

# Economic Role 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. 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 role and the impact of the Ports of Auckland is measured for the Auckland and national economies. The role and 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 POT 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 role of the Port has been measured for the 2010 calendar year, and a set of scenarios have been used to estimate the potential role of the Port in the future. Some of these future scenarios assess role of the Port if the “draft Auckland Plan economic growth goals are met”<sup>1</sup>.

## POAL 2010

Ports of Auckland is New Zealand's largest and most important seaport. In 2010<sup>2</sup>, Ports of Auckland handled over 894,000 TEU (twenty foot equivalent containers), 36% of the national total, The next largest volumes handled were by Tauranga (590,500 TEU) and Lyttelton (290,800 TEU). In terms of value of POAL is also the most important port in NZ, processing \$26.4 billion of exports and imports, 37 percent of New Zealand's total seaport trade, and 31% of trade across all ports (including airports).

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<sup>1</sup> 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.

<sup>2</sup> TEUs are for YE June 2011, values are for calendar year 2010.

The total role of the Port in the Auckland economy (that is core port activity plus facilitated trade role) is almost \$12.5 billion of value added sustaining the equivalent of 187,300 jobs. This includes a \$298.0 million core port activity and \$12.2 billion of trade. The Port therefore plays a role in facilitating almost one quarter (22.1 percent) of the total Auckland economy. The total role of the POAL on the national economy (core port activity plus trade role) is to help facilitate \$21.5 billion in value added and 336,200 jobs.

POAL is New Zealand's largest port for both imports and exports, and:

- Processed \$16.8 billion (CIF, Cost, Insurance and Freight) of import activity in 2010, representing 51 percent of sea imports and 40 percent of the country's total imports by value. The next largest import seaport is Whangarei at \$4.4 billion (where Marsden Point petrochemical imports dominate).
- Of the \$16.8 billion of imports through the Port, 67 percent are destined to remain in Auckland, representing 61 percent of all imports into Auckland.
- Nationally, POAL accounts for 31 percent of all trade (imports and exports passing through New Zealand's ports (air and sea).
- In 2010 the goods that Auckland based producers exported through POAL added value to the economy of \$1.9 billion, sustaining 26,200 jobs.
- The total annual export role in the Auckland economy from POAL is \$4.8 billion or 73,790 jobs.

### **POAL 2021 and 2031**

The Port is expected to continue to grow in importance in the future both at the national and city level. Assuming that the economy follows the historic growth path (EFM scenarios), Ports of Auckland's role in the Auckland economy would increase to help facilitate between:

- \$15.6 and \$16.5 billion of GDP by 2021, equivalent to between 234,400 and 247,400 jobs.
- \$18.4 and \$20.3 billion of GDP by 2031, equivalent to between 275,900 and 304,600 jobs.

If the economic growth goals in the draft Auckland Plan goals are achieved, the role of the Port in the Auckland economy is significantly larger and would increase to help facilitate between:

- \$22.0 and \$23.2 billion of GDP by 2021, equivalent to between 331,700 and 348,300 jobs.
- \$37.4 and \$41.7 billion of GDP by 2031, equivalent to between 563,200 and 627,600 jobs.
- 25.6 percent of Auckland's economic activity by 2031, from 22.1 percent in 2010. (Table 1.1).

The total role of the POAL in the national economy is also expected to grow significantly, and if the economy follows the historic growth path (EFM scenarios) the POAL will help facilitate between:

- \$25.4 and \$27.4 billion of GDP by 2021, equivalent to between 412,100 and 428,800 jobs.
- \$28.6 and \$32.9 billion of GDP by 2031, equivalent to between 447,600 and 512,200 jobs.

If the economic growth goals in the draft Auckland Plan goals are achieved, the role of the Port in the New Zealand economy would increase to between:

- \$32.8 and \$34.1 billion of GDP by 2021, equivalent to between 508,900 and 528,900 jobs.
- \$49.7 and \$54.3 billion of GDP by 2031, equivalent to between 764,900 and 835,200 jobs.

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

	Business-as-usual						Draft Auckland Plan Growth Goals					
	Auckland Economy			New Zealand Economy			Auckland Economy			New Zealand Economy		
	2010	2021	2031	2010	2021	2031	2010	2021	2031	2010	2021	2031
<b>Core Activity (\$m)</b>												
Port and Port Related	\$ 248	\$ 303	\$ 344	\$ 248	\$ 303	\$ 344	\$ 248	\$ 455	\$ 798	\$ 248	\$ 455	\$ 798
Cruise Industry	\$ 50	\$ 90	\$ 152	\$ 50	\$ 90	\$ 152	\$ 50	\$ 116	\$ 248	\$ 50	\$ 116	\$ 248
<b>Total Core</b>	<b>\$ 298</b>	<b>\$ 393</b>	<b>\$ 496</b>	<b>\$ 298</b>	<b>\$ 393</b>	<b>\$ 496</b>	<b>\$ 298</b>	<b>\$ 571</b>	<b>\$ 1,046</b>	<b>\$ 298</b>	<b>\$ 571</b>	<b>\$ 1,046</b>
<b>Facilitated Trade (\$m)</b>												
Imports	\$ 7,350	\$ 9,310	\$ 11,020	\$ 14,414	\$ 17,773	\$ 20,627	\$ 7,350	\$ 11,368	\$ 16,912	\$ 7,350	\$ 19,832	\$ 26,519
Exports	\$ 4,817	\$ 5,894	\$ 6,841	\$ 6,791	\$ 8,219	\$ 9,477	\$ 4,817	\$ 10,077	\$ 19,456	\$ 4,817	\$ 12,403	\$ 22,093
<b>Total Trade</b>	<b>\$ 12,167</b>	<b>\$ 15,204</b>	<b>\$ 17,860</b>	<b>\$ 21,205</b>	<b>\$ 25,993</b>	<b>\$ 30,104</b>	<b>\$ 12,167</b>	<b>\$ 21,445</b>	<b>\$ 36,368</b>	<b>\$ 12,167</b>	<b>\$ 32,234</b>	<b>\$ 48,612</b>
<b>Total Role</b>	<b>\$ 12,465</b>	<b>\$ 15,597</b>	<b>\$ 18,357</b>	<b>\$ 21,503</b>	<b>\$ 26,385</b>	<b>\$ 30,600</b>	<b>\$ 12,465</b>	<b>\$ 22,017</b>	<b>\$ 37,414</b>	<b>\$ 12,465</b>	<b>\$ 32,805</b>	<b>\$ 49,658</b>
<b>Total Employment (EC)</b>	<b>187,321</b>	<b>234,413</b>	<b>275,979</b>	<b>336,196</b>	<b>412,113</b>	<b>477,641</b>	<b>187,321</b>	<b>331,170</b>	<b>563,227</b>	<b>187,321</b>	<b>508,870</b>	<b>764,889</b>

## 2 Introduction

### 2.1 Objectives and Background

The primary objective of this study is to assess the role played by the Ports of Auckland Limited (POAL) in the Auckland and New Zealand national economies in 2010. This study follows the report prepared by McDermott Fairgray Group in 1999, Market Economics in 2005 and Covec in 2008.

