contained in the March 2009 report, *'Domestic Container Supply Study'*, completed by Cubic Transport Services Ltd and Njord Ltd.

However, although Cubic-Njord reports the volume of full and empty containers (in TEUs) through each of the major container ports in 2008, it does not provide any insights about the international flow of these volumes (ie container volumes by overseas origin or destination country).

Also, whilst Cubic-Njord reports the original source of its data is from major New Zealand container ports, they caveat that the level of detail provided did vary across ports, and some data points were therefore estimated by extrapolation.

To establish a picture of New Zealand's current import and export cargo volumes and flows from each New Zealand container port, the Shippers' Council purchased a detailed database of import and export data from Statistics New Zealand. This data, whilst not perfect, proved to be a rich source of information about the volume and value of New Zealand's imports and exports by month, detailed commodity level (at 4-digit Harmonised System commodity code), New Zealand origin or destination port, and overseas origin or destination country.

However, a major limitation of the raw data is that import and export volumes are measured in tonnes, rather than the number of containers (in TEU). In order to convert the volumes from tonnes to TEU, the Shippers' Council worked with its members, freight forwarders, importers, and ports to develop a set of assumptions for the conversion. The detailed approach and assumptions are set out in **Appendix 4**.

Although the Shippers' Council has taken every care to ensure the container volumes in the analysis are as accurate as possible, it is important to acknowledge they are only estimates, therefore a margin of error exists.

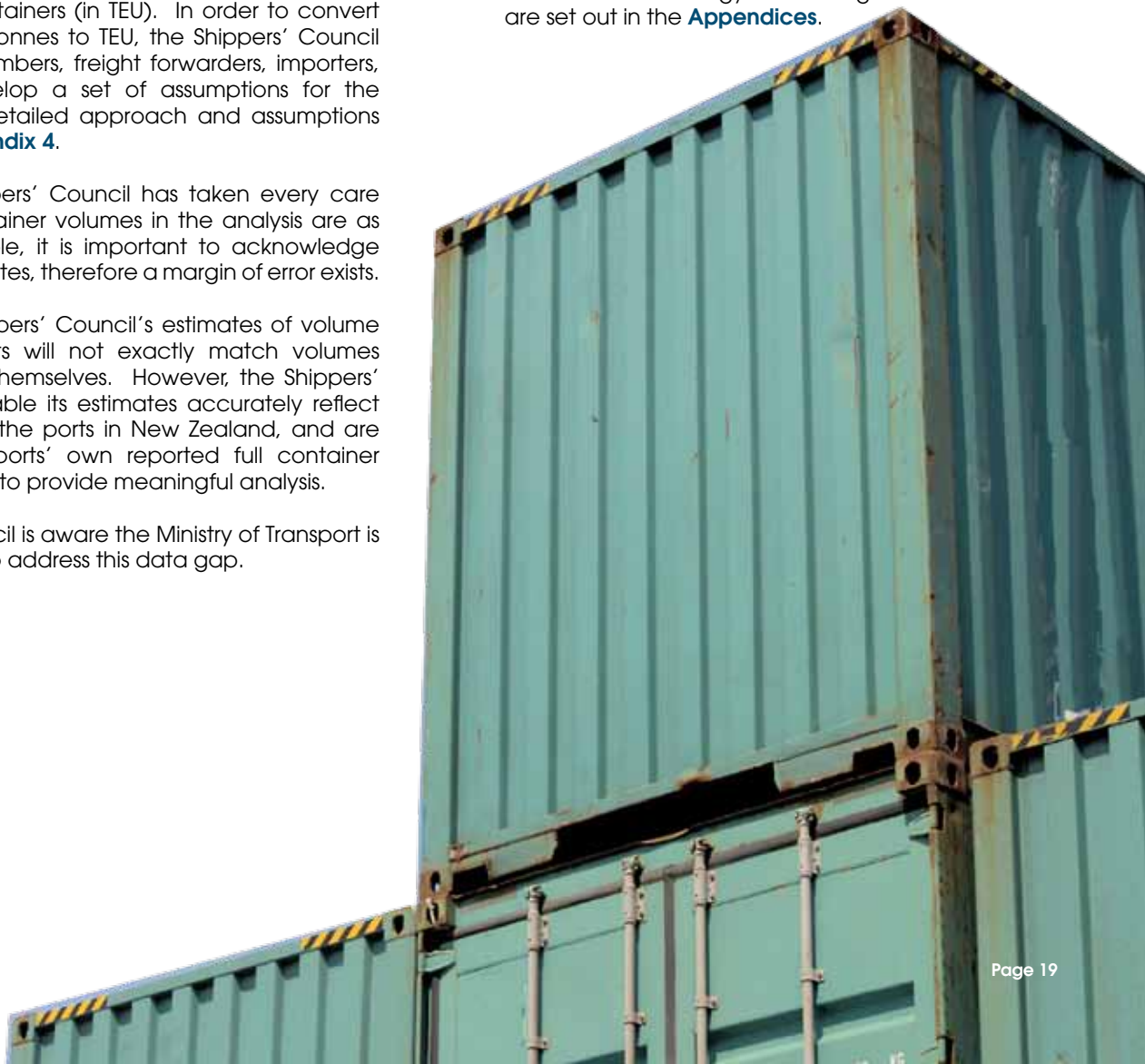
Inevitably, the Shippers' Council's estimates of volume throughput at ports will not exactly match volumes reported by ports themselves. However, the Shippers' Council is comfortable its estimates accurately reflect the relative size of the ports in New Zealand, and are close enough to ports' own reported full container volume throughput to provide meaningful analysis.

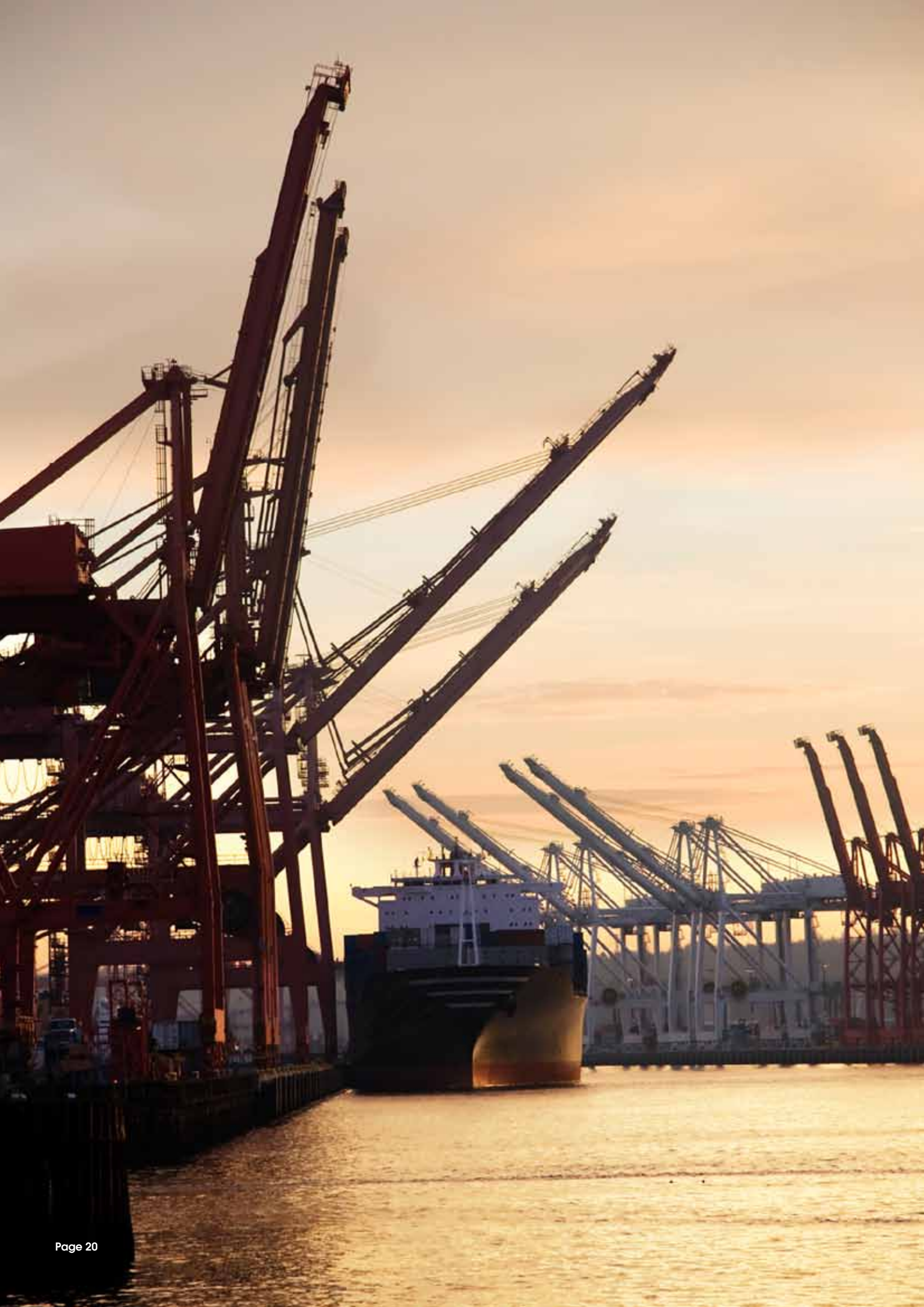
The Shippers' Council is aware the Ministry of Transport is undertaking work to address this data gap.

1.5 Report Structure

The remainder of this report is structured as follows:

- **Section 2** describes the key characteristics of larger container ships;
- **Section 3** describes the potential benefits and costs of larger ships;
- **Section 4** provides an overview of the current New Zealand export and import volumes currently shipped through South East Asia. It also outlines the current shipping services that operate on this route, as well as the total available capacity on this route;
- **Section 5** examines whether New Zealand's current and future cargo volumes could support one or more bigger ship services on the South East Asia route, and quantifies the potential benefits and costs from an end-to-end supply chain perspective;
- **Section 6** examines whether New Zealand's ports could support bigger ships, the investments required for them to have bigger ship capability, and which ports should be the initial bigger ship ports;
- **Section 7** examines whether New Zealand's surface transport infrastructure could support bigger ships and the investments required; and
- **Section 8** concludes.
- Detailed methodology and background information are set out in the **Appendices**.





Characteristics of Larger Container Ships

2. Characteristics of Larger Container Ships

The industry uses a number of different terms to refer to different classes of ships. A common set of terms used relates the size of the ship to the physical characteristics of the Panama Canal. These are described below in **Table 2**.

Table 2: Classification of Ships by Size

Ship Class	Description
Panamax	This term refers to ships are able to pass through the Panama Canal. The physical characteristics of the Panama Canal constrain the beam of ships to 32.2 metres (or approx. 13 containers wide). A typical Panamax ship is about 13 containers wide, with a draught of 12 to 13 metres. **(The draught of a ship refers to the depth of a loaded vessel in the water. It is measured from the level of the waterline to the bottom of the ship.)** These ships tend to have a nominal capacity of up to 5000 TEU.
Post-Panamax	These ships are currently too wide to pass through the Panama Canal. They are typically 16 to 17 containers wide, with a draught of 13 to 14.5 metres. They tend to have a nominal capacity of between 5000 to 10,000 TEU. The Panama Canal is currently being upgraded to accommodate this class.
Super Post-Panamax	These ships typically have a draught of between 14 to 16 metres, and are more than 18 containers wide, with a nominal capacity of over 10,000 TEU.

Source: World Bank (2003)

The actual dimensions of ships (even with the same nominal capacity) vary considerably between make and model, with different variations of length, beam (the width of the ship), and draught.

Ship designers are constantly looking at ways to minimise draught, as harbour deepening is expensive and many large ports around the world are river ports which are constrained on draught. Length, beam and draught are key characteristics of ships, as they determine whether ports can accommodate them, and the capital works required by ports to accommodate them.

Table 3 (following page) shows the key characteristics of example ships ranging in size from 2700 TEU to 14,500 TEU. OOCL Melbourne and Maersk Damascus (the example ships chosen to represent 2700 TEU and 4100 TEU ships respectively), currently call at New Zealand.

The Maersk Detroit represents a 5000 TEU ship because it called at two New Zealand ports in December 2009. The CSCL Africa and Hanjin Fuzhou represent an 8500 TEU ship and 10,000 TEU ship respectively because they are used by Lyttelton Port in its modelling. All other example ships were randomly selected from a list in Lloyd's Register to represent ships with the same capacity.

It is important to note that:

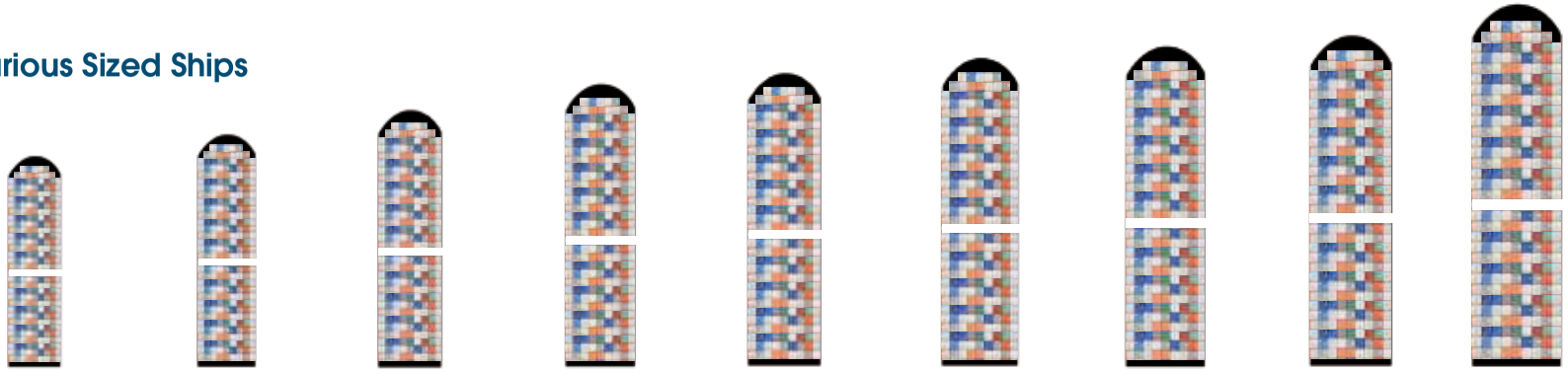
- The actual carrying capacity of a ship is lower than its nominal capacity and is dependent on a number of variables, including the size and deadweight of the vessel, the mix of full and empty containers carried, the mix of twenty and forty-foot containers carried, and the weight of the containers carried.
- The actual draught of ships may be less than the maximum ship draught (which is usually reported in shipping databases), because actual ship draught is correlated with actual ship and cargo weight.

  For example, 7000 TEU ships on an inbound import leg may have a draught of less than 14.5 metres when arriving in New Zealand because of the relatively low weight of imported containers and high proportion of empty containers carried.

  However, once fully laden with export cargo (which from New Zealand tends to be relatively heavy compared with imports), the last port of call in New Zealand is likely to need to cater for a draught close to the ship's maximum (ie about 14.5 metres for a 7000 TEU ship).
- The reefer container capacity shown is for ships not configured specifically for the New Zealand market (with the exception of the 4100 TEU Maersk Damascus). As with the current 4100 TEU ships that call at New Zealand, it is expected 5000 to 7000 TEU ships that service New Zealand in the future will be specially configured with more reefer slots to cater for New Zealand's export needs.

  At present, approx. 25% of New Zealand's total exports are shipped in reefer containers.

Table 3: Characteristics of Various Sized Ships



	Panamax ships			*Post-Panamax ships*			*Super Post-Panamax ships*		
	Ships that can currently be accommodated at NZ ports			*Ships that cannot currently be accommodated at NZ ports*					
Nominal Ship Capacity (TEU)	**2700 TEU**	**4100 TEU**	**5000 TEU**	**6500 TEU**	**7500 TEU**	**8500 TEU**	**10,000 TEU**	**11,000 TEU**	**14,500 TEU**
Example ship name	OOCL Melbourne	Maersk Damascus	Maersk Detroit	CMA CGM Corneille	Cosco Seattle	CSCL Africa	Hanjin Fuzhou (Cosco Asia)	CMA CGM Vela	Maersk Emma
Year built	2003	2002	2005	2009	2004	2005	2007	2008	2006
Actual capacity (TEU) at 14 MT/TEU*	2200	2840	3320	4870	5650	6230	7520	7890	11,000
Reefer container capacity (TEU)	300	1300	550	500	500	700	800	700	1300
Length (metres)	235.6	281.0	294.1	300.0	300.0	334.0	349.2	346.5	397.7
Beam (metres)	32.2	32.2	32.2	40.0	42.8	42.9	45.6	45.6	56.4
Number of containers wide	13	13	13	16	17	17	18	18	22
Max. draught (metres)	12.5	12.5	12.8	14.5	14.5	14.5	15	15.5	15.5
Max. speed (knots)	22.6	24.9	26.1	25.6	25.2	25.2	25.8	24.3	24.5
Dead weight (tonnes)	43,093	53,115	66,799	84,300	93,572	101,612	120,000	130,700	152,800
Gross tonnage	34,610	45,803	54,771	76,000	83,133	90,645	108,000	128,600	170,794

Source: Lloyds List: www.containership-info.com

**The actual capacity of these ships when leaving New Zealand is likely to be less than this, as the average weight of a New Zealand export container is heavier than 14 metric tonnes per TEU.*

Potential Benefits and Costs of Bigger Ships

The analysis in this report focuses on elements of supply chain costs likely to change as a direct result of bigger ships. Costs either not expected to change, or expected to change regardless of bigger ships, were not considered in the analysis because they are not specific to bigger ships.

The following supply chain costs likely to be impacted as a direct result of bigger ships calling at New Zealand, were identified.

3.1 Ship Voyage Operating Cost Savings

A number of international studies have shown economies of scale (through lower average voyage cost per TEU carried) can be gained through the use of larger container ships.

These cost savings accrue because some operating costs (including bunker fuel costs) do not increase proportionately with the size of the ship. Cost savings can therefore be gained because total costs are spread over the higher volume of cargo carried.

Figure 2 shows that voyage operating costs per TEU fall with increasing ship size (ie economies of scale are gained), albeit at a diminishing rate.

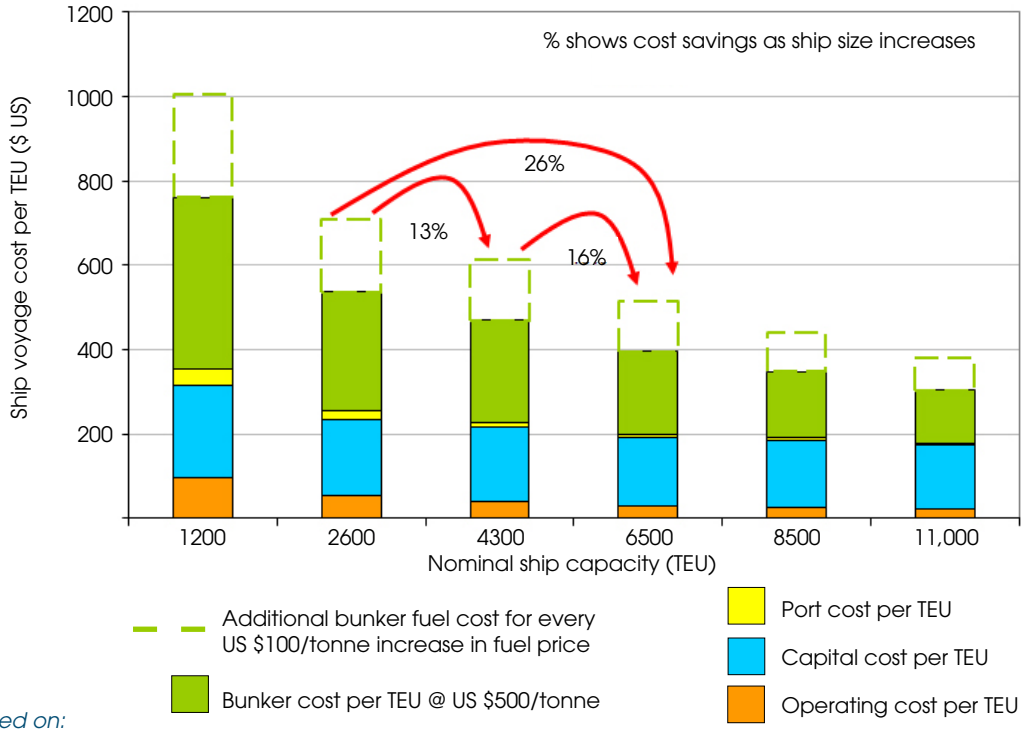
As ships get bigger, the quantum of the cost savings decreases. This is because at any given speed, the fuel efficiency of ships (in terms of fuel consumption rate) increases at a diminishing rate with increasing ship size. So whilst relatively high fuel efficiency (and thus fuel cost savings) can be gained initially by moving from small to medium-sized ships, fuel efficiency savings levels out with larger ships.

In particular, **Figure 2** shows the operating cost per voyage of a 6500 TEU ship is approx. 16% less on a per TEU basis than a 4300 TEU ship, and 26% less than a 2600 TEU ship.

This is consistent with other research (including Banchero Costa, 2010), which finds a 7500 TEU ship is approx. 15% cheaper to run on a per TEU basis than a 4500 TEU ship.

Figure 2 also shows shipping companies (and ultimately shippers) are less exposed to increasing fuel prices with larger ships. The approach and key assumptions underpinning the ship voyage cost analysis (based on Stopford, 2009) are set out in **Appendix 5**.

Figure 2: Ship Voyage Cost per TEU for Various Ship Sizes for a Weekly New Zealand to Singapore Service



Analysis based on:

- *An 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 approx. US $500 per tonne;*
- *Shipping companies owning their own ships, rather than chartering ships; and*
- *Average inbound ship utilisation (based on full paying containers) of 60%, and outbound utilisation of 86%.*

Source: New Zealand Shippers' Council analysis

Furthermore, if capacity on multiple smaller ship services was combined to form fewer larger ship services, shipping companies may also benefit from not having to operate as many ships overall.

An analysis of ship voyage costs shows the value to shipping companies of reducing the number of ships operating in a weekly string could be around US $18 to $21 million per ship per year for 2600 TEU ships, and US $30 to $34 million per ship per year for 4300 TEU ships.

New Zealand's export and import cargo owners should realise some of these benefits through:

- A reduction in the fuel component of their ocean freight charges through the bunker adjustment factor (BAF) and/or to the fuel component of base rates; and either
- A reduction in ocean freight base rates reflecting lower overall operating costs; or
- Enabling shipping companies to maintain sustainable returns without increasing ocean freight rates.

3.2 Reduced Carbon Profile of Shipping

Larger ships are more fuel efficient (and therefore more carbon efficient) than smaller ships because less fuel is required to transport each TEU of cargo.

A reduction in the carbon profile of shipping is particularly important for New Zealand because:

- Geographically, New Zealand is far from many of its key international export markets. Accordingly, the transportation of New Zealand exports to overseas markets is more carbon intensive than goods not travelling as far.

  This may affect the demand for New Zealand products in an environment where parties focus on food miles only, rather than the overall carbon footprint of the total supply chain.

- Any future international carbon trading or taxation scheme that covers the international ocean freight industry would increase shipping costs for exporters and importers. Whilst maritime greenhouse gas emissions are not yet covered internationally by the likes of the Kyoto Protocol, there is increasing pressure on the United Nations and the International Maritime Organization to introduce emissions tax or trading schemes for ocean freight (United Nations' Economic and Social Commission for Asia and the Pacific, 2007).

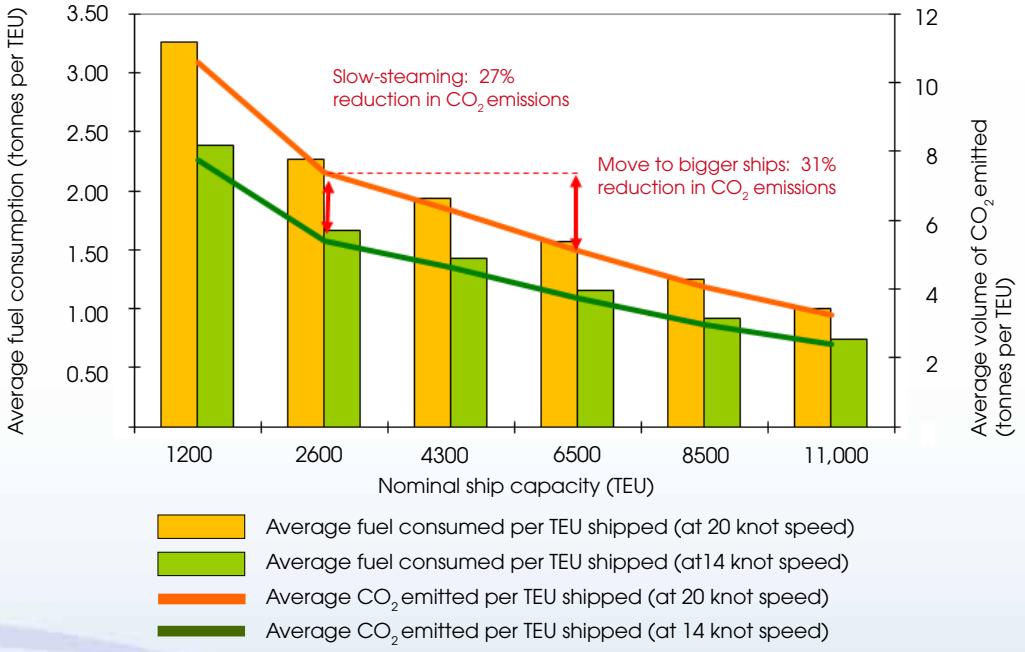
Given New Zealand's reliance on international shipping and its distance from key markets, at the current international carbon price of approx. €10 per tonne of carbon emitted, New Zealand exporters and importers would be particularly impacted.[9] Analysis suggests a carbon price of €10 per tonne would increase supply chain costs by approx. 4%.

