

Economic Impacts of the Ports of Auckland Limited 2010, 2021 and 2031

Prepared for

Ports of Auckland Limited



Ports of Auckland

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1 Executive Summary

The role of the Ports of Auckland Limited (POAL) is wide ranging and it's economic impact significant. As both a provider of infrastructure for exporters and importers, and a major commercial activity in its own right, the Port makes very significant contributions to the Auckland and national economies in terms of activity and job creation. In this study the economic impact of the Ports of Auckland is measured for the Auckland and national economies. The impact of the Port has been measured in terms of economic activity – value added (equivalent to GDP) and employment.

The Port's role includes the core activity on the Port (the Port operation itself and closely related activities) and the activity of businesses which use the Port to export and import goods (trade that is facilitated by the Port). Although not all international trade through the Port is dependent on the Ports of Auckland *per se*, it is dependent on the ports sector. Within the port options available, the shipping companies servicing New Zealand make high level decisions about which ports they will service, and therefore have a significant influence on trade flows, and which exporters and importers choose to use a particular port (such as POAL) because it is the most efficient way of meeting their needs. It is important to understand the quantum of activity that relies on the Port in some way.

It is equally important to understand the quantity of activity which is dependent on the Ports of Auckland. This activity is commonly referred to as the economic impact, which in the case of the Ports of Auckland is the activity which would be lost if the Port was removed. At the Auckland level the impact arises from both core activity and the share of trade activity which is dependent on the existence of the Port and is a net addition to the economy. At the national level the economic impact does not include much of the core activity, as in theory this could be transferred to other ports in New Zealand. However, in practice, in the long term, there is insufficient capacity at other ports (such as Port of Tauranga (POT)) to allow such a transfer, and POAL and Tauranga both will need to be operating at capacity and in a coordinated manner to meet the freight handling demands of New Zealand and the upper North Island (imports and exports).

The impact of the Port has been measured for the 2010 calendar year, and a set of scenarios have been used to estimate the potential impacts of the Port in the future. Some of these future scenarios assess impacts of the Port if the economic growth goals in the draft Auckland Plan economic growth goals are met¹.

POAL 2010

In total, POAL's Port activity creates:

- Total direct output of \$207.6 million per year.
- Direct value added to the Auckland economy of \$109.1 million, sustaining 652 jobs (ECs, or 'employment count') annually.
- Flow-on effects from direct value added that generate a further \$138.5 million in value added

¹ The Auckland Council has proposed a set of aspirational economic goals which if reached will cause a step change in the economy (Auckland Council 2011). The Council has suggested that the city should strive to obtain average growth in GDP of 5.1% to 6.2% per annum and/or exports growth of 6.8% to 7.5% per annum out to 2031.

and 1,375 ECs of additional employment, through indirect and induced impacts.

- The total impact of port activities on the Auckland economy is \$247.6 million in value added, or 2,027 employees.

In addition to the Port Activity, POAL supports a significant and growing international cruise industry in Auckland which would not exist without the services POAL supplies (pilotage, tugs, dredging and wharf infrastructure etc.). As a cruise exchange port, Auckland forms an important part of the network of stops in New Zealand, and if Auckland was unable to accommodate cruise activity, a number of the cruise ship operations may cease calling to New Zealand entirely, creating losses that would extend further than the Auckland area. In 2010 the Port's presence created \$50.3m of direct expenditure by the cruise industry, and the total effect of this injection into the Auckland economy generated \$50.4m of value added (GDP) and 791 jobs in Auckland, over and above the Port and Port-related activity outlined above.

While the Port has a significant role in a large proportion of the economic activity in Auckland, it is important to understand that much of the trade activity is not entirely dependent on the existence of the Port of Auckland. If POAL did not exist or its capacity was restricted a proportion of the trade which would have gone through POAL would simply be redirected to other ports in New Zealand. However the additional (transport) costs to exporters and importers would mean that some of the trade activity could not be redirected and would not occur. In total:

- If the Ports of Auckland were removed, the economic impact would be over \$741 million per annum (or 9,600 jobs) in the Auckland economy, through its core activity and the trade it handles.
- This combined role equates to 1.3 percent of productive economic activity in the Auckland economy (which is \$56.5 billion²).and sustains some 9,600 jobs (1.7 percent of Auckland employment).

POAL 2021 and 2031

The Port is expected to continue to grow in importance in the future both at the national and city level:

- If the Port and related activity has similar growth to expected growth in trade volumes and values, POAL would grow from \$247.6 million of value added in 2010 to \$343.8 million by 2031. The draft Auckland Plan economic growth goals projections indicate that the Port could grow at a faster rate, reaching up to \$905 million by 2031
- Cruise industry activity in Auckland is expected to grow from \$50.3 million in 2010 to \$152.3 million in 2031.
- The trade dependent on POAL in the Auckland economy was \$443.3 million in 2010, which is expected to increase to \$641.5 million by 2031, or up to \$1,729 million if the draft Auckland Plan economic growth goals are met.
- In total the activity in Auckland that is dependent on the existence of the Ports of Auckland is expected to increase from \$741 million in 2010 to range between \$997 to \$1,349 million by

² Industry contribution to the economy, excludes taxes.

2031, or \$2,576 to \$2,882 million if the draft Auckland Plan economic growth goals are met. (Table 1.1).

In total around \$598 to \$720 million of the national economy will be dependent on the existence of POAL by 2031, equivalent to between 9,200 and 11,100 jobs. If the draft Auckland Plan economic goals were achieved, the national impact of the Port would increase up to \$1.8 billion of GDP or some 27,100 jobs.

Table 1.1: Summary of the Ports of Auckland Economic Impact (GDP)

	Business-as-usual						Draft Auckland Plan Growth Goals (Highest)					
	Auckland Economy			New Zealand Economy			Auckland Economy			New Zealand Economy		
	2010	2021	2031	2010	2021	2031	2010	2021	2031	2010	2021	2031
Core Activity (\$m)												
Port Activity	\$ 248	\$ 303	\$ 344	\$ 4	\$ 8	\$ 9	\$ 248	\$ 484	\$ 905	\$ 248	\$ 16	\$ 31
Cruise Industry	\$ 50	\$ 90	\$ 152	\$ -	\$ -	\$ -	\$ 50	\$ 116	\$ 248	\$ 50	\$ -	\$ -
Total Core	\$ 298	\$ 393	\$ 496	\$ 4	\$ 8	\$ 9	\$ 298	\$ 600	\$ 1,153	\$ 298	\$ 16	\$ 31
POAL Dependent Trade (\$m)												
Imports	\$ 152	\$ 192	\$ 227	\$ 140	\$ 186	\$ 221	\$ 152	\$ 241	\$ 375	\$ 152	\$ 236	\$ 368
Exports	\$ 292	\$ 357	\$ 414	\$ 305	\$ 366	\$ 424	\$ 292	\$ 657	\$ 1,354	\$ 292	\$ 667	\$ 1,365
Total Trade	\$ 443	\$ 549	\$ 641	\$ 445	\$ 552	\$ 645	\$ 443	\$ 898	\$ 1,729	\$ 443	\$ 902	\$ 1,734
Total Impact	\$ 741	\$ 942	\$ 1,138	\$ 448	\$ 561	\$ 655	\$ 741	\$ 1,499	\$ 2,882	\$ 741	\$ 918	\$ 1,765
Total Employment (EC)	9,584	12,261	14,980	7,083	8,656	10,103	9,584	19,553	37,841	9,584	14,108	27,056

2 Introduction

2.1 Objectives and Background

The primary objective of this study is to quantify the economic impacts of the Ports of Auckland Limited (POAL) on the Auckland economy and the national economy in 2010. This study follows the report prepared by McDermott Fairgray Group in 1999, Market Economics in 2005 and Covec in 2008. This report is one of two, the other being the “Economic Role of POAL 2010, 2021, 2031” which assesses the role of the POAL within the economy.

This study extends the previous research to examine two additional objectives. One new objective is to estimate the proportion of exports and imports through POAL that are entirely dependent on the existence of POAL. This will enable us to establish the economic impact of the Port on the Auckland and national economy.

The second new objective is to establish the impact of POAL in the future under a range of growth scenarios. This work will provide a guide to POAL, policy makers and stakeholders on the potential size of the Port in the future, and establish the potential future impact of POAL if the growth goals contained in the draft Auckland Plan economic are realised.

POAL History

Formed in 1988 from the former Auckland Harbour Board, POAL has undergone a number of ownership structures. Auckland Regional Holdings (ARH) was established in 2004 by an Act of Parliament to be responsible for the ownership and management of a range of assets that provide returns to be used to fund transport and water quality projects across the city. ARH took control of the 100 percent of POAL shares held by the Auckland Regional Council in 2005, along with America's Cup Village Ltd (ACVL), then the 100% shareholding in POAL was transferred to Auckland Council Investments Ltd (ACIL) with the 2010 amalgamation of Auckland's local bodies.

