

Executive Summary

Introduction

The movement of freight plays a vital role in a modern economy. The freight task in New Zealand is substantial, moving the equivalent of about 50 tonnes per year for each member of the population. Given the size of the freight task and its importance throughout the economy especially in supporting the movement of exports where the costs and quality of freight transport services may be particularly critical, effective planning is important to ensure that the freight sector is able deliver effective support for the wide range of activities in the agricultural industrial and commercial sectors. This planning needs to be supported by an understanding of the sector and of the different activities which it encompasses.

The National Freight Demands Study undertaken in 2008 (2008 NFDS) was possibly the first attempt to provide a comprehensive understanding of the sector and to provide forecasts of future activity at both a nationwide and regional level which could be used as the basis for this planning. However with the passage of time the results have become outdated, especially given the advent of the global economic crisis which emerged just as the study was being completed. This study therefore updates the earlier work and also takes the opportunity to expand the analysis, taking account of additional experience in this area and including additional sources of data particularly those derived from the Freight Information Gathering System (FIGS) developed by the Ministry of Transport. These were not available for the earlier work.

Approach to the Study

In order to examine the freight task in detail, 29 commodity movements were identified and investigated separately. This represents an expansion over the 17 commodities identified for the 2008 NFDS. For each of these commodities, information was built up from a wide range of published and unpublished sources and this was supported by discussions with a large number of participants in the freight sector. The steps involved for each commodity followed the broad approach undertaken in the earlier NFDS and included:-

- Identifying the total size of the market and where possible the regional distribution of activities
- Determining the linkages between the areas where the goods are produced or imported and where they are consumed or exported.

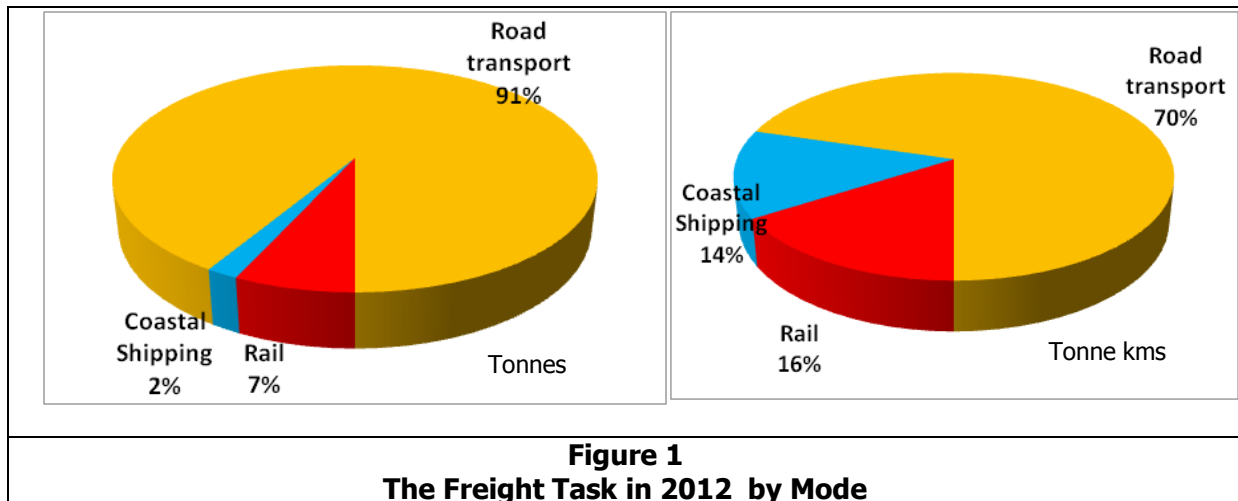
This was undertaken for each commodity and the totals were then compared against control totals in tonne-km terms derived from external sources for each mode, and the extent of the shortfall estimated. This amounted to about 8 per cent of the total. The total estimated tonne-kms and tonnes derived from the commodity analysis were adjusted to bring them into balance with the control totals, taking account of the traffic which had possibly not been identified elsewhere and a General Freight commodity was defined to cover this traffic. This was assumed to be comprised of intra-regional movements. Details of total rail and coastal shipping movements were obtained and subtracted from the adjusted totals to give the total road movements and these were checked against observed traffic counts to confirm that they provided a satisfactory match.

The Scale of the Freight Task

Our estimates of the scale of the current freight task are set out in Table 1.

Table 1 The Freight Task in 2012				
Mode	Tonnes		Tonne-kms	
	Million tonnes	Per cent of total	Billion tonne-kms	Per cent of total
Rail	16.1	7%	4.2	16%
Coastal shipping	4.3	2%	3.6	14%
Road transport	215.6	91%	18.5	70%
Total	236.0	100%	26.3	100%

Road is the dominant mode in terms of both tonnes and tonne-kms accounting for 91 per cent of tonnes moved and 70 per cent of tonne-kms. This is illustrated in Figure 1



Drivers of the Freight Task

A number of factors are affecting the freight task, some of these factors are the result of international events and others are driven by the domestic market:-

- The effects of the Global Financial Crisis which has had a particularly marked impact on the demand for movement of building materials and also to a lesser extent for manufactured and retail goods, and
- The growth in the volumes transported of a range of agricultural products, especially logs and timber, and milk and dairy products. These in particular have contributed to an increase of over 50 per cent in total export volumes from 2006-07 to 2012.

The freight industry is responding in a number of ways:-

- Changes in international shipping patterns which have affected the balance of traffic between Auckland and Tauranga and have also affected movements through some of the smaller ports such as Timaru and New Plymouth

- The development of more sophisticated methods of product distribution especially for supermarket and other retail goods through the use of distribution centres and online inventory management to help manage stock-holding and transport delivery costs and to ensure high levels of product availability at all parts of the distribution chain. These have been supported by the development of transport solutions integrated across the whole supply chain from raw material to finished product, and in turn both of these have been assisted by improvements in data availability from sourcing through to final delivery
- A growing desire to apply environmentally sustainable solutions to the movement of freight, which has encouraged a shift to rail transport
- Investment in both road and rail and the introduction of High Productivity Motor Vehicles (HPMVs,) all of which allow more efficient freight operations and reductions in costs.

Emerging trends such as the growth in online shopping, improved data and information systems, increasingly congested urban road and rail networks and changes in international shipping services are forcing the freight sector to reassess the way it operates and to innovate to meet customer needs and improve efficiency.

