

New Zealand's marine economy: 2007–13



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1 Purpose and key findings

New Zealand's marine economy: 2007–13 provides information about the economic activities that took place in, or used, the marine environment, or that produced goods and services necessary for those activities, and made a direct contribution to the national economy from 2007 to 2013.

Our marine environment is intricately linked to our society and economy. Almost all our imports and exports, both by value and volume, pass through the marine environment; most of our oil and gas reserves are located offshore; and our fishing industry is significant. Yet there is limited understanding of how much these and other activities together contribute to New Zealand's economy.

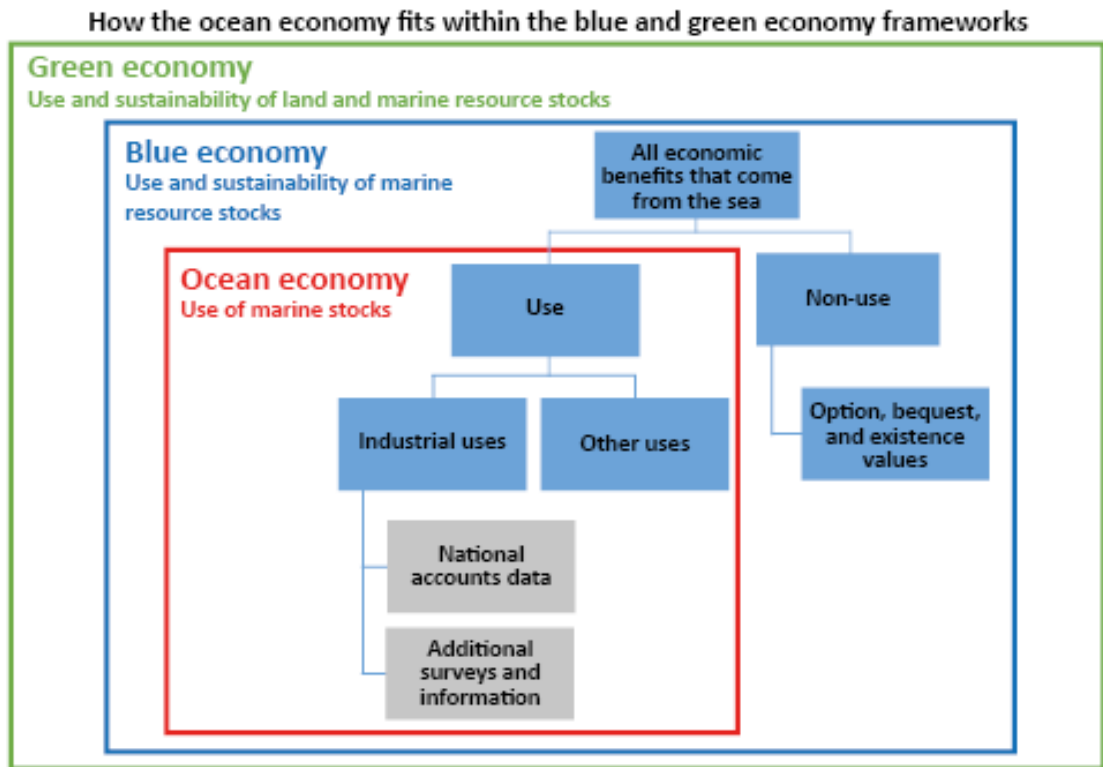
We attempt to fill this information gap by using a methodology consistent and comparable with other economies. This report aims to improve our understanding of how New Zealand's marine environment is used to generate economic activity (measured as its contribution to gross domestic product (GDP)). Information about the contribution our marine environment makes to the national economy is useful for policy development relating to ocean (marine) management and for informing public debate.

The oceans provide opportunities for economic growth and are crucial in addressing many global challenges, including food security, climate change, and energy and resource provision. Realising this potential, while managing adverse effects, demands sustainable approaches to economic development. A sound statistical and methodological base at national and international levels is important for monitoring changes in the scale and performance of ocean-based industries and their contribution to the overall economy (OECD, 2016). This economic information can be evaluated in a sustainable development framework, where the benefits from resource use are evaluated against costs to the environment or biodiversity. The likelihood that decision-making will be successful increases as information and statistical data on marine activity become available and accessible (Surís-Regueiro et al, 2013).

This report does not attempt to value natural capital, nor does it distinguish between marine-based activities that are extractive or non-extractive, use or non-use, or that enhance or degrade the marine environment.