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 role 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. It will also establish the potential future role of POAL if the economic growth goals in the draft Auckland Plan 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 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 share market in 2005 has paid dividends and made in-specie distributions totalling more than \$527m to its Council-owned shareholders.

## 2.2 Overview

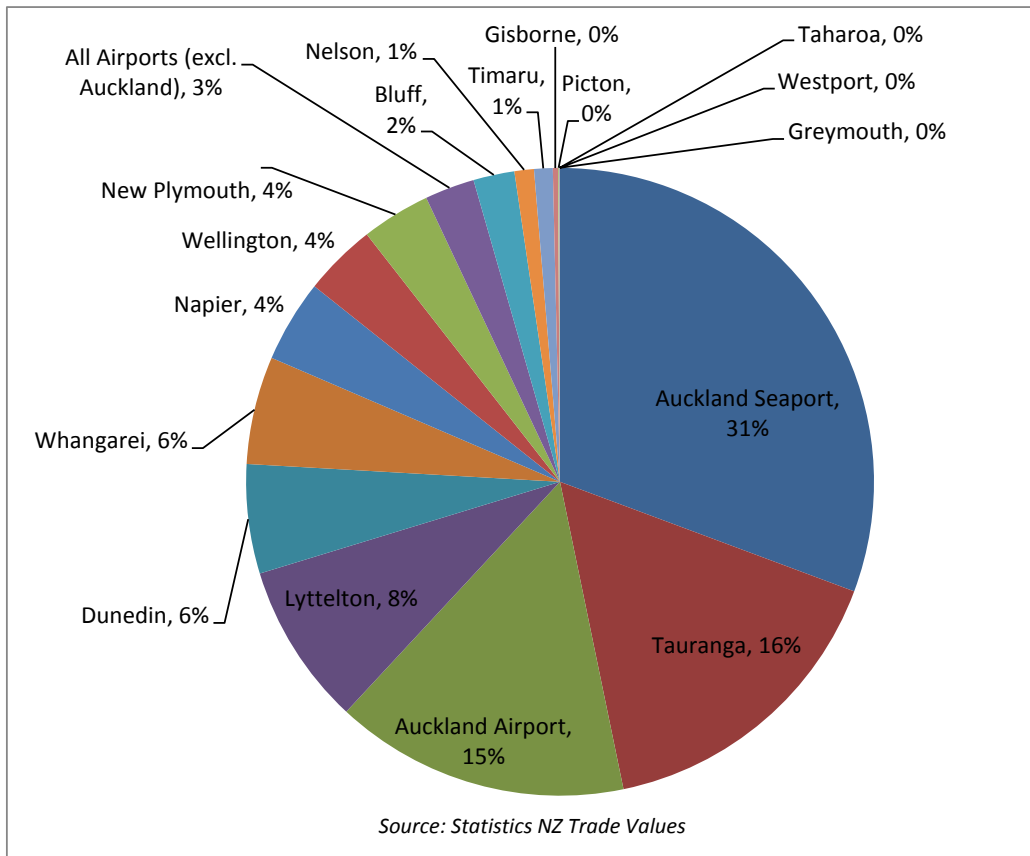
Third, and most importantly, is the Port's role in supporting and facilitating business activities which import and export goods. As these activities are vital to the nation's economy, the role of POAL and other ports is vital to the nation's economy.

Previous studies have measured how POAL plays a major role in the Auckland and national economies. The Ports of Auckland is an essential link to New Zealand's major overseas markets, providing New Zealand manufacturers and producers with export access, and allowing importers to source and ship goods from overseas to input into intermediate production or final consumption. Businesses benefit in particular from the service frequency maintained by the Port of Auckland to major trading partners. The Port of Onehunga provides further access to international markets for importers and exporters from other regions in New Zealand, through the Ports of Auckland.

The operation of both ports is a major centre of activity, through the provision of services to shipping lines, exporters and importers and cruise ships. Port operations are the core of POAL's business, providing cargo handling and marine services for Auckland and Onehunga. These services generate revenue to POAL, add value and provide employment. The Port of Auckland accounts for the majority of international and domestic activity, while the Port of Onehunga accounts for a much smaller share (less than 1 percent of the Port's revenue which is equivalent to 2% of the TEU processed by POAL).

New Zealand is a trading nation, with high shares of the goods which are consumed here being imported, and similarly high shares of the goods which are produced here being exported. New Zealand's geographic isolation has meant very high dependence on seaports in conducting international trade. Over 82 percent by value of all overseas merchandise trade (exports and imports) is carried out through seaports in New Zealand.

**Figure 2.1: Share of Trade Value through NZ Sea and Airports (2010)**



Of New Zealand's total seaport trade by value, 37.3 percent is handled through POAL (equivalent to 31% of trade passing through all ports, Figure 2.1). This is a 2.6 percent reduction in share since 2000, although the value of trade handled by POAL has increased by 41 percent since 2000, and 25 percent since 2005, an average annual growth over the last decade of 3.5 percent which is higher than average annual GDP growth over the same time of 2.4 percent. The decrease in share reflects the rise of POT as first an export port and more recently import port – increasing its share of imports (through seaports) to 12.9 percent in 2010 from 8.5 percent in 2000. After POAL, the largest ports in NZ, by the dollar value (CIF) of goods handled are:

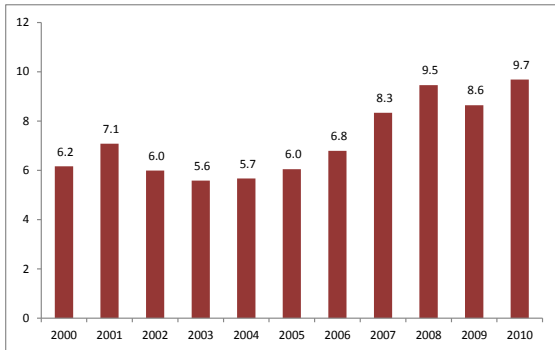
- POT, which handles 19.5% of all trade through NZ seaports (16.1% when also including airports) (Table 2.1)
- Christchurch (Lyttelton) handles 10.2 percent of seaport trade (8.4 percent including airports)
- Dunedin and Whangarei both account for 6.8 percent of seaport trade (5.6 percent including airports)
- Napier handles 5.2 percent of seaport trade, and Wellington accounts for 4.6 percent.