Online shopping, for example, places new challenges on traditional supply chains under which goods have been shipped from manufacturers in reasonably large size consignments (full container load), to distribution centres, from where they are deconsolidated and transferred to retail outlets. The consumer collects the goods and transports them to the final destination. Now the consumer is increasingly cutting out the retail step in the chain and seeking to have the goods delivered to the home. This presents considerable challenges for the freight sector which has to innovate and adapt to meet this new demand.

As more detailed data becomes accessible, the freight sector is identifying ways in which this information can be utilised to improve operational efficiency, including fleet scheduling, vehicle management, and capacity utilisation. Furthermore, improved information is assisting in more efficient stock management, order picking and overall supply chain management. Better information about traffic flows is also assisting operators to schedule services during off peak periods which results in faster transit times, improved vehicle utilisation and higher productivity.

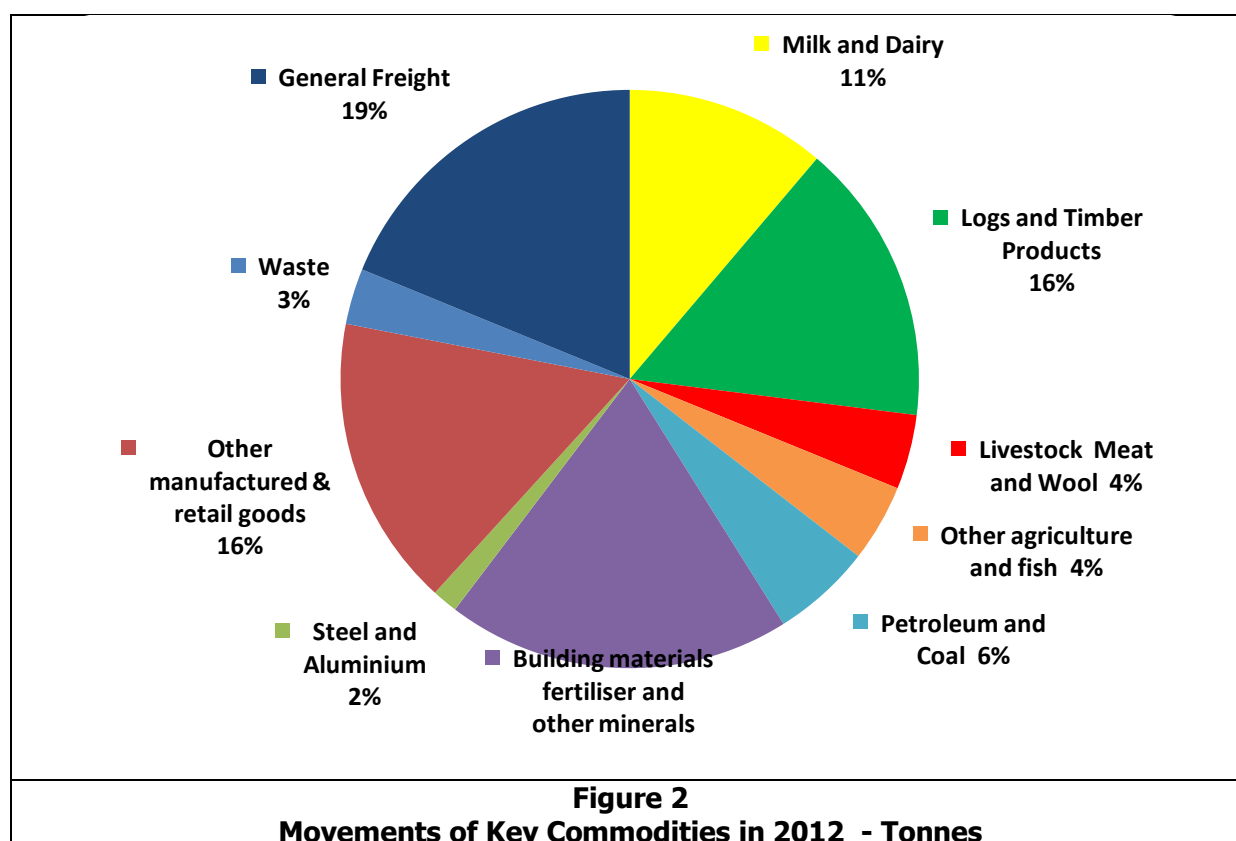
The freight sector is highly competitive with a large number of operators. This means as freight owners continue to push the sector for efficiencies, the market will continue to respond and adapt through innovation.

The Freight Task in Detail

The commodities have been combined into broad groups and the 2012 Freight Flows estimated for each are set out in Table 2, and Figure 2 and 3.

Commodity Group	Tonnes lifted (million)	Tonne-kms (billion)
Milk and dairy	26.4	2.5
Logs and timber products	37.3	4.6
Livestock meat and wool	9.8	1.5
Other agriculture and fish	10.2	1.1
Petroleum and coal	13.2	3.9
Aggregates	27.0	0.8
Building materials fertiliser and other minerals	18.4	1.5
Steel and aluminium	3.4	0.3
Other manufactured & retail goods	38.5	7.6
Waste	7.4	0.2
General Freight	44.4	2.1
Total	236.0	26.3

In tonnage terms movements are dominated by building materials (including aggregates), general freight, manufactured and retail goods and logs and timber products which account for almost three quarters of all movements.



In tonne-km terms the position is somewhat different reflecting the relatively short distances transported by building materials and general freight. The movements are dominated by manufactured and retail goods which have a nationwide coverage, logs and timber products and petroleum and coal between them accounting for 62 per cent of the total.