An analysis of the fuel and carbon efficiency of various sized ships (shown in **Figure 3**), confirms both the average amount of fuel consumed per TEU transported and the average volume of carbon emitted per TEU transported, decreases with increasing ship capacity. As shown in **Figure 3**, a 6500 TEU vessel emits 31% less carbon per TEU than a 2600 TEU vessel.

With New Zealand's relatively high proportion of renewable electricity generation, the carbon profile of shipping to and from New Zealand could further be reduced if vessels were to adopt plug-in protocols at New Zealand ports.

[9] *The New Zealand Treasury's Carbon Price Information Release refers. http://www.treasury.govt.nz/government/kyotoposition/carbonprice*

Figure 3: Average Fuel Consumption and Carbon Emissions per TEU for Various Sized Ships



Source: New Zealand Shippers' Council analysis

In addition to the design fuel efficiency of ships, there are also opportunities for shipping companies to increase fuel and carbon efficiency by sailing at slower speeds, and ensuring the ship's hull is smooth, to reduce water resistance (Stopford, 2009).

As discussed in **Appendix 5**, a number of international shipping carriers have introduced slow-steaming in an effort to reduce bunker fuel consumption and carbon emissions.[10] In late 2009, it was reported Maersk had reduced shipping speeds from around 20 knots to 14 knots on a number of its international routes.[11]

Figure 3 on the previous page shows that holding hull smoothness constant, a reduction of sailing speed from 20 knots to 14 knots would reduce fuel consumption and carbon emissions significantly for all ship sizes. However, as discussed below, the increased shipping time to market as a result of slow-steaming is unlikely to be acceptable to exporters (particularly for exporters of highly time-sensitive perishable goods such as fresh fruit and vegetables, and chilled meat), without corresponding freight rate concessions to offset the additional transit time and wider supply chain costs incurred as a result (eg higher depreciation and inventory holding costs).

However in saying this, even with freight rate concessions, significant increases in transit times will still not be acceptable to some exporters of perishable goods because of the finite shelf-life of some goods (eg chilled meat, and fresh fruit and vegetables).

The Shippers' Council does not believe shipping companies will be able to maintain such slow-steaming speeds over time (particularly if fuel savings are not passed on to shippers). Furthermore, from New Zealand's perspective, greater carbon efficiencies could be achieved through the introduction of larger vessels compared with slow-steaming (ie 31% reduction in carbon, compared with 27% reduction - as shown in **Figure 3** on the previous page).

3.3 Additional Cargo Aggregation Costs

Depending on the future configuration of shipping services, some cargo may incur additional domestic transport costs (ie road, rail, or coastal shipping), as a result of having to redirect cargo from one port to another due to bigger ships potentially calling at fewer ports.

The impact of cargo aggregation will not be spread evenly over all shippers. Those with export facilities located near smaller ports with no direct South East Asia service call will potentially be impacted more than those located near ports continuing to receive a direct South East Asia service call.

[10] *Maersk's issue paper on energy consumption refers. http://about.maersk.com/en/CorporateCitizenship/Environment%20Documents/Energy_consumption1.pdf*

[11] *`Maersk Throttles Speed on More Routes' (15 December 2009), Janet Porter, Lloyd's List, http://www.lloydslist.com/ll/news/maersk-throttles-speed-on-more-routes/1260545072750.htm;jsessionid=68E22A587B4F603BCF54E7AF780EAF6A.065acf6a61c52eed94766d1ba7da5d95d4ecd58a*

It is important to note the consolidation of carriers and services is already happening in New Zealand, regardless of whether 5000 to 7000 TEU ships are introduced.

Regional exporters whose local port does not offer direct calls to particular overseas destinations, are already incurring aggregation costs through their ocean freight charges, as carriers tranship cargo from feeder to main line services. Therefore, in many cases, exporters incur additional road or rail costs which will be offset in part or in full by reduced ocean freight costs.

For example, several New Zealand ports - New Plymouth, Nelson, and Timaru - are not currently served by a direct South East Asia service. The aggregation of cargo from these ports to larger ports already occurs.

So, whilst cargo from regions not directly served by a South East Asia shipping service will incur cargo aggregation costs, only some will incur additional cargo aggregation costs as a direct result of bigger ships.

However, for cargo aggregated from one port to another, cargo aggregation costs (and the time involved) may be offset by time savings gained as a result of shippers being able to access a greater variety and frequency of shipping services. This includes access to bigger ship services that may have shorter transit times than smaller ship services because larger ships tend to call at fewer ports.

3.4 Value of Time

A number of recent international studies have examined the impact of transport time on the cost of trade, and a country's overall trade performance. They have found lengthy shipping times impose additional costs on shippers and reduce the overall competitiveness of a country's exports.

Conversely, lower transport times reduce costs and have positive economic benefits for exporters, importers, and for the country as a whole. Transit times may be reduced if cargo is aggregated (eg by rail) to a bigger ship port in New Zealand, and then shipped directly to a major international transhipment port, rather than steaming around a number of New Zealand ports first.

Hummels (2001) identifies two time-related costs for exporters and importers. They are:

- **Inventory holding costs.** For exporters, inventory holding costs include the opportunity cost of capital tied up in goods in transit. For importers, inventory holding costs include the cost of having to hold larger stocks of inventory to accommodate variations in the arrival time of imports. For imported goods, any additional inventory holding costs are likely to be inflationary, as importers pass on these costs to their customers. There is less scope for exporters to pass on these costs, as it would reduce the international competitiveness of New Zealand's exports.

Assuming a weighted average cost of capital of 10% per annum, inventory holding costs equate to approx. 0.03% of the value of the cargo per day.

- **Product loss of value.** This captures any reason a newly produced good might be preferable to an older good. Examples include the spoilage or reduced shelf life of fresh meat and produce, items with immediate information content such as newspapers, and highly seasonal goods, for which demand is difficult to forecast, for example Christmas or Easter-themed products, seasonal fashion apparel.

For the chilled meat and fresh produce sectors, the rate of depreciation is exponential – ie the rate of depreciation (loss of value) is relatively low or non-existent initially, but increases quite steeply as transit time increases.

Related to this, changes to shipment time to market also have wider macroeconomic impact on a country's overall trade performance if they reduce the export viability of fresh products.

For example, the Meat Industry Association noted the shelf life of chilled meat ranges from 70 to 90 days. If transit delays mean chilled meat has to be frozen down, its economic value could be reduced by up to 50%, as it is in essence a distressed product.

It is important to note in cases where transit times are too high or there are uncertainties about shipping times, the export of fresh or chilled product is not a viable business model. Meat is therefore likely to be exported in frozen form (at a discount to chilled product) rather than in chilled form.

3.5 Strategic National Benefit

Predictable and reliable delivery time to market is central to the overall competitiveness of exporters in the global supply chain – particulary for New Zealand exporters because they are geographically distant from many of their key markets.

There is a strategic national benefit for New Zealand as a whole in being able to secure and maintain direct shipping access via major international shipping hubs. A number of commentators (including ports, carriers, and industry experts) have acknowledged the risk of some New Zealand shipping services hubbing through Australian ports if New Zealand's infrastructure is not capable of accommodating larger ships. [12, 13]

[12] *Maersk Line New Zealand's Managing Director has been quoted saying he "believes there is a long-term possibility (New Zealand) may lose all direct international callers and accede to a feeder role via Australia." PortStrategy.com (29 May 2010). http://www.portstrategy.com/news101/australasia/nz-ports-future-under-scrutiny*

[13] *Logistics and Transport New Zealand (June 2010). 'Handling Larger Container Ships: Ports of Auckland – Ready and Waiting', Volume 8 Issue 4.*

It will be a major concern to New Zealand exporters and importers if transhipping through Australia increases transport costs, and the length and variability of shipment time to market.

Firstly, this is because for each time cargo is handled at a port, it incurs an additional cargo-handling charge. For an Australian hub port scenario, because all cargo (imports and exports) would be transhipped through Australia, they would incur an additional cargo handling (or transhipment) charge in Australia. Auckland Regional Holdings (2009) estimates the average cargo handling charge at Australian ports is approx. NZ $400 per TEU.

Auckland Regional Holdings (2009) also estimates transit times would increase by at least four days if New Zealand cargo were transhipped through Australia, compared with more direct services from New Zealand to the same destination (holding all other parameters constant, including sailing speed, port calls etc).

Transhipping through Australia also puts New Zealand cargo in a vulnerable position during peak Australian export seasons, because container slots allocated for New Zealand exports could be reallocated to larger Australian exporters who need the extra capacity and have the bargaining power to secure it from shipping companies, at New Zealand's expense.

The situation where New Zealand export volumes have been compromised for Australian exporters has occurred in the past, with services to the Americas (where both New Zealand and Australian export markets are served by the same service, with New Zealand called after Australia).

Significant port infrastructure developments at Australian ports make the threat of an Australian hub scenario more real. Australia's three largest container ports (Melbourne, Sydney, and Brisbane) are all making considerable investments in response to projected future growth, and to cater for the increasing size of container ships.

3.6 Infrastructure Investment Required

In order to realise the economies of scale from the use of larger ships, New Zealand's ports and surface transport infrastructure must have the capability to support them.

Some ports may need to invest capital to increase the depth of their channel and berth pockets, lengthen their berths, purchase more post-Panamax cranes to maintain or increase container handling productivity, and/or increase storage capacity.

Specific port and surface transport infrastructure investments that may be required to support larger ships in New Zealand are discussed in **Sections 6** and **7** respectively.

The benefits and costs of various bigger ship scenarios are quantified in **Section 5**.


163080 4
42G1
MAX.G.W.
TARE
MAX.C.W.
CU. CAP.
30.480 KGS
67.200 LBS
3.820 KGS
8.420 LBS
26.660 KGS
58.780 LBS
67.7 CU.M.
2.390 CU.FT.

Context - Current Shipping Volumes

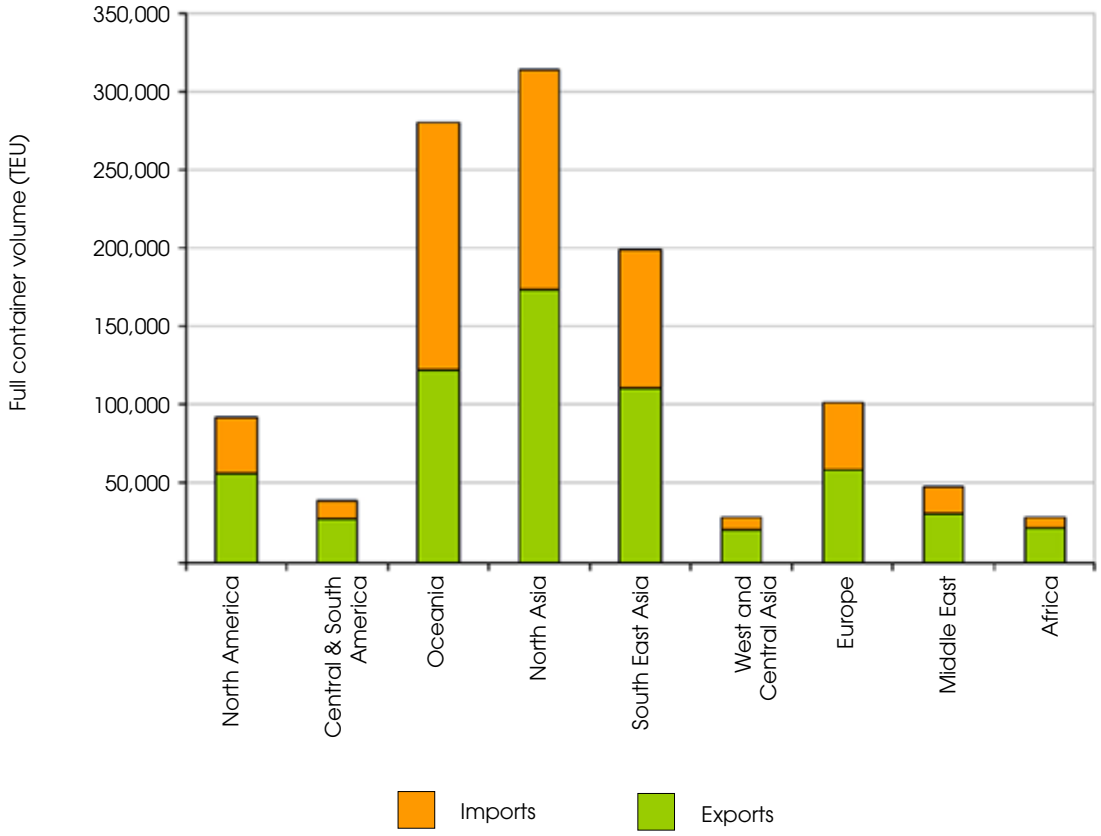
(between New Zealand and South East Asia)

4. Context - Shipping Volumes and Capacity between NZ and SE Asia

4.1 Current Cargo Volumes

Figure 4 shows the key origins and destinations of New Zealand's containerised imports and exports in 2008. In that year, New Zealand's three largest trading regions (in terms of container volumes) were North Asia, Oceania, and South East Asia respectively.

Figure 4: Volume of New Zealand's Total Containerised Trade to the World in 2008 by Region



Source: Statistics New Zealand, New Zealand Shippers' Council analysis

New Zealand is connected to its key overseas markets by means of the following shipping routes:

- Trans-Tasman;
- West Coast North America;
- East Coast North America, South America, and Europe via the Panama Canal;
- South East Asia, Central Asia, Middle East, Africa, Europe, and North Asia via either Singapore or a Malaysian hub port; and
- North Asia (including China, and Japan).

The South East Asia route, which carries some trans-Tasman cargo and all cargo transhipped through South East Asia (including cargo originating from or destined for South East Asia, Central Asia, Middle East, Africa, Europe and North Asia) is New Zealand's largest shipping route. It accounted for approx. 48% of New Zealand's containerised exports, and 41% of containerised imports in 2008. Some (but not all) North Asian and European volumes are carried on this route.[14]

[14] *The Shippers' Council estimates approx. 40% of total North Asia volume is transhipped through South East Asia, based on the difference between total North Asia volumes, and the available capacity on the direct North Asia services, and estimates approx. 70% of European volume is transhipped through South East Asia.*

As shown in **Figure 5** and **Figure 6**, in 2008 approx. 299,000 TEU of exports (an average of 5,800 TEU per week), and 209,000 TEU of imports (an average of 4,000 TEU per week), were shipped on services between New Zealand and South East Asia.

An increasing volume of North Asia cargo is now moving on the South East Asia services and being transhipped to its final destination. If it continues, this trend will further add to the case for an increase in vessel size on the New Zealand to South East Asia services.

However, exporters and importers are likely to only do this for non-perishable goods that are not time sensitive, and if there were benefits to them of doing so (in terms of shipping cost savings or improved supply chain efficiency). In particular, a number of importers noted they would not be averse to shipping their goods from North Asia via South East Asia if benefits could be gained, because most of their imports are non-perishable goods. The relative size of the opportunity from North Asia volumes for the South East Asia shipping route is shown in **Figure 5** and **Figure 6**.

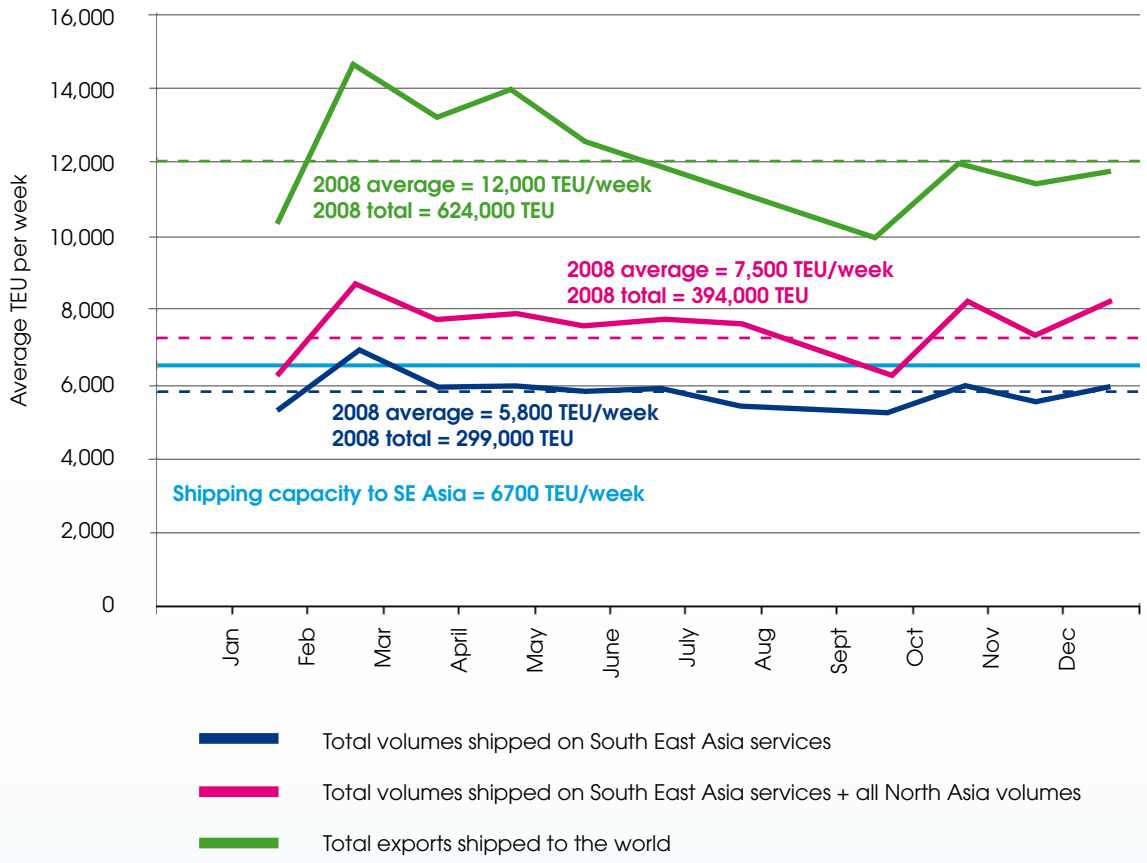
Seasonality of New Zealand's Container Trade

New Zealand's containerised trade is highly seasonal, with peaks and troughs in demand during the year. This seasonal variation is due primarily to the fact agricultural production (including dairy, meat, and fresh fruit and vegetables) is highly seasonal.

Figure 5 shows there is an export peak over the summer months (around February to April), and a trough around September, before export volumes pick up again over the spring period. Peak export volumes are approx. 17% higher than the annual weekly average.

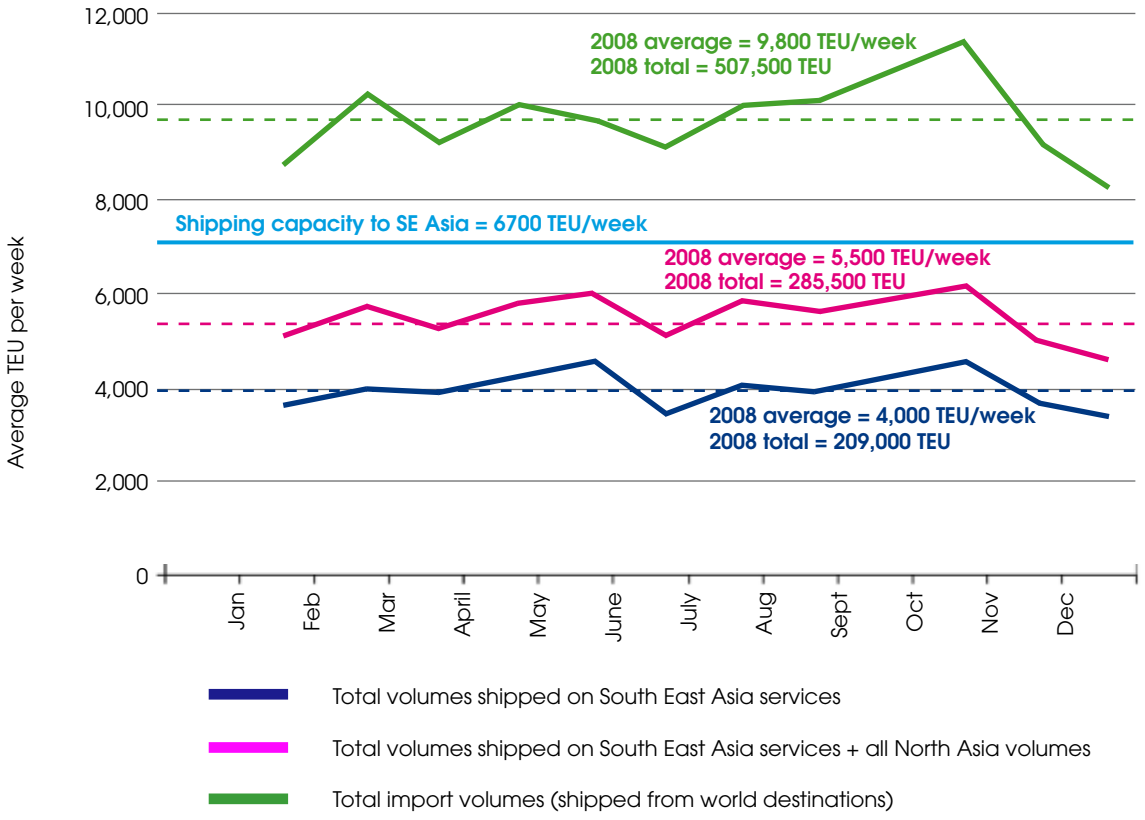
Import volumes also display a seasonal pattern, but the variation is not as great as for exports. The variation from the annual weekly average volume is most pronounced in the months leading up to Christmas (September to November). This import volume peak is largely due to retail importers stocking up inventory before the Christmas season. Peak import volumes are about 15% higher than the annual weekly average.

Figure 5: 2008 Volume of New Zealand's Containerised Exports by Month for Selected Destinations



Source: Statistics New Zealand, New Zealand Shippers' Council analysis

Figure 6: 2008 Volume of New Zealand's Containerised Imports for Selected Regions of Origin



Source: Statistics New Zealand, New Zealand Shippers' Council analysis

Shipping companies typically increase shipping capacity during these peak periods to cater for the increase in demand for shipping services. Extra capacity is usually provided by bringing in extra ships to carry more load, but can also be provided by increasing the size (and capacity) of the ships used. For example, in April 2010, the 4500 TEU ship, OOCL New Zealand, replaced the 2700 TEU OOCL Melbourne on voyages between New Zealand and South East Asia on the NZS service to cater for peak cargo volumes.

Imbalance of Container Trade

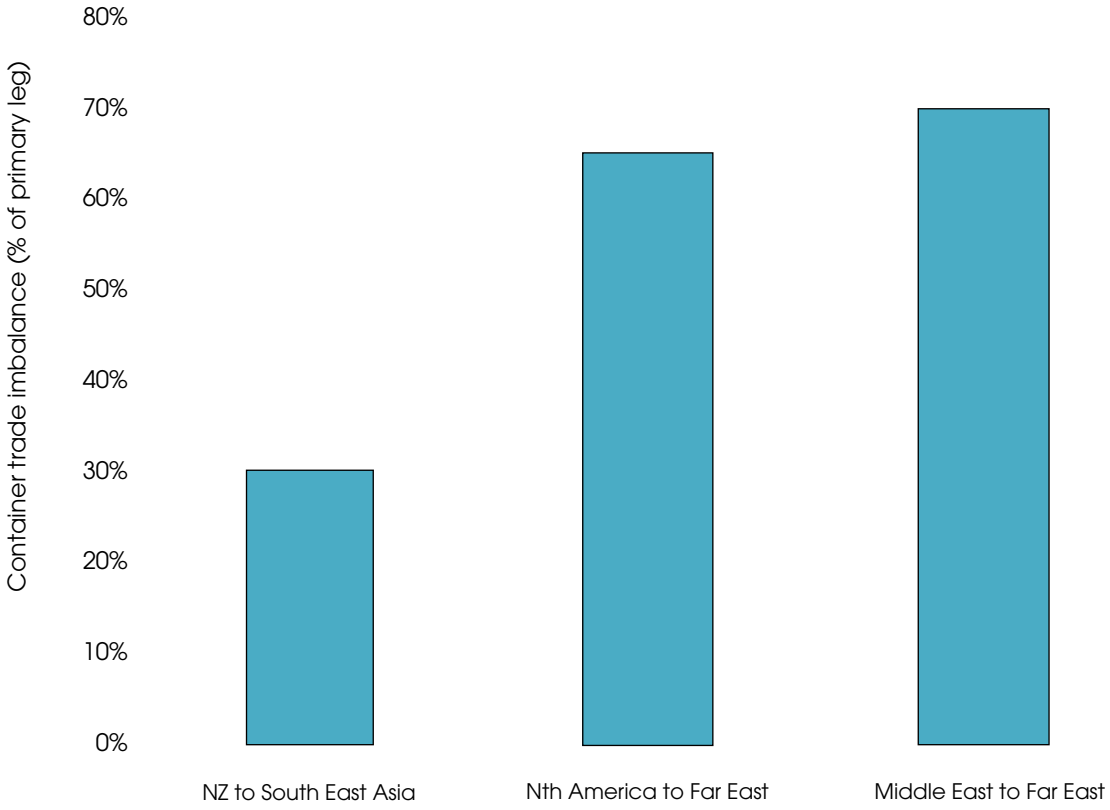
Based on the current weekly shipping capacity of approx. 6700 TEU between New Zealand and South East Asia (**Section 4.2** refers), the average capacity utilisation of inbound ships to New Zealand is around 60% (ie ships entering New Zealand are on average approx. 60% filled with loaded cargo inbound across all services), and the average capacity utilisation of outbound ships from New Zealand is 86% (ie ships leaving New Zealand are on average approx. 86% filled with loaded cargo across all services). This is consistent with estimates provided by the International Container Lines Consortium – the industry association for the international container lines operating in New Zealand.