**Table 2.1: Share of NZ Trade (CIF, 2010)**

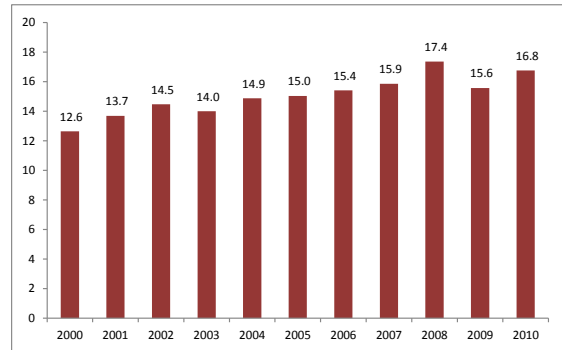
Port Name	Share of all Ports			Share of Seaports		
	Exports	Imports	Trade	Exports	Imports	Trade
<b>Auckland Seaport</b>	21.8%	40.0%	30.7%	25.3%	51.3%	37.3%
<b>Tauranga Seaport</b>	21.8%	10.1%	16.1%	25.2%	12.9%	19.5%
<b>Auckland Airport</b>	10.1%	20.6%	15.2%	n/a	n/a	n/a
<b>Christchurch Seaport (Lyttelton)</b>	9.7%	6.9%	8.4%	11.2%	8.9%	10.2%
<b>Dunedin Seaport</b>	9.8%	1.2%	5.6%	11.4%	1.5%	6.8%
<b>Whangarei</b>	1.0%	10.4%	5.6%	1.1%	13.3%	6.8%
<b>Napier</b>	7.0%	1.3%	4.2%	8.1%	1.7%	5.2%
<b>Wellington Seaport</b>	2.6%	4.9%	3.7%	3.0%	6.3%	4.6%
<b>New Plymouth</b>	6.1%	0.8%	3.5%	7.1%	1.1%	4.3%
<b>All Other Airports</b>	3.7%	1.4%	2.6%	n/a	n/a	n/a
<b>Invercargill Seaport (Bluff)</b>	2.9%	1.3%	2.1%	3.3%	1.7%	2.6%
<b>Nelson</b>	1.4%	0.6%	1.0%	1.7%	0.7%	1.2%
<b>Timaru</b>	1.4%	0.5%	1.0%	1.6%	0.6%	1.2%
<b>Gisborne</b>	0.5%	0.0%	0.3%	0.6%	0.0%	0.3%
<b>Picton/Taharoa/Westport/Greymouth</b>	0.2%	0.0%	0.1%	0.2%	0.0%	0.1%
<b>Total</b>	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

In the calendar year 2010, POAL handled \$26.4bn of trade (Figures 2.2 and 2.3). Total trade in 2010 was made up from \$9.7bn of exports and \$16.8bn of imports. Since 2000 total trade value through POAL has grown by 41 percent, with exports growing 57 percent and imports 33 percent.

**Figure 2.2: Exports through Ports of Auckland (\$b, for calendar years)**



**Figure 2.3: Imports through Ports of Auckland (\$b, for calendar years)**



During the recession in 2009 (Global Financial Crisis), imports declined by 10 percent and then recovered to a level close to the post-recession highs. Export growth has been faster overall (57 percent growth since 2000) and with rapid growth in recent years (average annual growth of over 10 percent since 2005), which is due in large part to growth in dairy exports, and to a lesser extent other food exports.

## 2.3 Defining the Economic Effects

### 2.3.1 Scope

The economic role 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 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 role of that port within the economy.

A critical step in measuring the economic role 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.

### 2.3.2 Economic Role

The Ports of Auckland has a role in facilitating both trade and other activities that flow through or use the Port. The role of the Port is a measure of the economic activity that has some link to the Port. The economic role includes both the immediate or direct effect of activity that uses the Port on the economy, and also the flow-on effects of the activities through the economy. These effects are calculated using multiplier analysis (see Section 2.4).

In this study the direct economic role of the Port is defined as the core economic activity and the facilitated trade that flows through the Port. The direct impact is obtained by measuring the values of the activities undertaken in the Port, including directly related activities. These activities are grouped into three categories: port and related activities (port operations, stevedoring, marine operations, sea transport, portions of freight forwarding, road and rail freight transport, and cruise tourism); and activities driven by international market access (international exports and imports).

The total economic role of the Port goes beyond the direct activities, which the Port generates, as these results in two types of flow-on effects in the economy. First, indirect impacts occur because goods, materials and services need to be supplied to businesses that are directly impacted by the Port. The suppliers of these products do not interact directly with the Port, but are nevertheless affected because they supply to businesses which do. These supplies are known as "intermediate inputs". Further value is added and people are employed in the production of intermediate inputs.

For example, when carpet is exported the direct impact is measured in terms of the value added and people employed by the manufacturers producing it. The indirect impact relates to the chain of businesses supporting that production – the farmer producing wool (and their suppliers), the trucking companies providing transport, the wool scourer, and suppliers of dyes, looms and so forth. Because the customers of those businesses (the carpet manufacturers) depend upon the Port, it can be argued that each of these intermediate suppliers also depends on the Port to a greater or lesser extent.

The second flow-on effect is known as the induced impact. This is the additional economic activity associated with spending by people employed as a result of the direct and indirect impacts. In the above example, both the employees of the carpet manufacturers, and employees of intermediate suppliers to the manufacturers would stimulate this additional activity. The impacts therefore relate to the increased capacity of these employees to consume final goods and services, and will be felt in areas like grocery manufacturing, retailing, housing, the leisure sector and so forth.

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

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.

## 2.5 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 Auckland Economy and the role of the Ports of Auckland.
- Section 4 covers POAL's role in the Auckland and National economy in 2010.
- Section 5 presents the economic impact of the Port at the Auckland and national levels.
- Section 6 describes how the Port's role and impact will change in the future under a set of scenarios.
- Conclusions are contained in Section 7.

## 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

Auckland area is home to 1,459,000 residents in 504,000 households<sup>3</sup>, 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.<sup>4</sup>

### 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 1.56<sup>5</sup>) 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 0.15<sup>6</sup>). Table 3.1 shows the structure of employment in Auckland, compared with the national picture.

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<sup>3</sup> Statistics New Zealand Population and Household Forecasts 2006

<sup>4</sup> Draft Auckland Plan, September 2011

<sup>5</sup> Auckland has 56% more employment in Wholesale Trade relative to the rest of New Zealand

<sup>6</sup> 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 produced GDP value of almost \$56 billion<sup>7</sup>, 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).