In [International comparisons](#) we note that studies similar in scope to New Zealand's marine economy sometimes use the terms 'ocean economy' or 'maritime economy' – these terms are broadly equivalent. The United Nations Environment Programme (UNEP) launched the Green Economy Initiative in 2008. The working definition of a green economy is one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP, nd). Recently, the importance of measuring the blue economy (within a sustainable environmental framework) has been emphasised in Asia-Pacific developing economies, although the measurement and use of these studies is still in development. This emphasis has come from the social and environmental impact of economic development. The concept of the ocean (or marine) economy within a blue or a green economy using a sustainable development framework is shown in figure 1. Where the ocean economy has minimal environmental or equity considerations, the blue economy – encompassing the red – adds principles of sustainability and equity.

Figure 1



See [Environment statistics](#) for more information on Statistics NZ's wider environmental statistics framework.

Key findings

In 2013:

- The marine economy contributed \$4.0 billion to New Zealand's economy (1.9 percent of total GDP).
- Offshore minerals (mainly oil and gas) was the largest contributor to the marine economy, at 48 percent (\$2 billion).
- Shipping, and fisheries and aquaculture contributed 24 and 22 percent, respectively.
- There were 102,400 filled jobs in New Zealand's marine economy.
- Of these filled jobs, 47 percent were in shipping and 46 percent in fisheries and aquaculture.
- Total marine economy value added, including indirect effects, was estimated at \$7.7 billion (3.5 percent of GDP). The indirect component accounted for \$3.7 billion of this value, or 47.7 percent of total marine economy value added.

From 2007 to 2013:

- The strong growth in the marine economy between 2007 and 2008 was attributable to increased value added from offshore minerals. In 2007, offshore minerals

contributed \$771 million. This increased to \$2.2 billion in 2008 mainly due to additional production from new oil fields.

- Between the 2007 and 2013 March years, 299 building consents were issued for wharves and 26 for wharf sheds, an average annual value of \$18.8 million and \$600,000, respectively.
- We excluded activities where the boundary between marine and non-marine components could not be identified with any degree of precision, such as government and defence, marine manufacturing, and research and education. The estimates are therefore an undercount of the contribution of the marine economy to the national economy.
- The contribution of the marine economy to the total economy was consistent, averaging 2.0 percent across both periods 1997–2002 and 2007–13. This is shown in table 2 in the Excel tables accompanying this report.

About the marine economy

The marine economy is a function of both industry and geography. It is the sum of the economic activities that take place in, or use, the marine environment, or produce goods and services necessary for those activities, and make a direct contribution to the national economy.

This report updates [New Zealand's marine economy: 1997–2002](#) published in 2006 and analyses nine broad categories of direct activities that take place within the marine economy.

The nine activity categories include:

1. offshore minerals
2. shipping
3. fisheries and aquaculture
4. marine services
5. marine tourism and recreation
6. research and education
7. government and defence
8. marine manufacturing
9. marine construction.

Our estimates of the marine economy cover the first five categories. We excluded activities where the boundary between marine and non-marine components could not be identified with any degree of precision, such as government and defence, marine manufacturing, and research and education. The estimates are therefore an undercount of the contribution of the marine economy to the national economy.

New Zealand's marine economy: 1997–2002 differs from this study in several aspects: a change in industrial classification from the Australian and New Zealand Standard Industrial Classification 1996 (ANZSIC96) to ANZSIC06; and a reorganisation of central government agencies resulting in the omission of the government and defence activity category from current work. Depending on user need and feedback, we may be able to develop a methodology to include the government and defence estimates in future updates. We may also backcast the current ANZSIC 2006 estimates to 1997 if sufficient demand is identified.

The sample errors for marine tourism and recreation, and marine services are above 50 percent for all years. Data are indicative only and should be interpreted cautiously. For further information on how the industries are selected and categorised, see [Appendix: Marine industry activity categories](#).

All data used in this report was checked for confidentiality.

All values are in current prices and for March years unless otherwise stated.

2 Our marine economy 2007–13

Marine economy GDP

In 2013, New Zealand's marine economy contributed \$4.0 billion (1.9 percent) to the national economy as measured by GDP (\$218 billion). While this value represents an increase of nearly 50 percent in value added over the period 2007–13, the proportion of total GDP remained steady at about 2 percent.