So whilst most services are relatively full when leaving New Zealand with loaded paying export cargo, some may have lower usage rates on the inbound import leg (based on loaded, paying New Zealand import cargo only). Because of this, all three existing New Zealand to South East Asia services call at one or more Australian ports before arriving in New Zealand on the inbound leg. The Shippers' Council understands this is to allow shipping companies to carry Australian imports to Australia, and to pick up Australian exports to New Zealand, in order to increase overall ship usage on the inbound leg.

Moving into the future, it is reasonable to expect some services will need to continue to call at Australia before arriving at New Zealand on the inbound leg. It is important to note the services that loop through Australian ports before or after calling at New Zealand, are not the same as services that hub through Australia.

Reference is often made to New Zealand's unfavourable imbalance of container trade. Although there is an equipment challenge in New Zealand for refrigerated containers (as shown in **Figure 7**), the imbalance of overall containers is generally favourable when compared with other major trading lanes, and therefore should not be a constraint on services calling New Zealand.

Figure 7: Comparison of the Container Trade Imbalance between New Zealand and other Major Trading Lanes in 2008



Source: Containerisation International (May 2010) pp 5-6, Statistics New Zealand, New Zealand Shippers' Council analysis

4.2 Current Shipping Capacity

At present, there are three dedicated container shipping services between New Zealand and South East Asia, carrying cargo originating from or destined for countries in Asia, Europe, the Middle East, Africa, and also Australia.

For exports, this cargo is unloaded at major South East Asia hub ports (eg Singapore, or Tanjung Pelepas in Malaysia), and transhipped on larger vessels travelling to the cargo's final destination or waypoint hubs.

There are also direct dedicated container shipping services on other trade lanes – for example, between New Zealand and Australia, the Americas and North Asia.

These services carry all cargo originating from or destined for Australia and the Pacific Islands, North and South America, the majority of cargo originating from or destined for North Asia, and some of the cargo originating from or destined for Europe. All other cargo not carried on these lanes, is likely to be carried on ships that hub through South East Asia.

The three services between New Zealand and South East Asia provide an average actual carrying capacity of approx. 6700 TEU each direction per week. The largest vessel servicing this route on a regular basis has an actual capacity of 2700 TEU (ie the largest-sized ship currently servicing New Zealand on a regular basis). The other two services use ships with average actual capacities of approx. 2000 TEU each. The characteristics of these three services are shown in **Table 4** on the following page.

Table 4: Characteristics of Current Container Shipping Services between New Zealand and South East Asia

Service Name	Service Providers	Route[15]	Frequency of Service	Average Nominal Ship Capacity	Average Actual Ship Capacity (TEU)[16]
NZ1	Maersk, MISC (Vessel-sharing arrangement)	Singapore - Brisbane - Auckland - Dunedin - Tanjung Pelepas - Singapore	Weekly	4100 TEU	2700 TEU
NZS	PIL, NYK, OOCL MOL, MISC, Hapag Lloyd (Vessel-sharing arrangement)	Singapore - Brisbane - Auckland - Christchurch - Wellington - Napier - Tauranga - Port Kelang - Singapore	Weekly	2700 TEU	2000 TEU
Capricorn	MSC	Singapore - Jakarta - Fremantle - Melbourne - Sydney - Bluff - Dunedin - Christchurch - Wellington - Napier - Tauranga - Brisbane - Singapore	Weekly	2700 TEU	2000 TEU
Total actual weekly shipping capacity between New Zealand and South East Asia (per direction)					**6700 TEU**

In addition to the above dedicated container services, some shipping companies also provide multi-purpose liner services between New Zealand and South East Asia.

For example, Tasman Orient Line has a multi-purpose service that carries a combination of break-bulk, containers, heavy lift cargo, machinery, and hazardous cargo between New Zealand and South East Asia (via the Pacific Islands).[17]

Multi-purpose liner services have been excluded from the analysis as the focus of this report is on dedicated container line services.

[15] *MISC Agencies website: http://www.miscnz.co.nz/schedules.html (retrieved on 25 February 2010).*
[16] *Based on average New Zealand export container weight.*
[17] *Swires Shipping / Tasman Orient Line website: http://www.tasmanorient.co.nz/web/services.jsp?fid=386#*

Feasibility and Costs/Benefits of Bigger Ships Calling New Zealand

5.1 Can New Zealand's Cargo Volumes Support Bigger Ships?

The answer to this is yes.

There are two main ways New Zealand can support larger ships between New Zealand and South East Asia.

The first does not require cargo volume growth, and can occur immediately (subject to port capability) by combining the capacity of existing shipping services through vessel-sharing arrangements.

The second does not require capacity on existing services to be combined. Instead, it requires cargo volume growth, so is slightly longer term than the first.

5.2 Combining Capacity on Current Shipping Services through Vessel-Sharing Arrangements

Two or more smaller ship services can combine capacity to form one larger ship service (eg using a ship with double the capacity of smaller ships) through, for example, a vessel-sharing arrangement.

Because overall shipping capacity on the route remains the same, this allows bigger ships to be introduced immediately, subject to port capability, based on current cargo volumes (without waiting for growth in cargo volumes). If New Zealand's ports were capable of handling bigger ships, this would allow the benefits of bigger ships to be realised immediately.

For example, as discussed in **Section 3**, New Zealand currently ships an average of approx. 5800 TEU of exports, and 4000 TEU of imports each week on the three South East Asia services (one using 4100 TEU ships, and the other two using 2700 TEU ships).

Together, these three shipping services (NZ1, NZS and Capricorn) provide an actual carrying capacity of approx. 6700 TEU per week in each direction. As shown in **Table 5**, around the same capacity could be provided by:

- Two weekly 5000 TEU services;
- One weekly 6000 TEU service, and one weekly 4100 TEU service; and
- One weekly 7000 TEU service, and one weekly 2700 TEU service.

Table 5: Capacity Combination Examples that would enable the Use of Larger Ships

		Number of weekly services using each-sized ship			
Nominal Ship Capacity (TEU)	**Actual Ship Capacity (TEU)**	**Status Quo**	**Scenario 1**	**Scenario 2**	**Scenario 3**
2700	2000	2			1
4100	2700	1		1	
5000	3300		2		
6000	4000			1	
7000	4600				1
Total actual weekly capacity per direction (TEU)		**6700**	**6600**	**6700**	**6600**

Source: New Zealand Shippers' Council analysis

As shown in **Table 6**, the three example scenarios shown in **Table 5** all deliver significant positive net end-to-end supply chain benefits compared with the status quo. These are in the form of supply chain cost savings from reduced ship voyage and carbon emission costs, after taking into account any infrastructure investment costs, and possible increases in cargo aggregation, time and transhipment costs for shippers where relevant.

The key characteristics of each scenario, and details of the approach are set out in **Appendix 6**.

Table 6: Net Supply Chain Cost Savings under Vessel-Sharing Arrangements (based on estimated 2010 volumes)

Cost per TEU (NZD)	Status Quo NZ - Singapore direct 1x weekly 4100 TEU, and 2x weekly 2700 TEU services	Scenario 1 NZ - Singapore direct 2x weekly 5000 TEU services	Scenario 2 NZ - Singapore direct 1x weekly 6000 TEU and 1x weekly 4100 TEU service	Scenario 3 NZ - Singapore direct 1x weekly 7000 TEU and 1x weekly 2700 TEU service	Scenario 4 NZ - Aust, then Aust - S'pore (AU hub) 1x weekly 4100 TEU and 2x weekly 2700 TEU services from NZ to Aust, then tranship on 7000 TEU services from Aust. to S'pore
Ship voyage cost (@ US $500 bunker fuel price)	$1,052	$729	$738	$667	$730
CO_2 emission costs	$49	$29	$32	$27	$37
Cargo aggregation costs	$0	$83	$83	$21	$0
Overseas transhipment costs	$0	$0	$0	$0	$400
Annualised port investment cost	$0	$0	$22	$48	$0
Depreciation cost of perishable goods	$0	$11	$9	$4	$52
Inventory holding costs	$106	$120	$114	$112	$173
Total supply chain costs per TEU	**$1,207**	**$972**	**$998**	**$879**	**$1,391**
Cost savings per TEU compared with the status quo	-	**$234**	**$208**	**$328**	**$(184)**
Total volume of loaded import and export containers shipped through South East Asia (TEU)	508,000				
Total net supply chain cost savings for NZ (NZD per year)	-	**$119 million**	**$106 million**	**$166 million**	**$(94) million**
Total net supply chain cost savings for NZ – including strategic benefit of avoiding hubbing through Australia (NZD per year)	-	**$213 million**	**$200 million**	**$260 million**	-

Source: New Zealand Shippers' Council analysis

The analysis shows the net end-to-end supply chain benefit to New Zealand from a direct bigger ship service between New Zealand and Singapore, is in the range of NZ $208 to $328 per loaded TEU compared with the status quo, assuming the current bunker fuel price of around US $500 per tonne.

Based on current export and import volumes shipped through South East Asia, total net supply chain cost savings from these scenarios to New Zealand could be up to NZ $166 million per year. This excludes the significant flow-on benefits to the rest of the economy resulting from the economic-multiplier effect (depending on the level of spare capacity in the economy).

The container liner industry itself suggests a review of the status quo is inevitable, which could result in ships hubbing through Australia. The analysis shows an Australian hub scenario would increase net supply chain costs to the New Zealand economy by up to NZ $94 million per year relative to the status quo.[18]

The real value of bigger ships to the New Zealand economy, which includes the strategic benefit of avoiding the risk of hubbing through Australia, could therefore be up to NZ $260 million per year.

It is important to note whilst the above scenarios all deliver positive net supply chain benefits compared with the status quo, these benefits cannot be realised immediately (despite having the cargo volume to support it) as no New Zealand port is currently capable of handling ships larger than 5000 TEU when fully loaded.

In order to capture the benefits of bigger ships, in particular 7000 TEU ships, as they deliver the highest benefits, two of New Zealand's ports would need to invest as soon as practicable to become 7000 TEU ship capable. This is discussed in the next section.

Although combining the capacity of some services may reduce the number of options available for some shippers at some ports, vessel-sharing arrangements do not fundamentally reduce the level of competition between shipping companies, as the number of shipping companies competing against each other remains the same.

Vessel-sharing arrangements already exist between a number of shipping companies operating in New Zealand. Nevertheless, before further consolidation takes place, these arrangements should be subject to provisions ensuring anti-competitive behaviour such as cartel pricing or capacity restrictions does not result.

[18] *This significant cost increase relative to the status quo is largely due to the significant increase in shipment time to market (and the high associated costs), and the relatively high cost of cargo handling at Australian ports when transhipping through Australia. The analysis shows transhipping through Australia would increase shipment time by approx. nine days compared with the status quo.*

5.3 Cargo Volume Growth over Time will Enable Bigger Ships

Cargo volume growth can be accommodated by shipping companies in a number of ways, without the need to combine capacity. They include:

- Increasing the size of ships on existing services; or
- Introducing new services.

From a shipper's perspective, the optimal way for cargo growth to be accommodated is through the introduction of larger ships on existing services.

Because of the economies of scale that can be gained from the use of larger ships, the introduction of more smaller ship services to cater for increased capacity demand is sub-optimal.

The introduction of new services (eg a fourth service between New Zealand and South East Asia) would see the continuation of small and more costly vessels servicing New Zealand.

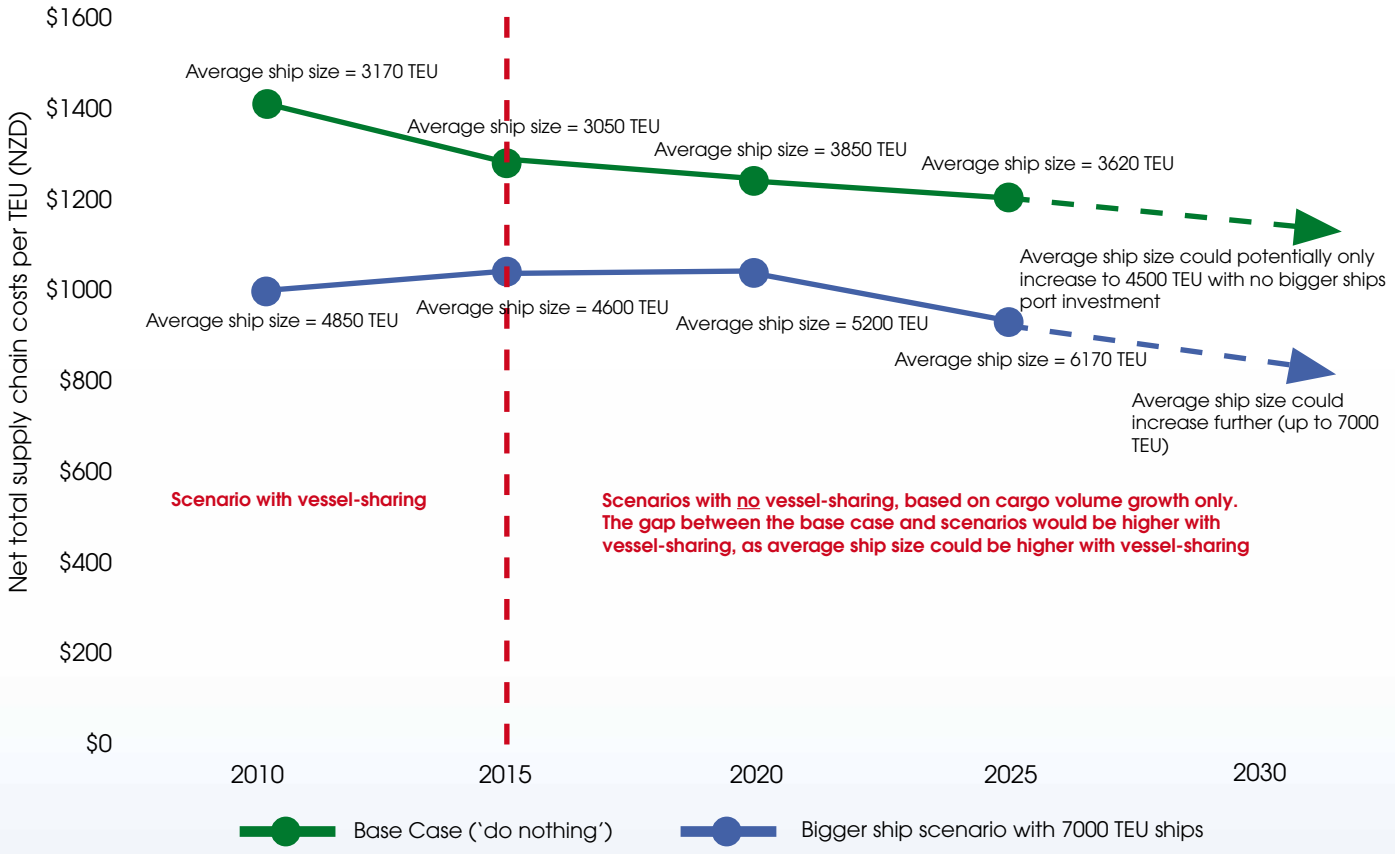
Although this avoids the capital costs required to accommodate larger ships, it results in lower efficiencies for shippers and raises questions about the sustainability of these 'boutique' services (Boyle, 2010, refers). As shown in **Figure 8**, scenarios using larger ships (7000 TEU ships in particular), to cater for future volume growth (and therefore an increased average ship size), are more efficient than scenarios that introduce more services with similar-sized ships as those deployed today (future 'base cases'). The scenarios modelled for 2015 and 2020 are discussed in more detail below.

Scenario Modelling

To ascertain when New Zealand could support larger ships (5000 to 7000 TEU ships in particular) without combining service capacity, the Shippers' Council projected the 2008 containerised export and import volumes to 2030 using a range of potential growth rates.

A 0% growth rate for imports and exports was applied between 2008 and 2010, given the volatility in trade volumes over the past few years due to the global economic recession. From 2011 onwards, as the economy recovers, two conservative growth rates (3% and 5%) were used to project export container volume growth, and 5% to project import volume growth.

Figure 8: Comparison of Net Total Supply Chain Costs per TEU of Potential Future Base Cases with 7000 TEU Ship Scenarios over Time



Source: New Zealand Shippers' Council analysis

These growth rates were chosen for the following reasons:

- A 3% per annum growth in export volume is based on the weighted average of the Ministry of Agriculture and Forestry's (2010) projected growth of New Zealand's key agricultural and forestry sectors (including dairy, meat, wool, and fruit and vegetables) to 2014.[19]

- A 5% per annum containerised export growth rate is consistent with:

- The weighted average of the Ministry of Transport's long term export growth projections (to 2031) for key export sectors;[20] and

- The growth rates used by a number of ports (including the Ports of Auckland and Lyttelton Port) in their expansion plans. The Ports of Auckland (2008) notes a 5% per annum growth rate is a conservative long term container growth rate, particularly compared with the 7% per annum growth rate observed between 1989 and 2007.

The mid-point of 4% per annum export volume growth was applied to the cost-benefit analysis (presented below) to simplify the analysis. The Shippers' Council believes this is a conservative estimate of future long term export container volume growth. It is not inconceivable that as New Zealand and the rest of the world move out of the current economic downturn, New Zealand could easily see a number of high growth years where export growth rate exceeds this range. Furthermore, if more bulk export cargo is converted to containerised format (as observed with log exports in 2007/08), the growth rate of containerised exports may exceed the rates discussed above.

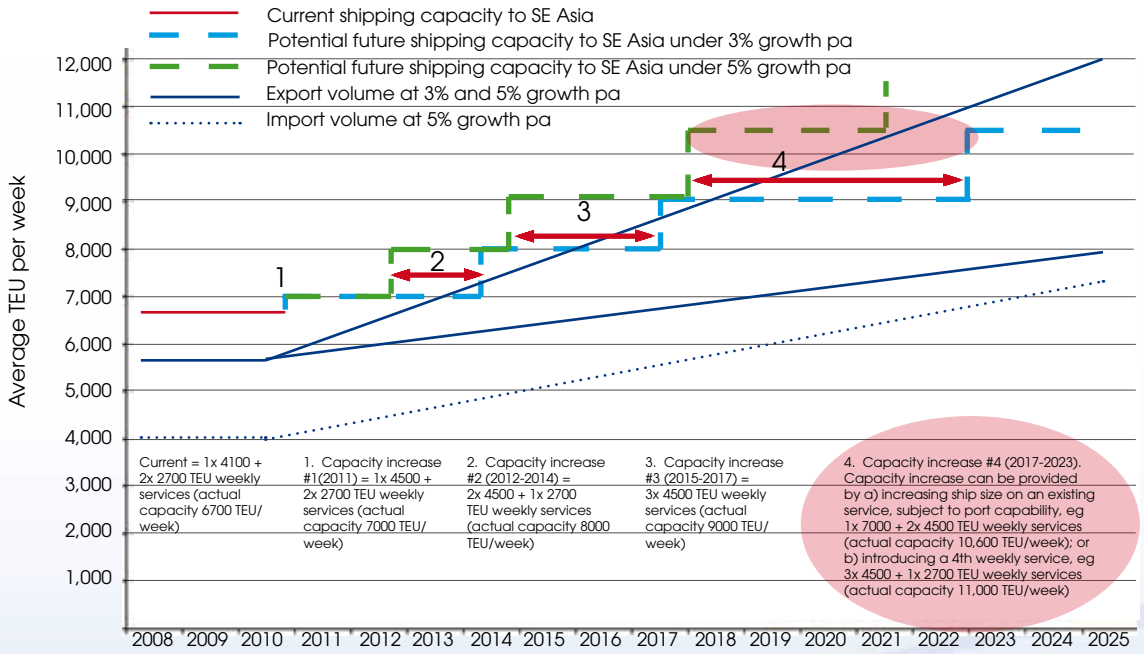
- Growth in import volumes is driven by economic growth. A 5% per annum growth in containerised import trade is estimated, based on research by the United Nations' Economic and Social Commission for Asia and the Pacific (UNESCAP) (2007, pp 33) which finds container volume growth increases by 1.5% per annum for every 1% per annum increase in economic growth. According to the Economist Intelligence Unit, New Zealand's average projected GDP growth rate is approx. 3.4% per annum for the coming decade.

Figure 9 shows the projected growth paths of containerised exports and imports shipped on South East Asia services, based on the above growth rates. It also shows the potential shipping capacity required to support future volumes. It is important to note the actual shipping capacity provided per week needs to be higher than the average weekly export or import volume (whichever is higher) to cater for extra capacity requirements during peak export and import periods, given the seasonal nature of New Zealand's trade, particularly for exports. Even if bigger ships are introduced, New Zealand exporters may still have seasonal requirements for extra loaders, eg for meat from the South Island, and apples from Nelson and the Hawkes Bay.

[19] *For export sectors not covered in the Ministry of Agriculture and Forestry's projections, it was assumed they would grow at the same rate as the agricultural and forestry average.*

[20] *Ministry of Transport (2010). Presentation to the New Zealand Shippers' Council on its 2031 Freight Forecast.*

Figure 9: Projected Growth of New Zealand Import and Export Container Volumes Shipped on South East Asia Services



Source: Statistics New Zealand and New Zealand Shippers' Council Analysis

Figure 9 (previous page) shows one of many possible scenarios of how shipping capacity may grow to cater for export and import volume growth. Step changes 1 to 3 assume a perfect step profile where each of the current three services increases the size of their ships to the maximum fully-laden ship size that can currently be accommodated at some New Zealand ports (ie approx. 4500 TEU, as evidenced by OOCL New Zealand).

Step change 4 highlights a critical point in time where a significant change to the overall profile of the existing South East Asia services is likely to occur. This is because by the time step change 4 is required, all three existing services have already increased the size of the ships they use to the maximum size currently allowable at some ports. If some of New Zealand's ports are not able to handle larger ships by 2017 to 2023, when further shipping capacity is required, a fourth weekly service using smaller ships (eg 2700 TEU ships) will be required to fill this capacity requirement. As described previously, this would be less efficient than introducing larger ships.

It is important to note the above scenario where all three current services increase their ship size to 4500 TEU, is a hypothetical profile which assumes perfect efficiency given current port constraints. It assumes larger services would give away some of their market share by allowing competing services to grow capacity, while holding their own capacity constant. In reality, it can be expected that as volumes grow, existing services would also increase capacity in order to maintain their share of the market. Therefore, it is likely some carriers would want to introduce ships larger than 4500 TEU before 2017 to 2023.

Assuming this is the case, it would be reasonable to expect configurations such as the following could be realistic potential future profiles of the existing South East Asia services:

- One weekly 5000 TEU, and two weekly 4100 TEU services; and
- One weekly 7000 TEU, one weekly 4100 TEU, and one weekly 2700 TEU service.

Based on the volume projections, both these configurations could be supported by New Zealand by around 2015/16. It is realistic to expect by 2020, New Zealand could support one weekly 7000 TEU service and two weekly 4100 to 4500 TEU services. More aggressive cargo volume growth rates, and shifts of bulk cargo to containerisation (as observed with log exports in 2007/08) could bring forward these positions.

Furthermore, all these scenarios assume volumes are transhipped in South East Asia. In practice, a South East Asia port call could be part of a bigger ship service between New Zealand and North Asia, or New Zealand and west coast North America for example. Such services would attract higher volumes, and enable bigger ships to be used earlier.

Table 7 (following page) sets out the results of the cost benefit analysis of each of these potential 2015/16 and 2020 scenarios using two different bunker fuel prices – the current US $500 per tonne price, and a potential future bunker fuel price of US $800 per tonne. A US $800 per tonne bunker fuel price was observed in mid-2008, and it is not inconceivable bunker rates could increase to this level again within five years. In particular, a number of analysts (cited in Lloyd's, 2010) predict fuel supply constraints are likely to drive up the price of oil, which could exceed US $200 per barrel (ie more than US $1000 per tonne) by 2013.

Each scenario has been compared to the likely base case at each point in time. The base cases reflect what the profile of the South East Asia services might look like if ships are not able to grow larger than the current limits at New Zealand ports. The key characteristics and details of the approach taken are set out in **Appendix 6**.