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<sup>7</sup> 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%
<b>Total</b>	<b>56,479</b>	<b>100%</b>	<b>105,420</b>	<b>100%</b>	<b>161,899</b>	<b>100%</b>

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%
<b>Total</b>	<b>1.9%</b>	<b>1.3%</b>	<b>1.5%</b>

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

## 4 Economic Role of Ports of Auckland in the Economy

### 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 quantum of activity that is either related to or is facilitated by the Port is estimated in this section. The study presents the measures of port activity, port related activity and facilitated trade activity in the Auckland economy. . These measures are combined to establish the total economic role of the Port in the Auckland economy.

### 4.2 Facilitated Trade

Ports of Auckland provides New Zealand exporters and importers with ready access to overseas markets, and the Port plays a vital role in ensuring the flow of goods in and out of this highly trade-dependent country.

To assess POAL's role in the Auckland and national economies the source of exports and destination of imports at a regional level is required. Understanding the interregional flow of imports and exports that pass through POAL provides a basis for gauging the facilitated contribution of POAL to the wider economy. The contributions described in this section relate only to the value of the exports and imports that is generated by their leaving or entering New Zealand.

The assessment of the facilitated role of POAL on Auckland and rest of New Zealand economies is based on 1) the regional desegregation of POAL import and exports and 2) a multiplier analysis to determine the wider impacts in terms of Gross Output, Value Added and employment. The method used to estimate the source and destination of the imports and exports that move through POAL is discussed in the Appendix B. The results of this analysis are presented in the following subsections.

The export origin is commonly defined as the location of the last producer in the chain before the goods leave the country. The upstream inputs from other New Zealand firms are not international exports for the purposes of this study. This definition of international trade is the standard definition applied by the United Nations<sup>9</sup>.

For example if an Auckland exporter of shoes purchased leather from the Waikato and then produced shoes for export, the entire value of the shoes is defined as exports from Auckland. According to the standard definition the leather from Waikato is not an international export<sup>9</sup>. However, the model measures these backward linkages from export activity via the multiplier analysis.

## 4.2.1 Exports

Ports of Auckland is the largest export port in the country in value terms, (although only slightly larger than POT), handling \$9.7 billion worth of exports (FOB) and 293,000 TEUs in 2010<sup>10</sup>. This represents 25 percent of sea exports and 22 percent of total New Zealand merchandise exports by value, and 30 percent of sea exports by volume.

Figure 4.1 (below) shows the source of exports that pass through POAL, notable observations about which include that:

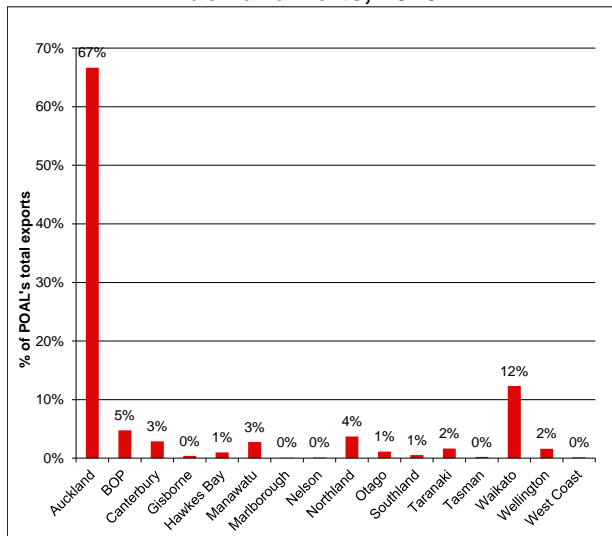
- The largest share (67 percent) of POAL exports (by value) is sourced from within Auckland.
- The next largest origins of exports through POAL is Waikato Region, with smaller shares from Northland and Bay of Plenty.
- POAL handles 39 percent of Auckland's total exports by value, 21 percent of Northland Region's exports and 20 percent of Waikato's, compared to 17 percent of total New Zealand Exports. (Figures 4.1. and 4.2).
- Of the \$9.7 billion exported through POAL, an estimated \$6.5 billion (67 percent) came from within Auckland, the remainder from the rest of New Zealand. The next largest export origin is the Northland region (21 percent of POAL exports valued at \$2 billion).
- In 2010 the goods that Auckland based producers exported through the Port added value to the economy of \$1.9 billion, sustaining 26,207 jobs. The total annual export role in the Auckland economy from POAL is \$4.8 billion or 73,790 jobs (Table 4.1).

**Table 4.1: Ports of Auckland Facilitated Exports (Auckland 2010)**

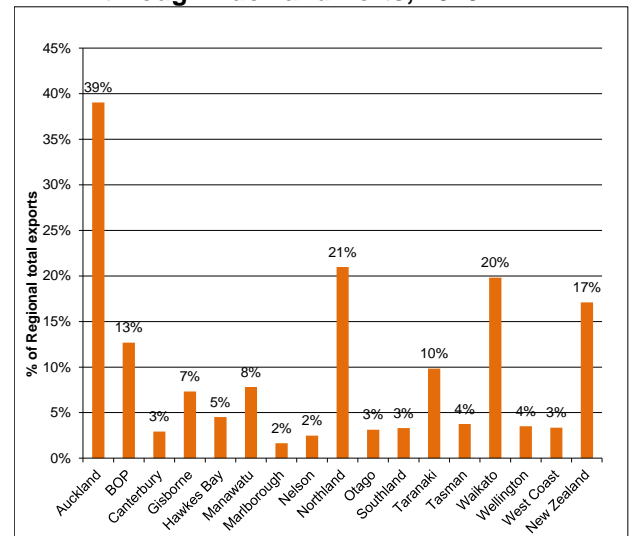
<b>Economic Activity</b>	
<b>Direct Effects</b>	
Gross Output (\$m)	\$ 6,455
GDP or Value Added (\$m)	\$ 1,937
Employment (ECs)	26,207
<b>Flow-on Effects</b>	
GDP or Value Added (\$m)	\$ 2,880
Employment (ECs)	47,583
<b>Total Impacts</b>	
Gross Domestic Product (\$m)	\$ 4,817
Employment (ECs)	73,790