POAL operate two ports in the Auckland area: the Port of Auckland located on the Waitemata Harbour and the Port of Onehunga on the Manukau. The Ports of Auckland is New Zealand's largest international port. It offers daily services to most of New Zealand's major trading partners, while the Port of Onehunga offers coastal shipping services and some trans-shipping of international goods to and from the rest of New Zealand, through subsidiary CONLINXX POAL also owns and operates an inland freight hub at Wiri, South Auckland.

The POAL affects the economy in a number of ways. First, the Port is a substantial operation in its own right. In the past year it generated turnover of \$170.8 million (revenue calendar year 2010). This generates a direct impact on the economy and flow on effects associated with the purchase of goods and materials to support the operation. Note that this excludes the portion of rental income from (approximately \$3.3 million) that is not related to port activity.

Second, POAL is owned by Auckland Council Investments Limited, which is owned by the Auckland Council. Profits from the port are used to pay dividends to the Council to help pay for regional infrastructure and services. Since POAL de-listed from the sharemarket in 2005 has paid dividends and made in-specie distributions totalling more than \$527m to its Council-owned shareholders.

Third, and most importantly, is the Port's role in supporting and facilitating business activities which import and export goods. As these activities are vital to the nation's economy, the role of POAL and other ports is vital to the nation's economy.

2.2 Defining the Economic Effects

2.2.1 Scope

The economic impact of Ports of Auckland Limited is a measure of its contribution to the Auckland and national economies. This contribution is most appropriately expressed in terms of Gross Domestic Product (GDP) or value added, and the number of people employed in creating that added value. Both measures have been used in this study and are discussed in more detail in the appendices.

The focus in the study is on impacts of "what is" as well as on "what might otherwise be". Both the present and future situations are analysed with and without a port in Auckland. This allows an estimation of the most likely impacts arising from the POAL operation and the potential losses to both the Auckland and national economies should the Port no longer be able to function on Auckland's waterfront.

Businesses are dynamic and adjust to change. However the Auckland economy would be dramatically different without its Port. The overall result would be higher cost structures for both exporters and importers which would work out over time as businesses relocated to other regions or adjusted to the new realities. It is important to make these comparisons when considering the extent of the Ports of Auckland effect, because there is a port in existence and the study objective is to show the impact of that port within the economy.

A critical step in measuring the economic impact of POAL is defining the specific activities which are attributable to the Port. Three types of economic activity are assessed:

- a) **POAL Core Activity:** is the Ports of Auckland direct activity.
- b) **POAL Trade Activity:** is the imports and exports that flow through the Ports of Auckland.
- c) **POAL Dependent Trade:** is the trade that flows through the Ports of Auckland that would be lost if POAL was removed from the port sector.

2.2.2 POAL Core Activity

The core activity is a measure of the value which POAL adds to the economy, and includes the POAL activity and activity by other operators that rely directly on the Port to conduct their activity. The core economic impact is split into two subcategories:

1. **Port Activity.** This category includes the core Port activities which define the operation of the Port, and supporting services such as logistics, port infrastructure and port security. This is not simply the total POAL activity, as some POAL activity is not strictly port sector activity. For example the Port Activity measure excludes the portion of rentals received by POAL that

comes from non-port properties, which is not considered to be true port related activity.

2. **Cruise Tourism.** This includes spend by the cruise industry in Auckland, and is defined as core economic impact because it would be lost if the Port was removed. For example, if the Port did not exist, the cruise passengers that currently visit Auckland would not be able to spend money on shore excursions in the city. Therefore, the existing cruise passenger spend on shore excursions in Auckland is entirely dependent on the ability to access the shore via POAL.

2.2.3 POAL Trade Activity

The trade activity arises from the amount of business activity which the Port facilitates, but which is not necessarily dependent on that port, though it does depend on the existence of the port sector. This is a broader but less specific effect than the impacts measured in the POAL dependent trade, and arises where a sector uses the Port for exports or imports. Part of that sector's activity is dependent on that trade, and on the existence of port services, but that dependency cannot be reasonably linked to a specific port. Thus, not all the export trade passing through Auckland can reasonably be defined as dependent on the POAL.

However, all of the activity to produce those exports is facilitated by the existence of the Port, even if not dependent on it. While the impacts measure the "true" economic impact of the Port, the facilitated trade is more representative of the overall role which the Port plays in the economy, even when alternative ports exist.

Ports of Auckland has a substantial facilitated trade, because of the large shares of imports and exports that it services. Moreover, it is clear that a much larger share of New Zealand's trade passes through the POAL than would be indicated by the size of Auckland's natural (closest) catchment area. POAL is operating as a New Zealand hub port and trade from the natural catchments of other ports also passes through Auckland, indicating that there are substantial advantages to importers and exporters from using the Port, and that for this trade, POAL has more than just a facilitation effect.

2.2.4 POAL Dependent Trade

While a port seldom generates demand for trade just from its existence, it does provide an opportunity for that trade to occur, and the existence of a port is a necessary (but not sufficient) condition for trade to take place. This trade usually increases the size of the economy, especially where access to international markets means the scale of sustainable activity is greater than that which the domestic market alone would support. If a specific port does add to the amount of trade and the size of economic activity, then that is also part of its core impact. However in this study we have measured the trade impact separately to enable easier comparison with past studies.

An important part of estimating the trade impact of the Port is the concept of port dependence, and distinguishing to what degree sectors of the economy are dependent on the Port for their existence. Typically, sectors will serve both domestic and international markets, so the situation is not always clear cut. A sector may have some of its total activity dependent on a port, because one part of its output goes for export (and is "port dependent"). The proportions of port dependence will vary between sectors and individual businesses. For this study, the proportion of each sector's output

which goes to export has been considered as port dependent.

However, there is also a key distinction to be made between general port dependence and dependence on a particular port. Many businesses which export goods through the POAL are dependent on having a port, but may also continue to operate if there was no port at Auckland, because their port dependency may be met at another port. If there were no port services at all, then the level of activity of exporting businesses would be smaller, because they would no longer have direct access to overseas markets. Therefore, the situation is that some or all aspects of many businesses are port dependent but not Auckland Port dependent.

This does not mean that exporting and importing businesses are indifferent to the Port they use, nor that the existence of POAL has no bearing on the size of the local, regional or national economies. Where exporting or importing through Auckland is the most efficient means of trading, then the extra efficiency (whether cost, time, convenience or other advantage) over the alternative may generate an economic impact which is directly attributable to that particular port. Consider the following example. A business, by exporting through the Ports of Auckland, is able to export at lower cost, and therefore sells more goods overseas than it could through the next most convenient port. Assume the business's total output is \$100m, including \$50m to export. Assume also that if the business did not have access to the POAL, its total exports would only be \$40m. Thus, the additional \$10m of exports are attributable to Auckland. This would mean that 50 percent of the output of that business can be considered "port dependent", and the 10 percent which is only sustainable because of access to the POAL is "Auckland port dependent".

For that part of a business which is dependent on the specific port, all the value it adds to the economy can be attributed to the Port, because without the Port the business and all its interactions would not exist. For that part which is port dependent but not on a specific port, then the value added can be attributed to ports in general, though not tied to a specific port.

A related and more general effect is the impact of a port on business location decisions, where activities have been attracted to Auckland because of the Port. While this is also hard to quantify, and is mixed in with other factors, there are clear causal links for many existing businesses. Similarly, activities which have established in Auckland to be near the Port in the past (such as freezing works and wool scourers) increased the size of the economy both directly and through their flow on effects, increasing the mass of the economy even though the specific activities have since disappeared. In this study the business location choice is not assessed, rather our assessment is based on total growth. While it is not possible to identify the shares of this total growth that will come from the growth/expansion of existing businesses as opposed to the start-up of new businesses. If POAL were to relocate out of Auckland, start-ups that would rely on POAL would likely follow the relocation and be lost to Auckland, while among existing Auckland businesses some would stay in Auckland and some would follow the relocated POAL.

This report therefore presents a conservative assessment of the impact of the port on the Auckland economy as it ignores the real effect of new start-ups potentially locating with the port rather than with the rest of the economy.

The literature supports these theories; a recent report from the Reserve Bank³ on the impact of the addition of a new port in the New Zealand network found that there is a positive relationship between export activity and the addition of a new port. The authors theorise that the addition of a new port reduces the cost structures of exporters which encourages more export behaviour.

This finding also holds for the opposite outcome where a port is removed from a network. A recent study for the Ministry of Transport⁴ used a national level General Equilibrium model and some stylised scenarios to estimate the impact of the consolidation of New Zealand port network into two large operators. The results showed a negative relationship between the reduction in seaport operators and the level of economic activity in the New Zealand.