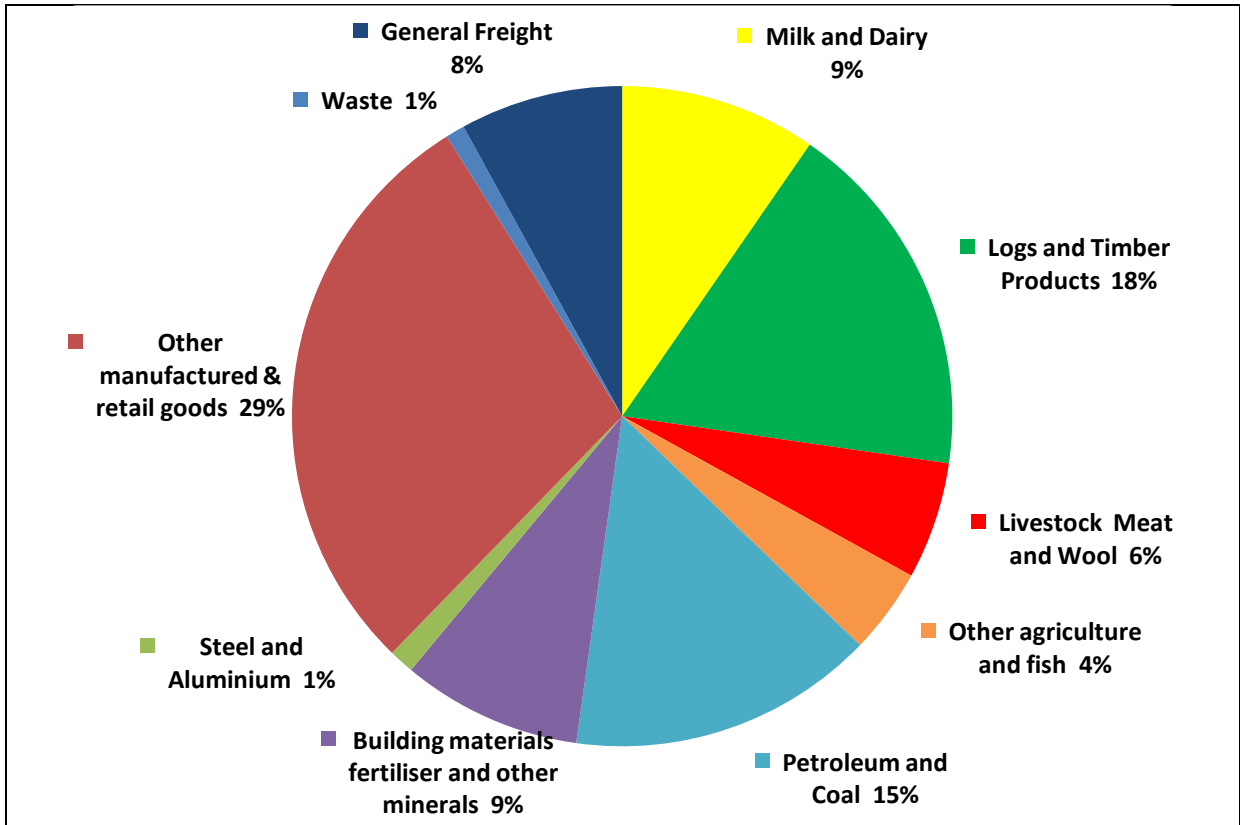


Figure 3
Movements of Key Commodities in 2012 - Tonne-kms

The pattern of movements nationally is summarised in Table 3 and 4.

**Table 3
Total Freight Movements 2012 (million tonnes)**

		Destination														
		Northland	Auckland	Waikato	Bay of Plenty	Gisborne	Hawke's Bay	Taranaki	Manawatu	Wellington	TNM	West Coast	Canterbury	Otago	Southland	Total
Origin	Northland	12.0	1.9	0.1	0.9	0.0	0.2	0.1	0.0	0.4	0.3	0.0	0.6	0.2	0.2	16.9
	Auckland	0.9	38.3	2.4	2.9	0.1	0.5	0.5	1.3	1.2	0.1	0.0	1.2	0.1	0.0	49.4
	Waikato	0.1	4.3	23.8	3.1	0.0	0.2	0.3	0.1	0.1	0.0	0.0	0.1	0.0	0.0	32.1
	Bay of Plenty	0.2	1.9	1.8	20.2	0.1	0.2	0.1	0.3	0.1	0.0	0.0	0.1	0.0	0.0	25.0
	Gisborne	0.0	0.1	0.1	0.2	3.2	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	3.8
	Hawke's Bay	0.0	0.2	0.2	1.0	0.5	7.4	0.1	0.7	0.1	0.0	0.0	0.1	0.0	0.0	10.3
	Taranaki	0.1	0.2	0.4	0.3	0.0	0.2	6.1	0.3	0.1	0.0	0.0	0.1	0.0	0.0	7.6
	Manawatu	0.0	0.3	0.1	0.2	0.0	0.9	1.9	5.7	1.5	0.0	0.0	0.1	0.0	0.0	10.6
	Wellington	0.0	0.7	0.1	0.0	0.0	0.1	0.1	0.9	6.4	0.0	0.0	0.1	0.0	0.0	8.4
	TNM	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.1	8.0	0.4	0.5	0.0	0.0	9.3
	West Coast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.8	0.1	0.0	5.5
	Canterbury	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.9	0.7	31.0	1.3	0.6	35.4
	Otago	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	8.5	0.7	10.0
	Southland	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.1	10.1	11.7
Total	13.3	48.8	29.0	28.8	4.1	9.9	9.3	9.5	9.9	9.3	3.7	37.7	11.3	11.6	236.0	

Notes: TNM is the combination of the Tasman, Nelson and Marlborough regions
Where flows are non-existent they are denoted by "-". Where they are small they are denoted by 0.0.

Table 4
Total Freight Movements 2012 (billion tonne-kms)

		Destination														
		Northland	Auckland	Waikato	Bay of Plenty	Gisborne	Hawke's Bay	Taranaki	Manawatu	Wellington	TNM	West Coast	Canterbury	Otago	Southland	Total
Origin	Northland	0.9	0.3	0.0	0.3	0.0	0.2	0.1	0.0	0.4	0.3	0.0	0.8	0.3	0.4	3.8
	Auckland	0.1	1.0	0.3	0.6	0.1	0.2	0.2	0.7	0.8	0.0	0.0	1.1	0.1	0.0	5.2
	Waikato	0.0	0.4	1.2	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	2.3
	Bay of Plenty	0.1	0.4	0.2	1.5	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	2.6
	Gisborne	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
	Hawke's Bay	0.0	0.1	0.0	0.3	0.1	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.2
	Taranaki	0.0	0.1	0.1	0.1	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.8
	Manawatu	0.0	0.1	0.0	0.1	0.0	0.2	0.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0	1.3
	Wellington	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.9
	TNM	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.2	0.0	0.0	1.1
	West Coast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	1.1
	Canterbury	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.1	1.1	0.5	0.3	3.3
	Otago	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.1	1.1
	Southland	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.4	1.0
Total	1.2	3.9	2.0	3.3	0.6	1.2	1.2	1.5	1.7	1.3	0.3	5.1	1.7	1.3	26.3	

Notes: TNM is the combination of the Tasman, Nelson and Marlborough regions

Where flows are non-existent they are denoted by "-". Where they are small they are denoted by 0.0.