<sup>10</sup> TEUs are YE June 2010, FOB is 2010 calendar year

**Figure 4.1: Source of Exports through Auckland Ports, 2010**



**Figure 4.2: Share of Total Regional Exports through Auckland Ports, 2010**



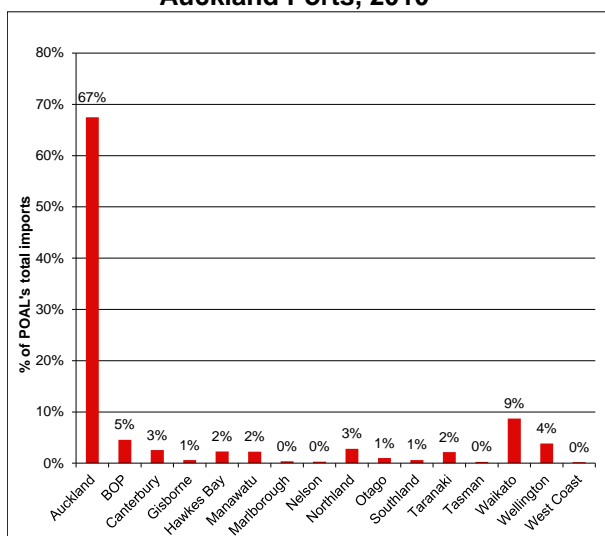
Source: Statistics NZ Import Data and MEL GRIT Model

## 4.2.2 Imports

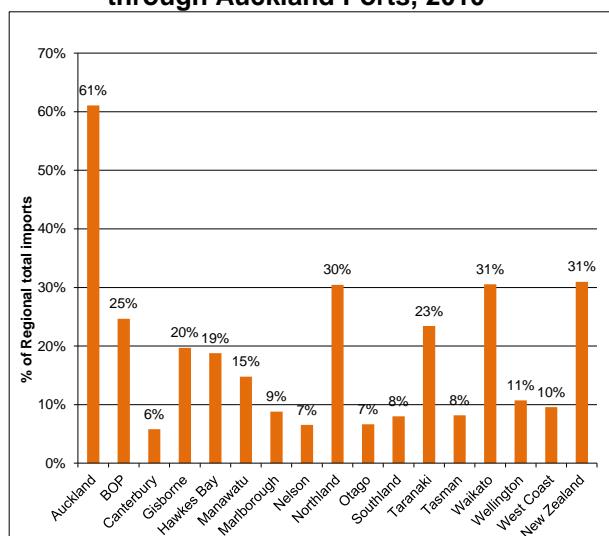
The Port of Auckland is a bigger import than export port, and as well as being New Zealand's largest export port, it is also the biggest import port, with \$16.8 billion (CIF) of import activity in 2010, representing 51 percent of sea imports and 40 percent of the country's total imports. The next largest import seaport is Whangarei at \$4.4 billion (where Marsden Point Petrochemical imports dominate). Of the \$16.8 billion of imports through the Port, 67 percent are destined to remain in Auckland, representing 61 percent of all imports into Auckland. The balance is imported through the Auckland International Airport, Tauranga or Northland ports (Figures 4.3. and 4.4).

The impact in this section relates to the value which imports add to the Auckland economy, either through the production process (when imports are used as an intermediate input) or through trade sector margins and indirect taxes (when imports satisfy final demands).

**Figure 4.3: Destination of Imports through Auckland Ports, 2010**



**Figure 4.4: Share of Total Regional Imports through Auckland Ports, 2010**



Source: Statistics NZ Import Data and MEL GRIT Model

Of the \$16.8 billion of imports passing through POAL:

- \$7.2 billion (43 percent) is used as intermediate inputs within Auckland in the production of goods and services (i.e. value is added to the imports).
- \$4.9 billion (29 percent) is used as intermediate inputs elsewhere within New Zealand in the production of goods and services.
- In total, \$4.6 billion (27 percent) of imports entering via POAL are consumed either by households as final demand (mainly through the retail sector) or other purposes that contribute little or no added value to the New Zealand economy.

In 2010, imports through POAL added value to the Auckland economy of \$3.0 billion, sustaining the equivalent of 42,656 jobs. The total annual import impact on the Auckland economy from POAL is \$7.3 billion or 110,712 jobs (Table 4.2).

**Table 4.2: Ports of Auckland Facilitated Imports (Auckland 2010)**

Economic Activity	
<b>Direct Effects</b>	
Gross Output (\$m)	\$ 11,306
GDP or Value Added (\$m)	\$ 2,981
Employment (ECs)	42,656
<b>Flow-on Effects</b>	
GDP or Value Added (\$m)	\$ 4,369
Employment (ECs)	68,056
<b>Total Impacts</b>	
Gross Domestic Product (\$m)	\$ 7,350
Employment (ECs)	110,712

### 4.2.3 Trade Summary

In 2010 international trade moving through POAL associated with the Auckland economy generated \$17.8 billion in output. The total contribution of POAL to the Auckland economy is \$12.2 billion in value added or 184,503 jobs. Both of these measures illustrate that POAL can be seen as a facilitator for around one third of the Auckland economy (Table 4.3).

**Table 4.3: Ports of Auckland Facilitated Trade (Auckland 2010)**

Economic Activity	
<b>Direct Effects</b>	
Gross Output (\$m)	\$ 17,762
GDP or Value Added (\$m)	\$ 4,918
Employment (ECs)	68,864
<b>Flow-on Effects</b>	
GDP or Value Added (\$m)	\$ 7,249
Employment (ECs)	115,639
<b>Total Impacts</b>	
Gross Domestic Product (\$m)	\$ 12,167
Employment (ECs)	184,503

### 4.3 Auckland Role

The economic role of the Port in Auckland is the total value of the core activity and the trade which the Port facilitates, and:

- The core activity of the Port generates \$298 million in value added or 2,818 job equivalents.
- This represents 0.5 percent of productive economic activity (and employment) in the Auckland economy.
- The trade that is facilitated by the Port generates \$12.2 billion in value added (21.5 percent of Auckland value added) or 184,500 jobs (31.8 percent of Auckland employment).
- In total, POAL facilitates almost \$12.5 billion worth of economic activity in Auckland (22.1 percent of Auckland's productive economic activity) through its core and facilitated roles. This level of activity sustains some 187,300 jobs (32.3 percent of Auckland employment) (Table 4.4).

**Table 4.4: Ports of Auckland Economic Role (Auckland 2010)**

Economic Activity	Core Activity	Trade Role	Total Role
<b>Direct Effects</b>			
Gross Output (\$m)	\$ 258	\$ 17,762	\$ 18,020
GDP or Value Added (\$m)	\$ 132	\$ 4,918	\$ 5,049
Employment (ECs)	1,080	68,864	69,944
<b>Flow-on Effects</b>			
GDP or Value Added (\$m)	\$ 166	\$ 7,249	\$ 7,415
Employment (ECs)	1,738	115,639	117,377
<b>Total Impacts</b>			
Gross Domestic Product (\$m)	\$ 298	\$ 12,167	\$ 12,465
Employment (ECs)	2,818	184,503	187,321

**It is important to understand the significance of these results as they show that one fifth of Auckland's economic activity is facilitated by the Port of Auckland, therefore, events and developments which affect the Port will also potentially affect up to one fifth of the Auckland economy.**

The results do not show that on

e fifth of the economy is **dependent** on the POAL. Rather, they show that around 0.5 percent of the economy is dependent (the Port's core impact) and that *some share* of the facilitated trade impact is also **dependent** on the Port.