The scenarios analysed are only a small selection of potential possibilities. The future is difficult to predict, and the factors affecting shipping profile and scheduling are complex. The scenarios modelled are those the Shippers' Council believes are amongst the most efficient ways bigger ships could service New Zealand (with maximum port coverage where possible), at the time of publishing this report.[21]

[21] *An Australian loop scenario with multiple 7000 TEU services was also considered, which could mean no New Zealand ports would need to invest to become 7000 TEU ship capable, as the ships would be entering and leaving New Zealand relatively light. However, due to resulting low port coverage and high costs of cargo aggregation, the Shippers' Council does not believe this scenario would be desirable in New Zealand.*

Table 7: Potential Net Supply Chain Cost Savings in 2015/2016 and 2020 (based on Cargo Volume Growth)

	2015/2016				2020		
Cost per TEU (NZD)	**Base Case** NZ - Singapore direct 1x weekly 4100 TEU, & 3x weekly 2700 TEU services	**Scenario 1** NZ - Singapore direct 1x weekly 5000 TEU, & 2x weekly 4100 TEU services	**Scenario 2** NZ - Singapore direct 1x weekly 7000 TEU, 1x weekly 4100 TEU & 1x weekly 2700 TEU service	**Scenario 3** NZ - Aust, then Aust to S'pore (AU hub) 1x weekly 4100 3x weekly 2700 TEU services from NZ to Aust, then transhipon 7000 TEU services from Aust. to S'pore	**Base Case** NZ - Singapore direct 1x weekly 4500 TEU. 2x weekly 4100 TEU services & 1x weekly 2700 TEU service	**Scenario 1** NZ - Singapore direct 1x weekly 7000 TEU, 1x weekly 4500 TEU & 1x weekly 4100 TEU service	**Scenario 2** NZ - Aust, then Aust to S'pore (AU hub) 1 x weekly 4500 TEU, 2 x weekly 4100 TEU, & 1x weekly 2700 TEU services
Ship voyage cost (@US $500 bunker fuel price)	$996	$917	$751	$811	$963	$783	$819
CO_2 emission costs	$3	$2	$2	$2	$3	$2	$2
Cargo aggregation costs	$0	$6	$11	$0	$0	$10	$0
Overseas transhipment costs	$0	$0	$0	$400	$0	$0	$400
Annualised port investment cost	$0	$0	$37	$0	$0	$31	$0
Depreciation cost of perishable goods	$0	$6	$2	$48	$0	$2	$39
Inventory holding costs	$110	$126	$108	$173	$114	$110	$169
Total supply chain cost/TEU @ US $500/tonne bunker fuel price	**$1,110**	**$1,057**	**$911**	**$1,435**	**$1,079**	**$939**	**$1,430**
Additional ship voyage cost @ US $800/tonne bunker fuel price	$172	$144	$152	$141	$160	$143	$149
Total supply chain cost/TEU @US $800/tonne bunker fuel price	**$1,282**	**$1,202**	**$1,063**	**$1,576**	**$1,239**	**$1,082**	**$1,579**
Cost savings per TEU compared with base case @US $500/tonne bunker fuel price	-	**$52**	**$198**	**$(325)**	-	**$140**	**$(350)**
Cost savings per TEU compared with base case @US $800/tonne bunker fuel price	-	**$80**	**$219**	**$(294)**	-	**$157**	**$(340)**
Total volume of loaded import/ export containers via SE Asia (TEU)	660,500				787,000		
Total net supply chain cost savings for NZ @US $500/tonne bunker fuel price (NZD/year)	-	**$35m**	**$131m**	**$(215)m**	-	**$111m**	**$(276)m**
Total net supply chain cost savings for NZ @US $800/tonne bunker fuel price (NZD/year)	-	**$53m**	**$144m**	**$(194)m**	-	**$124m**	**$(267)m**
Total net supply chain cost savings @US $500/tonne bunker fuel price incl. strategic benefit of avoiding hubbing through Aust (NZD/year)	-	**$250m**	**$346m**	-	-	**$387m**	-
Total net supply chain cost savings @US $800/tonne bunker fuel price incl. strategic benefit of avoiding hubbing through Aust (NZD/year)	-	**$247m**	**$338m**	-	-	**$391m**	-

Source: New Zealand Shippers' Council Analysis

The analysis shows that based on a potential future bunker fuel price of approx. US $800 per tonne, the net supply chain benefits to New Zealand of bigger ships could be up to NZ $144 million per year in 2015/16, and NZ $124 million per year in 2020, compared with the base case at each time point. Accounting for the strategic benefit of avoiding costs associated with an Australian hub scenario, the real value of bigger ships could be up to NZ $338 million per year in 2015/16, and NZ $391 million per year in 2020.

To realise these benefits, at least two of New Zealand's container ports need to become 7000 TEU ship capable within five years. Port investment requirements are discussed in the next section. It is important to note all the scenarios above are only for services between New Zealand and South East Asia. Hence there will still be a network of other services (eg North Asia, the Americas, and trans-Tasman) which would in conjunction with rail, support empty container repositioning on a similar basis to the status quo.

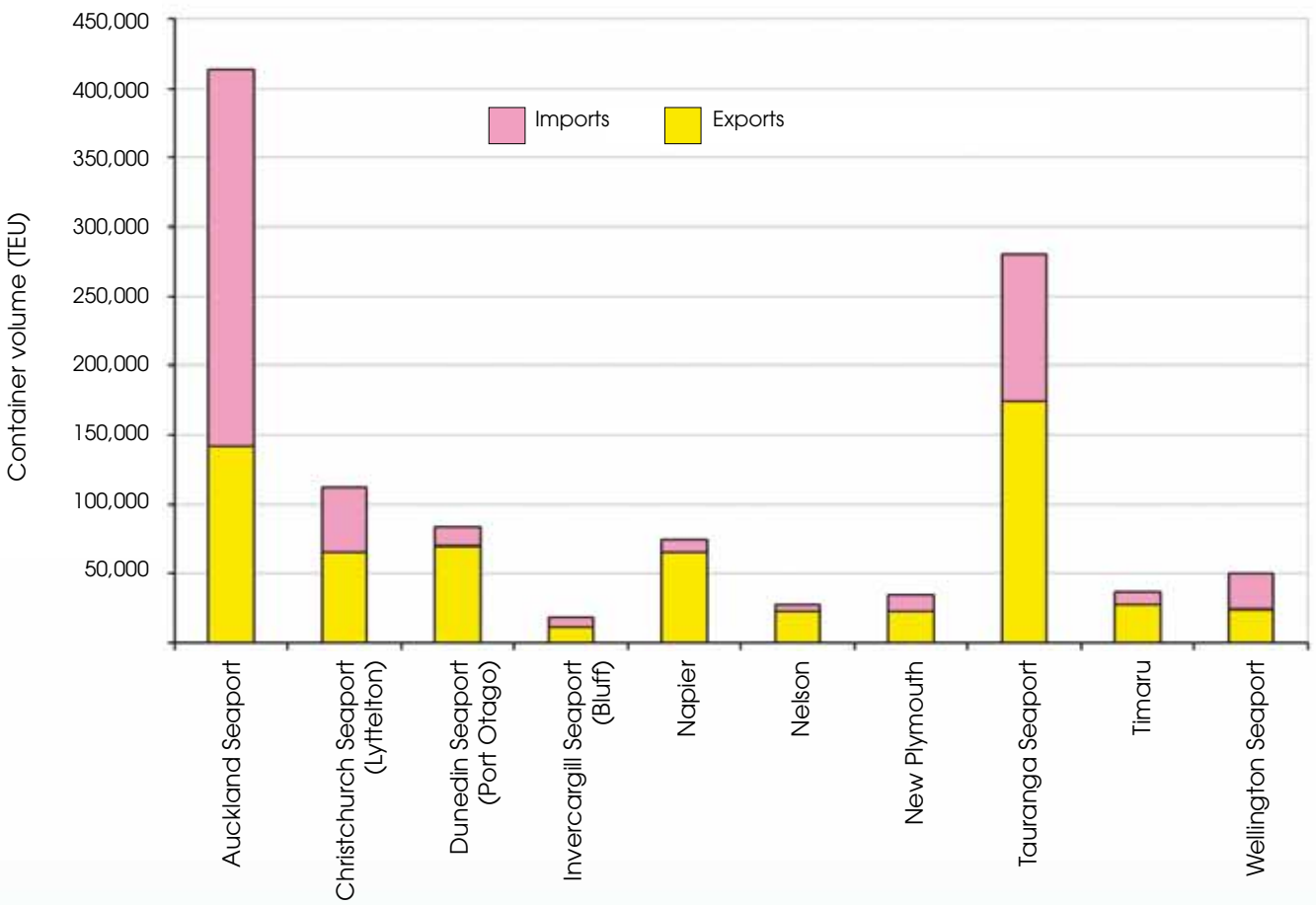
Port Infrastructure Capability and Investment Requirements

6.1 Overview of the New Zealand Port Sector

New Zealand currently has four main container ports - Auckland, Tauranga, Lyttelton and Otago, and six other bulk and general purpose ports that have some container handling capability. This is a large number of ports for a country of New Zealand's size, with a total volume of approx. 1.2 million TEUs of full container imports and exports - a relatively small volume by international comparison.

As shown in **Figure 10**, Tauranga is the largest containerised export port, but Auckland is the largest container port when import volumes are included. In the South Island, although the ports of Lyttelton and Otago both handled similar volumes of containerised export cargo in 2008, Lyttelton handled approx. three times the volume of full imported containers than Otago.

Figure 10: Total Full Container Volume Throughput at New Zealand Ports in 2008 by Port



Source: Statistics New Zealand, New Zealand Shippers' Council analysis

Appendix 7 provides a reconciliation of the listed volumes (of fully loaded export and import containers only) with the headline throughput volumes often reported by ports (which includes domestic, transhipments, and empty container movements).

There is an opinion in some quarters that the returns in the port sector are not commercially acceptable (Auckland Regional Holdings, 2009, and Rockpoint, 2009a, refers).

One of the reasons promulgated for the continued low returns earned by New Zealand ports is that a number of ports are subsidising the regional development initiatives of their local government shareholders at the expense of their own:

- Financial bottom lines in the short term;
- Ability to fund strategic long term assets in a timely manner; and
- Long term efficiency and competitive position.

All of New Zealand's ports have local or regional government as their largest shareholder. All ports (including the publicly listed ports) have at least 50% local or regional government ownership interest, and a number of ports (including Ports of Auckland and Port Otago) are 100% owned by local or regional government.

As highlighted in the Government's National Infrastructure Plan, local governments have a tendency to treat their ports as strategic assets to facilitate regional economic activity (including employment).

Some ports may feel the pressure to distribute high dividend streams to their owners, who rely on the dividend to fund local infrastructure projects. For example, Ports of Auckland distributed a total of NZ $208 million over the past five years to its sole shareholder, Auckland Regional Holdings. This dividend has been used to fund Auckland's other infrastructure initiatives, including public transport.[22]

Moving forward, local government shareholders should expect lower funding streams from ports to fund regional projects. Instead, ports should be empowered to retain earnings where appropriate to help fund port-related strategic long term assets that will both increase the efficiency of the port and future-proof it.

[22] *Auckland Regional Council (17 February 2010). 'Ports' Profits Benefit Infrastructure by $208 million'. http://www.arc.govt.nz/council/news-and-events/regionwide-news/regionwide-news_home.cfm?news_uuid=D9A2C063-145E-173C-984F-B97B432B386F*

In recent years, a number of ports have engaged in merger talks with their competitors. There have been talks between the ports of Auckland and Tauranga about the potential merger of their two container businesses. However, talks have failed due to a combination of different political interests and the competing commercial interests of both businesses. More recently, the ports of Lyttelton and Otago have announced their intention to proceed to the second stage of exploring a merger of the respective port operations.[23]

Whilst a single merged entity in the North or South Island could deliver improved asset utilisation and profitability for port shareholders, port mergers are of national importance and there are questions that need to be addressed. Before an opinion can be formed on the value of any merger proposal, clarity would be required with respect to:

- The purported synergies and benefits and how they would be realised;
- The implications for the wider supply chain;
- How competitive pricing would be maintained in the absence of any real competition; and
- The potential implications on continued investments given the reduced level of competition within the port sector.

[23] *Port Otago and Lyttelton Port Joint Media Release (19 February 2010). 'Merger Negotiations to Continue between Key South Island Ports.'*

6.2 Port Hubbing in New Zealand

There is an increasing global trend towards the use of hub-and-spoke models for shipping, with major ports (the hubs) aggregating freight from smaller regional centres (the spokes). A hub-and-spoke model is particularly relevant for a bigger ships future, as bigger ships are likely to call at fewer ports.

Over the long term (20 to 40 years), two bigger ship ports on each island could emerge in New Zealand to support container volume growth. In particular, analysis undertaken by Auckland Regional Holdings (2009) shows both the ports of Auckland and Tauranga in the North Island, and Lyttelton and Otago in the South Island, would be required to meet projected North and South Island container volume growth by 2040 under various growth scenarios, even allowing for an increase in port productivity over time. The Shippers' Council agrees with this finding.

However, in the short to medium term, given the high levels of investment required at New Zealand's ports to become bigger ship capable (in particular, 7000 TEU ship capable when fully loaded), the Shippers' Council believes it makes sense for two ports (one in each island) to make the investment initially.

The reasons for this include:

- Avoiding the duplication of infrastructure investments; and

- Allowing cargo to be aggregated at a small number of bigger ship ports so these ports can make acceptable commercial returns on investment.

This is consistent with the views of a number of stakeholders, including Auckland Regional Holdings (2009) and Port of Tauranga (2009). Two or more ports investing simultaneously to become bigger ship capable on each island, would mean cargo volumes would have to be spread between the competing ports. This is likely to erode ports' ability to earn commercially acceptable returns on capital – thus reducing their incentive to invest, as multiple ports would be competing for a relatively low volume of cargo.

Interviews with exporters, importers, ports and shipping companies suggest a bigger ship scenario is likely to have two bigger ship ports in New Zealand initially:

- One in the North Island, given the relatively large container volumes currently being moved through North Island ports (71% of total throughput); and

- One in the South Island, given the relatively large volumes of exports (particularly high value refrigerated cargo) produced in the South Island.

The remaining container ports that bigger ships do not call at initially, will continue to play an important role in serving other international non-big ship services, and act as regional feeders to the bigger ship ports. They will also continue to serve the bulk cargo market.

It has been suggested in some circles that one bigger ship port (a 'super port') could emerge in New Zealand, instead of two. However, analysis suggests that because ships operate a fixed-day service, the current technology and speed of ships would allow sufficient time to call at two ports in New Zealand. It is therefore unlikely bigger ships would call at only one port in New Zealand when there is sufficient time to call at two.

Analysis undertaken by Auckland Regional Holdings (2009) suggests the most likely candidates for becoming bigger ship ports in New Zealand are Auckland, Tauranga, Lyttelton and Otago. This is based on an assessment of the ports' current infrastructure capacities, the cost and ease of port development, proximity to key population (consumption) bases or export industries, and the capacity of the supporting surface transport infrastructure. This is consistent with the Shippers' Council's own views, and those expressed by external stakeholders.

6.3 Investment Required for Ports to Become Bigger Ship Capable

Table 8 on the following page shows the current capabilities of the four potential bigger ship ports. It shows at present, all four ports are capable of handling 4100 TEU ships, and could all handle 5000 TEU ships if not fully-laden (ie the maximum ship draught is not reached).[24] This was recently evidenced by the arrival of the Maersk Detroit (a 5000 TEU ship) at the ports of Auckland and Otago in December 2009. Although not fully-laden, the Maersk Detroit is the largest container ship to call at New Zealand ports to date.

[24] *Port of Tauranga is the only port in New Zealand with both sufficient channel and berth pocket depth to accommodate a fully-laden 5000 TEU ship.*

Table 8: Current and Planned Capability at Selected New Zealand Ports

	Ports of Auckland	Port of Tauranga	Lyttelton Port	Port Otago
Maximum draught permissible at high tide	**13.9m** (no short term plans to increase this)	**13m** (15.7m planned)	**12.4m** (15m planned)	**12.5m** (14.5m planned)
Maximum draught permissible at low tide	**11.4m**	**11.7m** (14.5m planned)	**11.9m** (14.5m planned)	**11.8m**
Berth pocket draught	**12.5m** (14.3m planned)	**13m** (14.5m planned)	**12.4m** (14.5m planned)	**12.5m** (15m planned)
Maximum ship length permissible (LOA)	**350m** (360m planned)	**290m** (350m planned - longest vessel to date is QE2, 294m LOA)	**350m**	**294m** (347m planned)
Current operating area of container terminal	**45ha**	**39ha** (extra 33ha available at Sulphur Pt for development - extra also available at the Mount for development)	**8ha**	**15ha**
Operating area of inland port	Wiri inland port in South Auckland - 15ha (directly linked to Ports of Auckland by rail)	MetroPort inland port in South Auckland - 5ha, direct rail link to Port of Tauranga (Potential extra 8ha to expand if required, currently used by MetroBox)	CityDepot inland port - 9.5ha (CityDepot is 5 minutes from Lyttelton Port, direct rail link to Lyttelton Port)	No inland port, but alternative land available in Dunedin city if required
Current maximum throughput capacity	**1,060,000** TEU pa	**630,000** TEU pa	**350,000** TEU pa	**300,000** TEU pa
No. of post-Panamax cranes	**8** (3 have 18 TEU reach)	**4** (3 have 16 TEU reach, 1 has 18 TEU reach)	**2** (1 has 17 TEU reach)	**2**

Current Ability to Handle Fully Loaded Ships

Ship Capacity	Ports of Auckland	Port of Tauranga	Lyttelton Port	Port Otago
4100 TEU ship (LOA 281m, max. draught 12.5m)	✓	✓	✓	✓
5000 TEU ship (LOA 294m, max. draught 12.8m)	✗ (yes if not fully-laden, evidenced by Maersk Detroit)	✓	✗ (yes if not fully-laden)	✗ (yes if not fully-laden, evidenced by Maersk Detroit)
6000 TEU ship (LOA 300m, max. draught 13.5m)	✗	✗	✗	✗
7000 TEU ship (LOA 300m, max. draught 14.5m)	✗	✗	✗	✗

Source: Ports' websites, and various publicly available port documents (eg port development plans, annual reports, operational manuals etc)

At present, no New Zealand port is capable of handling a fully-laden 6000 or 7000 TEU ship. The constraints vary across ports, and include insufficient channel depth, berth pocket depth, and/or berth length.

However, all four of the largest container ports have long term plans to become 6000 to 7000 TEU ship capable. They note the timing of their investments depends on when 6000 to 7000 TEU ships are likely to be introduced to New Zealand. Some of these ports have also stated they would need a commitment from shipping lines to bring bigger ships to their port on a regular basis, before undertaking any capital works.[25]

Since vessels are only likely to reach their maximum draught at the last load port (**Section 2** refers), this suggests it is more imperative for the last bigger ship port called at, to undertake channel dredging than the first port of call in New Zealand.

The demographics of the New Zealand market suggest a North Island port is likely to be the first port of call for a bigger ship (ie to unload imports). Assuming a North – South rotation, the South Island port would always have the greater draught requirement. However, there are other possible scenarios, where the North Island port acts as the last port of call and is required to accommodate the maximum draught.

Given future shipping profiles are unknown, to allow shipping companies a reasonable degree of flexibility to design and schedule their services, both a North Island port and a South Island port should have the capability to handle 7000 TEU ships at their maximum draught.

Both a North Island port and a South Island port should make the investment to become 7000 TEU ship capable (at maximum draught) and let the market decide on what the shipping profile and rotation looks like, instead of constraining this decision.

Information provided by ports and other publicly available sources suggests the amount of capital investment required for each of the ports to become 7000 TEU ship capable is in the range of NZ $40 million to $200 million per port (see **Table 9** on following page). These amounts are not large by strategic infrastructure standards. On an annual basis, the cost of these port investments (taking into account the cost of capital and any depreciation on assets) is between NZ $5 to $23 million per port per year.

At least two to three years of lead time would be required for ports to acquire resource consents and complete capital works before ports are 6000 to 7000 TEU ship capable. Once resource consent has been approved, capital works may only take 12 months to complete.

Although larger ships require cranes capable of reaching at least 16 containers across, these post-Panamax cranes are becoming the norm in the market. New cranes purchased as part of ports' normal capital replacement programme are likely to be able to service 5000 to 7000 TEU ships. The cost of a new post-Panamax crane is in the region of NZ $10 to $15 million per crane.

[25] *Otago Daily Times (27 February 2010). 'Port Otago Proposing to Deepen Channel'. http://www.odt.co.nz/news/dunedin/95367/port-otago-proposing-deepen-channel*

Table 9: Investment Required at Ports to Become 6000 to 7000 TEU Ship Capable

Capital Work Required	Ports of Auckland (POAL)	Port of Tauranga (POT)	Lyttelton Port (LPC)	Port Otago (POE)
Channel deepening	POAL has no current plans to further deepen its channel. Channel can currently accommodate ships with maximum 13.9m draught (ie could take ships up to 6000 TEU fully-laden). To accommodate 7000 TEU ships fully-laden, POAL would need to deepen the harbour to take ships with 14.5m draughts. Resource consent would be required (not yet applied for).	POT has plans to deepen its channel to accommodate ships with a maximum draught of 14.5m at high and low tide. Resource consent application has been heard and the Hearing Panel has recommended the Minister of Conservation grants resource consent to deepen and widen the channel.[26]	LPC has plans to dredge harbour to allow ships up to 14.5m draught to enter and leave the harbour at all tides. Resource consent application has been lodged.	POE has plans to deepen channel to accommodate ships up to 14.5m draught at high tide. Resource consent application has been lodged.
Berth pocket deepening	POAL has plans to deepen berth pocket for vessels with up to 14.3m draught. Resource consent has been obtained.	POT has plans to deepen berth pocket to accommodate vessels with up to 14.5m draught. Resource consents have been obtained.	LPC has plans to deepen berth pocket to accommodate vessels with up to 14.5m draught. Resource consent application lodged.	POE has plans to deepen berth pocket to accommodate vessels with up to 15m draught.
Berth length expansion	POAL's current berth length, which allows maximum ship length 350m, can accommodate ships larger than 7000 TEU. There are plans to increase berth length to cater for ships up to 360m LOA.	POT has plans to increase berth length to accommodate ships up to 350m LOA (sufficient for 7000 TEU ships).	LPC's current berth length, which allows maximum ship length of 350m, is sufficient to accommodate ships larger than 7000 TEU.	POE plans to increase berth length to accommodate ships up to 347m LOA (sufficient for 7000 TEU ships).
Estimated no. of extra post-Panamax cranes required	0	0	Up to 2	Up to 2
Estimated total cost	NZ $50m[27] ($200m to accommodate ships with 14.5m draught at high and low tide, ie same as POT's plans)[28]	NZ $50-80m	NZ $40-80m[29]	NZ $100m
Max. ship size that could be accommodated	6000 TEU (7000+ TEU)	7000+ TEU	7000+ TEU	7000 TEU

Source: Information from ports, New Zealand Shippers' Council analysis

[26] *Port of Tauranga (3 June 2010). Media Release: Recommendation to Grant Port of Tauranga Consent to Dredge. http://www.port-tauranga.co.nz//Publications-and-Media-Room/News-Archive/Recommendation-to-Grant-Port-of-Tauranga-Consent-to-Dredge/*

[27] *Ports of Auckland (21 October 2009). Media Release: Ports of Auckland Corrects Market Misinformation. http://www.poal.co.nz/news_media/2009media_releases.htm*

[28] *Research company, Morningstar AspectHuntley (2009), estimates that Ports of Auckland would need to invest approx. NZ $200 million to dredge its harbour to accommodate vessels with up to 14.5 m draught (ie a fully laden 7000 TEU ship) at both high and low tides (ie the same as Port of Tauranga's plans). It is important to note that while the Ports of Auckland disputes the need to dredge to 14.5 m draught at both high and low tides in the foreseeable future, it has not disputed the NZ $200 million cost estimate should it dredge to this level in the future (Dominion Post, 22 October 2009. 'Auckland Disputes Need for Dredging').*

[29] *Lyttelton Port notes that this is a preliminary estimate of the capital cost required for it to become 7000 TEU ship capable. The commercial viability of its planned developments still needs to be tested.*

6.4 Which Ports Should Invest First?

Even though all four major container ports will be required to increase their capability in the longer term to support cargo growth, not all four will need to make the investment to become bigger ships capable initially.

When considering potential port call options for bigger ships, there needs to be confidence there is sufficient cargo within the port's catchment area to support such vessels. The Shippers' Council is comfortable either the ports of Auckland or Tauranga in the North Island, and the ports of Lyttelton or Otago in the South Island, would be capable of supporting bigger ships with investment in their long term assets.

A key question is which of the North Island and which of the South Island ports should be encouraged to invest first, to enable the benefits of bigger ships to be realised as soon as possible.

Whilst there is a degree of picking winners in this approach, short of ports agreeing on a port investment hierarchy on their own, it is necessary for shippers to put forward a position on their preferred initial bigger ship ports in order to progress debate.

It is important to be clear that whilst there should be two ports investing to become 7000 TEU capable initially, the other major port on each island will continue to play an important role in the New Zealand logistics sector, as they will continue to serve other non-bigger ship international services, as well as domestic coastal shipping services.

In particular, they will continue to receive direct calls from ships similar in size to those deployed today on the South East Asia transhipment route.