Freight flows in tonnage terms are dominated by shorter distance movements within regions. There are also substantial flows in both directions between Auckland and Waikato and Bay of Plenty, reflecting the roles of the ports of Auckland and Tauranga in serving wider markets and the role of Auckland as a major market and distribution hub. This latter role of Auckland as a national distribution hub is also reflected in the flows to Manawatu and Wellington, and to Canterbury.

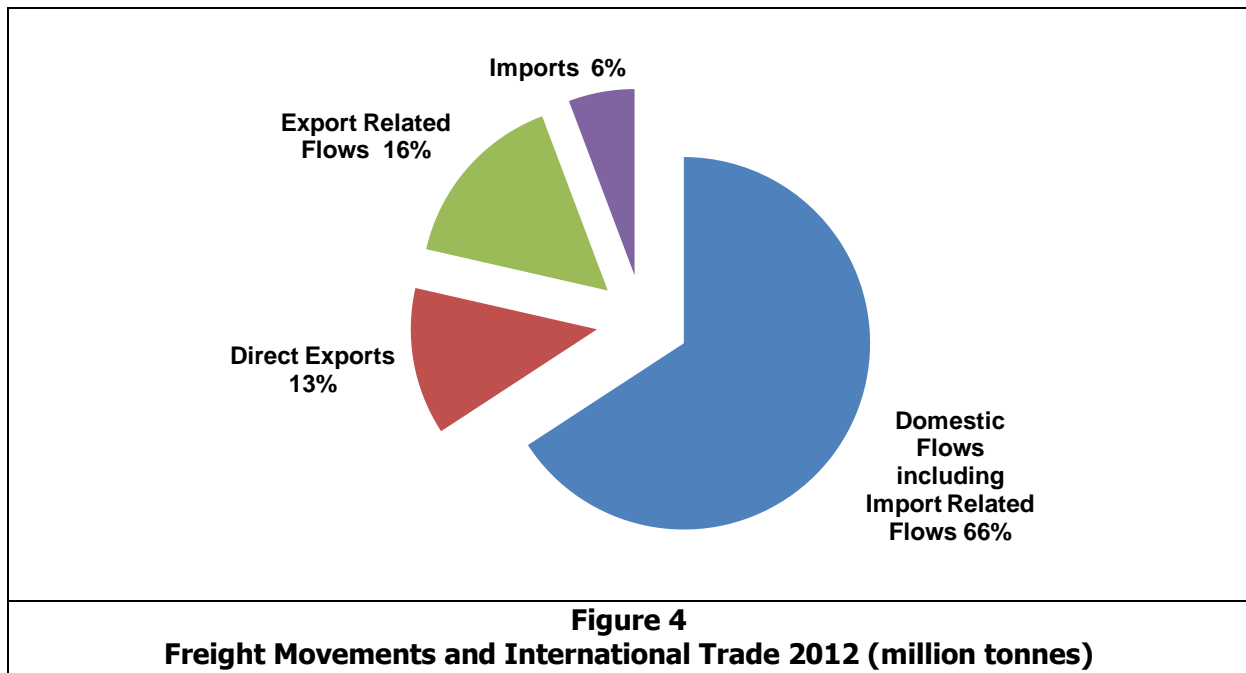
In the South Island there are substantial flows into Canterbury from West Coast, reflecting the movement of coal, and smaller movements from other South Island regions reflecting the more general role of Canterbury as a port and market. The relatively large flows outbound from Canterbury demonstrate its role as the main distribution hub for the South Island.

Freight and International Trade

An important role of the domestic freight sector is to support the movements of international trade, particularly the movements of exports, which are vital to the New Zealand economy. The proportion of the freight task associated with the movement of commodities in international trade is summarised in Table 5 and Figure 4. These figures are based on a number of assumptions and are indicative rather than precise estimates. Because of the difficulties of identifying the detailed supply chains particularly for imports, the figures probably represent a conservative assessment of the overall movements associated with international trade.

Table 5				
Freight Movements and International Trade 2012				
Type of movement	Million tonnes	Per cent of total	Billion tonne-kms	Per cent of total
Total	236.0	100%	26.3	100%
Export related movements	67.1	28%	7.7	29%
Of which				
Direct exports	30.1	13%	3.7	14%
Other flows related to exports	37.0	16%	4.0	15%
Imports	13.5	6%	1.5	6%
Domestic trade	155.0	66%	17.0	65%

Note: Percentages are rounded



Of the total freight volumes identified in 2012, it is estimated that about 30 per cent of both tonnes and tonne-kms are associated with export products at some point along the supply chain. Over time this share is forecast to decline slightly with the constrained growth in a number of the key agricultural sectors which contribute to the major export movements. Imports are expected remain broadly constant. Overall movements associated with international trade are estimated to represent over a third of total domestic freight movements and as indicated above the share may be greater.