The rest of the POAL effect arises because the balance of trade is dependent on ports in general and Auckland is the Port chosen by import and export activities. Previous research has shown the reasons for this choice include frequency of shipping services, the extensive direct coverage of overseas markets, and service reliability. These all relate to trading efficiency and by implication, competitiveness. Accordingly, even though the major share of trade through the POAL is not dependent specifically on the Port, it is certainly not indifferent to which port is used.

#### **4.4 National Role**

Ports of Auckland handles 37 percent of New Zealand's exports and imports (by \$ value). As well as servicing the bulk of trade needs for Auckland, the Port handles goods for other regions throughout the country. This national role of the Port is significant in the New Zealand economy, and arises in two ways. First, the effect on the Auckland economy has flow on impacts through the rest of the country, as Auckland businesses purchase goods and services from other regions, and spending by Auckland consumers creates demand for businesses throughout the nation.

Second, there is a direct role through export and import businesses which operate in other regions and use the Ports of Auckland to meet their trade needs. These business operations have flow on effects throughout the regional economies, and some flow on to the national economy.

In 2010:

- POAL core and trade activity in Auckland generated nearly \$12.5 billion, which sustained the equivalent of some 187,300 jobs in NZ.
- In addition, the Port facilitated trade activity in the rest of New Zealand that was worth \$9.0 billion in value added and sustained some 148,900 jobs.
- POAL's role in the national economy is therefore \$21.5 billion (around 13.3 percent of total NZ economic activity) which sustains 336,200 jobs (Table 4.5).
- POAL's role in the New Zealand economy is wide-ranging, and while the major share of the impact is directed through the Auckland economy, there are broader direct and indirect effects throughout New Zealand.

**Table 4.5: Ports of Auckland Economic Role (National 2010)**

Economic Activity	Auckland Role	RONZ Role	National Role
<b>Direct Effects</b>			
Gross Output (\$m)	\$ 18,020	\$ 8,681	\$ 26,701
GDP or Value Added (\$m)	\$ 5,049	\$ 2,263	\$ 7,312
Employment (ECs)	69,944	33,396	103,341
<b>Flow-on Effects</b>			
GDP or Value Added (\$m)	\$ 7,415	\$ 6,776	\$ 14,191
Employment (ECs)	117,377	115,479	232,856
<b>Total Impacts</b>			
Gross Domestic Product (\$m)	\$ 12,465	\$ 9,038	\$ 21,503
Employment (ECs)	187,321	148,875	336,196

## 5 Ports of Auckland Future

### 5.1 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 growth set out 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. In this scenario volume growth remains ahead of GDP growth, in line with historic trends.
- 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 role of the Port must increase, while growth of trade through POAL is likely to continue to exceed GDP growth, it may not be to the same extent as in the past. This is partially because future growth under the aspirational (Auckland Plan) growth futures will come more from industries that do not utilise POAL to facilitate exports to the same extent as businesses in the past. (e.g. business services, the marine sector and tourism) . Note, that import trade will continue to grow at high rates in keeping with the aspirational growth targets under the Draft Growth Goals. Also, import growth is key for export businesses growth, regardless of how goods are exported and is not simply focused on increased consumption of retail and consumer goods.

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

### 5.2 Scenario Trade Futures

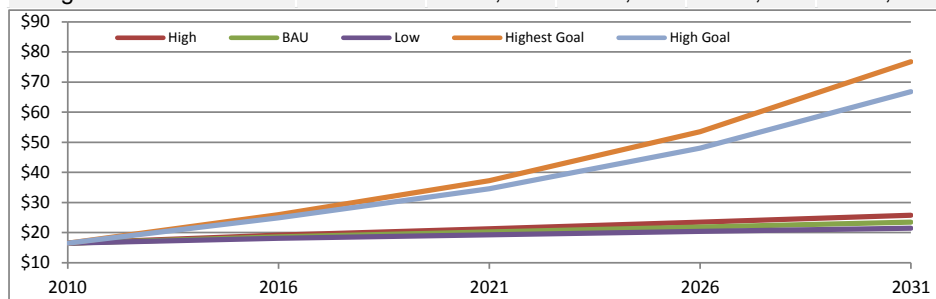
The following tables and graphs present the export and import projections which underlie each scenario. These tables provide a projection of the imports and exports that are expected to come from Auckland and the rest of New Zealand. These projections are then used to estimate the level of imports and exports that flow through POAL under the five scenarios.

#### 5.2.1 Auckland

If the general growth trend occurs into the future we would expect Auckland exports to grow from \$16.5 billion in 2010 to a level between \$21.5 to \$25.8 billion by 2031. The draft Auckland Plan economic growth goals scenarios show that if the Council achieves its aspirational growth goal exports will grow to \$66.8-\$76.8 billion by 2031 (Table 5.1).

**Table 5.1: Auckland Exports 2010 to 2031 (\$ million)**

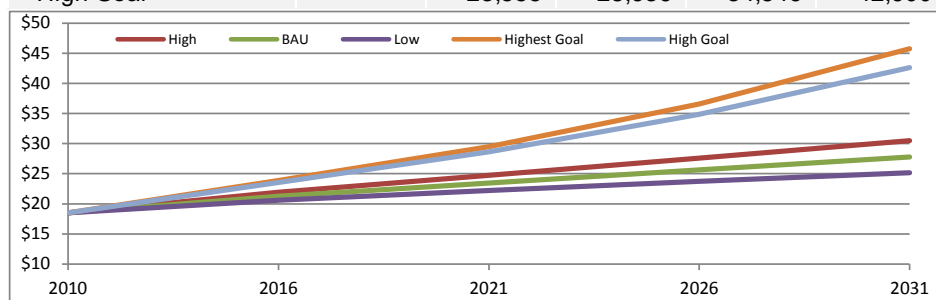
Scenarios	2010	2016	2021	2026	2031
<b>EFM Projections</b>					
High		19,196	21,315	23,515	25,806
BAU	16,539	18,615	20,236	21,860	23,486
Low		18,071	19,259	20,406	21,512
<b>Auckland Unleashed</b>					
Highest Goal		25,953	37,261	53,493	76,799
High Goal		24,899	34,599	48,075	66,800



If the general growth trend persists into the future we would expect Auckland imports to grow from \$18.5 billion in 2010 to a level between \$25.2 to \$30.5 billion by 2031. The draft Auckland Plan economic growth goals future scenario shows slower growth in imports compared to exports, with imports expected to grow to a level between \$42.6 and \$45.8 billion by 2031 (Table 5.2).