2.2.5 Economic Impact

The economic impact of the Port is a subset of the economic role described above. The economic impact of the Port equals the amount of activity that is directly attributable to the Port and would be lost if POAL ceased operations. This includes core activity, and also trade activity. Given that much of the facilitated trade through the Port will still continue even if the Port did not exist by instead using other ports, the impacts of a port will generally be smaller than its economic role.

The economic impact can be identified for the Auckland economy specifically, as well as at the national level. The Auckland impact differs from the national impact in that parts of the core activity are dependent on the existence of POAL at the regional level, while not being dependent at the national level.

The direct economic impact at the Auckland economy level is equal to the core activity and the city level trade impacts of the Port. From the Auckland perspective the core economic activity is totally dependent on the existence of the POAL. However at the national level much of the activity on the Port could move to other ports if POAL was closed. Using the cruise passenger example, it may be that passengers have a fixed holiday budget and that a stop at Auckland may have no effect on the amount they spend in New Zealand. If this were the case, then at the national level the removal of the Port would produce no impact.

However, some of the core economic activity would be lost to the New Zealand economy if POAL activity ceased. Broadly certain activities on the Port are directly generated from the amount of trade occurring there. Therefore it is reasonable to assume that for these activities the amount of port activity that would be lost at the national level will be roughly proportional to the level of lost trade activity. For example, if the national trade impacts are 2 percent of the total trade activity, then we would expect that around 2 percent of the POAL port activity will be lost. This method has been applied to the port activity and transport and storage activities, while it is assumed that capacity at other ports is unlimited, and all other core activities will continue at new locations in New Zealand. In reality it is likely that if cruise ships cannot visit Auckland, they may not visit New Zealand at all, and

³ Fabling, Grimes and Sanderson, 2011

⁴ NZIER, 2010

there are capacity issues which may mean that other port activity could not relocate to other ports in the absence of POAL.

The direct economic impact at the National level is equal to the proportion of core impacts that do not transfer to other location in New Zealand and the national level POAL dependent trade.

Both the direct national and Auckland impacts have associated indirect and induced impacts. In this study we have applied similar input output models for both the economic role and the economic impact assessments.

2.3 Multiplier Methodology

This assessment uses multiplier analysis (also known as input-output analysis) to measure the economic role of POAL. Multiplier analysis is the most commonly used modelling technique for measuring total economic impacts, as it describes how any change in the level of output in one industry will result in changes in other industries because of interdependence between them. This flow-on effect is estimated using multipliers, which are ratios of direct, indirect and induced changes in output.

Conventional measures of economic role and impact (value added and employment) have been used in this study:

- Value added is preferred over output or turnover because those measures frequently lead to double counting. Value added broadly equates to gross domestic product (GDP) as a measure of economic activity at the national level, and gross regional product on the regional level.
- Employment is measured in employment count (EC) modified to include working proprietors (MEC). In this study we use MEC as this is the best estimate of total employment to provide a measure of labour demand associated with the Port's existence.

A detailed explanation of the IO model and multiplier methodology is provided in Appendix A.

2.4 Report Overview

This report is divided into 7 sections:

- Section 1 presents the Executive Summary, highlighting the major findings of the study and presenting the key results
- Section 2 describes the objective of the study and outlines the methodology and approach adopted.
- Section 3 provides a brief commentary on the economic context in which POAL operates.
- Section 4 covers the economic impacts of POAL's activities.
- Section 5 presents the economic impact of the Port at the Auckland and national levels.
- Section 6 describes how the Port's economic impact will change in the future under a set of scenarios.

3 Economic Context

3.1 Scope

The Auckland area contains the old cities of North Shore, Waitakere, Auckland, and Manukau, as well as the Papakura District, Rodney District and parts of the Franklin District. This study focuses on the economy of the entire Auckland area in the national context.

3.2 Demographics

The Auckland area is home to 1,459,000 residents in 504,000 households⁵, Canterbury is the next largest region with just under 559,000 residents, followed by Wellington 477,000. Auckland's share of total New Zealand population has grown steadily over the past three decades from 26 percent in 1981 to almost 31 percent in 1999, 32.6 percent in 2005 and 33.1 percent in 2011, and the region is currently attracting over 39 percent of New Zealand's total growth. This growth is attributable to natural increase, internal migration patterns (movements from rural areas to cities), and large shares of international immigrants settling in Auckland. Auckland's population is expected to grow by more than a million people over the next 30 years, with the city projected to have 60 percent of New Zealand's total population growth over that period.⁶

3.3 Employment

In 2010 there were around 580,100 ECs (employee count) working in Auckland (Statistics NZ Business Directory, 2010). The manufacturing industry is largest employer in the region with almost 72,500 ECs (12 percent). Retail Trade, Personal Services and Government sectors are the second largest employment sectors in Auckland each accounting for (10 percent) of the employment in the area. While Auckland CBD is the heart of business services and retail, Manukau and Auckland isthmus are the centres of the manufacturing base, although there is a degree of light industry in Waitakere and the North Shore. The manufacturing sector is well supported by the Ports of Auckland, which provides convenient access to export markets.

The Location Quotient (LQ) shows that Auckland has higher than average representative of Wholesale Trade (LQ of 1.56⁷) which is reliant on the POAL and AIAL to supply imported goods, and lower than average proportions of the primary production sectors – agriculture, forestry and fishing workers (LQ of 0.15⁸). Table 3.1 shows the structure of employment in Auckland, compared with the national picture.

⁵ Statistics New Zealand Population and Household Forecasts 2006

⁶ Draft Auckland Plan, September 2011

⁷ Auckland has 56% more employment in Wholesale Trade relative to the rest of New Zealand

⁸ New Zealand has much more agriculture employment, in relative terms nearly 7 times more than Auckland

Table 3.1: Employment, Auckland vs. New Zealand 2010 (EC)

	Auckland Area	New Zealand	Location Quotient
Agriculture, Forestry and Fishing	1%	6%	0.15
Mining	0%	0%	0.18
Manufacturing	12%	12%	1.03
Electricity, Gas and Water Supply	1%	1%	0.80
Construction	6%	6%	0.88
Wholesale Trade	9%	6%	1.56
Retail Trade	10%	11%	0.96
Accommodation, Cafes and Restaurants	6%	7%	0.89
Transport and Storage	5%	5%	1.17
Communication Services	3%	2%	1.40
Finance and Insurance	4%	3%	1.42
Property and Business Services	2%	2%	1.12
Government Administration and Defence	10%	8%	1.33
Education	6%	5%	1.16
Health and Community Services	5%	6%	0.79
Cultural and Recreational Services	9%	9%	1.00
Personal and other Services	10%	11%	0.90

Source: Statistics New Zealand Business Directory Database

3.4 Business Activity

The employment structure closely reflects business activity. In 2010 Auckland's industries produce GDP value of almost \$56 billion⁹, approximately 35 percent of New Zealand's total GDP (Market Economics Ltd, 2010). The largest contributors to GDP in Auckland are business services (finance, insurance, real estate), wholesale and retail, and manufacturing. Auckland generates a higher than average share of its GDP from the business services and wholesale, and lower than average shares from the primary sectors. The contribution of manufacturing is on a par with the national average (Table 3.2).

⁹ Note that the GDP value presented here is the value added produced by each industry which is roughly equivalent of National Income and Net Factor payments to the rest of the world. This measure excludes taxes and subsidies which means that Auckland's total GDP cannot be calculated from table 3.2.

Table 3.2: Productive Activity, Auckland, Rest of New Zealand and New Zealand 2010 (\$m)

	Auckland Area		Rest of New Zealand		New Zealand	
Agriculture, Forestry and Fishing	422	1%	7,646	7%	8,068	5%
Mining	86	0%	1,944	2%	2,030	1%
Manufacturing	7,737	14%	14,996	14%	22,733	14%
Electricity, Gas and Water Supply	1,385	2%	2,961	3%	4,346	3%
Construction	2,895	5%	6,664	6%	9,559	6%
Wholesale Trade	5,220	9%	5,432	5%	10,653	7%
Retail Trade	3,410	6%	7,037	7%	10,447	6%
Accommodation, Cafes and Restaurants	812	1%	2,257	2%	3,069	2%
Transport and Storage	2,776	5%	3,707	4%	6,483	4%
Communication Services	2,247	4%	2,832	3%	5,079	3%
Finance and Insurance	5,087	9%	5,823	6%	10,910	7%
Property and Business Services	14,879	26%	21,990	21%	36,869	23%
Government Administration and Defence	1,967	3%	6,393	6%	8,360	5%
Education	2,313	4%	4,798	5%	7,111	4%
Health and Community Services	2,924	5%	7,027	7%	9,950	6%
Cultural and Recreational Services	1,438	3%	2,187	2%	3,625	2%
Personal and other Services	880	2%	1,727	2%	2,607	2%
Total	56,479	100%	105,420	100%	161,899	100%

Source: Market Economics Ltd

Table 3.3 outlines forecast growth between 2010 and 2031. Overall the Auckland economy is expected to grow slightly faster than the national economy (1.9 vs. 1.5 percent). The largest growth is expected in the Construction sector followed by Health and Community services.