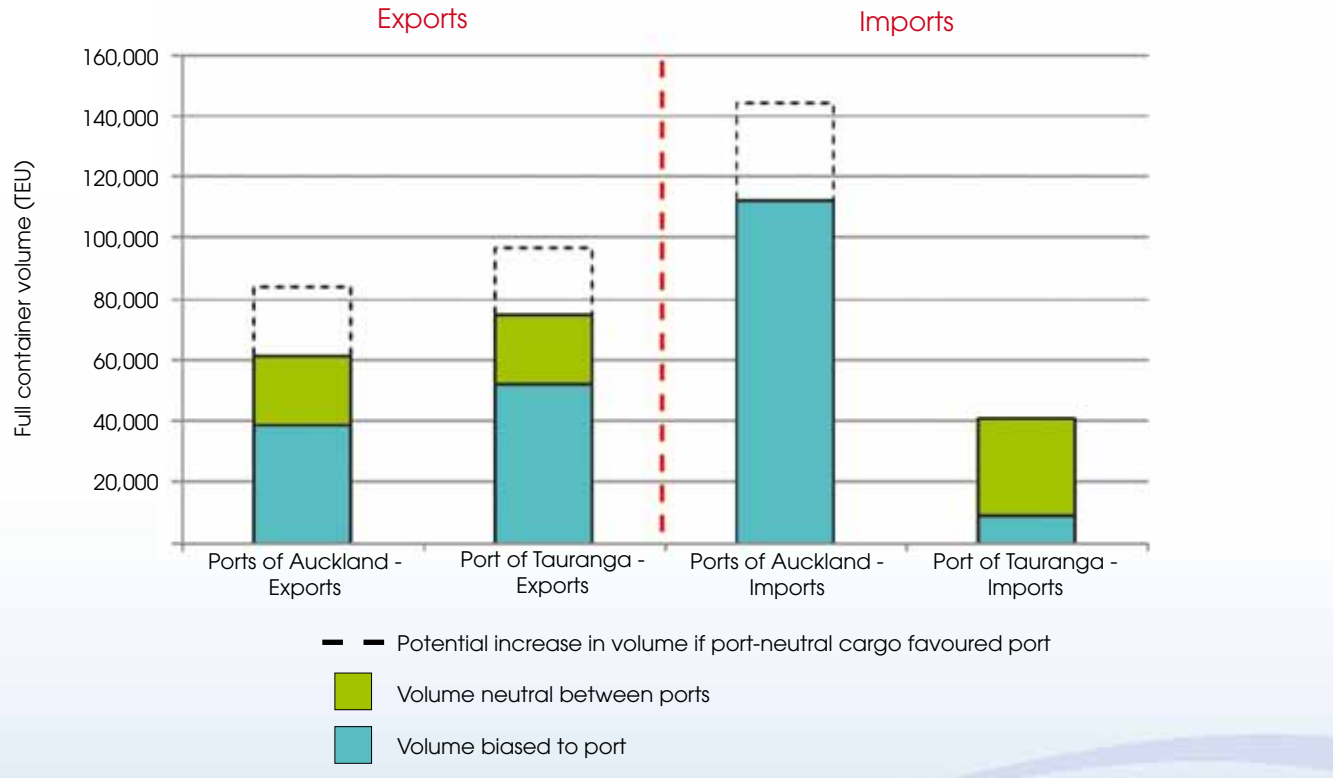
Because all four major ports are likely to continue to receive a direct South East Asia service call in the future, with the exception of an increasing share of Auckland-destined imports which could be moved through Port of Tauranga via MetroPort under some scenarios, the Shippers' Council does not envisage large volumes of cargo would be redirected between the ports of Auckland and Tauranga, or between the ports of Lyttelton and Otago.

The Initial North Island Bigger Ship Port

Although the Port of Tauranga is currently the largest port in New Zealand based on the overall volume of cargo handled (both bulk and containerised), as shown in **Figure 11**, Ports of Auckland is the largest container port – primarily due to the large volumes of containerised import volumes handled.

Although in 2008 POAL handled approx. 18% fewer full export containers than Tauranga, import volumes at Auckland were more than double that of Tauranga.

Figure 11: Comparison of Container Throughput Volumes on South East Asia Services at Ports of Auckland and Tauranga in 2008



Source: Statistics New Zealand, New Zealand Shippers' Council analysis

Based on cargo volumes alone, even accounting for the volume of port-neutral cargo that could shift in either port's favour, Ports of Auckland would be the natural choice of location for the initial North Island bigger ship port.

However based on the evidence presented to date, the Shippers' Council has serious doubts about Ports of Auckland's readiness and ability to develop the port to become bigger ships capable (in particular, 7000 TEU ships), within five years.

On the other hand, analysis and research points to the Port of Tauranga being the logical North Island port to undertake this investment initially. Analysis and research of capital expenditure requirements and other qualitative factors suggests the Port of Tauranga is in a more advanced state of investment readiness than Auckland, and can therefore enable the realisation of bigger ship benefits sooner. **Table 10** on the following page summarises these factors.

The key reasons for this are:

- Port of Tauranga already has capital plans to become 7000 TEU ship capable (fully loaded). The information provided by Ports of Auckland to date suggests it only has plans to accommodate fully-loaded 6000 TEU ships in the foreseeable future.

- Port of Tauranga can make the investment to become 7000 TEU ship capable at a significantly lower cost than Ports of Auckland.

  Port of Tauranga estimates it will cost between NZ $50 to $80 million to become 7000 TEU ship capable (fully loaded) at both high and low tides. Ports of Auckland currently only has plans to invest to become 6000 TEU ship capable (fully loaded) in the foreseeable future, at a cost of approx. NZ $50 million.

  However research firm, Morningstar AspectHuntley (2009), reports Ports of Auckland would have to spend more than NZ $200 million to have the same planned draught capability as Port of Tauranga (including further harbour deepening to accommodate ships with 14.5 metres of draught at both high and low tides).

  Whilst Ports of Auckland has publicly disputed the need for the port to dredge the harbour further, it has not disputed Morningstar AspectHuntley's NZ $200 million estimate if it were to dredge to the same harbour depth as Port of Tauranga's current plans.

- Ports of Auckland's current ownership structure (100% ownership by Auckland local government, through Auckland Regional Holdings) means decision-making associated with the port is highly political. Port investment decisions are likely to be stalled by a number of highly political issues, including:

  - Current uncertainties and debate surrounding the Auckland Super City governance and organisational structures, and the new policies and associated funding arrangements;[30]

  - The ongoing debate about whether port operations (or expanded port operations) on prime central Auckland waterfront real estate is the best use of the waterfront space. As highlighted in the recent TV1 *Sunday* programme[31] on the redevelopment of Queen's Wharf, there is vocal local opposition even to the development of a cruise ship terminal on the waterfront – an industry significantly more glamorous than cargo operations. Ports of Auckland will no doubt face even greater challenges if it is to expand its operations or physical footprint;

  - Concerns that creeping urbanisation near the rail corridor and port in central Auckland (in particular, current plans to develop multi-storey apartments on Auckland's Orakei Peninsula) may compromise plans by KiwiRail and Ports of Auckland to significantly increase rail freight movements to and from the port. KiwiRail is concerned the proposed District Plan change to accommodate for the development will give the impression rail operations will at all times meet the proposed zone controls, and ignores the need to ensure the operational aspects of the corridor are considered, as development occurs in the future.[32]

  It is clear these issues will need to be resolved before Ports of Auckland can undertake any major capital works.

  Given the lead time required for the port to acquire resource consents and undertake capital works, strategic decisions about whether Ports of Auckland should invest to become 7000 TEU ship capable need to be agreed within the next year or so, if the port is to become 7000 TEU ship capable within five years.

  The recent track record of political decision-making in Auckland, including slow progress and back-tracking of decisions made about major projects (including the recent debacle over the redevelopment of Queen's Wharf for the Rugby World Cup 2011) creates much doubt about the region's ability to make and implement strategic decisions in a timely way. The Shippers' Council is not confident the above issues will be resolved within this timeframe.

- The Port of Tauranga is in a more advanced stage in its resource consent application to dredge the harbour to accommodate ships with 14.5 metres draught at both high and low tides. The Hearing Panel has recommended the Minister of Conservation grants Port of Tauranga resource consent for this work, whereas Ports of Auckland has yet to apply for the required resource consents to dredge its channel.

[30] *New Zealand Herald (8 March 2010). 'The Lockout of Auckland'. http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10630595&pnum=2.*

[31] *'Tin Sheds', TV1 Sunday Programme, aired on 27 June 2010. View at: http://tvnz.co.nz/sunday-news/tin-sheds-part-1-7-26-video-3613265 and http://tvnz.co.nz/sunday-news/tin-sheds-part-2-7-23-video-3613271*

[32] *New Zealand Herald (23 June 2010). 'Developers Warned About Train Noise'. http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10653742*

- Although a significant proportion of North Island imports are destined for the Auckland region, the Port of Tauranga provides an efficient alternative to the Ports of Auckland for these imports, as it is directly linked to its inland port in South Auckland (MetroPort) via efficient rail services.

  In 2008, approx. 83,000 TEU of imported goods (from all global regions, not just South East Asia) destined for the Auckland market, were shipped through Port of Tauranga via MetroPort, instead of moving through Ports of Auckland.

  KiwiRail has advised the current below-rail network between Auckland and Tauranga has sufficient capacity to move significantly larger volumes of freight between the two regions (**Section 7.2** refers).

  The cost-benefit analysis (presented in **Section 5**), takes into account that a significant proportion of Auckland-destined imports may be moved through the Port of Tauranga and MetroPort for some scenarios, and would incur additional inland transport costs.

For the reasons outlined previously, Port of Tauranga should explore implementation of its capital plan as soon as practicable, with a view to becoming 7000 TEU ship capable within five years.

Ports of Auckland should prepare to implement its capital plan in the future when the North Island is ready for two bigger ship ports through trade growth. In the interim, the port will continue to play an important role in servicing other international shipping services that deploy ships up to 4500 to 5000 TEU in size.

Other benefits of Port of Tauranga becoming 7000 TEU ship capable first, include the opportunity for bulk cargo owners to leverage off port investments (such as harbour dredging) to gain economies of scale savings from using larger bulk cargo ships.

It is recognised any such investments are a commercial matter for the parties concerned, and there may be regulatory and/or commercially sensitive factors not in the public domain that have not been factored into the analysis.

Table 10: Summary of Qualitative Factors Affecting Ports of Auckland and Tauranga's Bigger Ships Investment Readiness and Potential

	Ports of Auckland	Port of Tauranga
Port expansion potential	Limited potential to expand physical footprint due to CBD location. Throughput growth has to be accommodated via reclamation (costly), productivity improvements through technology (eg automated stacking cranes), and use of inland ports.	Plenty of potential to grow port's physical footprint. Significant undeveloped land at Sulphur Pt (33ha) for port to expand without reclamation. Also potential for port to grow container operations at the Mount.
Ability to fund bigger ships capital plan	POAL has committed funds for upgrade and deepening of berth pocket to become 6000 TEU ship capable (fully loaded), at cost of NZ $50m. Subsequently funded from new banking facility. POAL currently has no plans to become 7000 TEU ship capable (fully loaded). Unclear if port has ability to fund NZ $200m over next 3 years to become 7000 TEU capable (this is 4x the amount planned to become 6000 TEU capable). Could be potential constraints due to local government reliance on port dividends to fund local transport and water/wastewater infrastructure.	Capital plan to become 7000 TEU ship capable can be immediately sourced from available facilities.
Status of resource consent process	Consent obtained for berth pocket deepening. Resource consent yet to be lodged for channel deepening to become 7000 TEU capable.	Resource consent application has been heard for all capital works. The Hearing Panel has recommended the Minister of Conservation grants resource consent to deepen and widen channel.
Investment readiness	No short-medium term plans to become 7000 TEU capable (fully loaded). Only plans for 6000 TEU. 100% ownership by local government (Auckland Regional Holdings) means decision-making highly political. Port decisions likely to be stalled by Auckland Super City uncertainties over governance and organisational structures, and new policies.	Port ready to invest, pending resource consent approval.
Other considerations	Sensitivity and creeping urban development near rail corridor and CBD port needs addressing. Debate whether port is best use of Auckland's CBD needs to be resolved.	Bulk exporters can leverage off port investments (in particular channel dredging) by bringing in larger bulk cargo ships. Port of Tauranga directly connected to inland port in South Auckland (MetroPort) via efficient rail services.

The Initial South Island Bigger Ship Port

The question of which port - Lyttelton Port or Port Otago - should invest to become the first South Island bigger ship port, is much simpler than for the North Island. Analysis and research points to Lyttelton Port being the logical South Island port to make this investment first.

Both ports have undertaken substantial scoping studies to investigate the capital investment required to become 7000 TEU ship capable, and have preliminary estimates on cost. Both ports believe they will have no problems funding their capital plans, and both have lodged resource consent applications. Comparisons of these qualitative factors are summarised in **Table 11** (following page). The Shippers' Council is not aware of any issues that may stall the timing of investments should the ports decide to do so immediately (pending resource consent approval).

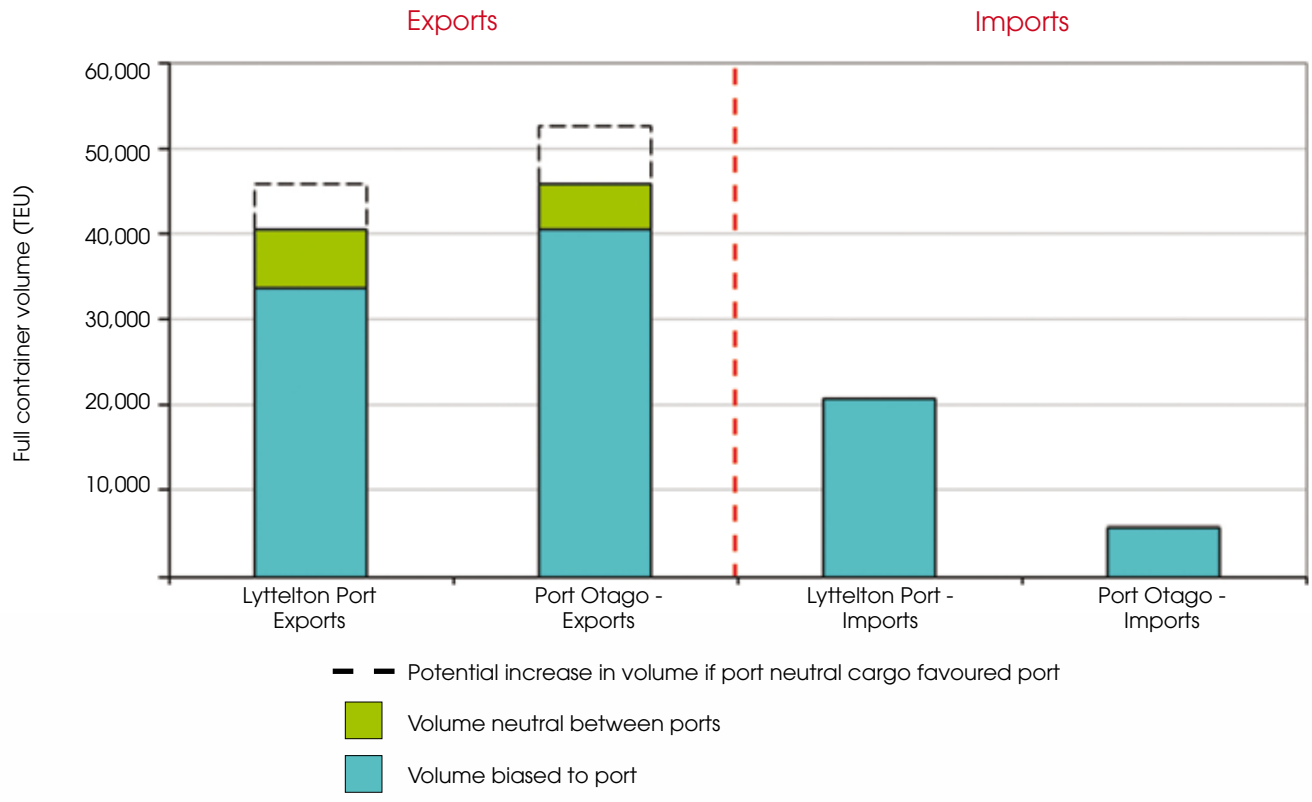
The question, then, really comes down to port throughput, and the cost of investment. Lyttelton Port currently handles the highest volume both of bulk and container cargo in the South Island.

In terms of container volumes alone, as shown in **Figure 12**, even though Lyttelton Port handled 12% fewer full export containers (transhipped through South East Asia) than Port Otago in 2008, its imports were more than 2.6 times that of Port Otago's.

Overall, Lyttelton Port handled approx. 18% more container volume than Port Otago in 2008 (based on volumes shipped through South East Asia only).

It should also be noted Lyttelton Port's volumes will have increased since 2008, reflecting additional dairy export volumes (biased to Lyttelton) routed through the port since the 2008 data was collected.

Figure 12: Comparison of Container Throughput Volumes on South East Asia Services at the Ports of Lyttelton and Otago in 2008



Source: Statistics New Zealand, New Zealand Shippers' Council analysis

In addition, as with the Port of Tauranga, Lyttelton Port also handles a significant volume of bulk cargo (in particular, coal). Therefore there is also an opportunity for bulk cargo owners to leverage off port investments at Lyttelton Port (including harbour dredging), and benefit from the economies of scale from using larger bulk cargo ships.

Furthermore, preliminary estimates by both ports, suggest it would be more cost effective for Lyttelton Port to become 7000 TEU capable, compared with Port Otago. Lyttelton Port estimates it will cost between NZ $40 and $80 million to become 7000 TEU ship capable. This compares with approx. NZ $100 million for Port Otago.

For these reasons, Lyttelton Port should start exploring implementation of its capital plan as soon as practicable, with a view to becoming 7000 TEU ship capable within five years.

Port Otago should revise and prepare to implement its capital plan in the future when the South Island is ready for two bigger ship ports.

In the meantime, the port will continue to play an important role in servicing other international shipping services that deploy ships up to 4500 to 5000 TEU in size.

Table 11: Summary of Qualitative Factors Affecting Ports of Lyttelton and Otago's Bigger Ships Investment Readiness and Potential

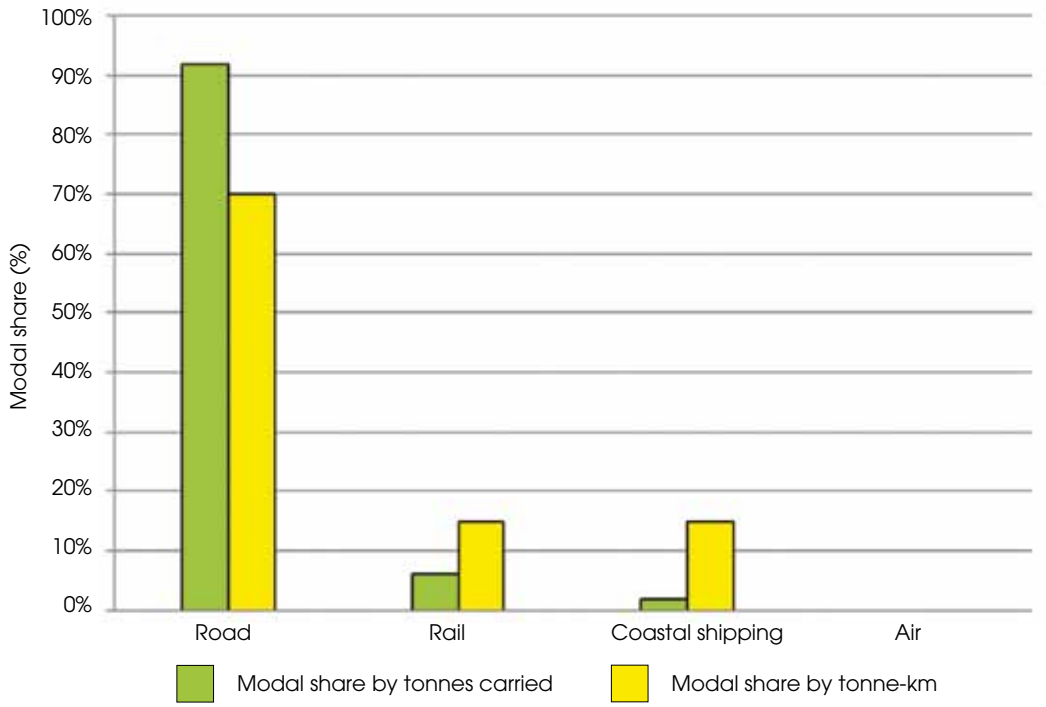
	Lyttelton Port	Port Otago
Port expansion potential	Potential to expand operations on its inland port (located at CityDepot). Potential to expand the footprint of the container terminal itself through reclamation.	Potential to expand the footprint of the container terminal through reclamation or establishment of an inland port.
Ability to fund bigger ships capital plan	Capital plan can be fully funded.	Port is confident of being able to source funding for its projects.
Status of resource consent process	Resource consent application has been lodged.	Resource consent application has been lodged.
Investment readiness	Ready to invest, pending resource consent approval.	Ready to invest, pending resource consent approval, board approval, and commercial demand. Incremental channel improvements will be made after consents have been obtained.

Can New Zealand's Transport Infrastructure Support Bigger Ships?

7.1 The Relative Competitiveness of the Various Modes

At present, road transport is by far the predominant mode of choice for moving domestic and international freight within New Zealand. The National Freight Demands Study (Ministry of Transport et al, 2008) found road freight movements accounted for approx. 92% of the total national freight task by tonnage lifted in 2006/07 (this includes the movement of both domestic and international cargo - see **Figure 13**). In contrast, rail accounted for 6%, and coastal shipping 2%. The overall tonnage moved by air was negligible, accounting for less than 1% of the total freight task.

Figure 13: Breakdown of New Zealand's 2006/07 Domestic and International Freight Task by Modal Share



Source: Ministry of Transport et al (2008)

A recent survey of New Zealand shippers undertaken by Rockpoint (2009a), found the key determinants of modal choice for shippers in order of importance were reliability, product care, safety, timeliness, and cost.

Road offers significant advantages over rail and coastal shipping over short distances, and for smaller consignments, because it provides greater reliability, scheduling flexibility, and faster speed of delivery.

Given the majority of freight movements in New Zealand are over short distances (73%, according to the National Infrastructure Plan, 2010), it is not surprising road accounts for such a large proportion of domestic freight movements.

Furthermore, the competitiveness of road transport has been enhanced since 1 May 2010, with heavier trucks being permitted on the road network.

Rail and coastal shipping are better able to compete with road for longer distance movements and large consolidated volumes – particularly where delivery time is not as important, because the cost and environmental advantages of these modes outweigh service disadvantages (Rockpoint, 2009a).

This is reflected in the higher modal share for rail and coastal shipping (15% each) when comparing tonne-km. In general, rail and coastal shipping performs more efficiently than road for the transport of long-haul bulk cargo, where there is a need to transport high volumes of cargo (National Infrastructure Plan, 2010; Rockpoint, 2009a).

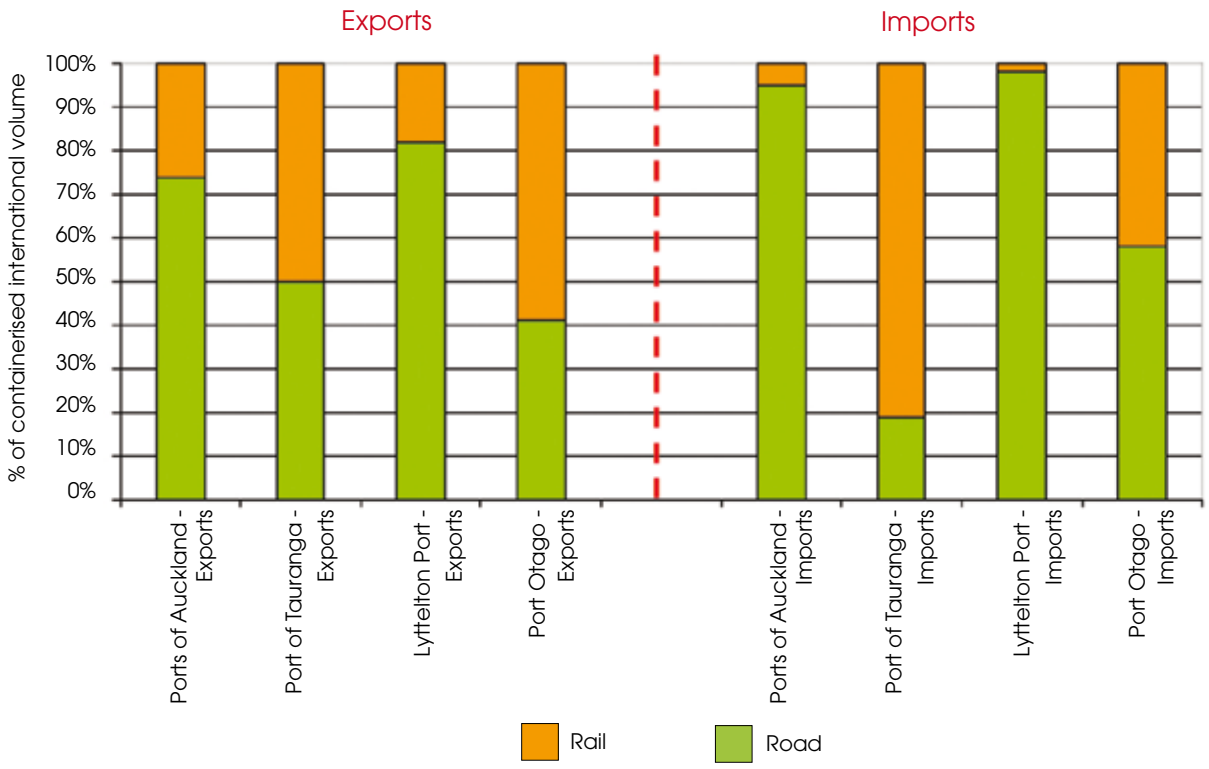
In terms of longer distance journeys and for large consolidated volumes (ie the more relevant surface transport journey type for bigger ships), rail is likely to play a greater role than coastal shipping for aggregating cargo, particularly for intra-island movements.

Even though coastal shipping will have a role to play, the role is likely to be more limited than rail because relatively short transit times, high cargo exchange costs and an infrequent service model (ie weekly or bi-weekly services compared with multi-day rail services) combine to detract from coastal shipping's competitive position when compared to rail.

This is consistent with Rockpoint's conclusion about the potential role of coastal shipping in its 2009 coastal shipping study.