Changes from 2006-07

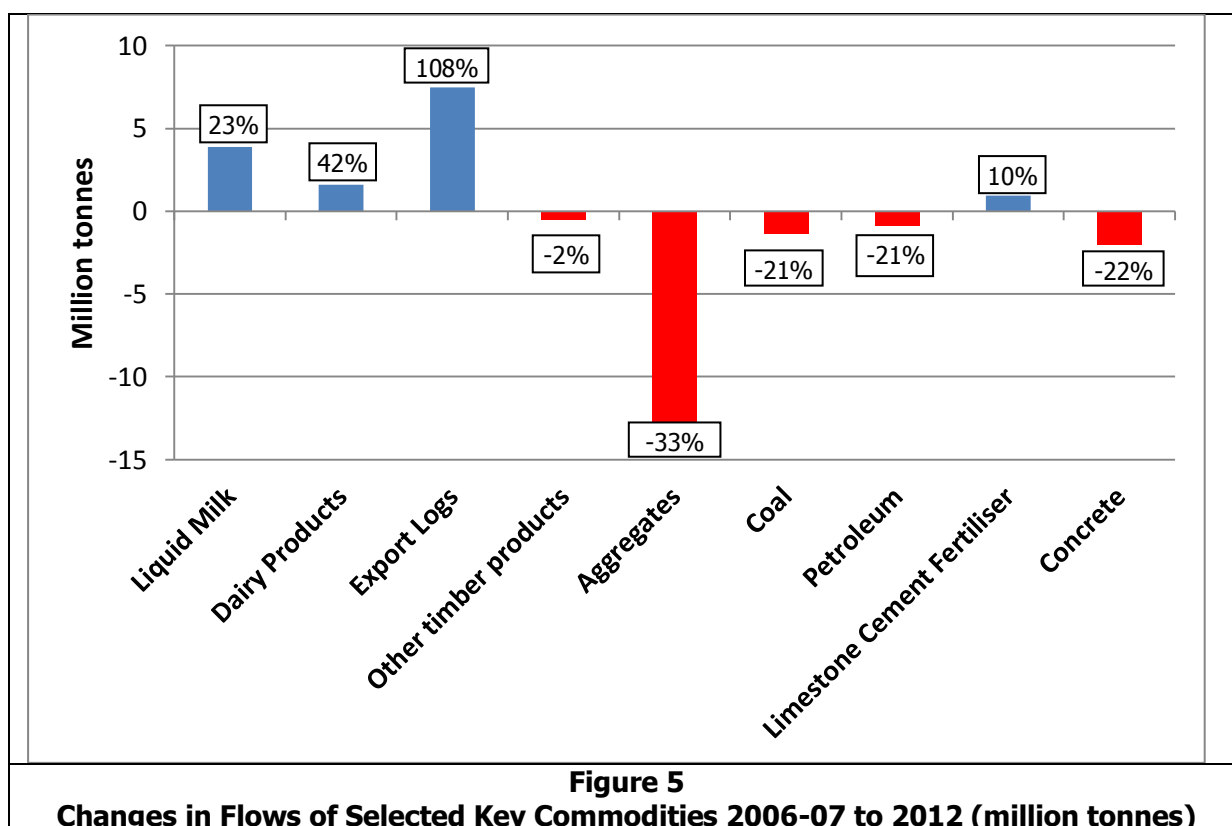
The reported changes in the overall patterns of freight flows between 2006-07 and 2012 are set out in Table 6.

Mode	2006-07		2012		Change from 2006-7 (per cent)
	Total	Per cent of total	Total	Per cent of total	
Tonnes (m)					
Rail	13.7	6%	16.1	7%	18%
Coastal Shipping	4.2	2%	4.3	2%	2%
Road transport	207.8	92%	215.6	91%	4%
Total	225.7	100%	236.0	100%	5%
Tonne-kms (bn)					
Rail	3.9	15%	4.2	16%	8%
Coastal Shipping	4.0	15%	3.6	14%	-10%
Road transport	18.8	70%	18.5	70%	-2%
Total	26.7	100%	26.3	100%	-2%

Notes: The published 2006-07 figures also included airfreight which is not included in the figures above; Percentages are rounded

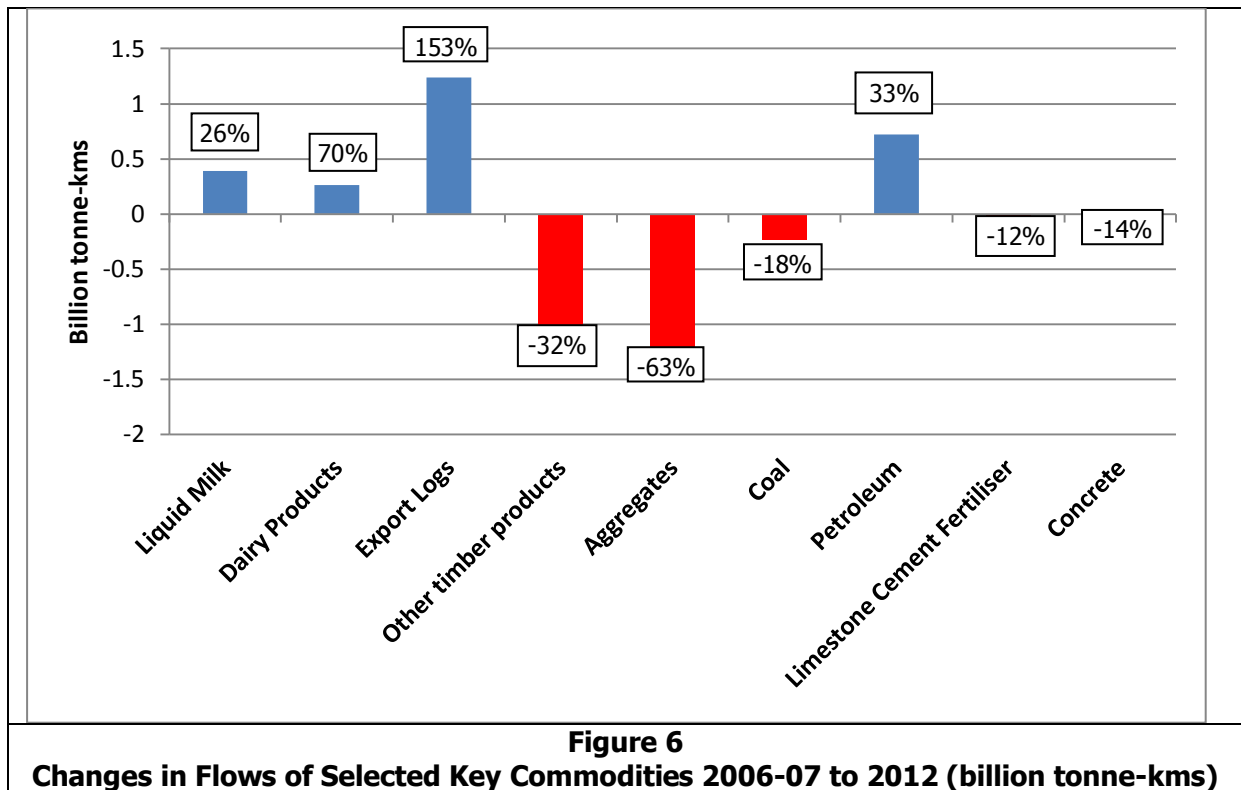
While we have taken the opportunity to improve our approach to the estimation of the size of the freight task, (particularly in terms of tonnes) and so the figures may not be strictly comparable, the position revealed is of relatively little change between 2006-07 and 2012. Total tonnages are estimated to have risen slightly and total tonne-kms fallen slightly. In terms of the tonnes carried all three modes have increased their totals but with rail growing more strongly than the other modes. In terms of tonne-kms road and coastal shipping have fallen partly matched by an increase in rail. In terms of both measures the overall modal splits are similar in the two years.

While the overall freight task has remained broadly unchanged there have been some significant changes in the volumes carried of particular commodities. Changes for key commodities where comparisons are possible are set out in **Figure 5**.