Table 3.3: Average Annual Growth Forecasts of Productive Activity (2010 to 2031)

	Auckland Area	Rest of NZ	New Zealand
Agriculture, Forestry and Fishing	1.2%	1.0%	1.0%
Mining	1.6%	1.2%	1.2%
Manufacturing	1.8%	1.4%	1.5%
Electricity, Gas and Water Supply	1.7%	1.0%	1.3%
Construction	2.5%	2.4%	2.4%
Wholesale Trade	1.8%	1.5%	1.6%
Retail Trade	1.8%	1.2%	1.4%
Accommodation, Cafes and Restaurants	1.7%	1.0%	1.2%
Transport and Storage	1.4%	1.0%	1.2%
Communication Services	1.9%	1.2%	1.5%
Finance and Insurance	1.8%	1.1%	1.4%
Property and Business Services	2.2%	1.3%	1.7%
Government Administration and Defence	1.7%	0.9%	1.1%
Education	1.4%	0.9%	1.1%
Health and Community Services	2.4%	0.8%	1.3%
Cultural and Recreational Services	1.9%	1.1%	1.4%
Personal and other Services	1.8%	1.1%	1.4%
Total	1.9%	1.3%	1.5%

Source: Market Economics Ltd EFM Business-as-Usual Scenario

4 Economic Impacts of Port Activity

4.1 Scope

This section presents the estimated economic role of the Ports of Auckland in the Auckland and national economies. All measures in this section are for the calendar year 2010, and all references to Auckland should be interpreted as the new Auckland Council area. The section calculates the quantum of activity that is either related to or is dependent on the Port, which together show the economic impact of the Port in the Auckland economy.

4.2 Port Activity

Core port activity includes general port sector operations (container terminal operations, cargo handling, general wharf operations), and marine services (towage, pilotage and line handling) for Auckland and Onehunga. POAL also facilitates cruise ship visits (which are accounted for in Cruise Tourism, section 4.3) and provides maritime control centres for both of Auckland's harbours. These activities define the operation of the Port and are supported by a range of services including logistics, port infrastructure, and port security. In this section we include demurrage as a component of transport and storage impacts, and exclude the portion of rental activity of POAL properties that are not related to port activity.

In total, Port activity creates:

- Total direct output of \$207.6 million
- Direct value added to the Auckland economy of \$109.1 million, and sustains 652 jobs¹⁰.
- Flow-on effects from direct value added that generate a further \$138.5 million in value added and 1,375 ECs of additional employment, through indirect and induced impacts.
- The total impact of port activities on the Auckland economy is \$247.6 million in value added, sustaining some 2,027 jobs. (Table 4.1).

Table 4.1: Port Activity (Auckland 2010)

Economic Activity	
Direct Effects	
Gross Output (\$m)	\$ 207.6
GDP or Value Added (\$m)	\$ 109.1
Employment (ECs)	652
Flow-on Effects	
GDP or Value Added (\$m)	\$ 138.5
Employment (ECs)	1,375
Total Impacts	
Gross Domestic Product (\$m)	\$ 247.6
Employment (ECs)	2,027

¹⁰ Estimated using Statistics New Zealand Business Frame Database (2010) Meshblocks 432400, 438204, 438209, 438210 and 438217.

4.3 Cruise Tourism

The cruise industry in New Zealand is highly dependent on the Ports of Auckland. Auckland's proximity to the international airport and high quality hotels in the CBD as well as efficient passenger, freight, and provisioning services make it the focal point for the cruise industry within New Zealand. The majority of cruises either begin or end in Auckland, and businesses in the region capture the pre- and post-cruise tourism activity. As well as most of the provisioning, Auckland provides most of the bunkering (refuelling) required by the industry, and captures most of the airline spend made by cruise tourists in New Zealand¹¹.

Some of the cruise activity within Auckland is purely reliant on the existence of the Port. For example passenger day spend in Auckland would be lost to the area if the Port did not exist, and cruise liners would redirect spend on goods and services to other regions or other countries. The Port also forms an important part of the network of stops in New Zealand, and if POAL was unable to accommodate cruise activity a number of the cruise ship operations may stop entire voyages to New Zealand and that the loss may extend further than the Auckland area. Further, there would be no Cruise Industry in Auckland without POAL due to the services supplied to the Cruise industry by the Ports, including tugs, dredging and infrastructure.

We draw on the estimates of regional impacts from the 2010 study completed for the Ministry of Tourism and Cruise New Zealand to summarise the spend which occurs in Auckland as a result of the Port. In that report the Auckland area was estimated to receive \$50.3m of cruise industry direct expenditure as a result of the Port's presence (excluding airfares and bunkering)¹². The total effect of this injection into Auckland economy generated \$50.4m of value added (GDP) and 791 jobs in Auckland (Table 4.2), and around \$153 million in value added to New Zealand (not included below).

Table 4.2: Cruise Tourism Activity (Auckland 2010)

Economic Activity	
Direct Effects	
Gross Output (\$m)	\$ 50.3
GDP or Value Added (\$m)	\$ 22.6
Employment (ECs)	428
Flow-on Effects	
GDP or Value Added (\$m)	\$ 27.8
Employment (ECs)	363
Total Impacts	
Gross Domestic Product (\$m)	\$ 50.4
Employment (ECs)	791

¹¹ In this study the majority of airline spend and bunkering is excluded from the cruise activity

¹² Estimated by adding the last half of the 2009/2010 season and the first half of the 2010/11 season.

5 Ports of Auckland Impact on the Economy

5.1 Scope

The economic impact of the Port equals the amount of activity that is directly attributable to the Port and would be lost if POAL ceased operations. This can be identified for the Auckland economy specifically, as well as at a national level. It is important to understand that some of the potential loss (impacts) at the Auckland level is not a loss at the national level. The differences are described in the following sections.

5.2 Core Activity

The Auckland impact differs from the national impact in that parts of the core activity are dependent on the existence of POAL at the City level, while not being dependent at the national level. The economic impact at the Auckland economy level includes all of the core activity. From the Auckland perspective the core economic activity is totally dependent on the existence of the POAL.

At the national level much of the activity on the Port could move to other ports if POAL was closed. However, some of the core economic activity would be lost to the New Zealand economy if POAL activity ceased.

Broadly, certain activities on the Port are directly generated from the **amount** of trade occurring there. Therefore it is reasonable to assume that for these activities the amount of port activity that would be lost at the national level will be roughly proportional to the level of lost trade activity. This method has been applied to the port activity and transport and storage activities. While it is assumed that all other core activities will continue at new locations in New Zealand.

5.3 POAL Dependent Trade

The existence of the Port is a necessary but not sufficient condition for all trade that flows through the Port. Whilst some of the trade activity is dependent on POAL specifically, the major share is dependent on ports in general but chooses to make use of the Port of Auckland as the best option.

Empirical measurement of trade impacts can be problematic because while establishing general port dependence is relatively straightforward, identifying business or sector dependence on a **specific port** is inherently difficult without extensive surveying. Even then, a business's ability to accurately attribute a share of its output to a particular cost saving or efficiency gain associated with a specific port would be doubtful. The removal or restriction of POAL would affect the cost structure of all businesses that use the Port in their import and export activity. Standard economic theory indicates that competitive businesses that face higher costs will produce less output for a given price.

5.3.1 Trade Redirected

The first step in the estimation of the trade impact of POAL is to establish the new location of the trade flows that would occur if POAL did not exist. In this study it is assumed that all cargo that used POAL would be redirected to the two largest North Island ports, Northland Port and Ports of Tauranga. The

example is illustrative; in reality these ports do not have the capacity nor infrastructure to accommodate all of POAL's trade making this exercise entirely theoretical.

Generally, the study assumes that exporters and importers choose the closest port to reduce transport costs and time. In particular, the POAL trade that has an origin or destination south of Auckland is assumed to be redirected to the Ports of Tauranga, while trade to or from areas North of Auckland are assumed to be redirected through Northland Port. The export and import trade from Auckland is assumed to be redirected to Ports of Tauranga as this port offers economies of scale which are not available at the Northland Port.

Applying these assumptions shows that 4 percent of the POAL exports would be redirected through Northland Port and the remaining 96 percent of exports flow through Ports of Tauranga, while around 3 percent of POAL imports would be redirected through Northland Port and 97 percent of imports flow through Ports of Tauranga.