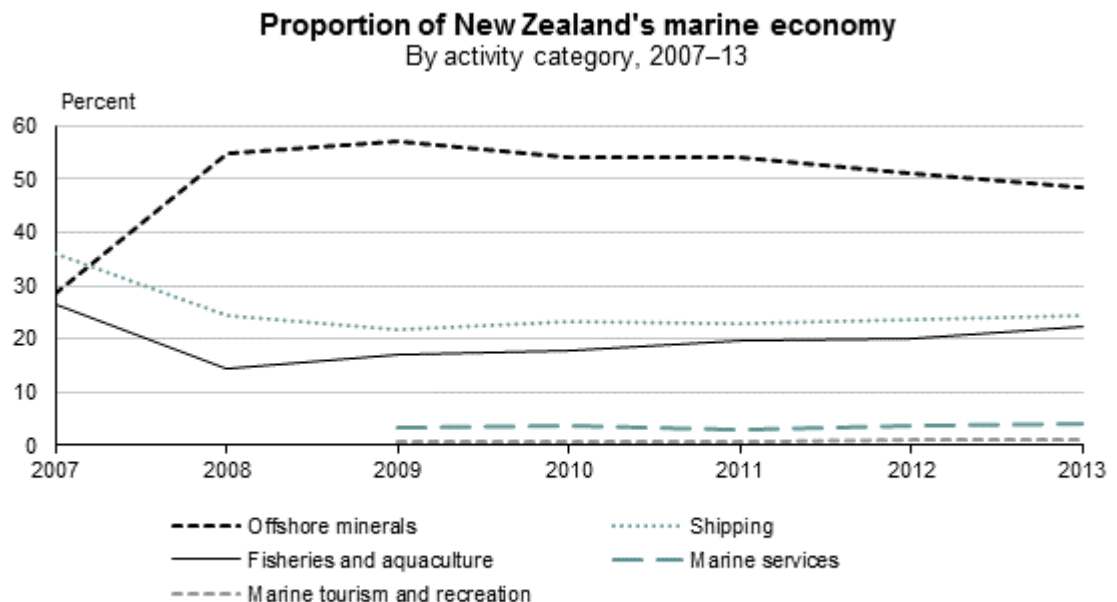
New Zealand's marine economy: 1997–2002 (published in 2006) estimated the marine economy's contribution to the national economy at 2.9 percent (\$3.3 billion) in 2002, as measured by total all industries. The difference in contribution to the national economy between the earlier and later work was caused by the inclusion of the government and defence category in the 2006 release, which was not repeated in this work and by the comparison of the marine economy with total all industries (a subset of total GDP). When the government and defence category is removed and GDP is used rather than total all industries (for better international comparability) from the 2006 release, the contribution of the marine economy to total economy was consistent, on average at 2.0 percent for the periods 1997–2002 and 2007–13. This is shown in table 2 in the Excel tables accompanying this report.

The marine economy grew strongly in 2007–08 mainly due to increased value added from offshore minerals (see figure 2). In 2007, offshore minerals contributed \$771 million, rising to \$2.2 billion in 2008 mainly due to increased production.

Composition of the marine economy

From 2007 to 2013, offshore minerals was the largest contributor to the marine economy (figure 2). In 2013, it contributed 48 percent.

Figure 2



Note: Data not available for marine tourism and recreation and marine services for 2007 and 2008 due to a change in survey design.