In general this shows considerable growth for a number of basic agricultural products (excluding meat where there has been little change) balanced by sharp declines in building materials, especially aggregates. For other products the volumes are much the same. In addition although direct comparisons are not possible because of a change in the approach to assessment movements of retail and manufactured goods have remained broadly constant over the period.

Changes in the tonne-kms for these commodities are set out in **Figure 6**. While in some instances these mirror the position in **Figure 5**, changes to the patterns of distribution of petroleum and limestone, cement and fertiliser have resulted some differences in the pattern recorded.



Drivers of Growth

In developing future freight forecasts we have drawn information from a wide range of sources including:-

- The views of industry stakeholders
- Forecasts from the government, trade associations, key producers and other authoritative sources
- Our analysis of the recent and longer term trends in freight growth by commodity
- Approaches used elsewhere to estimate freight growth

This has been supported by forecasts of key economic drivers such as population and GDP growth, particular factors affecting growth at a regional level, (for example the expansion of the irrigated areas) and an assessment of the potential impacts of supply constraints. Commodities were defined as primarily demand driven or supply constrained and appropriate indices based on both national macroeconomic and regional factors affecting demand and supply were developed and applied to the 2012 estimates. Population forecasts were derived from the Statistics NZ medium projections and GDP forecasts were derived from a combination of the NZIER consensus figures for early years and OECD projections for the longer term. The key drivers identified are set out in Table 7.

Table 7 Identification of drivers		
Underlying Economic Drivers	Specific demand forecasts	Specific supply forecasts
Foreign Consumption Population Regional economic activity GDP per capita Energy demand	Aggregate demand Concrete demand	Dairy production capacity Arable and grazing production capacity Log availability Fish Availability Horticulture supply

As the forecasts are undertaken at the commodity level, there is variability in the growth rate of freight for each commodity. Some commodities grow slower than the overall rate of economic growth while others grow at rates slower than their historical trend – this is often referred to as decoupling of freight from economic growth.

Commodities which grow at a rate below GDP growth are largely those where historical trends have indicated that population growth, rather than economic growth, is the most important driver of demand. Industries where population growth is a major component of the forecast are: Logs to Sawmills, Inputs to panel making, Inputs to pulp and paper, Sawn timber, Pulp and paper, Panels, Manufactured Goods, Supermarkets and Food Goods, Imported Vehicles, Coal, Steel and Aluminium and General Freight.

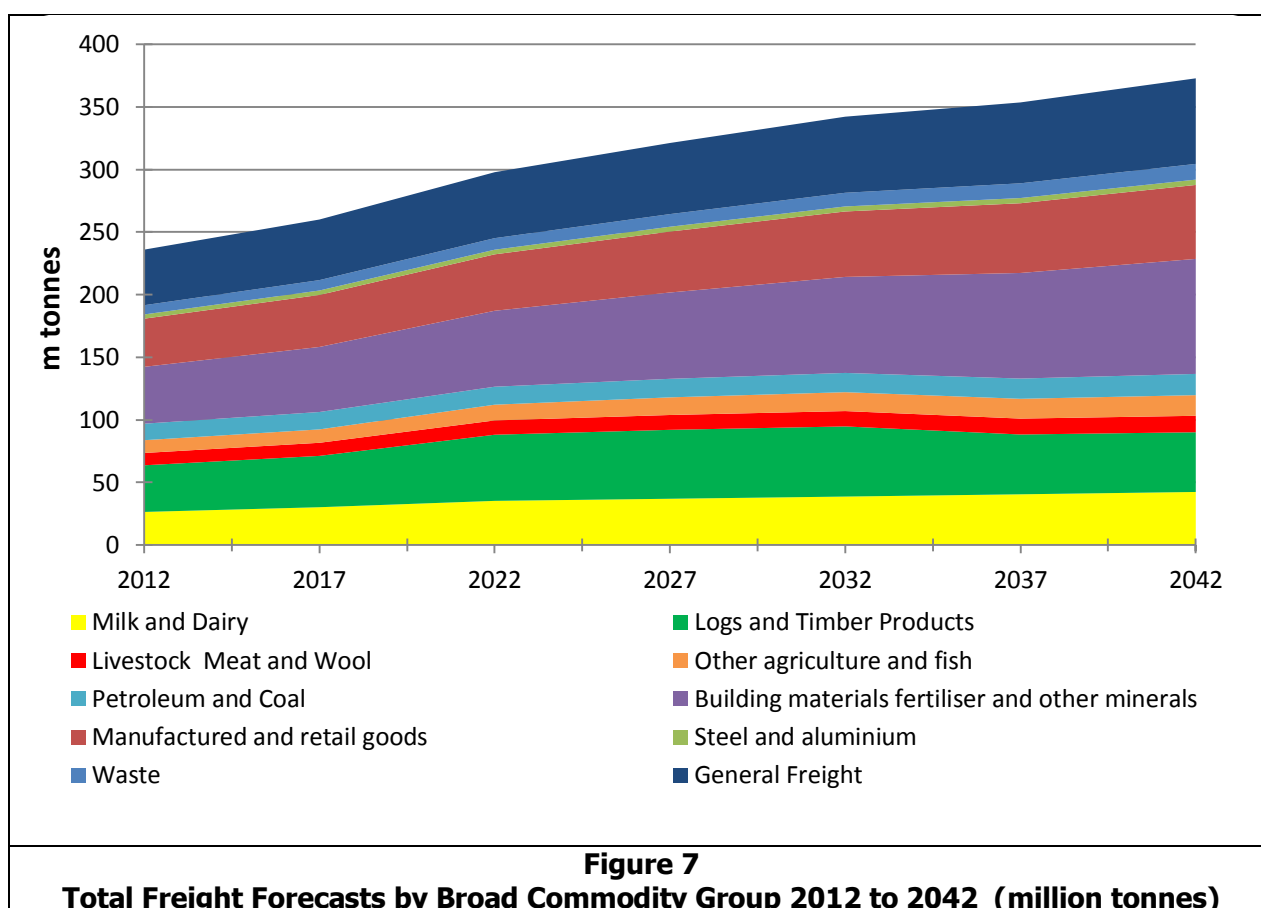
For some other commodities (Other Retail Goods, Grain, Other Minerals, Couriers and Post) decoupling involves a downwards adjustment to the level of growth that would be expected from historical trends. In these cases the downwards adjustment results in growth rates moving towards a one for one relationship with GDP over time.