**Table 5.2: Auckland Imports 2010 to 2031 (\$ million)**

Scenarios	2010	2016	2021	2026	2031
<b>EFM Projections</b>					
High		21,908	24,723	27,581	30,490
BAU	18,513	21,254	23,451	25,620	27,758
Low		20,611	22,221	23,743	25,183
<b>Auckland Unleashed</b>					
Highest Goal		23,885	29,480	36,576	45,767
High Goal		23,555	28,636	34,846	42,600



## 5.2.2 Rest of New Zealand

If the general growth trend continues into the future we would expect the rest of New Zealand's exports to grow from \$40.1 billion in 2010 to a level between \$49.8 and \$57.9 billion by 2031. The import activity is expected to grow from \$35.6 billion in 2010 to a level between \$47.8 and \$49.2 billion by 2031. The draft Auckland Plan economic growth goals scenarios use the high growth projection for the rest of New Zealand trade activity (Table 5.3).

**Table 5.3: Rest of New Zealand Trade 2010 to 2031 (\$ million)**

Scenarios	2010	2016	2021	2026	2031
<b>Exports</b>					
High		45,171	49,316	53,560	57,915
BAU	40,129	44,070	47,277	50,458	53,611
Low		43,036	45,416	47,704	49,897
<b>Imports</b>					
High		39,766	43,050	46,181	49,169
BAU	35,625	39,567	42,680	45,642	48,446
Low		39,388	42,365	45,182	47,832

### 5.3 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.

#### 5.3.1 Port and Related Activity

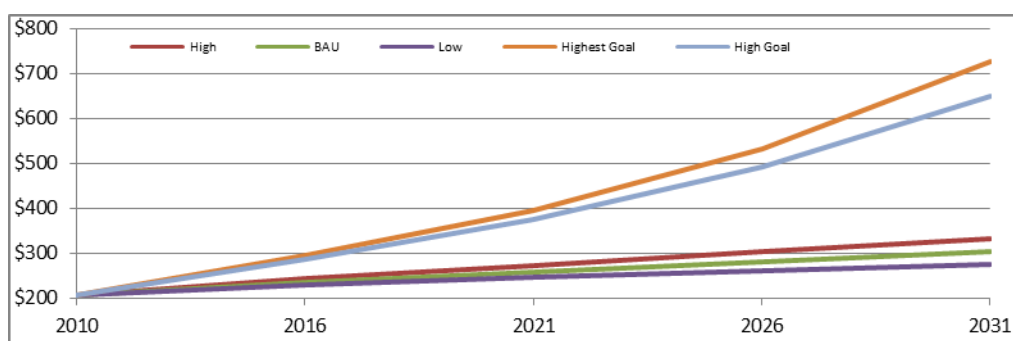
Port and Port Related activity is forecast by holding the relationship between current port activity and trade activity constant and projecting trade activity into the future using the EFM and the draft Auckland growth goals assessments. This is cross checked against POAL internal projection data:

- The three EFM scenarios (High, BAU and Low) generate levels of trade activity used to forecast Port activity.
- 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 scenarios. However, it is believed that in order to maintain a conservative position, the relationship is held constant between current port activity and trade volumes and these are projected forward under the Draft Auckland Growth goals (for each of the Growth Goal high and highest projections).

If Port activity grows under these assumptions, POAL is expected to grow from \$207.6 million in 2010 to a level between \$277 million and \$333 million by 2031. Under the draft Auckland Plan projections the Port would grow at a faster rate, reaching between \$648m and \$726m million by 2031 (Table 5.4).

**Table 5.4: Port Activity 2010 to 2031 (\$ million)**

Scenarios	2010	2016	2021	2026	2031
<b>EFM Projections</b>					
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
<b>Auckland Unleashed</b>					
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 activity associated with the port grows at the rates defined in the EFM, that is, growth is related to the level of activity in the whole economy. The EFM records the interrelationships between all industries in the economy so the model implicitly includes the relative demand for these associated activities under each scenario.

### 5.3.2 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.

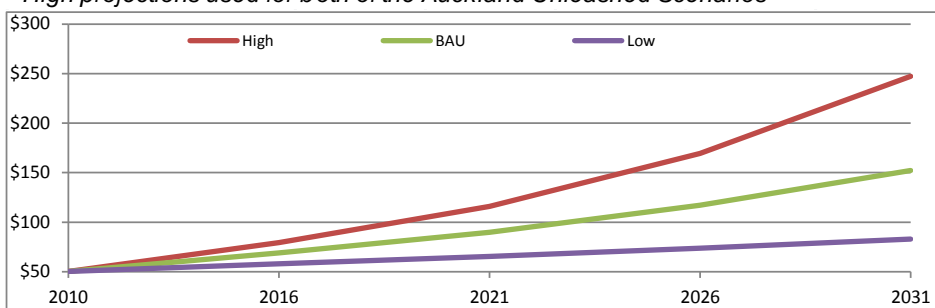
The historic data shows that during the past decade the industry activity in Auckland and New Zealand has grown rapidly. It also shows that the majority of the growth has occurred in the last five years with either very weak growth or even negative growth in the first half of the decade. In this study 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 growth goal scenarios.

**Table 5.5: Cruise Activity 2010 to 2031 (\$ million)**

Scenarios	2010	2016	2021	2026	2031
<b>Projections</b>					
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



## 5.4 Ports of Auckland Future Role in the Economy

Applying all the growth scenarios outlined above indicates that the Port's role in the Auckland economy is expected to remain relatively constant in the base EFM scenarios from 22.1 percent 2010 to range of 21.3 to 22.2 percent in 2031. If the AU growth goals are met the Port's role will be more pronounced with over 24.8 percent of the activity in Auckland being related to the Port and trade that flows through the Port.

The Port's role in the national economy is expected to increase from 13.3 percent of the Auckland economy in 2010 to a level between 13.6 to 14.0 percent in 2031 (base EFM scenarios). If the draft Auckland Plan growth goals are met the Port's role will be more pronounced with over 17.0 percent of the activity in the national economy being related to the Port and trade that flows through the Port.

### 5.4.1 Auckland Economy

The Ports of Auckland have a significant and growing role in the Auckland economy. The Port facilitated activity is worth nearly \$12.5 billion (value added) in 2010. If the economy continues to follow long term growth trends (BAU) the Port will facilitate \$18.4 billion of the Auckland economic activity by 2031. The results show that the Port's role will increase rapidly if the Council's growth goals are achieved, with the Port's role in the economy growing to over \$37.4 billion by 2031 (Table 5.6).