Figure 5.1: Export redirected Port by Source Region, 2010

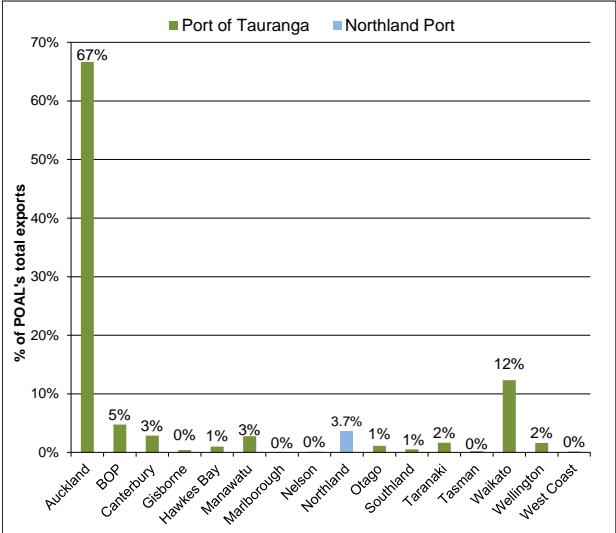
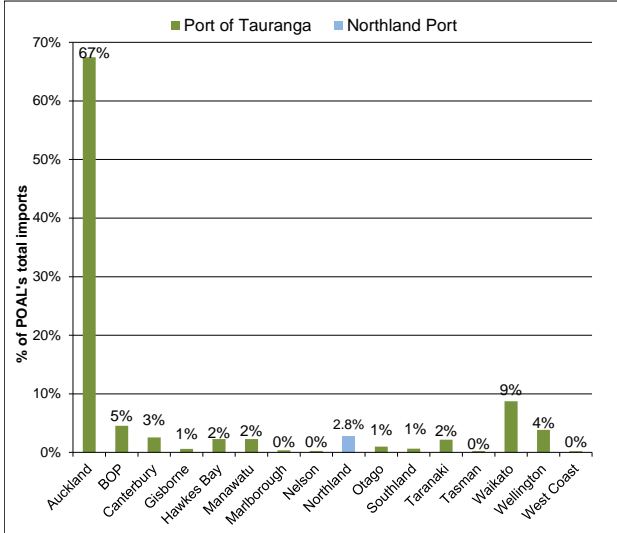


Figure 5.2: Import redirected Port by Destination Region, 2010



5.3.2 Costs Effects

Once the redirection of the trade flows are estimated it is possible to establish the additional costs associated with the distribution of trade. The cost per tonne of goods has been calculated using data from several studies¹³ and some POAL internal data. The following costs are estimated in this study;

- **land movement costs**, the additional land transport costs of redirecting trade to a new port.
- **land time costs**, the additional land time costs of redirecting trade to a new port.
- **sea shipping costs**, the additional sea transport costs of redirecting trade to a new port.
- **sea time costs**, the additional sea time costs of redirecting trade to a new port.

¹³ including; NZTA (2010), The New Zealand Productivity Commission (2011), Pearson (2007), NZIER (2010 b)

- **competition effects**, the additional costs associated with the reduction in competition in the in the port industry.

In 2010 the average tonne of imported products through POAL had a value of \$2,239 and export goods had a value of \$3,167. The model estimates show that the average tonne of POAL imports would cost an additional \$18 (or 0.8 percent of value) to transport to market if POAL was removed from the network. The average tonne of POAL exports would cost \$30 more to redirect to other ports which is equivalent of 1.0 percent of the value of the goods. The details of the transport cost calculations are discussed in Appendix B. The majority of the additional costs are associated with the land movement, with very little additional costs associated with the sea movement.

If all POAL export and import goods from Northland were shipped through Tauranga the additional costs associated with the removal of POAL would be marginally higher at the national level. This would cause a small increase in the overall trade impact associated with the removal of POAL.

5.3.3 POAL Dependent Trade

The additional cost of transport created by the removal of POAL would cause some trade activity to become uneconomic. Importing and exporting businesses face different market demand structures which mean that the ability to pass on costs in the form of price increases varies, as explained below.

Exporters' Behaviour

Most New Zealand exporters are small operators relative to the international market. For this reason New Zealand exporters generally have very little influence over the price that they receive for their goods. This means that exporters are unable to pass on any of the costs associated with the change in the Port network. The export demand structure means that the exporters must internalise the additional transport costs which reduces the exporting sectors willingness to produce goods for export.

For example, New Zealand exporters of onions produce a very small proportion of the world's output. The world price for onions is set by demand and supply factors which New Zealand operators have no influence over. Mostly New Zealand onions exporters sell their products at the given world price which will be the same whether there is a port at Auckland or not. It follows that if POAL was removed from the New Zealand port network some onions farmers will have higher transport costs while still receiving the same world price, and some exporters will chose to produce less output for the export market. Further, a lack of capacity at ports other than POAL (notably Tauranga) means that shipping through a different port may not even be possible, especially for certain time-sensitive exports that must be moved quickly and handled in a particular way (e.g. refrigerated).

This relationship between costs and supply is called the trade-cost elasticity of trade, which defines the proportion of quantity produced in the face of increasing prices. It is hard to quantify the elasticity of supply to increases in costs for each industry. In this study several scenarios of supply elasticities have been used to estimate the impact of removing the Port at Auckland on the quantity of exports. International literature suggests that the supply elasticity to costs for exporting industries is in the range of 2 to 5. This means that a 1 percent percentage increase in costs will cause a 2 to 5 percent decrease in export activity.

Importers' Behaviour

New Zealand importing companies face a different demand structure to New Zealand exporting companies, importers face a domestic price which can vary from the world price. In general importers will be able to pass on some of the additional transport costs in the form of price increases. However any increase in price will affect the level of domestic demand and the quantity of imports purchased domestically.

For example most electronic goods consumed in New Zealand are imported and the removal of the Port of Auckland would lengthen the supply chain and increase the cost of transporting these goods to consumers in the large Auckland market by increasing the time and distance these imported goods take to reach the marketplace. Importers would be able to pass some of the additional transport costs onto consumers as a price increase, which would impact negatively on consumer demand. Some domestic consumers will decide to postpone purchases of new electronic goods as a result of the price increases. This percentage decrease in consumption caused by the price change is referred to as price elasticity of demand.

The price elasticity of demand, or the effect of the resulting price increase, will be different for each imported good and it is not possible to estimate the exact demand elasticity for each product type. In this study several scenarios of price elasticity have been used to estimate the impact of removing the Port at Auckland on the quantity of imports. The international literature suggests that the price elasticity of demand of importing industries is in the range of -0.5 to -2. This means that a 1 percent percentage increase in costs will cause a 0.5 to 2 percent decrease in import activity.

Trade Impact

The trade impact of no longer having POAL is estimated by combining the additional transport cost estimates and supply and demand elasticities. In this study two scenarios are presented to provide an indication of the range of potential impacts that could occur if the Port was removed from the New Zealand network of ports: the High scenario applies the elasticity values that produce the highest trade impact and the Low scenario applies elasticities that produce the lowest trade impact¹⁴. The impact of removing the Port from Auckland would cause an annual reduction in trade activity of between \$301 million and \$874 million in the Auckland area.

In total, it is estimated that the trade impact of Ports of Auckland would range between \$227 to \$660 million worth of economic activity (GDP) in the Auckland economy. This impact equates to some 3,480 to 10,109 jobs in Auckland (Table 5.1). In the rest of this study the trade impact figure from the Medium scenario is used as a conservative estimate.

¹⁴ The high scenario applies elasticity values of -2 (import supply) and 2 (export demand). The low impact scenario applies elasticity values of -0.5 (import supply) and 0.5 (export demand).

Table 5.1: Ports of Auckland Dependent Trade (Auckland 2010)

Economic Activity	LOW	MEDIUM	HIGH
Direct Effects			
Gross Output (\$m)	\$ 301	\$ 587	\$ 874
GDP or Value Added (\$m)	\$ 90	\$ 176	\$ 262
Employment (ECs)	1,251	2,442	3,634
Flow-on Effects			
GDP or Value Added (\$m)	\$ 137	\$ 267	\$ 398
Employment (ECs)	2,230	4,353	6,476
Total Impacts			
Gross Domestic Product (\$m)	\$ 227	\$ 444	\$ 660
Employment (ECs)	3,480	6,795	10,109

5.4 Auckland Economic Impact

The total economic impact of POAL activity is equal to the core activity and the portion of the trade activity that is dependent on the existence of POAL:

- The core activity that is dependent on POAL generates \$298 million in value added, and supports 2,800 jobs.
- The trade activity that is dependent on POAL generates \$444 million in value added or 6,800 jobs. This represents around 0.6 percent of productive economic activity and employment in the Auckland economy.
- In total \$742 million worth of economic activity in the Auckland economy is caused by the Port, core activity and through the exports and imports it handles (trade activity).
- This combined role equates to 1.3 percent of productive economic activity in the Auckland economy and sustains some 9,613 jobs (1.7 percent of Auckland employment) (Table 5.2).