As shown in **Figure 14**, it is important to note rail already plays a major role in the movement of international containerised cargo to and from New Zealand's major ports – particularly for movements to and from the ports of Tauranga and Otago.

Figure 14: Breakdown of Modal Share for the Movement of International Containerised Cargo in 2008 [33]



Source: KiwiRail, and Ports

[33] *Excludes purely domestic movements, where the origin and final destination points are within New Zealand.*

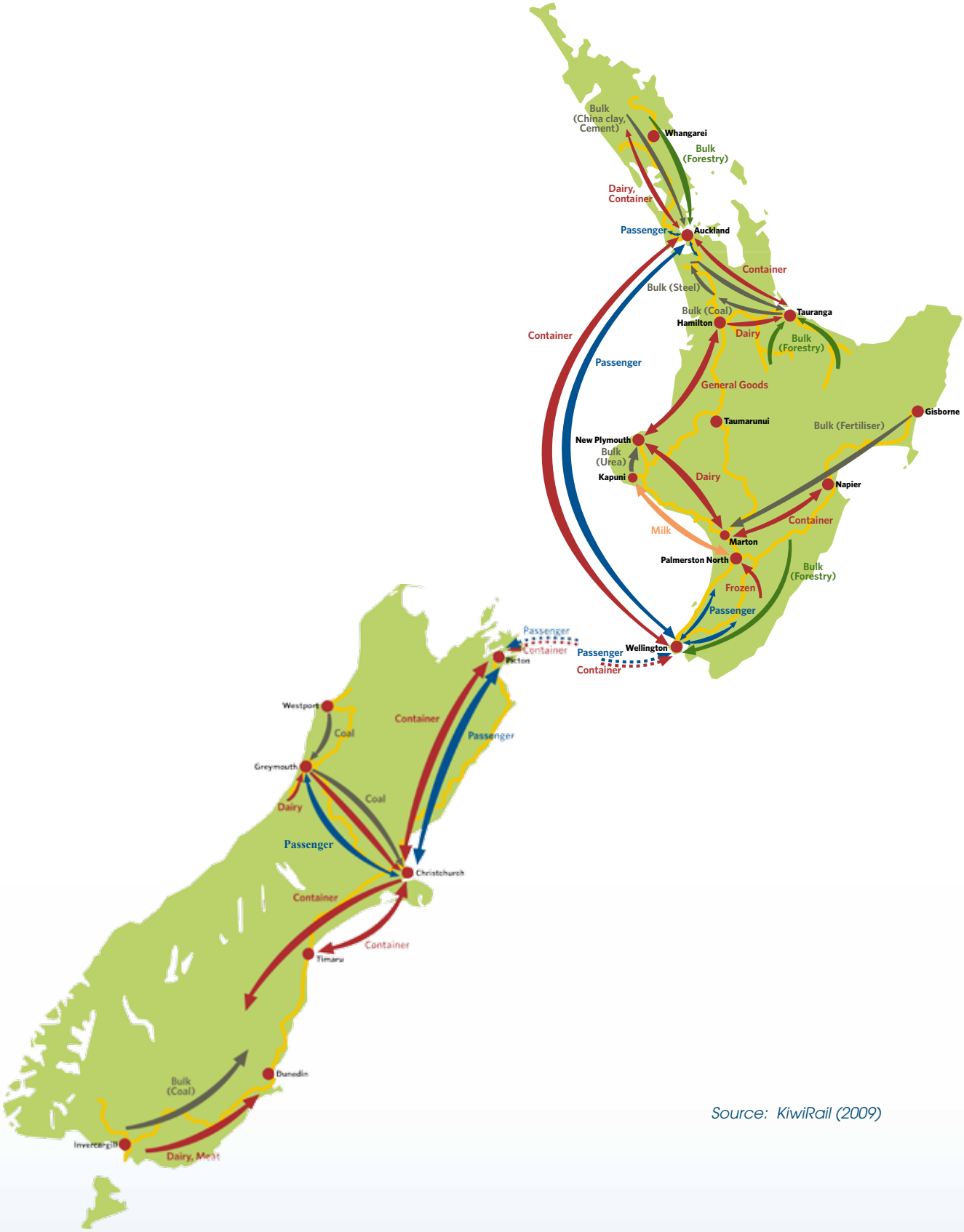
7.2 Capacity of Surface Transport Infrastructure

Because rail is likely to play a more prominent role than road and coastal shipping over longer distance inter-regional journeys and for the movement of large consolidated volumes, this section focuses on the capability of New Zealand's rail network.

KiwiRail currently runs approx. 900 freight trains per week (approx. 130 trains per day) on the national rail network, carrying a mixture of freight bound to and from ports, bulk goods such as coal, milk, steel and forestry products, and domestic goods moved between cities (KiwiRail, 2009).

As shown in **Figure 15** and **Table 12** (following pages), the national rail network in New Zealand consists of nine main freight lines. The East Coast Main Trunk, which connects Auckland with Tauranga, is the busiest route in the network, with up to 32 train movements on the line per day on weekdays.

Figure 15: New Zealand Rail Network and Key Traffic Flows



Source: KiwiRail (2009)

Table 12: Daily Train Movements and Capacity Utilisation by Line

Line	Current no. of trains per day (weekdays)	Current max. possible trains per day	Line capacity utilised
North Auckland Line	4	9	44%
East Coast Main Trunk (inc. Kawerau)	32	48[34]	67%
North Island Main Trunk: a) Auckland - Te Rapa b) Te Rapa - Wellington	 17 17	 110 57	 15% 30%
Marton - New Plymouth Line	10	48	21%
Stratford - Okahukura Line [35]	2	6	33%
Palmerston North - Gisborne Line: a) Palmerston North - Napier b) Napier - Gisborne	 6 2 per week	 32 9	 19% 4%
Main North Line (Christchurch - Picton)	12	41	29%
Midland Line (West Coast - Christchurch)	16	32	50%
Main South Line (Christchurch - Invercargill)	20	36	56%

Source: KiwiRail

KiwiRail has advised the rail network currently has sufficient below-rail (ie track) capacity to move larger volumes of freight to and from New Zealand ports. As shown in **Table 12**, the current line utilisation ranges from between 15% to 67% of capacity on the main segments of the network.

There is also sufficient current track capacity at the ports to handle significantly more freight train services than the numbers currently operating (see **Table 13**). The key rail capacity constraint at ports is related to the productivity of cargo handling (ie how quickly trains can be loaded or unloaded at the port). Current rail capacity at ports can be increased up to its theoretical track capacity with improved train turn-times at ports.

[34] *The current limiting factor on the East Coast Main Trunk line is the Kawerau branch. Excluding the Kawerau branch, the current maximum line capacity is 72 trains per day. KiwiRail is currently investing to increase the capacity of this line. Excluding the Kawerau branch (which is not being upgraded), the maximum daily capacity will increase from 72 to approx. 96 trains per day once capital works are completed in 2011.*

[35] *No rail freight services currently operate on the Stratford to Okahukura line, as a freight derailment in November 2009 caused serious damage to the line. KiwiRail is currently reviewing the future of this line. Refer: New Zealand Herald (9 November 2009). 'Line's Mothballing Sets Off Alarm Bells.' Matthew Dearnley, http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10608125*

Table 13: Rail Capacity and Utilisation at the Four Key Ports

Port	Current max. berth siding length at port	Current no. daily services (return trains/day) at port	Current capacity (return trains/day) at port	Current theoretical track capacity (return trains/day) at port
Ports of Auckland	28 UK wagons (470m)	7-10	16	35
Port of Tauranga	37 IM/UKV wagons (700m)	5	9	36
Lyttelton Port	16 UK wagons at CityDepot (270m) Work currently underway to double siding length to accommodate 24, then 48 UK wagons	6	16	20
Port Otago	29 UK wagons (450m) (40 UK wagons planned)	4	9	24

Source: KiwiRail, Port Otago

Depending on which ports bigger ships call at in the future, and the service profile of the other non-bigger ship international services (which together impact on where and how cargo is aggregated), the line between Auckland and Tauranga could be a potential pressure point on the network given the potentially large volumes of cargo that could be moved between the two regions by rail (for example, via MetroPort).

However, investments currently being undertaken by KiwiRail on this line alleviate this concern. KiwiRail is completing a series of network infrastructure improvements on the Auckland to Tauranga line to increase both the capacity and reliability of the line, should additional capacity be required.

This includes building two new and two extended crossing loops to double the line capacity, at a cost of approx. NZ $5 million (KiwiRail, 2009). All work is scheduled to be completed by the first quarter of 2011.

Additional track infrastructure investment (beyond that already planned) is not required to support bigger ships in the foreseeable future.

However, depending on the configuration of future shipping services, the potential movement of larger volumes of cargo between Tauranga and Auckland, and between regions not served by a South East Asia service and those that are, may require further investment in above-rail capacity (ie locomotives and wagons).

The Government recently committed NZ $750 million over the next three years to support KiwiRail's `Turn-around Plan' – a targeted investment programme which aims to turn KiwiRail into a sustainable rail business within 10 years.[36]

Key features of the plan include targeted investment on key routes, and adding new locomotives and wagons to the fleet (KiwiRail, 2010). KiwiRail should, as a priority, ensure the funding is targeted at parts of the rail network that will support a bigger ships future.

There may also be challenges for rail freight movement during the day time in metro areas of key urban centres – particularly in Auckland, due to planned expansion of the urban passenger rail network (including electrification), and the close proximity of the Britomart passenger transport terminal to Ports of Auckland.

[36] *Office of the Minister of Transport (18 May 2010). Press Release: "Government Investment for Rail Turnaround". http://www.beehive.govt.nz/release/government+investment+rail+turnaround*

In particular, there are concerns around:

- Freight train paths potentially being squeezed in favour of passenger train services;
- Scheduling issues associated with large freight trains operating in conjunction with passenger rail services on the urban network; and
- Potential conflict of a 24 hours per day, 7 days per week rail freight operation from the port with any future residential and commercial property development near the rail network – in particular, around the Orakei Basin area.

In terms of road and coastal shipping, the Shippers' Council is not aware of any infrastructure constraints (not already being addressed) that may impede bigger ships calling at New Zealand.

The Shippers' Council is aware there are traffic congestion issues within major urban centres (such as Auckland), and on routes approaching major urban centres.

However, traffic congestion typically only occurs during peak morning and evening periods on weekdays. Outside these times, the national road network (including in Auckland), has abundant excess capacity.

However in saying this, a significant amount of investment has been committed to improving the local and national road networks.

In particular, the Government has identified seven state highways of national importance in its Government Policy Statement on Land Transport Funding (2009) to focus investments on projects that will deliver the most value in terms of congestion reduction and facilitating economic productivity.

A total of approx. NZ $10.7 billion over 10 years has been ear-marked for reducing congestion and improving safety on these `roads of national importance' (National Infrastructure Plan, 2010).

The Shippers' Council is also aware the trucking industry has some concerns over truck turn-over time at some ports, particularly at Ports of Auckland. However, this is a constraint at the port, rather than a road infrastructure bottleneck per se.

Conclusions and Recommendations

8. Conclusions and Recommendations

Conclusions

- The profitability and international competitiveness of exporters and importers is dependent on the efficiency and cost-effectiveness of New Zealand's international supply chains.
- In global terms, the total volume of containers handled across New Zealand ports represents a little less than 1% of annual global container throughput.
- Global shipping lines are going through a major realignment as they fully exploit the vessel-sharing concept.
- Whilst New Zealand will continue to receive shipping services, if New Zealand's ports are not bigger ships capable within five years, there is a risk services could become 'boutique' in nature, where only relatively small and old vessels (by international standards) with a higher operating cost per container can be accommodated by the ports.
- New Zealand's export trade is already being impacted by the consolidation of carriers.
- Significant net supply chain benefits could be gained with larger container ships, particularly on the South East Asia route (the subject of analysis), and using 7000 TEU ships. The introduction of bigger ships to New Zealand could also reduce the carbon footprint of shipping exports and imports by approx. 31%.
- New Zealand's four largest container ports (Auckland, Tauranga, Lyttelton, and Otago) can currently handle ships in the range of 4500 to 5000 TEU (nominal capacity), but do not have the capability to handle ships larger than these sizes.
- New Zealand could realise up to NZ $144 million per year of net supply chain benefits from 2015/16, with bigger ships operating on the South East Asia route only, and with infrastructure developments at two ports to become 7000 TEU ship capable. Competitive factors and the specific dynamics of individual supply chains will determine just how much of the potential benefit is passed to cargo owners.
- In addition to efficiency gains, the benefit of being able to accommodate larger ships for New Zealand is a strategic one – an insurance policy that protects the efficiency of New Zealand's existing international supply chain.
- If some of New Zealand's ports are not 7000 TEU ship capable within the next five years, there is a risk shipping companies may increasingly hub through Australian ports such as Melbourne, Sydney, or Brisbane, which are all undertaking significant development to become bigger ships capable.
- This would be detrimental to New Zealand exporters and importers – increasing net supply chain costs by up to NZ $194 million per year from 2015/16 (if only South East Asia services were affected), and increasing transit times to market.
- The real value to New Zealand of having bigger ships operate on the South East Asia route, could therefore be up to NZ $338 million per year from 2015/16, and increasing up to NZ $391 million per year by 2020. These estimates are direct benefits only, and exclude the significant flow-on benefits to the rest of the economy due to the economic multiplier effect.
- Bigger ships can be enabled in a number of different ways. Assuming current shipping configurations between New Zealand and South East Asia do not change, with cargo volume growth over time, New Zealand could support 5000 to 7000 TEU services within five years, based on conservative cargo growth rates.
- Alternatively, existing services may combine capacity through vessel-sharing arrangements to capture the economies of scale from bigger ships, which would enable 5000 to 7000 TEU ships sooner.
- The timing of New Zealand port investments to become 7000 TEU ship capable (ie sooner rather than later) is therefore essential to ensure New Zealand ports remain competitive and capable, and thus continue to secure shipping capacity with direct links to key international hubs and markets.
- Although all four major container ports in New Zealand will be required to increase their capability in the longer term to support projected cargo growth, not all four will need to make the investment to become bigger ships capable initially.
- It would be logical for two ports (one in the North Island and one in the South Island) to invest to become 7000 TEU ship capable within five years.
- The analysis and research points to the ports of Tauranga and Lyttelton being the logical candidates to start exploring implementation of capital plans to become 7000 TEU ship capable. It is recognised, however, any such investments are a commercial matter for the parties concerned and there may be regulatory and/or commercially sensitive factors not in the public domain that have not been factored into the analysis.
- Under a scenario where a North Island and a South Island port become bigger ships capable, the remaining two large container ports, Auckland and Otago, would continue to play a vital role in servicing New Zealand exports and imports.
- Given significant government investment has already been committed to improving the national rail freight network, further direct government financial support should not therefore be required to support a bigger ships future.

Recommendations

The Shippers' Council recommends that:

- Before further industry consolidation takes place, the Government ensures the legislative framework is not a barrier to bigger ships being introduced to New Zealand, and takes the required steps to ensure anti-competitive behaviour such as cartel pricing or capacity restrictions (whether by ports or carriers), does not result due to increased use of vessel-sharing arrangements and/or port consolidation.

- Shipping companies consider opportunities to further combine capacity on some of the services that currently call at New Zealand, to bring forward the timing of the scale benefits to New Zealand.

- Two ports (one in the North Island and one in the South Island) should invest to become 7000 TEU ship capable within the next five years.

- Under a scenario where a North Island and a South Island port become 7000 TEU ship capable, the remaining two key container ports should secure the necessary resource consents and prepare to implement appropriate capital plans in the future, when it becomes viable through growth in trade, for New Zealand to have two bigger ship ports on each island.

- KiwiRail should, as a priority, ensure the NZ $750 million of government funding earmarked for its turn-around plan is targeted at parts of the rail network that will support a bigger ships future.

One of the key challenges faced in the development of this report has been gathering accurate data on container volume throughput and flows that can be meaningfully compared across ports. Although ports and carriers have been forthcoming with the data requested, reconciliation of the numbers with other publicly available information and shippers' experience with shipping product to and from New Zealand, has been difficult.

Whilst the Shippers' Council has taken every care to ensure the container volumes used in the analysis are as reflective of reality as possible, it is important to acknowledge they are estimates only, and a margin of error therefore exists.

However, the Shippers' Council is comfortable these estimates accurately reflect the relative size of the ports in New Zealand, and are close enough to ports' own reported full container volume throughput to provide meaningful analysis and to draw valid conclusions. The Shippers' Council recommends that:

- The Ministry of Transport, in its current work on improving the data gap, should establish a mandatory data collection regime and ensure the data collection methodology and approach developed is robust, and consistently applied by all relevant parties.

Appendices

Appendix 1: Glossary of Terms

BAF	Stands for 'bunker adjustment factor'. This is the adjustment made by carriers to ocean freight costs due to fuel price changes.
Beam	The width of a ship.
Berth	The space allotted to a vessel at the wharf.
Bigger ships	Refers to container ships of between 5000 to 7000 TEU of nominal capacity, whenever used in this report.
Bulk cargo	Cargo moved in non-containerised or unitised form, such as coal, logs, gypsum (dry bulk) or diesel (bulk liquid).
Bunker fuel	The type of fuel which is used in ships' main engines.
Cargo (or freight)	Goods transported by sea, air or land.
Cargo owners	The owners of cargo that is transported. In this report, this refers to exporters and importers, and is used inter-changeably with 'shippers'.
Carriers (or lines)	Ship owners or operators.
Coastal shipping	Shipping service between ports within New Zealand.
Container	Metal box structure of standard design, used to carry cargo in units. Containers can be twenty or forty foot in length. The standard measure of a container is a TEU (twenty-foot equivalent unit).
Container terminal	Facility designed to handle containers using special purpose equipment such as container cranes, straddle carriers and container stacking areas.
Containerised cargo	Cargo transported in containers.
Dredging	The process of excavating materials underwater to widen or deepen waterways.
Draught (or draft)	The depth of a loaded vessel in the water. It is measured from the level of the waterline to the bottom of the ship.
Dry container	A non-refrigerated container.
Hubbing	A practice where shipping lines call at one port in a country or region, rather than at several ports. Alternative transport services (such as road) then carry goods to other centres.
Inland port	An inland site linked to a seaport that carries out some of the functions of the seaport, eg container storage and inter-modal transfers.
LOA	Stands for 'length overall'. It refers to the maximum length of a vessel.
Panamax ships	Ships that can transit the Panama Canal. They are typically up to 5000 TEU in nominal capacity.
Post-Panamax ships	Ships that currently cannot transit the Panama Canal, typically with a nominal capacity of 5000 to 10,000 TEU. The Panama Canal is being upgraded to accommodate this class of ships.
Post-Panamax cranes	Cranes capable of servicing Post-Panamax ships. They have greater outreach than Panamax cranes.
Reclamation	The process of creating new land from sea or riverbeds.
Reefer container	A refrigerated container used for chilled or frozen cargo.
Shippers	Parties who consign goods for transport.
Transhipment	The shipment of goods to an intermediate destination, and from there to another destination.
TEU	Stands for 'twenty-foot equivalent unit'. It is a standard measure of container volume.
Vessel-sharing	Arrangements between shipping companies to share capacity on ships.

Appendix 2: Overview of New Zealand's Trade Sector

New Zealand's Total Sea Trade (Bulk and Containerised)

New Zealand's heavy reliance on international sea freight for the movement of imports and exports to and from our key overseas trading partners, means that potentially, large supply chain improvement opportunities can be leveraged off trends in the international shipping industry.

According to Statistics New Zealand, New Zealand imported a total volume of 17.0 million tonnes of goods, and exported a total volume of 25.1 million tonnes of goods in 2008.

The total value of New Zealand's exports in 2008 was NZ $37.4 billion (FOB)[37] – or approx. 28% of New Zealand's gross domestic product (GDP) in that year. Nearly all this volume (99.6%) was carried by sea to overseas markets.

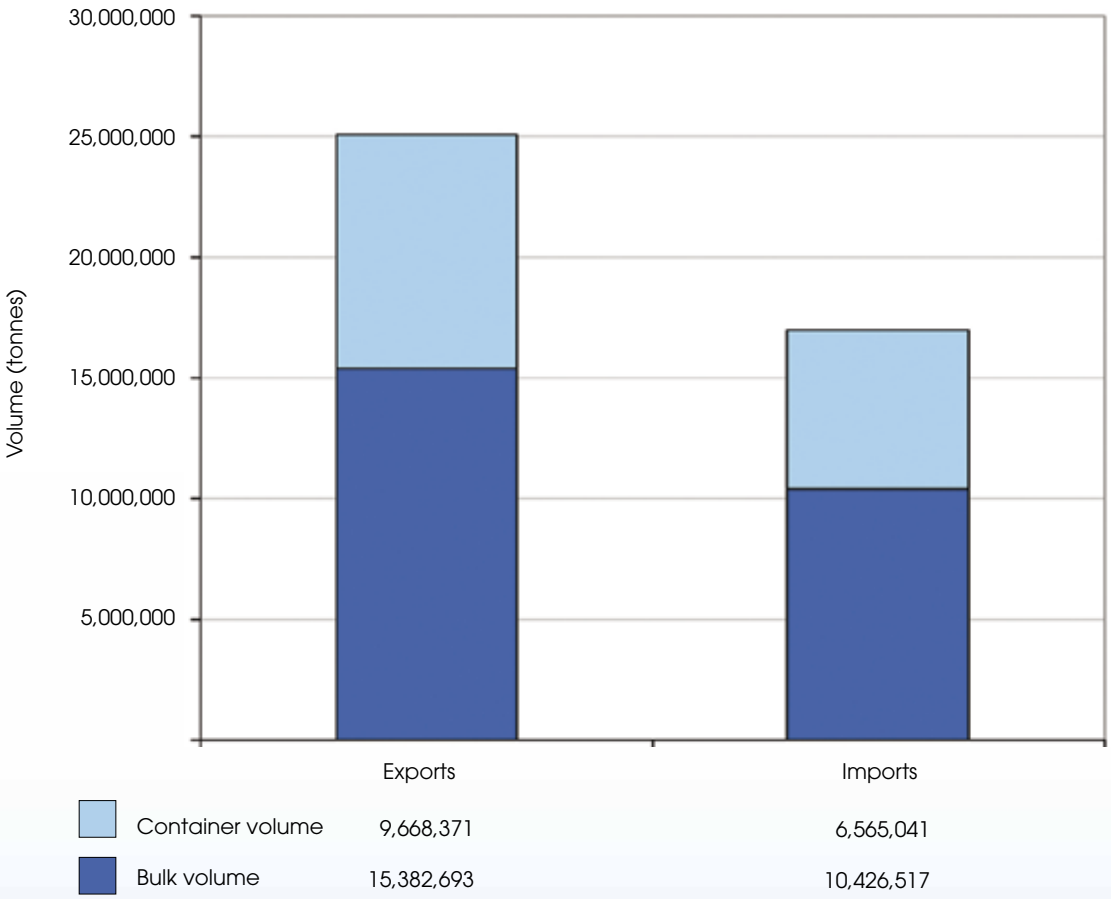
Although most of our export and import cargo by volume is shipped in bulk or break-bulk form[38], containerised cargo represents a significant proportion of our trade.

As shown in **Figure 16**, approx. 39% of import and export cargo by volume respectively, was shipped in containers in 2008.

[37] *The Free on Board (FOB) value is the current market value of goods in the country of origin, including all costs necessary to get them on board the ship or aircraft. It excludes freight, insurance and other costs involved in transporting goods between countries.*

[38] *Cargo typically shipped in bulk form includes coal, petroleum, logs, sugar cane, fertilisers etc. Cargo shipped in break-bulk form (where there is some form of packaging) includes processed forestry products, and some cartoned or trayed fruit and vegetables.*

Figure 16: New Zealand Sea-Freighted Import and Export Volumes by Shipment Type (2008)



Source: Statistics New Zealand, New Zealand Shippers' Council analysis

New Zealand's Containerised Sea Trade

In 2008, New Zealand exported a total volume of approx. 624,000 TEU of goods, and imported a total volume of approx. 507,500 TEU of goods.

A significant volume of logs (normally exported in bulk form), was exported in containers in 2008 due to the high and volatile bulk ship charter rates in that year. The Shippers' Council estimates approx. 18% of logs was exported in containers in 2008. This compares with nil in 2009 and at present, as logs reverted back to bulk shipping, when bulk ship charter rates normalised following the global economic downturn in 2008/09.

However, with ship charter rates and fuel prices trending upwards again, there is a potential for some log exports to switch back to containerisation.

Taking into account 2008 was an anomaly for log exports (inflating overall container exports from New Zealand), and the opportunity log exports presents to the container shipping market, the data was normalised to reflect a hypothetical 5% containerisation of logs.

The adjusted export container volumes are shown below in **Table 14**, along with total import volume. These figures are the basis of the analysis undertaken for this study.

The total value of New Zealand's containerised trade in 2008 was NZ $28.3 billion (FOB) for exports, and NZ $22.7 billion (CIF)[39] for imports. This represents 21% and 17% of New Zealand's GDP respectively.