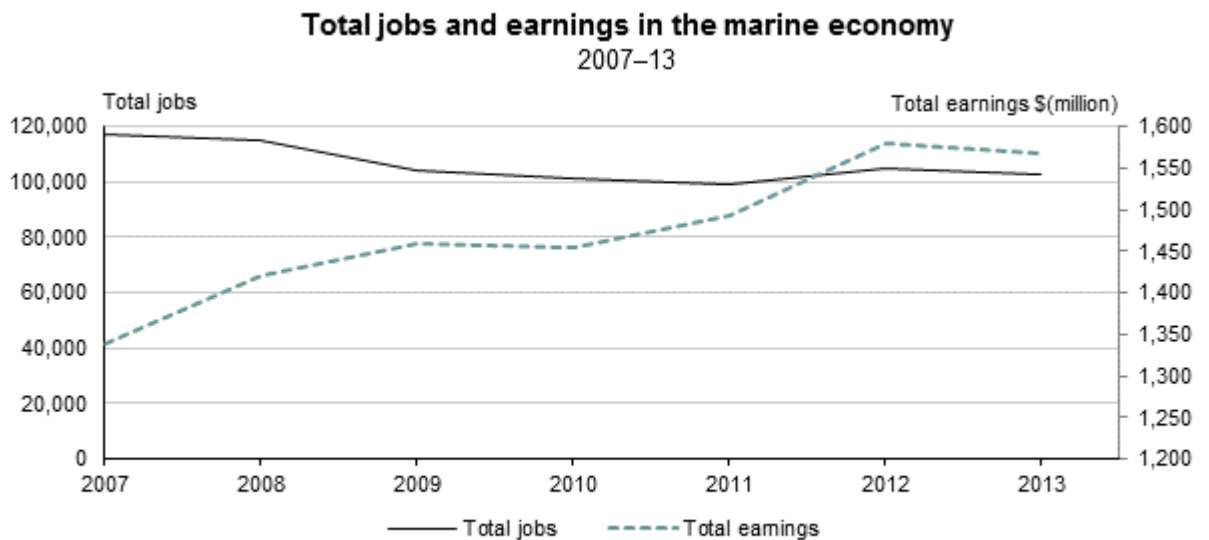
Source: Statistics New Zealand

Jobs and earnings in the marine economy

In 2013, 28,498 wage or salary earners worked in the marine economy. These people held 102,400 filled jobs with total earnings of \$1.6 billion (figure 3). Over 2007–13, total earnings increased 17 percent (\$229 million) while the number of filled jobs decreased 12 percent (14,500 jobs).

Of the 28,498 wage or salary earners, 83 percent had another job in the same industry. This is an interesting insight into the marine economy that is provided by Linked Employer-Employee Data (LEED).

Figure 3



Source: Statistics New Zealand

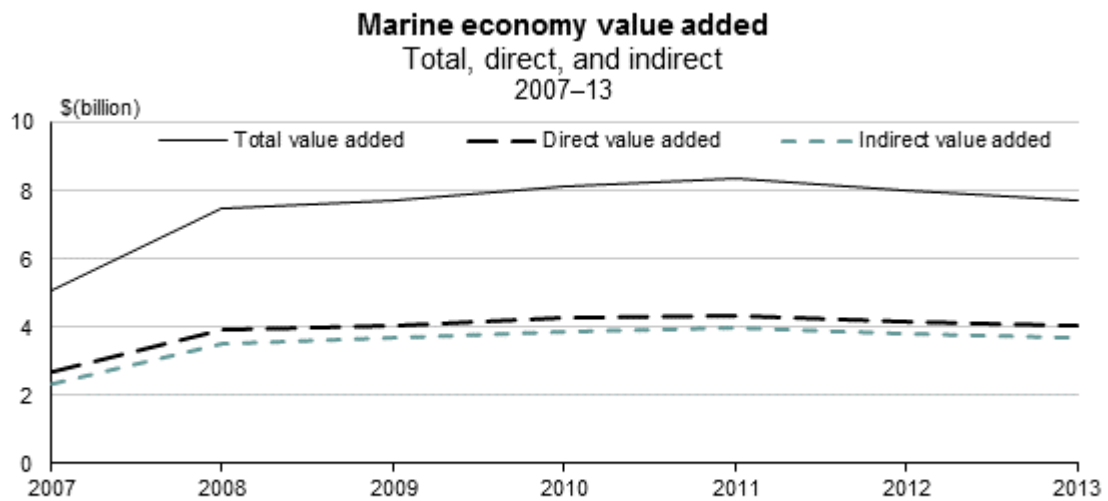
Indirect estimates of marine economy GDP

Provisional estimates for the indirect value added of the marine economy have been derived. The estimates in the previous section account only for the direct effects of the use of the marine environment on economic activity. For any given output of goods and services, other industries within and outside the marine economy supplied intermediate inputs used in the production of those goods and services. Measuring these indirect effects, therefore, gives an indication of the broader economic significance of the marine economy.

The previous marine economy report stated that incorporating indirect effects would be a potential improvement to understanding the marine economy.

Total marine economy value added was estimated at \$7.7 billion in 2013, or 3.5 percent of GDP (figure 4). The indirect component accounted for \$3.7 billion of this value, or 47.7 percent of total marine economy value added.