Table 5.2: Ports of Auckland Economic Impact (Auckland 2010)

Economic Activity	Core Impact	Trade Impact	Total Impact
Direct Effects			
Gross Output (\$m)	\$ 258	\$ 587	\$ 845
GDP or Value Added (\$m)	\$ 132	\$ 176	\$ 308
Employment (ECs)	1,080	2,442	3,523
Flow-on Effects			
GDP or Value Added (\$m)	\$ 166	\$ 267	\$ 434
Employment (ECs)	1,738	4,353	6,090
Total Impacts			
Gross Domestic Product (\$m)	\$ 298	\$ 444	\$ 742
Employment (ECs)	2,818	6,795	9,613

5.5 National Economic Impact

The impact of POAL from the national perspective in 2010 is shown in Table 5.3, which shows that:

- The majority of the impact from POAL's core activity is not included in the measure of

economic impact at the national level, because 99 percent of that activity would not be lost if POAL ceased operation because it would relocate to other ports. That is, that activity is not dependent on the existence of the Port specifically and will continue even if there was no port in Auckland).

- Generated trade impacts in the rest of New Zealand of almost \$445 million in value added, which sustained some 7,050 jobs.
- The Port's trade impact was over \$448 million, and some 7,080 jobs in the national economy.

Table 5.3: Ports of Auckland Economic Impact (National 2010)

Economic Activity	Core Impact	Trade Impact	Total Impact
Direct Effects			
Gross Output (\$m)	\$ 3	\$ 492	495
GDP or Value Added (\$m)	\$ 2	\$ 146	148
Employment (ECs)	10	2,016	2,025
Flow-on Effects			
GDP or Value Added (\$m)	\$ 2	\$ 299	\$ 301
Employment (ECs)	21	5,036	5,057
Total Impacts			
Gross Domestic Product (\$m)	\$ 4	\$ 445	448
Employment (ECs)	31	7,052	7,083

6 Ports of Auckland Future

6.1 Scope

The Port is expected to have a significant role in the Auckland and national economies in the future. This role will become even more important in the future if the Auckland Council achieves the level of economic growth set out as goals in the draft Auckland Plan. .

In this study, the role of and likely future economic activity associated with POAL in the future (2021 and 2031) is estimated under five future scenarios. :

- Business as Usual (BAU). This is a mid-range scenario using Market Economics Ltd regional and national economic growth projections from the Economic Futures Model (EFM) in line with current medium growth population and export projections.
- EFM 'Low' and 'High' scenarios present growth futures that are, respectively, slightly slower and faster than the BAU scenario, but generally assume that historic growth trends continue into the future.
- Draft Auckland Plan economic growth goals 'High' and 'Highest' scenarios. Auckland Council has proposed a set of aspirational economic goals which if reached will cause a step change in the economy (Auckland Council 2011) and a significant increase in exports through Ports of Auckland and Auckland Airport. If the Council intends to reach its export goal, the capacity and role of the Port must increase, while growth of trade through POAL is likely to continue to exceed GDP growth it is unlikely to exceed it as greatly as it has in the past. This is because future growth under these aspirational (Auckland Plan) growth futures will come more from industries that rely less on POAL (e.g. business services, the marine sector and tourism) to achieve export success than has been the case historically, and because the rate of containerisation has slowed (given most trade is now containerised).

The assumptions underlying these scenarios are explained in detail in Appendix C.

6.2 Core Port Activity Futures

The core activity of the Port in the future is forecast using a range of data sets and projections. The data and assumptions used to project each of the activities types are explained below.

6.2.1 Port Activity

Port activity is forecast using the EFM projections, draft Auckland growth goal information and POAL internal projection data.

Port activity is forecast using the EFM projections and POAL internal projection data:

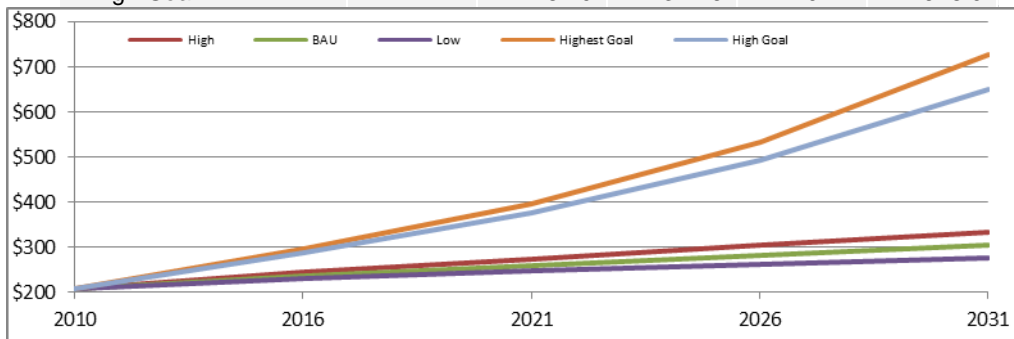
- The three EFM scenarios (High, BAU and Low) generate estimates of trade volumes and values. These are translated into Port activity by holding the current relationships constant.
- POAL internal projections are that it will grow at a rate which is significantly higher than the rest of the industry, GDP and the draft Auckland Plan economic growth goals scenarios. However, future growth is driven by the relationship between trade flows and port activity.

Therefore, this relationship is held and the trade growth under the draft Auckland growth goals is used to drive future POAL activity (under the 'High' and 'Highest' scenarios).

Under these assumptions, POAL would grow from \$207.6 million in 2010 to a level between \$276.6 million to \$333.5 million by 2031. The draft Auckland Plan growth goals indicate that the Port could grow at a faster rate, reaching \$648 to \$726 million by 2031 (Table 6.1).

Table 6.1: Port Activity 2010 to 2031 (\$ million)

Scenarios	2010	2016	2021	2026	2031
EFM Projections					
High		243.5	272.7	302.7	333.5
BAU	207.6	236.2	258.8	281.3	303.6
Low		229.1	245.7	261.5	276.6
Auckland Unleashed					
Highest Goal		295.2	395.3	533.5	726.0
High Goal		287.0	374.6	491.2	648.0



These projections assume that transport and storage activity grows at the same rate as the increase in trade value (because transport and storage activity at the Port is closely linked to the volume of goods that are exported and imported through the Port) and that other activities grow at the rates defined in the EFM, which is related to the level of activity in the whole economy. The EFM records the interrelationships between all industries in the economy so these activities grow in relation to the inter-industry demands placed on them under each scenario.

6.2.2 Cruise Tourism

Since 1996 Market Economics has conducted economic research for the New Zealand cruise industry, both at the regional and national level. Due to the volatile nature of the industry over this time and the relatively short history, long term projections have never been generated. In the absence of long term projections for cruise industry activity it is reasonable to rely on the historic trends as the best indicator of future activity.

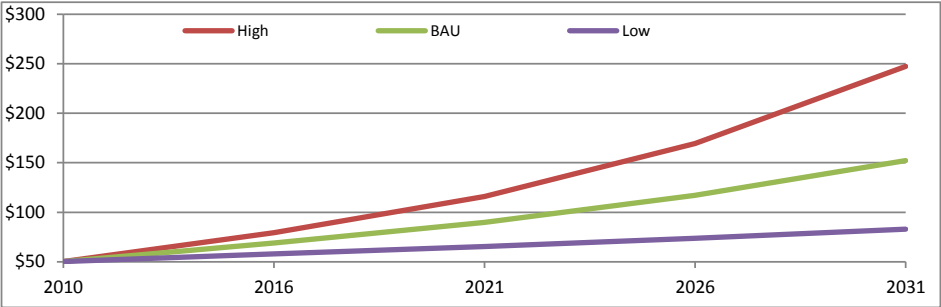
The historic data shows that during the past decade the industry activity in Auckland and New Zealand has grown rapidly. It also shows that the majority of the growth has occurred in the last five years with either very weak growth or even negative growth in the first half of the decade. In this study the Business as Usual growth rate is assumed to equal the growth from the past decade (average), while the Low and High scenarios are assumed to have growth rates similar to the average in the first half (slow) and last half (fast) of the decade.

Cruise industry activity in Auckland is expected to grow by around 2.4 to 7.9 percent per annum. While the business as usual growth is expected to be around 5.4 percent per annum. Under these growth scenarios the industry would grow from \$50.3 million in 2010 to around \$83.0 million to \$247.4 million in 2031. In this study we have applied the High cruise growth projections in the draft Auckland Plan economic growth scenarios.

Table 6.2: Cruise Activity 2010 to 2031 (\$ million)

Scenarios	2010	2016	2021	2026	2031
Projections					
High*		79.3	115.9	169.4	247.4
BAU	50.3	69.1	89.9	117.0	152.3
Low		58.1	65.4	73.7	83.0

*High projections used for both of the Auckland Unleashed Scenarios



6.3 Ports of Auckland Future Impact on the Economy

The proportion of the Auckland economy that is dependent on the Port was around 0.9 percent in 2010. This is expected to grow to around 1.3 percent by 2031. If the draft Auckland Plan economic growth goals are met the Port’s impact will be around 1.7 percent of the activity in Auckland being dependent on the Port and trade that flows through the Port. The proportion of the national economy that is dependent on the Port was around 0.1 percent in 2010, and is expected to grow to between 0.3 and 0.6 percent under all of the scenarios out to 2031.