[39] *Cost including Insurance and Freight (CIF) is the value declared by the importer to Customs. It represents the Free on Board (FOB) cost at foreign ports, plus shipping and insurance.*

Table 14: New Zealand's Containerised Export and Import Volumes in 2008 (Adjusted for Logs) by Port

New Zealand Port	Total Container Export Volume (TEU)	Total Container Import Volume (TEU)
Auckland Seaport	142,171	271,500
Christchurch Seaport (Lyttelton)	65,466	46,285
Dunedin Seaport (Port Otago)	69,579	13,670
Invercargill Seaport (Bluff)	11,309	6,812
Napier	64,864	9,678
Nelson	22,531	5,488
New Plymouth	22,526	12,145
Tauranga Seaport	173,847	106,195
Timaru	27,164	9,423
Wellington Seaport	24,396	26,218
Grand Total	**623,852**	**507,413**

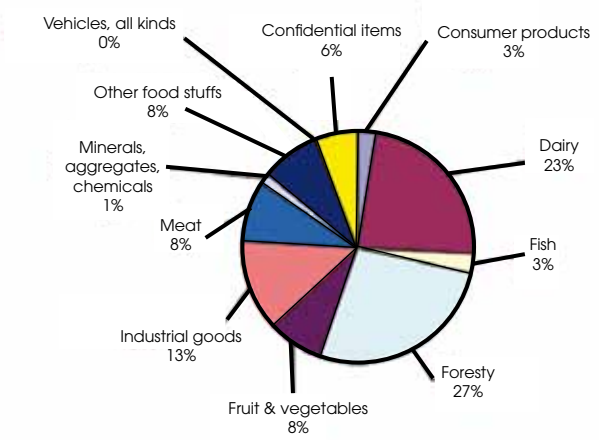
Source: Statistics New Zealand, New Zealand Shippers' Council analysis

New Zealand's Containerised Trade by Commodity

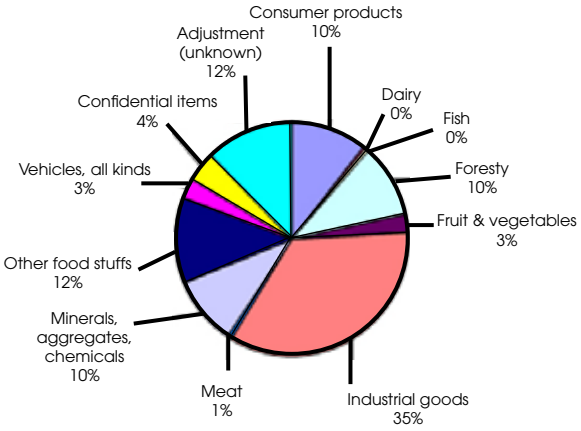
New Zealand's containerised export trade consists predominantly of products from the primary sector. Forestry and dairy were the largest export contributors by volume in 2008 – accounting for 27% and 23% of New Zealand's total containerised trade. Together, dairy, fish, forestry, fruit and vegetables, and meat accounted for 69% of New Zealand's total containerised trade by volume in 2008.

New Zealand's imports comprised primarily of industrial goods (accounting for 35% of total containerised imports by volume), and consumables such as food stuffs and general consumer products (accounting for 22% of total containerised imports by volume). The total volume of containerised exports and imports in 2008 by commodity, is illustrated in **Figure 17** on the following page.

Figure 17: Total Volume of Containerised Exports and Imports in 2008 by Commodity



% of Containerised Export Volume



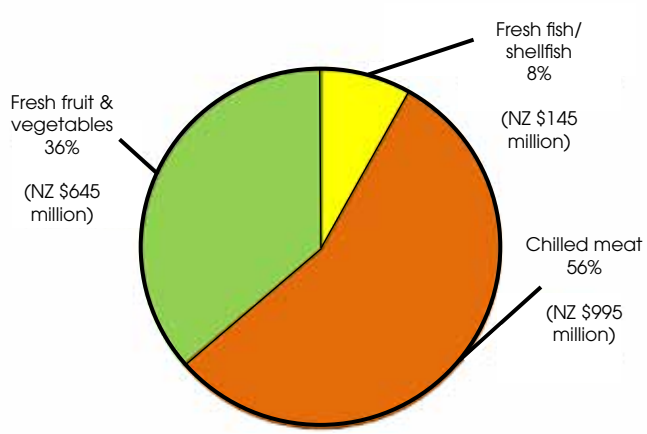
% of Containerised Import Volume

Source: Statistics New Zealand, New Zealand Shippers' Council analysis

Highly time-sensitive perishable export goods such as fresh fruit and vegetables, chilled meat, and fresh fish/shellfish, accounted for 7% of New Zealand's 2008 containerised exports by volume. The total value of these perishable exports was approx. NZ $1.8 billion (FOB) in 2008, shown in **Figure 18** below. Chilled meat contributed to more than half of this value.

The reliability and length of shipment times to markets is particularly important for these goods because of their very limited shelf life. Increased shipment time to market reduces the overall quality, shelf life, and therefore the value of the goods.

Figure 18: Total Value of New Zealand's Perishable Containerised Exports in 2008 (FOB)



Total value of perishable containerised exports in 2008 = NZ $1.8 billion (FOB)

Source: Statistics New Zealand, New Zealand Shippers' Council analysis

Container Mix Imbalance in New Zealand

Approx. 75% of New Zealand's exports in 2008 were shipped in dry (unrefrigerated) containers, with the remaining 25% shipped in refrigerated (reefer) containers. In contrast, 95% of imports were shipped to New Zealand in dry containers, and 5% in reefer containers. Because of New Zealand's relatively large reefer container requirements, a relatively high number of empty reefer containers are imported to make up for the imbalance.

Cubic-Njord (2009) estimates approx. 157,000 TEU of empty reefer containers were imported to New Zealand in 2008.

According to Cubic-Njord (2009), the container mix imbalance in New Zealand resulted in a total of approx. 255,000 TEU of empty containers being imported to New Zealand in 2008 (61% reefer, 39% dry). A total of about 102,000 TEU of empty containers was exported in 2008 (99% dry, 1% reefer).

To date, the cost of bringing in and repositioning empty containers to meet the needs of importers and exporters is borne by shipping companies.

However, as reported in Cubic-Njord (2009), recent announcements by some shipping companies suggest shippers may seek to recover these costs from exporters in particular.

This would increase the cost of international shipping for exporters, and increases the imperative for exporters, in particular, to investigate potential opportunities to make cost savings in their wider supply chains – including potentially through the use of larger container ships.

Appendix 3: Stakeholders

Table 15: List of Stakeholders Engaged

		Organisation
Ports	1.	Ports of Auckland
	2.	Port of Tauranga
	3.	Lyttelton Port Company
	4.	Port Otago
	5.	Port Napier
	6.	Port Nelson
	7.	Port Taranaki
	8.	CentrePort
	9.	NorthPort
	10.	SouthPort
	11.	Auckland Regional Holdings
Shipping lines	12.	International Container Lines Consortium
	13.	ANL
	14.	Hamburg Sud
	15.	Maersk
	16.	Swires
	17.	PIL
Exporters	18.	New Zealand Shippers' Council members
	19.	Business New Zealand
Importers	20.	The Warehouse
	21.	Foodstuffs
	22.	DB Breweries
Freight forwarders	23.	Mainfreight
	24.	Oceanbridge
	25.	Mondiale
Surface transport	26.	KiwiRail
	27.	Road Transport Forum
	28.	New Zealand Shipping Federation
Government	29.	Ministry of Transport
	30.	Treasury
	31.	Customs
	32.	Ministry of Economic Development
	33.	New Zealand Transport Agency
	34.	Office of the Minister of Transport
Other stakeholders	35.	Rockpoint
	36.	Western Blue Highway Project Team
	37.	Chartered Institute of Logistics and Transport in New Zealand
	38.	New Zealand Business Council for Sustainable Development
	39.	Murray King, subject matter expert in rail
	40.	Geoff Vazey, former Chief Executive of Ports of Auckland
	41.	Jon Mayson, former Chief Executive of Port of Tauranga
	42.	Richard Paling, author of National Freight Demands Study
	43.	Bo Samuelsson, co-author of the Cubic-Njord container supply study

Appendix 4: Data Analysis – Approach and Assumptions

It became apparent early in the study, there is currently little import and export container volume and flow data comparable across New Zealand ports, as there is currently no mandatory data collection for container movements in New Zealand.

To date, the most comprehensive set of publicly available unique international container volume data through New Zealand ports (excluding transhipment and domestic coastal feeder volumes), is in the March 2009 report, *'Domestic Container Supply Study'*, completed by Cubic Transport Services Ltd and Njord Ltd. However, whilst Cubic-Njord reports the number of full and empty dry and reefer containers (in TEUs) through each of the major container ports in 2008, it does not provide any insights on the international flow of these volumes (ie volumes by overseas origin or destination country).

It should also be noted that whilst Cubic-Njord reports the original source of its data is from major New Zealand container ports, it caveats that the level of detail provided varied across ports, and some data points were therefore estimated using extrapolation techniques.

To establish a more detailed picture of New Zealand's current import and export cargo volumes and flows from each major New Zealand container port, the Shippers' Council purchased a detailed database of import and export data from Statistics New Zealand.

The Statistics New Zealand data, whilst not perfect, provides a rich source of data on the volume and value of New Zealand's imports and exports by month, detailed commodity levels (at 4-digit Harmonised System commodity code), New Zealand ports, and overseas origin or destination countries and ports.

A major limitation with the raw data was the import and export volumes were measured in tonnes, rather than the number of containers in TEUs. In order to convert the volumes from tonnes to TEUs, the Shippers' Council worked with its members, freight forwarders, importers, and ports to develop a set of assumptions for the conversion. These assumptions include:

- The shipment approach for each HS-4 commodity type (ie whether they were shipped in bulk, dry containers, or reefer containers);
- The proportion of each type of commodity shipped in containers (this is relevant for commodities that use both bulk ships and container ships); and
- The average import and export weight (tonnes per TEU) of each full twenty-foot container for each HS-4 commodity type.

Each HS-4 commodity type was also categorised into ten high level product groupings for ease of reference. The results of the conversion are shown in **Table 16** and **Table 17** (following), along with comparisons with the container volumes reported in Cubic-Njord (2009) to act as a sanity check. The volumes reported are for 2008.

It is important to note both the Shippers' Council and Cubic-Njord's estimates differ from the throughput volumes reported by ports. As shown in **Figure 21** (p90), container throughput volumes reported by ports are higher, because they include all containers handled by ports – including international, domestic, and transhipment cargo, and also full and empty containers.

In contrast, the Shippers' Council and Cubic-Njord's estimates are for full containers of cargo exported or imported (ie excludes empty containers, and domestic and transhipped cargo).

Overall, the Shippers' Council's estimated container volumes aligned closely with the Cubic-Njord volumes (and other data provided by ports). Where there were significant differences, the Shippers' Council sought to understand the reasons for the differences, and made adjustments to the data accordingly. Adjustments were made for some ports because of the following data anomalies identified:

For exports:

- A significant volume of Lyttelton Port's exports (approx. 2.3 million tonnes) was categorised by Statistics New Zealand as 'confidential items' (which the Shippers' Council treated as containerised cargo). Discussions with Lyttelton Port confirmed much of this volume (estimated at approx. 95%) is likely to be bulk coal exports;
- Statistics New Zealand also recorded a significant volume of 'confidential items' for Port Taranaki (New Plymouth). Because Port Taranaki handles a large volume of bulk cargo, it was assumed approx. 50% of the confidential items was bulk cargo;
- In comparing the Shippers' Council's estimated volumes with the Cubic-Njord volumes, it was observed the Shippers' Council's volumes were approx. 20,000 TEU higher than Cubic-Njord's for Port Otago, and approx. 20,000 TEU lower than Cubic-Njord's for Port Timaru.

  Fonterra noted this roughly equated to the volume of dairy products it shipped from Port Timaru, but then transhipped at Port Otago.

  Discussions with the New Zealand Customs Service (which collects the data for Statistics New Zealand) confirmed the New Zealand export port recorded, is the port where exports were loaded onto the last vessel to leave New Zealand.

  That is, in the case of the Fonterra dairy transhipment, the Statistics New Zealand data would recognise the product originating from Port Timaru as exports from Port Otago, whereas the ports themselves would recognise the cargo as exports from Port Timaru. An adjustment of 14,300 TEU for transhipment between Port Otago and Timaru was allowed, as this is the total transhipment volume recorded by Port Otago in 2008.

For imports:

- The Shippers' Council's estimated volume for the Ports of Auckland was approx. 62,000 TEU less than that recorded by Cubic-Njord and the Ports of Auckland. The difference could be due to conversion assumptions for some commodity types being inaccurate for the Ports of Auckland, as the conversion assumptions were not port-specific. For example, some commodities typically imported in bulk form at other New Zealand ports, may be imported in containers at the Ports of Auckland, or the average weight per TEU for some commodities may differ between ports. As it was difficult to pinpoint the exact assumption error, the Shippers' Council assumed Ports of Auckland's own recorded container volumes (as reported in Cubic-Njord) to be correct. An adjustment was made to make the two equate.

Table 16: Total 2008 Container Volume (Full Containers Only) Exported from New Zealand (in TEUs) by Port and Product Type

NZ Seaport	Consumer Products	Dairy	Fish	Forestry	Fruit & veges	Industrial goods	Meat	Minerals, aggregates, chemicals	Other food stuffs	Vehicles all kinds	Confidential items	Total	Adjustment	Adjusted total	Cubic-Njord total	Variance	% Variance
Auckland	4,504	50,498	2,691	18,295	10,130	22,628	10,645	2,770	17,297	615	2,099	142,171		**142,171**	138,900	3,271	2%
Chch (Lyttelton)	658	12,417	4,028	10,742	4,782	14,456	3,600	233	6,208	66	165,537	222,727	(157,260)	**65,466**	67,100	(1,634)	(2%)
Dunedin (Otago)	1,061	43,176	4,154	10,292	1,621	5,243	13,754	382	3,989	54	154	83,879	(14,300)	**69,579**	66,200	3,379	5%
Invercargill	174	677	126	7,834		1,302	572	527	86		11	11,309		**11,309**	8,100	3,209	28%
Napier	1,239	2,937	258	25,268	13,533	8,626	6,439	35	6,418	32	80	64,864		**64,864**	68,000	(3,136)	(5%)
Nelson	413	462	3,225	12,644	3,199	616	523	3	1,439	2	6	22,531		**22,531**	34,100	(11,569)	(51%)
New Plymouth	191	6,260	55	726	321	1,775	1,823	150	316	6	21,805	33,428	(10,903)	**22,526**	25,500	(2,974)	(13%)
Tauranga	4,541	22,350	1,757	69,906	13,959	16,326	12,386	4,568	13,095	241	14,718	173,847		**173,847**	204,900	(31,053)	(18%)
Timaru	400	5,606	408	1,499	729	1,133	1,967	2	1,110	7	3	12,864	14,300	**27,164**	35,200	(8,036)	(30%)
Wellington	2,729	333	595	10,110	261	7,826	1,569	262	612	29	70	24,396		**24,396**	32,000	(7,604)	(31%)
Total	**15,910**	**144,716**	**17,297**	**167,317**	**48,535**	**79,929**	**53,276**	**8,933**	**50,568**	**1,051**	**204,483**	**792,015**		**623,852**	**680,000**	**(56,148)**	**(9%)**

Source: Statistics New Zealand, and New Zealand Shippers' Council analysis

Table 17: Total 2008 Container Volume (Full Containers Only) Imported into New Zealand (in TEUs) by Port and Product Type

NZ Seaport	Consumer Products	Dairy	Fish	Forestry	Fruit & veges	Industrial goods	Meat	Minerals, aggregates, chemicals	Other food stuffs	Vehicles all kinds	Confidential items	Total	Adjustment	Adjusted total	Cubic-Njord total	Variance	% Variance
Auckland	30,466	949	1,393	26,666	8,599	79,516	2,063	17,252	29,578	9,623	3,593	209,696	61,804	271,500	271,500		0%
Chch (Lyttelton)	4,819	310	412	4,837	1,349	20,484	181	6,660	4,633	1,574	1,025	46,285		46,285	55,900	(9,615)	(21%)
Dunedin (Otago)	1,758	18	28	1,457	193	4,228	74	4,079	1,477	182	175	13,670		13,670	13,000	670	5%
Invercargill	46	6		1		1,659	2	542	638	6	3,912	6,812		6,812	1,800	5,012	74%
Napier	1,154	1	53	1,360	418	2,066	239	1,407	2,160	117	703	9,678		9,678	13,800	(4,122)	(43%)
Nelson	1,158		170	103	99	2,977		375	130	412	63	5,488		5,488	5,700	(212)	(4%)
New Plymouth	106	4		15	1	6,472	1	1,395	1,268	48	2,833	12,145		12,145	2,300	9,845	81%
Tauranga	10,424	583	262	12,538	1,654	46,021	642	10,918	16,859	1,073	5,222	106,195		106,195	107,900	(1,705)	(2%)
Timaru	95	8	13	58	22	3,058	3	1,221	1,964	12	2,970	9,423		9,423	29,900	(20,477)	(217%)
Wellington	3,202	95	77	4,487	629	9,252	198	4,517	1,957	1,094	712	26,218		26,218	29,800	(3,582)	(14%)
Total	**53,229**	**1,974**	**2,407**	**51,522**	**12,965**	**177,048**	**3,402**	**48,487**	**60,662**	**14,141**	**21,209**	**447,046**		**507,413**	**531,600**	**(24,187)**	**(5%)**

Source: Statistics New Zealand, and New Zealand Shippers' Council analysis

Appendix 5: Shipping Voyage Cost Model for a New Zealand to Singapore Service

A number of international studies, including Cullinane and Khanna (2000) and Stopford (2009), have shown voyage costs per TEU decrease with increasing ship size for various international shipping routes, including a trans-Atlantic, and trans-Pacific route.

To estimate cost savings for different-sized ships for a New Zealand to Singapore service, the Shippers' Council adapted Stopford's trans-Pacific model and changed some of the assumptions to better reflect the new route modelled and the changes that have occurred in the shipping environment over the past year (including changes in bunker fuel prices and ship charter rates etc).

A direct New Zealand to Singapore shipping route was applied to the model, with one North Island hub port, and one South Island hub port (ie Singapore – one North Island port – one South Island port – Singapore). It was assumed the North Island hub port would be either Ports of Auckland or Port Tauranga, and the South Island hub port would be either Lyttelton Port or Port Otago.

Table 18 shows the round trip voyage distance between Singapore and each of the two bigger ship port combinations. Because all the distances are very similar (there is only a 33-mile difference between the highest and lowest voyage distance), to keep the modelling manageable and not too complicated, the average round trip voyage distance of 11,040 miles was used to represent the different combinations of two New Zealand bigger ship ports.

Table 18: Round Trip Distances between Singapore and Two New Zealand Hub Ports

Route	Round Trip Voyage Distance (Miles)
Singapore – Auckland – Lyttelton – Singapore	11,056
Singapore – Auckland – Otago – Singapore	11,047
Singapore – Tauranga – Lyttelton – Singapore	11,032
Singapore – Tauranga – Otago – Singapore	11,023
Average round trip voyage distance	**11,040**

Source: Dataloy Distance Table (www.dataloy.com)

Stopford's model is based on the following shipping cost components:

- **Operating costs.** The operating cost of the ship includes the cost of the crew, insurance, stores, maintenance, and administration. The operating costs used by Stopford in the original model, which are based on a 2006 study on the operating costs of German container ships compiled by HSH Nordbank, Ernst & Young, and Econum, were adopted. The operating costs range from around US $4,600 per day for a 1200 TEU ship to US $7,500 per day for an 11,000 TEU ship.

- **Capital costs.** The capital cost of the ship is the cost of owning or chartering a ship. Both types of arrangements were tested for sensitivity.

  In the case where the shipping company owns the ship, the annual capital cost includes the annual depreciation of the ship (Stopford uses a straight line depreciation method over 20 years), and the opportunity cost of the capital tied up in the ship per year (calculated using a 10% weighted average cost of capital). The capital value of each ship size is based on the figures in Stopford's original model, ranging from US $25 million for a 1200 TEU ship to US $130 million for an 11,000 TEU ship.

In the case where a shipping company charters the ship, the capital cost is based on the time charter rate. As shown in **Figure 19**, the charter rate for all ship sizes has been highly volatile over the past decade.

Figure 19: Container Ship Time Charter Rate Trends

Source: Clarkson Research, cited in Panmure Gordon & Co (2008)

In particular, ship charter rates have been very low in the past 12 months, as ocean carriers trimmed their fleets and pressed ship owners for deeper discounts amid slowing cargo volumes and sagging freight rates on most liner trade routes. Because of the volatile nature of ship charter rates, a low, medium and high charter rate for each ship size was modelled to test for sensitivity. The charter rates used are shown in **Table 19** (following page).

Table 19: Container Ship Charter Rates used in the Model (US dollars per day)

	Ship Size					
	1200 TEU	2600 TEU	4300 TEU	6500 TEU	8500 TEU	11000 TEU
Low charter rate	$4000	$4,500	$6,500	$8,250	$10,000	$12,000
Medium charter rate	$16,000	$18,000	$26,000	$33,000	$40,000	$48,500
High charter rate	$28,000	$31,500	$40,000	$55,000	$70,000	$89,000

Source: Various media reports,[40] and New Zealand Shippers' Council analysis

[40] ** 'Box Ship Charter Rates Plumb New Lows' (20 March 2009), Bruce Barnard, Journal of Commerce Online, http://www.joc.com/node/410208*
** 'Container Update' (17 December 2009), Harper Petersen & Co Market Report, http://www.harperpetersen.com/mark/69.html*
** 'Containership Charter Market Slumps' (26 August 2008), Maritime Connector, http://www.maritime-connector.com/NewsDetails/1534/lang/English/Container-ship-charter-market-slumps.wshtml*
** 'MSC Storms back into Boxship Charter Market' (23 April 2009), Janet Porter, Lloyds List, http://www.lloydslist.com/ll/news/msc-storms-back-into-boxship-charter-market/20017642641.htm*

The results of the modelling show the capital costs under a ship ownership model align closely to capital costs under a ship charter model with a medium charter rate. Therefore, the capital cost under a ship ownership model (or a medium charter rate scenario) is likely to be representative of the long run average capital cost.

Bunker fuel costs

Bunker fuel refers to the relatively low-grade fuel used to propel ships. It is a significant expense for shipping companies – accounting for between 50% to 60% of the total cost of operating a ship per voyage. Total bunker fuel cost is a function of bunker fuel prices and the ship's rate of fuel consumption (which in turn is related to the ship's sailing speed).

Bunker fuel price

As shown in **Figure 20**, bunker fuel prices have been extremely volatile over the last few years. The current bunker fuel price is approx. 60% of the six-year high price of US $760 per tonne (observed in September 2008).

In the 2009 year alone, bunker fuel prices fluctuated between US $250 per tonne at the beginning of the year, to about US $470 per tonne at the end of the year.

The modelling was based on a current bunker fuel price of approx. US $500 per tonne, and the impact of each additional US $100 per tonne increase in the price was tested for sensitivity.

Figure 20: Time Series of Bunker Fuel Price (2003 to March 2010)

Source: www.bunkerworld.com

Fuel consumption

Although shipping companies cannot influence bunker fuel prices, they have some influence on the ship's level of fuel consumption. As with any piece of machinery, the amount of fuel a ship burns depends on its design and the care with which it is operated.

In particular, operating at lower speeds reduces the amount of fuel burned (and therefore results in fuel cost savings) because of the reduced water resistance (Stopford, 2009). The relationship between fuel consumption and speed is:

$$F = F^* (S / S^*)^3$$

(Stopford, 2009)

Where F is the actual fuel consumption (in tonnes per day), F* is the design fuel consumption of the ship (in tonnes per day), S is the actual sailing speed of the ship (in knots), and S* is the design speed of the ship (in knots). The design fuel consumption and design ship speed of the various sized ships reported in Stopford were used.

Sailing speed

As well as contributing to fuel cost savings through lower fuel consumption, lower sailing speeds also reduce the amount of carbon dioxide emitted by ships.

The international focus on climate change (heightened by the United Nations-led Copenhagen climate change meetings in 2009) has put pressure on international shipping companies to reduce their carbon profile.[41]

For example, slow-steaming has been introduced on a large number of Maersk Line and Safmarine's routes.[42] In late 2009, it was reported Maersk had reduced its shipping speeds from around 20 knots to 14 knots on a number of its international routes.[43] Maersk has been reported to comment their customers have embraced slow-steaming, suffered little disruption to their supply chains, and are not asking for freight rate concessions, despite longer transit times for shippers.

The Shippers' Council challenges this view. A survey of the Shippers' Council members revealed Maersk's reduction in shipping speeds is already having an impact – particularly for exporters of time-sensitive perishable goods such as chilled meat, and fresh produce. In particular, a member from the meat industry noted:

"It definitely has an impact for chilled lamb shipments to Europe/USA/Canada. Our customers are certainly not happy with the fact that transit times are increasing … we certainly haven't seen any financial benefits and would be very interested to see if Maersk can show us on paper how we are benefiting financially. I think the financial benefit is a one-way street at present."

Internationally, France-based tyre manufacturer, Michelin, recently expressed concern over ocean carriers' plans to further extend the practice of super slow-steaming – raising concerns over the cost of increased transit times.[44]

The Shippers' Council does not believe shipping companies will be able to maintain such slow-steaming speeds over time (particularly if fuel saving benefits are not passed on to shippers). The impact of both a 20 knot speed, and a 14 knot speed ('low' speed) were tested.

Port costs

Port-related charges include various fees levied by ports on ships and/or cargo for the use of port facilities and services. Port charges fall into two main categories. They are:

- **Port dues** – levied on ships for the general use of port facilities, including docking, and wharfage. Actual charges may be based on the volume of cargo, the weight of cargo, the gross registered weight of the ship, or the net registered weight of the ship (Stopford, 2009). Port dues tend to be a fixed rate for different-sized ships.