Figure 4



Source: Statistics New Zealand

Stacking up: the \$4 billion marine economy in context

The contribution to GDP of marine-related industries amounted to 1.9 percent in 2013. This proportion is similar to that generated by the accommodation and food services industry (1.9 percent in 2013). As another example, the dairy cattle farming industry contributed 2.3 percent to GDP in the same year.

Including multiple industries in the marine economy affects the industries it can be compared with. The total marine economy cannot be added to those of the other industries which it comprises due to double counting. For example, the marine economy cannot be compared with manufacturing as a whole, as both seafood processing and shipbuilding and repair services are part of the manufacturing division.

International comparisons

Our estimates of New Zealand's marine economy fall within the range of estimates produced internationally. Most international studies present their results as a percentage of national GDP or GVA (gross value added); these results ranged from about 1 to 5 percent (table 1).

See [Methodology](#) for the difference between GDP and GVA.

Table 1

Estimates of international marine economies from other studies					
Country	Author	Study date	Data coverage	Marine sector GDP/GVA ⁽¹⁾	% of national GDP/GVA ⁽¹⁾
Australia	Allen	2004	1996–2003	A\$26.7b	3.6 of GVA
Australia	AIMS	2014	2001–12	A\$47.18b	...
Canada	RASCL	2004	1988–2000	C\$22.7b	1.5 of GDP
Canada	Gardner Pinfold	2009	2006	C\$17.7b	1.5 of GDP
France	Kalaydjian et al	2006	2005	€18.9b	1.4 of GDP
France	Kalaydjian et al	2008	2005	€21.5b	1.2 of GDP
NZ	Statistics NZ	2006	1997–2002	NZ\$3.3b	2.9 of GDP
NZ	Statistics NZ	2016	2007–13	NZ\$4.0b	1.9 of GDP
UK	Pugh & Skinner	2002	1999–2000	£39b	4.9 of GDP
UK	Pugh	2008	2005–06	£39b	4.2 of GDP
USA	Colgan	2004	2000	US\$118b	1.2 of GDP
USA	Kildow et al	2009	2004	US\$138b	1.2 of GDP
1. Data refers to the final year of study.					
Symbol: ... not applicable					
Source: Adapted from Kildow and McIlgorm (2010), Gardiner Pinfold (2009), and Australian Institute of Marine Science (AIMS) (2014).					

The Organisation for Economic Co-operation and Development (OECD) produced preliminary estimates based on its Ocean Economy Database, which very conservatively valued the global ocean economy's contribution to GVA at USD\$1.5 trillion in 2010, or approximately 2.5 percent of world GVA (OECD, 2016).

International studies are broadly comparable but data availability may differ from place to place resulting in different levels of coverage. There can also be differences in the definitions for marine sectors (Surís-Regueiro et al, 2013) and the industrial classifications used across economies. The repeat studies should also be reviewed to determine whether a change in the proportion of national GDP is caused by a change in the relative importance of the marine (or ocean) economies, or to a change in coverage. The 2006 New Zealand study, for example, differs from the 2016 study in several aspects: a change in industrial classification from the Australian and New Zealand Standard Industrial Classification (ANZSIC) 1996 to ANZSIC 2006, and a reorganisation of central government agencies resulting in the omission of the government and defence activity category from current work.

'Marine economy' is referred to differently around the world. The United States of America and OECD use 'ocean economy', while Australia, Canada, France, the United Kingdom, and New Zealand use 'marine economy'. The European Union, Norway, and Spain often use 'maritime economy' or 'marine sector'.

Results by activity category

In this section we present more detailed information about the five activity categories for which we have value added estimates. We explain any data issues specific to the interpretation of that category, including a brief discussion on the sub-activities included at the ANZSIC class level.

See [Appendix: Marine industry activity categories](#) for more information about the classes.