Taken together, these two effects mean that the relationship between GDP growth and freight growth in the forecasts is not as strong as has been seen in historical data.

Forecasts of the Future Freight Task

The forecasts which result from the application of the indices to the 2012 flows are set out below.

Commodity Group	2012	2017	2022	2027	2032	2037	2042
Milk and Dairy	26.44	30.22	35.28	36.97	38.72	40.53	42.41
Logs and Timber Products	37.26	41.01	52.85	55.09	56.04	47.80	47.70
Livestock Meat and Wool	9.85	10.47	11.44	11.85	12.27	12.70	13.14
Other agriculture and fish	10.21	10.69	12.56	14.10	15.11	15.81	16.51
Petroleum and Coal	13.19	13.92	14.37	14.80	15.39	16.18	16.95
Building materials fertiliser and other minerals	45.43	51.96	60.69	68.99	76.71	84.37	91.91
Steel and aluminium	38.47	41.56	45.10	48.68	52.29	55.74	59.08
Other manufactured and retail goods	3.40	3.54	3.71	3.87	4.02	4.15	4.26
Waste	7.37	8.32	9.22	10.09	10.94	11.76	12.55
General Freight	44.41	48.41	52.70	56.81	60.79	64.65	68.39
Total	236.02	260.10	297.91	321.25	342.27	353.68	372.93



Overall we forecast that the freight task in terms of tonnage will increase by around 58 per cent over the next 30 years. The rate of growth by commodity differs widely with logs and timber products expected to increase and then decline as the logs harvest reaches its maximum and then starts to fall. Livestock meat and wool also shows limited growth relative to the overall forecast position. We do however forecast very substantial growth in building materials and also in dairy products, the latter reflecting productivity growth offsetting the effects of increasing constraints on the land available. Manufactured and retail goods are expected to grow by the average rate, with a balance between limited growth in manufacturing and food retailing offset by strong growth in other retail flows.

Of significance is the forecast growth in tonne-km as set out in Table 9 and Figure 8.

Commodity Group	2012	2017	2022	2027	2032	2037	2042
Milk and Dairy	2.53	2.88	3.34	3.50	3.65	3.82	3.99
Logs and Timber Products	4.64	5.09	6.65	6.87	6.95	5.76	5.68
Livestock Meat and Wool	1.51	1.59	1.74	1.80	1.87	1.93	2.00
Other agriculture and fish	1.10	1.16	1.36	1.52	1.64	1.73	1.81
Petroleum and Coal	3.95	4.14	4.26	4.38	4.53	4.73	4.92
Building materials fertiliser and other minerals	2.32	2.75	3.47	3.86	4.25	4.64	5.02
Steel and aluminium	7.57	8.13	8.78	9.44	10.09	10.72	11.33
Other manufactured and retail goods	0.32	0.34	0.36	0.39	0.41	0.43	0.44
Waste	0.24	0.28	0.31	0.33	0.36	0.39	0.42
General Freight	2.09	2.27	2.46	2.64	2.82	2.98	3.15
Total	26.26	28.63	32.74	34.73	36.57	37.12	38.76

It is estimated that the increase in freight movements in tonne-km terms of around 12.5 bn tonne-kms or 48 per cent over the next 30 years will be somewhat less than the growth in tonnage terms, reflecting the change in traffic mix, especially the reduction in log traffic.

The average distance freight is transported decreases slightly from about 111 kms to 107 kms reflecting in part the changed commodity mix and in part changes in the modal split for individual commodities.

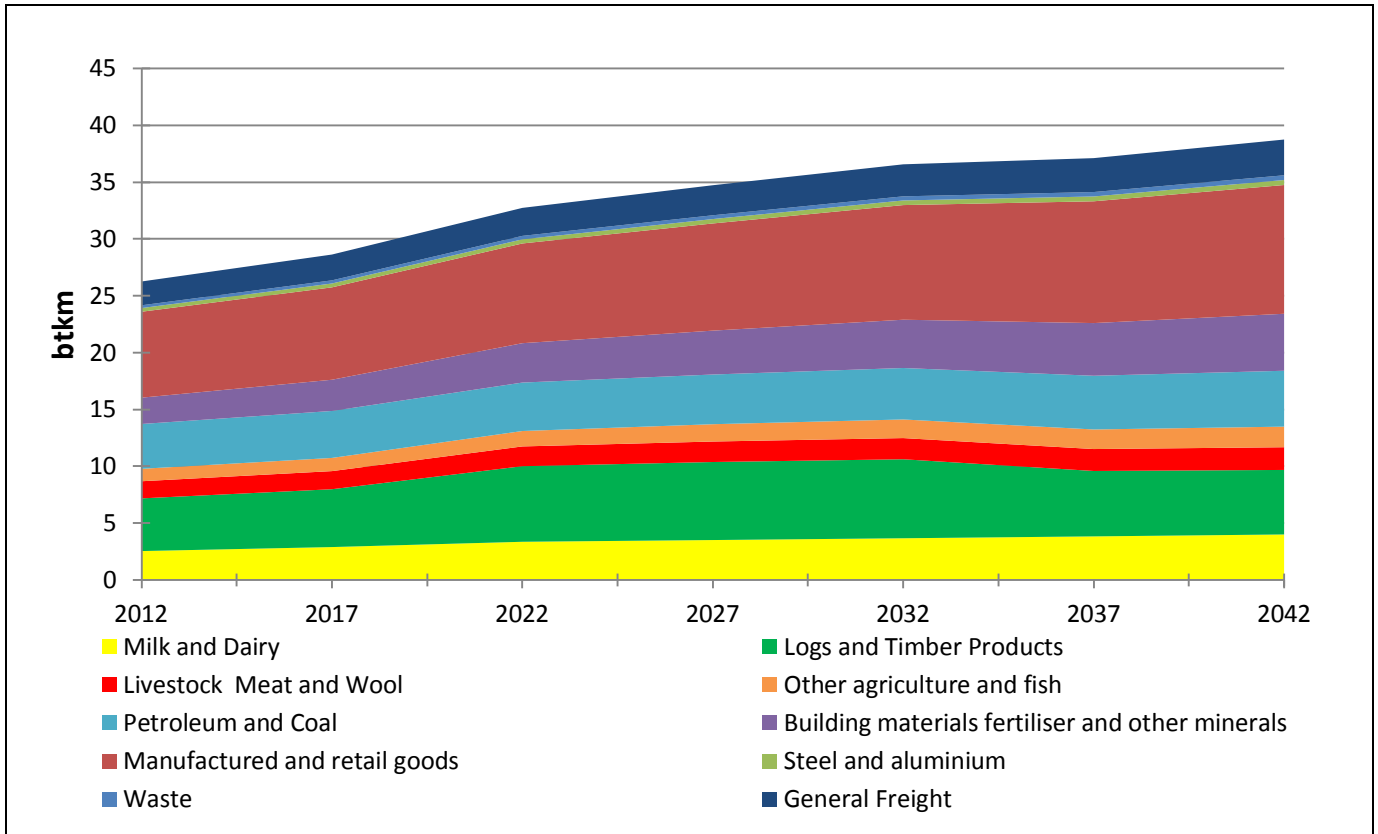


Figure 8
Total Freight Forecasts by Broad Commodity Group 2012 to 2042 (billion tonne-kms)