6.3.1 Auckland Economy

The activity in Auckland that is dependent on the existence of the Ports of Auckland is expected to increase from \$741 million in 2010 to range between \$997 and \$1,349 million by 2031, or \$2,576 to \$2,882 million if the draft Auckland Plan economic growth goals are met (Table 6.3).

Table 6.3: Impact on the Auckland Economy 2010 to 2031 (\$ million Value Added)

Scenarios	2010	2016	2021	2026	2031
EFM Projections					
High		888	1,019	1,170	1,349
BAU	741	853	942	1,036	1,138
Low		819	880	939	997
Auckland Unleashed					
Highest Goal		1,091	1,499	2,072	2,882
High Goal		1,059	1,417	1,905	2,576

6.3.2 National Economy

The activity in New Zealand that is dependent on the existence of the Ports of Auckland is expected to increase from \$448 million in 2010 to between \$598 and \$720 million by 2031 or \$1,558 to \$1,765 million if the draft Auckland Plan economic growth goals are met (Table 6.4)

Table 6.4: Impact on the National Economy 2010 to 2031 (\$ million Value Added)

Scenarios	2010	2016	2021	2026	2031
EFM Projections					
High		530	591	655	720
BAU	448	513	561	608	655
Low		498	533	566	598
Auckland Unleashed					
Highest Goal		668	918	1,269	1,765
High Goal		646	863	1,157	1,558

Appendix A: Auckland and New Zealand IO model

IO Methodology

The core of an IO modelling framework is a matrix recording transactions between different actors within an economy. Each column of the matrix reports the monetary value of an industry's inputs, while each row represents the value of an industry's outputs. Sales by each industry to final demand categories (i.e. households, local and central government, gross fixed capital formation, etc.) are also recorded, along with each industry's expenditure on primary inputs (wages and salaries, consumption of fixed capital, gross operating surplus etc.). Clearly the data requirements for constructing these IO matrices are enormous, and it is partly for this reason that IO tables are only produced in NZ on an irregular basis. The latest available IO table for the NZ economy is based on data for the 1995-96 financial year (Statistics New Zealand, 2001). A subsequent supply-use table, which contains much of the information required to generate an IO table, is, however, also available for the 2006-07 financial year (Statistics New Zealand, 2009).

The first major step required for the assessment of economy-wide effects is therefore to generate an appropriate IO table that can be used as a starting point for the study. Essentially two major tasks were involved: (1) production of an IO table for NZ; and (2) regionalization of the national table so as to produce an IO table for the Auckland region. In terms of the first task, Market Economics Ltd (MEL) has produced an IO table for NZ for the year ending March 2007. This is the latest year for which all economic data required to produce an updated table is available. The NZ IO is essentially derived by converting the 2006-07 national supply-use table available from SNZ to an IO table. This requires, first, separating the use of internationally produced goods and services (i.e. imports) and domestically produced goods in the Use Table. Estimates of physical imports are based primarily on data from the New Zealand Harmonised System while estimates of service imports are based on Balance of Payments data. Second, the 'domestic' supply and use tables are converted to an IO table by application of the fixed sales structure assumption.¹⁵

In terms of the second task, the Generating Regional Input-Output Tables (GRIT) procedure (Jensen *et al.*, 1979; West *et al.*, 1980) was relied on to produce an Auckland regional table from the 2006-07 national table. This method consists of a series of mechanical steps that reduce national input-output coefficients to sub-national (regional) equivalents with reference to available regional data. In this case reference was made particularly to employment by industry, population and household income data for the Auckland region.

A final important point to note about the IO framework utilized in this study is that it contains 48 different economic industries and a 49th industry "Ports of Auckland". The Ports of Auckland industry was established using detailed financial data to separate the Ports of Auckland from the Sea transport industry.

¹⁵ For an explanation of the different assumptions that can be employed in converting SUTs to IO tables refer to Smith and McDonald (2011).

Multiplier Methodology

Multiplier analysis (also known as input-output analysis) is the most commonly used modelling technique for measuring total economic impacts and can also be extended to measure the economic role of a port. Direct, indirect and induced impacts are estimated using multipliers derived from regional and national economic models, which are standard input-output models.

Multiplier analysis is based on the interdependence of the various industries that make up the economy. Market transactions (for both primary inputs and intermediate goods) relating to a particular industry are measured, and the resulting expenditures tracked as they move through the economy. Any change in the level of output in one industry will result in changes in other industries because of this interdependence. This flow-on effect is estimated using multipliers, which are ratios of direct, indirect and induced changes in output.

One of the assets of multiplier analysis is that the results it provides are easy to identify and digest, and relatively easy to use once input-output tables are available for a particular region.

While, multiplier analysis is widely applied in New Zealand and around the world, it is not without its limitations. The most common limitations relate to the historical nature of multipliers which are typically calculated from input-output tables from surveys undertaken 2-3 years previously. Therefore, they may not accurately reflect the current relationships between sectors in the current economy.

The multipliers used in this study are based on 1995/96 inter industry study carried out by Statistics NZ. A 2001 set of input-output tables for the Auckland area have been developed from that survey which have been further updated to reflect the 2010 economy (Statistics New Zealand Supply Use tables 2006/07). The current size and structure of the Auckland economy has been estimated according to 2010 employment statistics and output per EC, by sector. The Ports of Auckland has been disaggregated out using detailed financial data from the 2010 calendar year. This enables a detailed calculation of the Port's economic activity and port level multipliers.

It is important to understand that multipliers change over time. As an economy becomes more open and reliant on trade to provide goods and services, multipliers that summarise internal transactions are reduced. In other words, as larger portions of the country's needs are met through imports (be that for final demand goods or intermediate goods and services) the multipliers reduce.

Conventional measures of economic role and impact (value added and employment) have been used in this study. Value added is preferred over output or turnover because those measures frequently lead to double counting.

Value added measures all payments to factors of production (land, labour and capital), and excludes all purchases of intermediate inputs. It broadly equates with gross domestic product (GDP) as a measure of economic activity on the national level, and gross regional product on the regional level. Components of value added include compensation of employees (salary and wages), operating surplus (company profits), consumption of fixed capital (depreciation), and taxes less subsidies.

Employment is measured in employment count (EC) modified to include working proprietors (MEC). In this study we use MEC as this is the best estimate of total employment as it includes employees and

non-employee working proprietors. This provides a measure of labour demand associated with the Port's existence.

Note that additional MECs do not necessarily require that additional persons be actually employed. It may mean existing employees or proprietors work longer hours or that some people have two or more part time jobs. Therefore additional employment numbers presented here are “employment equivalents” rather than actual jobs created or sustained.

Appendix B: Estimating POAL Trade Impacts

In this study we estimate the proportion of the trade activity that is dependent on the existence of POAL. We used the following four steps to estimate the proportion of trade through POAL that is dependent on the Port.

1. **Cargo flows** – First we allocate cargo flows from POAL to other ports in the network. In this study it is assumed that all cargo that used POAL would be redirected to the two larger northland ports, Northland Port and Ports of Tauranga. The study assumes that exporters and importers choose the closest port to reduce transport costs and time. In particular the POAL trade that has an origin or destination south of Auckland is assumed to be redirected to the Ports of Tauranga. While the trade that flows to or from areas North of Auckland are assumed to be redirected through Northland Port. The majority of export trade from Auckland area is assumed to be redirected to Ports of Tauranga as this port offers economies of scale which are not available at the Northland Port.
2. **Calculate additional costs** – The second step is to calculate the additional costs required to move the export/import merchandise from or to the ports. This will include:
 - **road and rail transport costs**, which was estimated using average costs per kilometer tonne from the New Zealand Transport Agency Manual (2010), Pearson (2007) and POAL internal data. These studies and datasets suggest that the average transport cost per kilometre tonne in New Zealand is in the range of 10 to 21 cents (excluding container handling costs).
 - **road and rail time costs**, the Freight Study from the New Zealand Productivity Commission (2011) discusses the potential time costs associated with exporting and importing activity. The report suggests that on average an additional day of transport time creates a cost to importers and exporters of 0.6 to 1 percent of the value of the trade.
 - **reduction in competition effects**; the NZEIR (2010) study of freight futures suggests that the consolidation of the New Zealand port sector would cause increased market power which will result in high port costs and reductions in efficiencies. In this report we have assumed that the removal of POAL would allow other ports to increase port charges by 0.5% of the value of the export or import goods.
3. **Estimate the direct effects** – The effect of the removal of the Port can be estimated using a set of scenarios. In this study a range of studies have been reviewed to establish the range of elasticities for demand for imports and supply of exports. These elasticities measure the responsiveness of demand and supply to the change in costs and prices. Generally speaking the studies show that most imports goods have an elasticity of demand between 0.5 and 2. While most exporters have an elasticity of exports to transport costs of 2 to 5. In this study we have applied the highest and lowest elasticity for each industry to produce a high and low impact estimate.
4. **Estimate total effects** – The final step in the modeling of the trade dependent effects is to run the direct effect through the IO model to estimate the induced and indirect effects of the reduction in export and import activities.