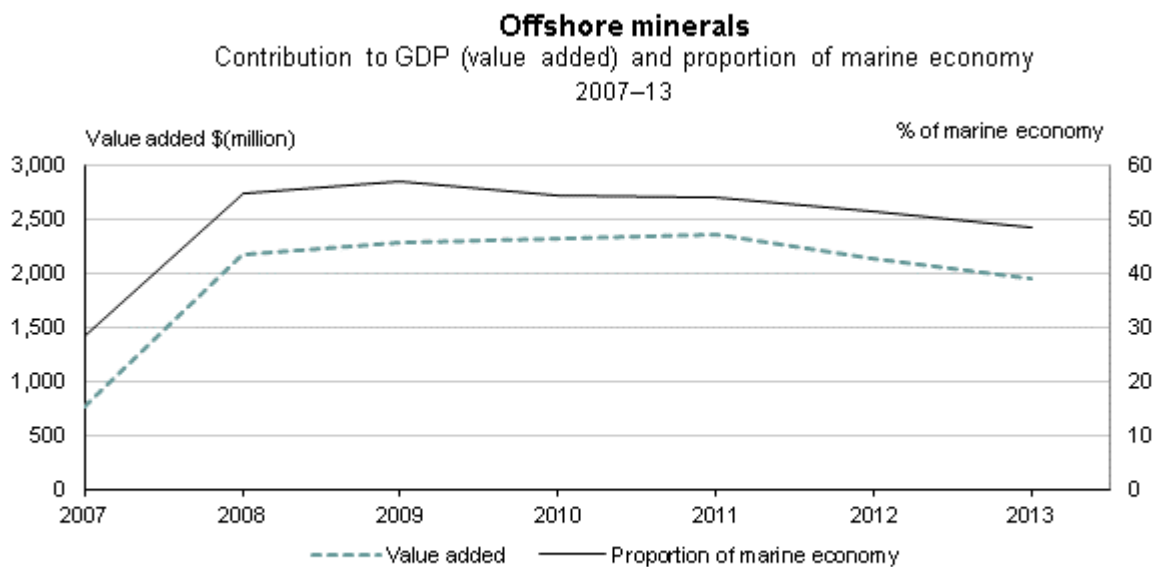
Offshore minerals (mainly oil and gas)

New Zealand produced 35,500 barrels of oil per day in 2013. Currently, 20 oil and gas fields in Taranaki are in production. Major offshore producing fields include Maui, Tui, Pohokura, Maari-Manaia, and Kupe (Venture Taranaki, 2015). Natural gas production is sold largely domestically and oil outputs are predominantly exported (Venture Taranaki, 2015). Over the period 2007–13, crude oil exports made up on average 4.2 percent of total goods exports and 3.0 percent of total exports (including services).

The contribution of offshore minerals increased in dollar value and as a proportion of the marine economy between 2007 and 2008 (figure 5). This increase was mainly attributable to additional production from new oil fields, particularly Tui and Pohokura.

In 2013, offshore minerals contributed \$1.95 billion to GDP (48 percent of the marine economy and 0.9 percent of the national economy). Although offshore minerals activity is highly capital intensive, on average 4,090 filled jobs were within this group, with a total earnings (before tax) contribution of \$134 million in 2013.

Figure 5



Source: Statistics New Zealand

New Zealand is unusual in that most of our oil and gas extraction is offshore; worldwide, around one-third of the oil and gas extracted comes from offshore sources (OECD, 2012).

In *New Zealand's Marine Economy: 1997–2002* the total contribution to offshore minerals from each ANZSIC industry included was 75 percent of the national total provided by national accounts, as advised by Crown Minerals at the time. For this report,

we used a slightly different proportion for each year as more offshore fields were brought into production over the 2007–13 period, meaning the offshore/onshore split varied from year to year. This proportional split ranged from 66 percent to 81 percent over the period and was based on information and advice provided by New Zealand Petroleum and Minerals. (NZP&M is part of the Ministry of Business, Innovation and Employment. It is responsible for providing advice on policy, operational regulation, and promoting investment in the mineral estate for the oil and gas industry). This split was not appropriate to use for LEED data, so total earnings and filled job numbers are provided for the entire onshore and offshore oil and gas industry.