The pattern of regional growth has also been identified and changes in the volumes of freight originating in each region (including the flows moving wholly within the region) are set out in Figure 9.

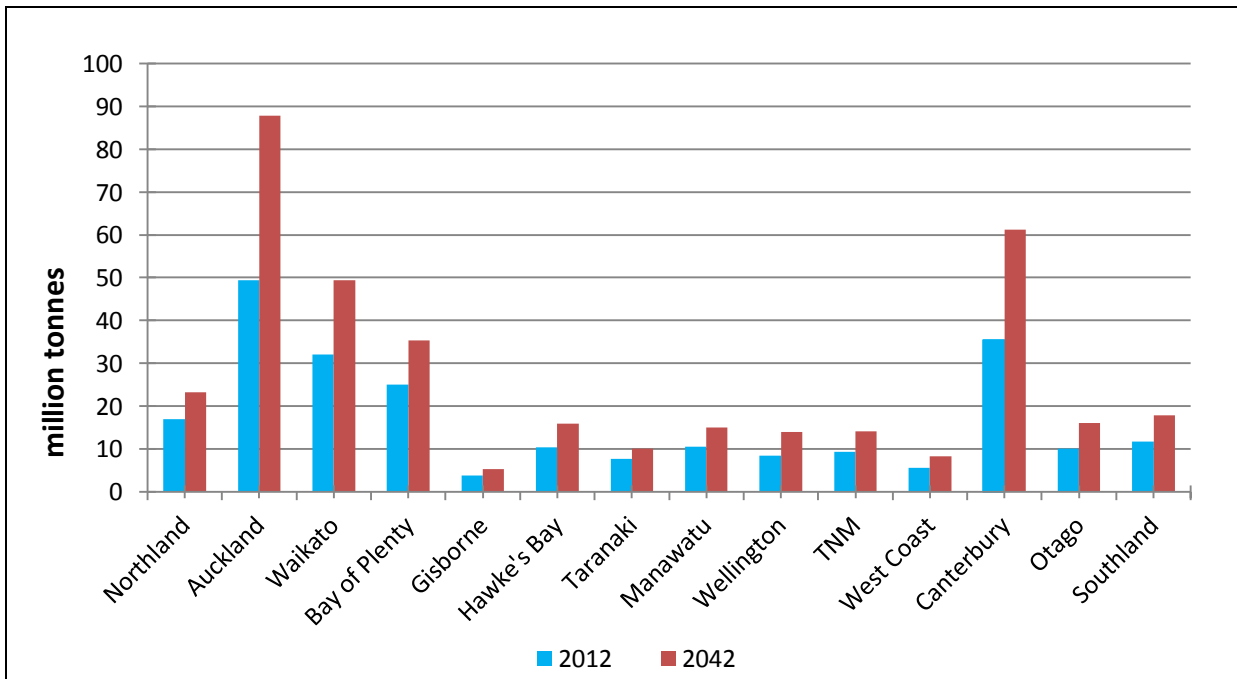


Figure 9
Changes in Freight Flows by Origin Regions 2012 and 2042 (million tonnes)

This highlights the high growth forecast for the Auckland region reflecting its growing share of population and economic activity and its increasing role as a national distribution centre. The increases forecast for Canterbury reflect its role both as a major agricultural area and as the centre for South Island distribution. Other high flows are forecast for the other regions in the "Golden Triangle"¹ This latter role of Auckland as a national distribution hub is also reflected in the flows to Manawatu and Wellington, and to Canterbury, although growth in the latter is tempered by the growth in direct deliveries to Lyttelton.

We have also examined the impact of the forecasts on the shares of the road, rail, and coastal shipping. In general the modal shares are likely to be much the same as in 2012. Each mode would therefore experience considerable growth over the period increasing by about 50 per cent over current levels in tonnage terms and by 45-50 per cent in tonne-km terms. This is set out in Tables 10 and 11.

Year	Rail	Coastal Shipping	Road	Total
2012	16.1	4.2	216.0	236.3
2042	24.3	7.60	341.0	372.9
Growth to 2042	51%	81%	58%	58%

Year	Rail	Coastal Shipping	Road	Total
2012	4.1	3.5	18.6	26.3
2042	5.9	5.1	27.6	38.8
Growth to 2042	44%	46%	48%	48%

A sensitivity analysis on the forecasts was also undertaken and two scenarios were developed:-

- A Low scenario with population growth at the 25th percentile of the Statistics NZ forecasts and a GDP forecast reduced by 0.25 percentage points below the NZIER Consensus forecasts for the short term and the OECD forecasts used for the longer term.
- A High scenario assuming population growth at the 75th percentile of the Statistics NZ forecasts and GDP growth 0.25 percent points above the NZIER Consensus and OECD forecasts

Overall, the sensitivity analysis shows that the final forecasts are fairly unresponsive to the changes in the population and GDP growth assumptions examined. In the low growth scenario, where compared to the base case forecasts population declines by around 2.5 per cent and GDP by around 7% by 2042, the overall level of freight forecast for 2042 declines by 4% when measured in tonnes and 3% when measured in tonne kilometres. The high growth scenario similarly results in only small changes in freight volumes.

The industries that are expected to be most heavily affected by changes in GDP and population are building materials, fertiliser and other minerals, waste, and General Freight. Export industries such as dairy and timber products are largely unaffected.

¹ 'Golden Triangle': Auckland, Waikato and Bay of Plenty

The regions with the largest changes are Wellington and Auckland. These regions are those with large populations and more limited primary production and so are most heavily affected by changes in domestic economic activity.