  The following port charges were used in the modelling:
  - *US $25,000 per port call for South East Asia ports;*
  - *US $32,000 per port call for Australian ports; and*
  - *NZ $20,000 per port call for New Zealand ports.*

  The above port rates are averages for ships with gross registered weights of between 28,000 to 32,000 tonnes (or about the size of a 2000 to 3000 TEU container ship).

  The higher port charges for larger ships reflects the additional capital investment ports have to make to be able to accommodate them – eg channel and berth pocket dredging, wharf strengthening and extensions, and/or the purchase of larger cranes. Because additional port investment costs are captured separately in the net benefit/cost analysis (set out in **Section 5**), port charges were kept the same across all ship sizes analysed, to avoid the double counting of additional port investment costs.

- **Service charges** – covers the various services the vessel uses in port, including cargo handling. Cargo handling charges are usually in the form of a rate per container handled.

  Because the focus of the analysis is on estimating any economies of scale from larger-sized ships, only port dues have been included in the analysis. This is because port dues tend to be a fixed rate for different-sized ships, whereas cargo handling charges are usually in the form of a rate per container handled.

[41] *The UN's International Maritime Organization estimates international shipping accounted for 870 million tonnes of carbon emissions in 2007 – equivalent to 2.7% of global emissions (International Maritime Organization, 2009).*

[42] *Maersk's issue paper on energy consumption refers. http://about.maersk.com/en/CorporateCitizenship/Environment%20Documents/Energy_consumption1.pdf*

[43] *'Maersk Throttles Speed on More Routes' (15 December 2009), Janet Porter, Lloyd's List, http://www.lloydslist.com/ll/news/maersk-throttles-speed-on-more-routes/1260545072750.htm;jsessionid=68E22A587B4F603BCF54E7AF780EAF6A.065acf6a61c52eed94766d1ba7da5d95d4ecd58a*

[44] *'Michelin Wary of Slow Steaming' (28 January 2010), Matthew Beddow, http://www.ci-online.co.uk/news/showNews.asp?News_ID=26732*

Therefore average cargo handling costs per TEU will be the same regardless of ship size, whereas average port due costs per TEU will differ with ship size.

Table 20 shows the other key assumptions and features of the shipping cost model (shown below for a direct New Zealand to Singapore service with one North Island and one South Island hub port).

Table 20: Key Assumptions and Features of the Shipping Cost model for a Direct New Zealand to Singapore Service with Two New Zealand Bigger Ship Ports

Vessel Size (TEU)	1,200	2,600	4,300	6,500	8,500	11,000
1. Ship Characteristics						
Nominal container capacity (TEU)	1,200	2,600	4,300	6,500	8,500	11,000
Design speed (knots)	18.3	20.9	23.8	25.2	25.5	25.5
Design fuel consumption (tonnes/day)	42	79	147	214	230	240
Operating speed - terminal to terminal (knots)						
- low speed	14.0	14.0	14.0	14.0	14.0	14.0
- medium/high speed	18.3	20.0	20.0	20.0	20.0	20.0
Actual fuel consumption (tonnes/day)						
- at low speed	18.8	23.7	29.9	36.7	38.1	39.7
- at medium/high speed	54.8	69.2	87.2	107.0	111.0	115.8
Time per port call (days)	0.7	1.0	1.2	1.6	2.0	2.4
2. Service Schedule						
Distance of round trip (nautical miles)	11,040	11,040	11,040	11,040	11,040	11,040
Service frequency (no. of services per week)	1	1	1	1	1	1
Number of voyages per annum	52	52	52	52	52	52
Port calls on round voyage	3	3	3	3	3	3
Days at sea						
- at low speed	32.9	32.9	32.9	32.9	32.9	32.9
- at medium/high speed	23.0	23.0	23.0	23.0	23.0	23.0
Days in port	2.1	3.0	3.6	4.8	6.0	7.2
Total voyage time (days)						
- at low speed	35.0	35.9	36.5	37.7	38.9	40.1
- at medium/high speed	25.1	26.0	26.6	27.8	29.0	30.2
No. of voyages per ship per annum						
- at low speed	10.4	10.2	10.0	9.7	9.4	9.1
- at medium/high speed	14.5	14.0	13.7	13.1	12.6	12.1
Required no. of ships in weekly string (rounded)						
- at low speed	5	6	6	6	6	6
- at medium/high speed	4	4	4	4	4	4
3. Capacity Utilisation and Mix of Containers Carried						
Nominal to actual capacity ratio	74%	74%	66%	66%	66%	66%
Actual container capacity of ship (TEU)	888	1,924	2,838	4,290	5,610	7,260
% loaded containers inbound (imports)	60%	60%	60%	60%	60%	60%
% loaded containers outbound (exports)	86%	86%	86%	86%	86%	86%
Loaded containers shipped inbound (TEU)	533	1,155	1,703	2,575	3,367	4,357
Loaded containers shipped outbound (TEU)	762	1,651	2,435	3,681	4,813	6,229
Loaded containers transported per voyage (TEU)	1,295	2,806	4,138	6,256	8,180	10,586
Total loaded containers transports per ship per year (TEU)						
- at low speed	13,250	28,558	41,431	60,633	76,841	96,462
- at medium/high speed	18,829	39,385	56,785	82,132	102,959	127,947
4. Ship Costs (US $)						
Operating costs ($/day)	4,643	5,707	6,000	6,500	7,000	7,500
Capital costs based on ship ownership model ($/day)	10,274	19,726	27,534	36,575	45,205	53,425
- capital value ($)	25 mill.	48 mill.	67 mill.	89 mill.	110 mill.	130 mill.
- depreciation period (years)	20	20	20	20	20	20
- interest rate (% pa)	10%	10%	10%	10%	10%	10%
Capital costs based on ship charter model ($/day)						
- low charter rate (current)	4,000	4,500	6,500	8,250	10,000	12,121
- medium charter rate	16,000	18,000	26,000	33,000	40,000	48,485
- high charter rate	28,000	31,500	40,000	55,000	70,000	89,091
Bunker price						
- medium bunker price ($/tonne)	500	500	500	500	500	500
- high bunker price ($/tonne)	600	600	600	600	600	600

Table 21: 2010 Scenarios - Service Route Profiles (based on Vessel-Sharing Arrangements)

	Status Quo	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Nominal Capacity (TEU)	NZ direct to Singapore (1x4100 TEU, 2x2700 TEU services)	NZ direct to Singapore (2x5000 TEU services)	NZ direct to Singapore (1x6000 TEU, 1x4100 TEU service)	NZ direct to Singapore (1x7000 TEU, 1x2700 TEU service)	NZ to Australia, then Australia to Singapore (AU hub) (NZ to AU: 1x4100 TEU, 2x2700 TEU services) (AU to Singapore: 7000 TEU services)
2700	**NZS:** Singapore-Brisbane-Auckland-Lyttelton-Wellington-Napier-Tauranga-Port Kelang-Singapore **Capricorn:** Singapore-Jakarta-Fremantle-Melbourne-Sydney-Bluff-Otago Lyttelton-Wellington-Napier-Tauranga-Brisbane-Singapore			Singapore-Melbourne-Auckland or Tauranga-Napier-Wellington-Lyttlelton or Otago-Bluff-Singapore	1. Melbourne-Auckland-Lyttelton-Wellington-Napier-Tauranga-Melbourne 2. Melbourne-Sydney-Bluff-Otago-Lyttelton-Wellington-Napier-Tauranga-Melbourne
4100	**NZ1:** Singapore-Brisbane-Auckland-Otago-Tanjung Pelepas-Singapore		Singapore-one main Nth Island port - one main Sth Island port - Singapore		Melbourne-Auckland-Otago-Melbourne
5000		1. Singapore-Melbourne-one main Nth Island port-one main Sth Island port-Singapore 2. Singapore-Brisbane-the other main Nth Island port-the other main Sth Island port-Singapore			
6000			Singapore-Melbourne-the other main Nth Island port-the other main Sth Island port-Singapore		
7000				Singapore-Brisbane-Auckland or Tauranga-Lyttelton or Otago-Singapore	Singapore-Melbourne-Singapore

Table 22: 2010 Scenarios - Shipping Capacity and Ship Types Used

	Number of Services using each Ship Size				
	Status Quo	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**
Nominal Capacity (TEU)	NZ direct to Singapore (1x4100 TEU, 2x2700 TEU services)	NZ direct to Singapore (2x5000 TEU services)	NZ direct to Singapore (1x6000 TEU, 1x4100 TEU service)	NZ direct to Singapore (1x7000 TEU, 1x2700 TEU service)	NZ to Australia, then Australia to Singapore (AU hub) (NZ to AU: 1x4100 TEU, 2x2700 TEU services) (AU to Singapore: 7000 TEU services)
2700 (2000 actual)	2			1	2
4100 (2700 actual)	1		1		1
5000 (3300 actual)		2			
6000 (4000 actual)			1		
7000 (4600 actual)				1	3 (between Melbourne & Singapore)
Total actual capacity (TEU)	**6700**	**6600**	**6700**	**6600**	**6700** (between NZ and Australia)

Table 23: 2010 Scenarios - Average Sailing Speed and Number of Ships Required in a Weekly String under each Scenario

	Number of Ships Required for a Weekly String				
	Status Quo	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**
Nominal Capacity (TEU)	**NZ direct to Singapore (1x4100 TEU, 2x2700 TEU services)**	**NZ direct to Singapore (2x5000 TEU service)**	**NZ direct to Singapore (1x6000 TEU, 1x4100 TEU service)**	**NZ direct to Singapore (1x7000 TEU, 1x2700 TEU service)**	**AU hub**
2700 #1	**5** (20.3 knots)			**5** (19 knots)	**3** (17 knots)
2700 #2	**6** (18.3 knots)				**3** (19 knots)
4100 #1	**4** (23.8 knots)		**4** (20 knots)		**2** (22 knots)
5000 #1		**5** (18 knots)			
5000 #2		**5** (18 knots)			
6000 #1			**5** (18 knots)		
7000 #1				**5** (19 knots)	**3** (22 knots)
7000 #2					
Total Number of ships required	**15**	**10**	**9**	**10**	**8** (between NZ and Australia)

Table 24: 2015/16 and 2020 Scenarios - Service Route Profiles

	2015/16 scenarios				2020 scenarios		
	Base Case	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Base Case**	**Scenario 1**	**Scenario 2**
Nominal Capacity (TEU)	**NZ direct to Singapore (1x4100 TEU, 3x2700 TEU services)**	**NZ direct to Singapore (1x5000, 2x4100 TEU services)**	**NZ direct to Singapore (1x7000, 1x4100, 1x2700 TEU services)**	**NZ to Aust, then Aust to S'pore (AU hub). (NZ to AU: 1x4100, 3x2700 TEU services, AU to S'pore: 7000 TEU services)**	**NZ direct to Singapore (1x4500 TEU, 2x4100 1x2700 TEU services)**	**NZ direct to Singapore (1x7000, 1x4500, 1x4100 TEU services)**	**NZ to Aust, then Aust to S'pore (AU hub). (NZ to AU: 1x4500, 2x4100, 1x2700 TEU services, AU to S'pore:7000 TEU services)**
2700	**NZS:** Singapore-Brisbane-Auckland-Lyttelton-Wellington-Napier-Tauranga-Port Kelang-Singapore **Capricorn:** Singapore-Jakarta-Fremantle-Melbourne-Sydney-Bluff-Otago-Lyttelton-Wellington-Napier-Tauranga-Brisbane-Singapore **New Service:** Singapore-Brisbane-Auckland-Otago-Tanjung Pelepas-Singapore		Singapore-Sydney-Auckland-Napier-Wellington-Otago-Bluff-Singapore	**NZS:** Melbourne-Auckland-Lyttelton-Wellington-Napier-Tauranga-Melbourne **Capricorn:** Melbourne-Bluff-Otago-Lyttelton-Wellington-Napier-Tauranga-Melbourne **New service:** Melbourne-Auckland-Otago-Melbourne	Singapore-Brisbane-Auckland-Otago-Tanjung Pelepas-Singapore		Melbourne-Auckland-Otago-Melbourne
4100	**NZ1:** Singapore-Brisbane-Auckland-Otago-Tanjung Pelepas-Singapore	Singapore-Brisbane-Auckland-Lyttelton-Wellington-Napier-Tauranga-Port Kelang-Singapore Singapore-Jakarta-Fremantle-Melbourne-Sydney-Otago-Lyttelton-Wellington-Napier-Tauranga-Melbourne-Singapore	Singapore-Melbourne-Auckland-Napier-Wellington-Otago-Singapore		Singapore-Brisbane-Auckland-Lyttelton-Wellington-Napier-Tauranga-Port Kelang-Singapore Singapore-Jakarta-Fremantle-Melbourne-Sydney-Otago-Lyttelton-Wellington-Napier-Tauranga-Melbourne-Singapore	Singapore-Sydney-Auckland-Napier-Wellington-Otago-Singapore	Melbourne-Auckland-Lyttelton-Wellington-Napier-Tauranga-Melbourne Melbourne-Otago-Lyttelton-Wellington-Napier-Tauranga-Melbourne
4500					Singapore-Brisbane-Auckland-Otago-Tanjung Pelepas-Singapore	Singapore-Melbourne-Auckland-Napier-Wellington-Otago-Port Kelang-Singapore	Melbourne-Auckland-Otago-Melbourne
5000		Singapore-Brisbane-Auckland-Otago-Tanjung Pelepas-Singapore					
7000			Singapore-Brisbane-Tauranga-Lyttelton-Singapore	Singapore-Melbourne-Singapore		Singapore-Brisbane-Tauranga-Lyttelton-Singapore	Singapore-Melbourne-Singapore

Table 25: 2015/16 and 2020 Scenarios - Shipping Capacity and Ship Types Used

	2015/16 scenarios: no. of services using each sized ship				2020 scenarios: no. of services using each sized ship		
	Base Case	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Base Case**	**Scenario 1**	**Scenario 2**
Nominal Capacity (TEU)	NZ direct to Singapore (1x4100 TEU, 3x2700 TEU services)	NZ direct to Singapore (1x5000, 2x4100 TEU services)	NZ direct to Singapore (1x7000, 1x4100, 1x2700 TEU services)	NZ to Aust, then Aust to S'pore (AU hub). (NZ to AU: 1x4100, 3x2700 TEU services, AU to S'pore: 7000 TEU services)	NZ direct to Singapore (1x4500 TEU, 2x4100 1x2700 TEU services)	NZ direct to Singapore (1x7000, 1x4500, 1x4100 TEU services)	NZ to Aust, then Aust to S'pore (AU hub). (NZ to AU: 1x4500, 2x4100, 1x2700 TEU services, AU to S'pore:7000 TEU services)
2700 (2000 actual)	3		1	3	1		1
4100 (2700 actual)	1	2	1	1	2	1	2
4500 (3000 actual)					1		1
5000 (3300 actual)		1				1	
7000 (4600 actual)			1	4 (between Melbourne and Singapore)		1	4 (between Melbourne and Singapore)
Total actual capacity (TEU)	**8700**	**8700**	**9300**	**8700 between NZ and Aust**	**10,400**	**10,400**	**10,400 between NZ and Aust**

Table 26: 2015/16 and 2020 Scenarios - Average Sailing Speed and Number of Ships Required in a Weekly String under each Scenario

	2015/16 scenarios: no. of ships required for a weekly string				2020 scenarios: no. of ships required for a weekly string		
	Base Case	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Base Case**	**Scenario 1**	**Scenario 2**
Nominal Capacity (TEU)	NZ direct to Singapore (1x4100 TEU, 3x2700 TEU services)	NZ direct to Singapore (1x5000, 2x4100 TEU services)	NZ direct to Singapore (1x7000, 1x4100, 1x2700 TEU services)	NZ to Aust, then Aust to S'pore (AU hub). (NZ to AU: 1x4100, 3x2700 TEU services, AU to S'pore: 7000 TEU services)	NZ direct to Singapore (1x4500 TEU, 2x4100 1x2700 TEU services)	NZ direct to Singapore (1x7000, 1x4500, 1x4100 TEU services)	NZ to Aust, then Aust to S'pore (AU hub). (NZ to AU: 1x4500, 2x4100, 1x2700 TEU services, AU to S'pore: 7000 TEU services)
2700 #1	**5** (17 knots)		**5** (19 knots)	**2** (17 knots)	**5** (17 knots)		**2** (19 knots)
2700 #2	**5** (20 knots)			**3** (17 knots)			
2700 #3	**6** (19 knots)			**3** (16 knots)			
4100 #1	**5** (20 knots)	**6** (18 knots)	**5** (20 knots)	**2** (18 knots)	**5** (21 knots)	**5** (19 knots)	**3** (19 knots)
4100 #2		**6** (19 knots)			**6** (20 knots)		**3** (19 knots)
4500 #1					**5** (18 knots)	**5** (20 knots)	**3** (18 knots)
5000 #1		**5** (18 knots)					
7000 #1			**4** (23 knots)	**3** (22 knots)		**5** (20 knots)	**3** (22 knots)
Total Number of ships required	**21**	**17**	**14**	**10** between NZ and Aust	**21**	**15**	**11** between NZ and Aust

Cost/Benefit Analysis Calculations:

The costs and benefits for each scenario were quantified based on a marginal cost approach, and cost savings/increases were calculated by comparing the scenarios with the base case at each point in time.

Ship Voyage Cost Savings

For each service in the scenarios, annual ship voyage costs (across all ships operated) were estimated by multiplying:

- The cost to shipping companies of running each sized ship on each route (calculated using the ship voyage cost model described in **Appendix 5**);
- The number of ships required to provide a weekly frequency service; and
- New Zealand's share of ship voyage costs. This was estimated by analysing the potential proportion of service capacity occupied by New Zealand import and export cargo on a round voyage. This was done to apportion costs/benefits between New Zealand and Australian shippers where relevant, because some round-trip voyages between New Zealand and Singapore may carry Australian import or export cargo.

The voyage costs under each scenario were compared with the base case at each point in time to calculate the change in cost.

For each of the scenarios, the average sailing speed was optimised for each service. The lowest speed the ship could sail at whilst maintaining the same number of vessels required in a weekly string, and allowing two to three days' slack time in the return voyage for unforeseen delays, was identified.

A long-run USD/NZD exchange rate of 0.66 (based on purchasing power parity) was used.

Carbon Cost Savings

Total carbon costs were calculated by multiplying:

- The total volume of CO_2 emitted (in tonnes) by all ships in service per year – from the ship voyage cost model;
- The international price of CO_2 (€10 per tonne); and
- The estimated proportion of ship voyage costs incurred by New Zealand import and export cargo.

An emission factor of 3.25 tonnes of CO_2 per tonne of bunker fuel burned (Maersk, 2009) was used to calculate the volume of CO_2 emissions.

The carbon costs under each scenario were compared with the base case to calculate the change in cost.

Cost of Cargo Aggregation

To estimate these costs, the Shippers' Council assessed how cargo currently moves from each major region to market, and how it is likely to change under each of the different scenarios – focusing on whether cargo is likely to be redirected from one port to another, and any modal transport changes compared with the status quo.

Under some scenarios (for example, where a 7000 TEU ship calls at Port of Tauranga), it was assumed a proportion of Auckland-destined imports (equivalent to the proportion of shipping capacity provided by the 7000 TEU services), would be shipped through Port of Tauranga. In these cases, the difference between moving these volumes by truck from Ports of Auckland to South Auckland (where major distribution centres are located) and railing these volumes from Port of Tauranga to MetroPort, was included as the additional cost of aggregating cargo.

Furthermore, ports that do not receive a direct South East Asia service call in each of the scenarios would also incur a cargo aggregation cost (ie the cost to road/rail/coastal ship cargo from a regional port to an export port). At present, cargo from some ports (New Plymouth, Nelson and Timaru) already incurs an aggregation cost because they do not get a direct South East Asia service call. Therefore, only cargo from Wellington, Napier, and Bluff (ie ports that currently receive a South East Asia service call), are potentially impacted by an additional cargo aggregation cost under some scenarios (where they do not get a South East Asia service call).

Cargo from Nelson may incur a slight increase in cargo aggregation cost depending on assumptions. It was assumed that under the status quo, Nelson cargo is coastal shipped to Wellington for export. In each of the scenarios, the same occurs if Wellington continues to get a direct South East Asia service call. If not, then it is assumed Nelson cargo is coastal-shipped to Lyttelton for export (thus incurring a slight increase in cost due to the extra distance).

Any additional cargo aggregation costs that might be incurred per TEU as a direct result of bigger ships, were estimated for each region based on the Shippers' Council's collective knowledge of road, rail, and coastal shipping costs.

The total cargo aggregation costs for all cargo was calculated by multiplying the total TEUs exported/imported through each port via Singapore by the estimated cost of cargo aggregation by region.

Time Costs

The analysis focused on estimating time costs for exporters, because exports will be more heavily impacted by time costs than imports. The time costs for importers were not estimated because it is mainly in the form of inventory holding costs, which would ultimately be passed on to buyers. Exporters have less scope to pass costs to buyers.

To estimate the change in time to transport export goods to market from each region, the Shippers' Council assessed how cargo currently moves from each major region to market, and how it is likely to change under each of the different scenarios – focusing on any modal transport changes.

The likely change in time taken to move goods from each region to export port via road, rail or coastal shipping (including time allowances for inter-modal exchanges, time at port, and time at sea) was estimated.

The time-related costs were calculated based on the following assumptions:

- Opportunity cost of holding inventory = 0.027% of value per day (based on a weighted average cost of capital of 10% per annum); and
- The value of perishable export goods (chilled meat, fresh fish/shellfish, and fresh fruit and vegetables) depreciates at an exponential rate.

Port Investment Costs

The capital requirements (and thus cost) of each port to become 7000 TEU ship capable (in terms of channel deepening, berth pocket deepening, and/or berth length expansion), varies from port to port.

However, information provided by the four ports suggests the average capital investment at each port to be 7000 TEU ship capable is approx. NZ $109 million per port.

To estimate the annualised cost of port investment (or the return required from ports to recover the cost of capital investment), the opportunity cost of capital and depreciation costs of depreciable assets were calculated, using a depreciation period of 20 years for depreciable capital expenditure, and a weighted average cost of capital of 10% per annum.

The Shippers' Council understands from ports that the cost of capital dredging, like land, is not depreciable, as it increases ports' asset value.

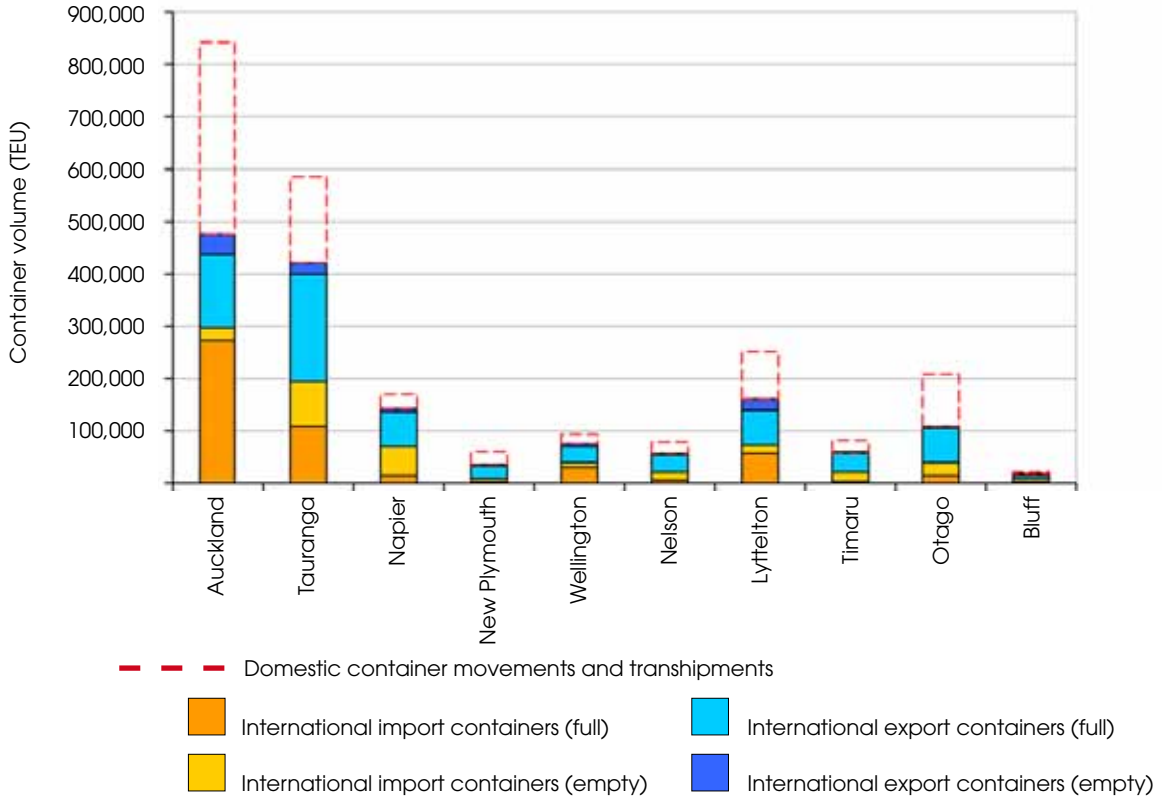
Given a substantial part of port investments is related to dredging, it was assumed approx. 75% of total port investment cost is for dredging, and therefore not depreciable.

Overseas transhipment costs

Transhipment in Australia is estimated to cost an additional NZ $400 per TEU.

Appendix 7: Composition of all Container Movement Types at Ports (including full and empty containers, domestic containers, and transhipments)

Figure 21: Composition of Container Movement Type by Port in 2008



Source: Cubic-Njord (2009), Rockpoint (2009)

List of Tables

List of Figures

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