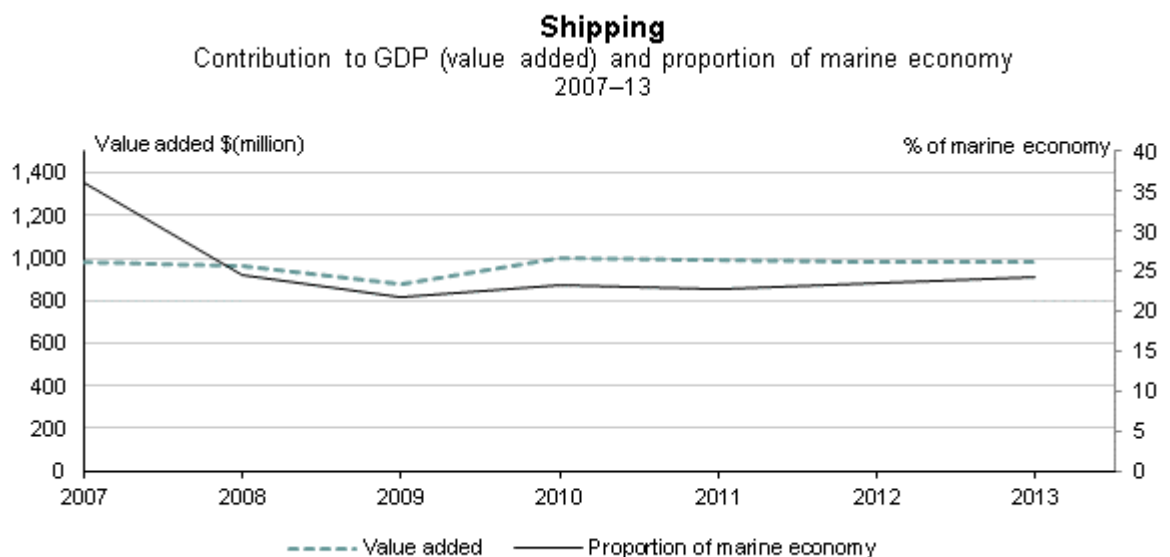
The offshore minerals activity category is made up of ANZSIC06 classes covering units engaged in oil and gas extraction and petroleum exploration. Units engaged primarily in oil and gas field support services are excluded as they are recorded under an ANZSIC06 B10900 other mining support services.

Shipping

Sea transport is the most-common transport type used for merchandise exports and imports in New Zealand. An average 87 percent of exports value, and 76 percent of imports value, were transported by sea between 2000 and 2010. This means New Zealand's 13 commercial cargo ports and shipping lanes are vital to the economy, with nearly 5,000 foreign cargo vessels visiting our ports in 2014 (Maritime NZ, 2014). New Zealand also has a significant boatbuilding industry, with estimated exports of about \$350 million in 2014 (Akehurst & Worley, 2014).

The contribution of shipping decreased after 2007 but recovered in 2010 (figure 6). The decrease was attributable to a downturn in domestic and international demand, particularly for the manufacturing component of this category (Exporter, 2013; Akehurst & Worley, 2014). As a proportion of the total marine economy, shipping's contribution remained stable at around 23 percent after declining in 2008 due to the increase in offshore minerals. In 2013, shipping contributed \$980 million to GDP (24 percent of the marine economy and 0.4 percent of the national economy). On average, 48,100 filled jobs were in the shipping category, with a total earnings (before tax) contribution of \$736 million in 2013. This value represented 47 percent of filled jobs and 47 percent of earnings for the total marine economy in 2013.

Figure 6



Source: Statistics New Zealand

The shipping activity category includes units within scope of the marine economy but also makes up part of ANZSIC06 division C manufacturing, and division I transport, postal, and warehousing. It also includes units engaged in shipbuilding and repair services, boatbuilding and repair services, water freight transport, water passenger transport, stevedoring services, and port and water transport terminal operations. Some of these activities may be on fresh water rather than the marine environment but most units in these industries are marine based.

Coverage for the shipping category is good, but some industries are excluded because their marine components could not be isolated from the non-marine components. For example, boats manufactured from fibreglass, and surf and sailboards are coded to other ANZSIC06 classes within manufacturing. An indication of the size of this undercount is available from the 2014 New Zealand Marine Industry Survey, which found that the small-boats sector (includes kayaks, personal watercraft, and dinghies) produced a total output of \$9.0 million in 2013. Of this, 62 percent (\$5.6 million) was exported and 38 percent (\$3.4 million) was sold domestically (Akehurst & Worley, 2014).