For example, assume it costs an extra \$30 per tonne to export via Tauranga. Comparing this additional cost to the value of goods from the industry (say \$4,000 per tonne) allows an estimate of the relative impact on price received by the exporter. Most New Zealand exporters are price-takers on the world market so they must absorb the cost. This means that other activities in the economy are relatively less profitable (0.75% of the value of the export goods $\$30 / \$4,000$) and businesses in the sector will reduce exporting activity. It may be that businesses in the industry are able to change activity relatively easily. In this case supply would be elastic and a small decrease in price (increase in costs) causes a large drop in export activity (say the 0.75% drop in the money received by the exporter cause a 1.5% reduction in export activity).

Appendix C: Economic Futures Model and Scenarios

The EFM traces the economic and environmental implications of user-defined scenarios of economic growth by 48 economic sectors over a twenty year timeframe. The model adopts a 'systems' perspective, acknowledging that many of the issues we face today are highly interconnected and complex. It uses an integrated approach to assess the possible implications of plausible scenarios, given a range of assumptions. The model helps to identify possible criticalities and limiting factors which may result from economic growth using 'what if' scenario analysis.

The EFM is based on a multi-regional economic input-output table, capturing the impacts of growth on the study area, as well as on the wider regional and national economies. The model uses input-output mathematics to capture not only the direct effects of final demand growth in a given sector, but also the indirect (i.e. upstream flow-on) and induced (i.e. resulting from consumer spending) effects associated with this growth. The impacts resulting from each scenario are compared with the 'baseline' Business-As-Usual (BAU) scenario, which is established by estimating sectoral domestic and export final demand, and by developing quantitative projections of population and export growth. The BAU scenario is based on future demographic and econometric projections of demand for goods and services by households, international exports and capital formation.

The Economic Futures Model enables users to quickly evaluate implications of various growth scenarios against the BAU, or between competing alternative scenarios. It models impacts on population, employment, Gross Regional Product, and employee compensation. The model can also generate high, medium and low projections, allowing users to track the sensitivity of the BAU to changes in key growth determinants. The model has a range of built in scenarios which estimate the most likely high to low growth futures for the regions and the country as a whole. The detail of this model can be found in the study presented by Auckland Regional Council (2008).

The baseline analysis in the EFM can be augmented by including information on prevailing or imminent economic conditions that the researcher or key regional stakeholders may wish to understand. In this study the growth goals from the draft Auckland Plan are entered into the model to create future scenarios. This allows understanding of the expected role of the Port if Auckland Council achieves its goal and exports grow rapidly.

The goals presented in the proposed policy are macro level goals, we must make a range of assumptions about how these goals translate into industry level growth. In this study it is assumed that the additional growth in exports will spread across the industries pro rata using the same distribution of growth as that presented in the highest EFM scenario. We note that this is a best estimate and that the Auckland Council is likely to focus its efforts on certain industries which means that the actual distribution of growth in the future is likely to vary significantly from the historic. It is believed that this estimation technique is the most reasonable as there is no information about which industries Council will target.

The following five scenarios are presented to provide an estimate of the expected role of the Port under a range of potential futures. The first three scenarios are base scenarios from the model which give an indication of the more likely futures if historic growth trends continue into the future. The fourth and fifth scenarios estimate the effect of the achievement of the Auckland Council growth goals.

1. **Business as Usual:** assumes that population growth in Auckland and New Zealand is defined by the Statistics New Zealand medium population projections. The growth in exports, multifactor productivity and capital formation are based on econometric projections using historic data. The transport and storage activity at POAL is assumed to grow at the same rate as the total trade through the Port. The Port and related activity is assumed to grow at the industry level growth rate from the BAU. While the cruise industry activity is assumed to continue growing at the historic average observed in the previous decade.
2. **EFM Low:** assumes that population growth in Auckland and New Zealand is defined by the Statistics New Zealand low population projections. The growth in exports, multifactor productivity and capital formation are 20 percent lower than the econometric projections used in the BAU. The transport and storage activity at POAL is assumed to grow at the same rate as the total trade through the Port. The Port and related activity is assumed to grow at the industry level growth rate from the Low. While the cruise industry activity is assumed to grow at the (slow) rate seen during the first half of the previous decade.
3. **EFM High:** assumes that population growth in Auckland and New Zealand is defined by the Statistics New Zealand high population projections. The growth in exports, multifactor productivity and capital formation are 20 percent higher than the econometric projections used in the BAU. The transport and storage activity at POAL is assumed to grow at the same rate as the total trade through the Port. The Port and related activity is assumed to grow at the industry level growth rate from the High. While the cruise industry activity is assumed to grow at the (high) rate seen during the last half of the previous decade.
4. **AU Highest:** assumes that population growth, multifactor productivity and capital formation are the same as the EFM high scenario. The macro level export growth in Auckland is maintained at 7.5 percent per annum out to 2031. The transport and storage activity at POAL is assumed to grow at the same rate as the total trade through the Port. Port related activity is assumed to grow at their respective industry level growth rates from the AU Highest scenario. The Port activity is assumed to grow at the rate defined in the POAL forecasts, which is higher than GDP growth (in line with recent POAL growth) and higher than the AU growth projections. The cruise industry activity is assumed to grow at the same rate as applied in the EFM High scenario.
5. **AU High:** assumes that population growth, multifactor productivity and capital formation are the same as the EFM high scenario. The macro level export growth in Auckland is maintained at 6.8 percent per annum out to 2031. The transport and storage activity at POAL is assumed to grow at the same rate as the total trade through the Port. Port related activity is assumed to grow at their respective industry level growth rates from the AU High scenario. The Port is assumed to grow at the rate defined in the POAL forecasts, which is higher than GDP growth (in line with recent POAL growth) and higher than the AU growth projections. The cruise industry is assumed to grow at the same rate as applied in the EFM High scenario.

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Glossary

Bunkering: The expenditure by cruise ships on fuel and other oils.

CIF: Cost, Insurance, Freight. A measure of the total cost of bringing goods to a destination, including the cost of the good itself, and freight and insurance charges.

Core Activity: POAL's direct activity including, demurrage, cement, petroleum and cruise sector.

Demurrage: A charge payable to a port in respect of failure to load or discharge goods to or from the port within the time agreed.

Dependent Trade: trade that flows through POAL that would be lost if POAL was removed from the port sector.

Direct Impacts: also termed the first round effects. They cover the direct spending that occurs by all players in the industry (i.e. passenger spend, cruise vessel spend and crew spend). This direct spending sustains a certain amount of direct employment to meet these direct needs, and generates a certain amount of direct value added (\$).

Employment Count (EC): Head count of salary and wage earners sourced from taxation data.

Gross Domestic Product (GDP): measures value-added of products produced within a country's borders. In this study the value of production is expressed in the prices of a base year so that comparison can be made with inflation removed (base year 2009).

Indirect Impacts: are the effects that occur when suppliers to the directly impacted businesses have to increase their production to meet the increase in demand for goods and services. This requires the further purchase of other goods and services from their suppliers. Indirect effects are calculated in terms of indirect gross output (\$), value added (\$) and employment (FTEs).

Induced Impact: the effect of additional wages and salaries paid into the economy inducing additional expenditure. Businesses, either directly or indirectly impacted, are assumed to be operating at maximum capacity and therefore additional demand causes them to either hire additional workers or pay overtime. This means more money is available to households in the economy. The induced effect covers how this money then flows through the system as people spend more.

Input Output Model (IO): A model of the economy that measures the interdependence of industries and households (see Appendix A for detail).

MEC: A count of employment modified to include working proprietors, that is, ECs plus non-employee working proprietors.

Provedor: An agent that supplies produce and any other supplies to the cruise ships. In the New Zealand cruise industry this service mainly relates to supplying fresh food and sundry grocery items.

TEU: twenty foot equivalent containers

Trade Activity: is the imports and exports that flow through the Ports of Auckland.

Valued Added (VA): measures all payments to factors of production (land, labour and capital), and excludes all purchases of intermediate inputs. It broadly equates with gross domestic product (GDP) as a measure of economic activity at the national level, and gross regional product at the regional

level. Components of value added include compensation of employees (salary and wages), operating surplus (company profits), consumption of fixed capital (depreciation), and taxes less subsidies.