**Table 5.6: Role in the Auckland Economy 2010 to 2031 (\$ million Value Added)**

Scenarios	2010	2016	2021	2026	2031
<b>EFM Projections</b>					
High		14,658	16,464	18,328	20,265
BAU	12,465	14,210	15,597	16,979	18,357
Low		13,777	14,789	15,754	16,675
<b>Auckland Unleashed</b>					
Highest Goal		17,478	23,155	30,928	41,688
High Goal		17,029	22,017	28,607	37,414

## 5.4.2 National Economy

The Ports of Auckland have a significant and growing role in the national economy as well. The Port facilitated activity worth over \$21.5 billion (value added) in 2010. If the economy continues to follow long term growth trends (BAU) the Port will help facilitate \$30.6 billion of the nation's economic activity by 2031. The results also show that the Port's national role will increase rapidly if the Auckland Council's growth goals are achieved, with the role growing to over \$49.7 billion by 2031 (Table 5.7) in value added terms.

**Table 5.7: Role in the National Economy 2010 to 2031 (\$ million Value Added)**

Scenarios	2010	2016	2021	2026	2031
<b>EFM Projections</b>					
High		24,765	27,427	30,120	32,863
BAU	21,503	24,224	26,385	28,512	30,600
Low		23,704	25,423	27,060	28,614
<b>Auckland Unleashed</b>					
Highest Goal		27,586	34,118	42,720	54,286
High Goal		27,043	32,805	40,139	49,658

## 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.<sup>11</sup>

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 49<sup>th</sup> 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.

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<sup>11</sup> 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 Source of Imports and Exports

The source of New Zealand exports and destination of overseas imports moving through POAL has been established using a linear optimisation approach that distributes individual regions' total import and export activity<sup>12</sup> to POAL based on the distance/time decay curves for 48 industry sectors based on the following criteria.

### Exports

1. The value of exports leaving New Zealand via POAL from all sectors and regions equal 17.1% (Source: Harmonised System data and Non-Merchandise Trade).
2. In each industry sector the total value of exports from all regions leaving the country via POAL should be in the same proportion as that obtained from the Harmonised System data e.g. 60% of the nation's dairy exports leave via POAL. (In the model the differences between the modelled values and target values are minimised).
3. The total value of exports to POAL from a region does not exceed the total exports from that region.

### Imports

1. The value of imports entering New Zealand via POAL from all sectors equals 31% (Source: Harmonised System data and Non-Merchandise Trade).
2. In each industry sector the total value of imports from all regions entering the country via POAL should be in the same proportion as that obtained from the Harmonised
3. The total value of imports from POAL to a region does not exceed the total imports to that region.

With these constraints in place the value of exports in a sector from a particular region is calculated using the following formula;

$$EP_R^i = e^{C_i \times D_R} \times EP_R^i$$

Where;

$EP_R^i$  is the value of sector  $i$  exports from region  $R$  received by POAL (\$m)

$e$  is the exponential function

$C_i$  is the coefficient for industry  $i$  that solves the constraints stated above.

$D_R$  is the time in hours from region  $R$  to POAL

$E_R^i$  is the total exports by sector  $i$  that is from the region  $R$  (\$m).

### Example: Horticulture and fruit growing exports from Waikato

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<sup>12</sup> Based on MEL's 123 Sector GRIT Model 2001

If the average distance from POAL to the Waikato region is 3 hours ( $D_{Waik}$ ) and the exports of horticulture from the region was \$228 million ( $E_{Waik}^{Hort}$ ). The model would calculate the distance decay coefficient C for the industry based on the amount of trade from the industry and its location relative to the proportion of the total trade from the industry that goes through POAL. In this case the distance decay constant for the horticulture industry is around -1.1 ( $C_{Hort}$ ). This decay constant and resulting decay curves for the horticulture industry is steep relative to other industries. Given this information and the constraints it is possible to calculate the value of exports from the Waikato horticulture sector that goes through POAL ( $EP_{Waik}^{Hort}$ ).

The follow calculation shows that around \$9 million of the Waikato horticulture sector exports flow to POAL.

$$EP_{Waik}^{Hort} = e^{C_{Hort} \times D_{Waik}} \times E_{Waik}^{Hort}$$

$$EP_{Waik}^{Hort} = e^{-1.1 \times 3} \times 228$$

$$EP_{Waik}^{Hort} = 9$$

## Appendix C: 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 D: 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 economic growth goals 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 petroleum/cement 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 petroleum/cement 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 petroleum/cement 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. The petroleum/cement activity is assumed to grow at the industry level growth rate from the AU Highest. 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. The petroleum/cement activity is assumed to grow at the industry level growth rate from the AU High. 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.

## References

- Auckland Council (2011) *Auckland Unleashed: The Auckland Plan Discussion Document*.
- Auckland Regional Council (2008) *Economic Futures for the Auckland Region, Part 1: Knowledge based for scenarios development*
- Bensassi. S, Martínez-Zarzoso. I, and Burguet. C (2011) *The uneven effect of maritime transport cost on international trade*, XII Jornadas de Economía Internacional, Castellon 16-18 June
- Covec (2008) *Economic Impact of POAL*
- Crozet, M. and Koenig, P. (2010), *Structural gravity equations with intensive and extensive margins*. Canadian Journal of Economics, 43: 41–62
- Fabling. R, Grimes. A and Sanderson. L (2011) *Any port in a storm? The impact of new port infrastructure on New Zealand exporter behaviour* RBNZ DP2011/01
- Market Economics (2006) *Economic Impact of the Ports of Auckland Ltd*
- Market Economics (2010) *New Zealand Regional Cruise Industry Study*
- McDermott Fairgray (1999) *Economic Impact of Closure of the Port of Auckland*
- New Zealand Productivity Commission (2011) *International Freight Transport Services*.
- New Zealand Transport Agency (2010) *Economic Evaluation Manual, V1 and V2*
- NZIER (2010) *Port Performance and Ownership: An assessment of the evidence*.
- NZIER (2010 b) *Freight Futures: Long term Sea Freight Scenarios*
- Paling. R, Sanderson. K and Williamson. J (2011) *Economic Linkages between New Zealand Cities*
- Pearson. B (2007) *Review of Road Freight Costs in New Zealand and Comparable Australian States*.
- Simonovska. I, & Waugh. M, (2011) *The Elasticity of Trade: Estimates and Evidence*, Working Paper 11-2, University of California at Davis, Department of Economics.
- Statistics New Zealand (2010) *Business Frame Database*
- Statistics New Zealand (2010) *HS2 Commodity Trade Data, value and tonnes by port*.
- United Nations and World Bank. (2009) *System of National Accounts 2008*, New York: United Nations Statistics Division.

## 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 and port related 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.

**Providor:** 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.