Fisheries and aquaculture

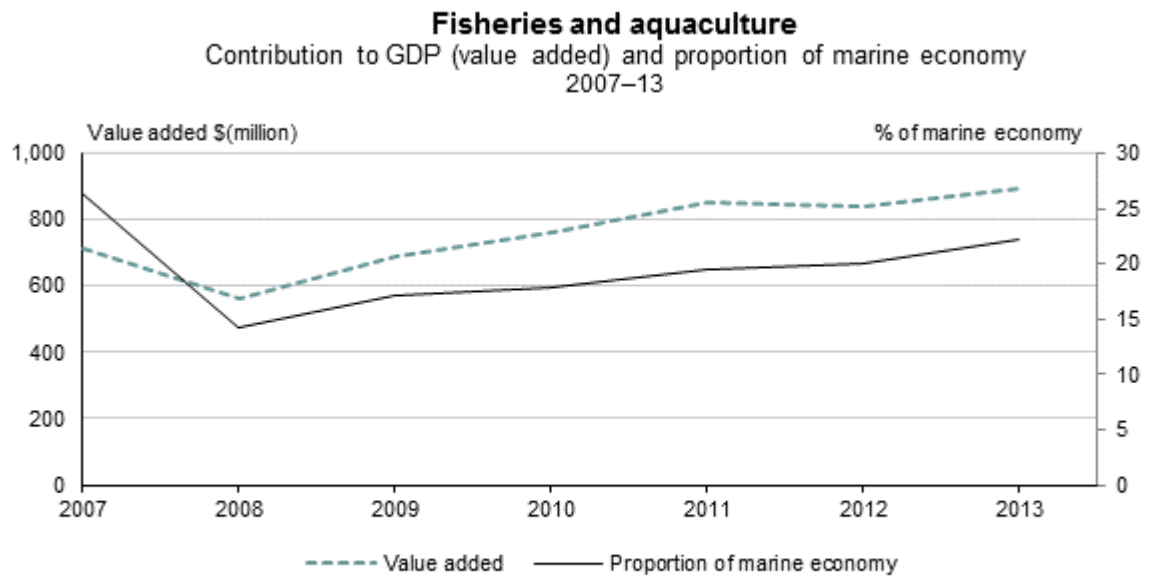
New Zealand's commercial fishing sector has changed significantly since the 1970s, when it was largely based on inshore fisheries with foreign vessels fishing offshore. With the introduction of the 200 nautical mile exclusive economic zone in 1977 and the introduction of the quota management system in 1986, New Zealand companies invested in fishing vessels and factories to catch and process available catch. The industry has grown from being primarily a domestic supplier to a leading exporter (Ministry for Primary Industries, 2012), with exports including aquaculture products worth \$1,380 million in 2015 (Statistics NZ, 2016).

New Zealand has a significant aquaculture industry. Exports of aquaculture products, mainly Greenshell mussels, King salmon, and Pacific oysters, were estimated to be worth nearly \$300 million in 2011 (Aquaculture New Zealand, 2011). In the June 2013 year, the average weekly household expenditure on fish and seafood was \$4.30, or 2 percent of a household's total weekly expenditure on food (including restaurant meals and ready-to-eat food).

Fisheries and aquaculture contribution decreased after 2007 in terms of both its contribution to GDP and its proportion of the marine economy (figure 7). The decline in proportion of the total marine economy was attributable to the increase in offshore minerals. In 2008, the contribution of fisheries and aquaculture to GDP declined by just over 20 percent and then recovered the following year. The decrease was attributable to a fall in output in a period where input costs remained high. For the fishing year ended 2008, which for most marine species is October 31, the total allowable commercial catch (TACC) declined 3 percent or 16,310 tonnes. Actual fish catch within New Zealand's EEZ declined 7 percent or 34,868 tonnes. In the year ended October 2007, both TACC and catch were almost unchanged from the October 2006 year (Clement & Associates, 2014). In 2008 compared with 2007, exports of fish, crustaceans, molluscs, and other aquatic invertebrates were down \$95 million dollars (8 percent) or nearly 2,000 tonnes (1 percent). TACC increased after 2010, while catch (in tonnes) has remained steady. The value of fish exports recovered in 2009.

In 2013, fisheries and aquaculture contributed \$896 million to GDP (22 percent of the marine economy and 0.4 percent of the national economy). On average, 47,430 filled jobs were in fishing and aquaculture, with a total earnings (before tax) contribution of \$657 million in 2013. This represented 46 percent of filled jobs and 42 percent of earnings for the total marine economy in 2013.

Figure 7



Source: Statistics New Zealand

This activity category includes units considered within scope of the marine economy but also make up part of ANZSIC division A agriculture, forestry, and fishing; C manufacturing; and F wholesale trade. Included are units engaged in offshore aquaculture, marine capture fisheries, seafood processing, and fish and seafood wholesaling. A minor amount of these activities may be operated on the freshwater rather than the marine environment but most of the units in these industries are marine based.

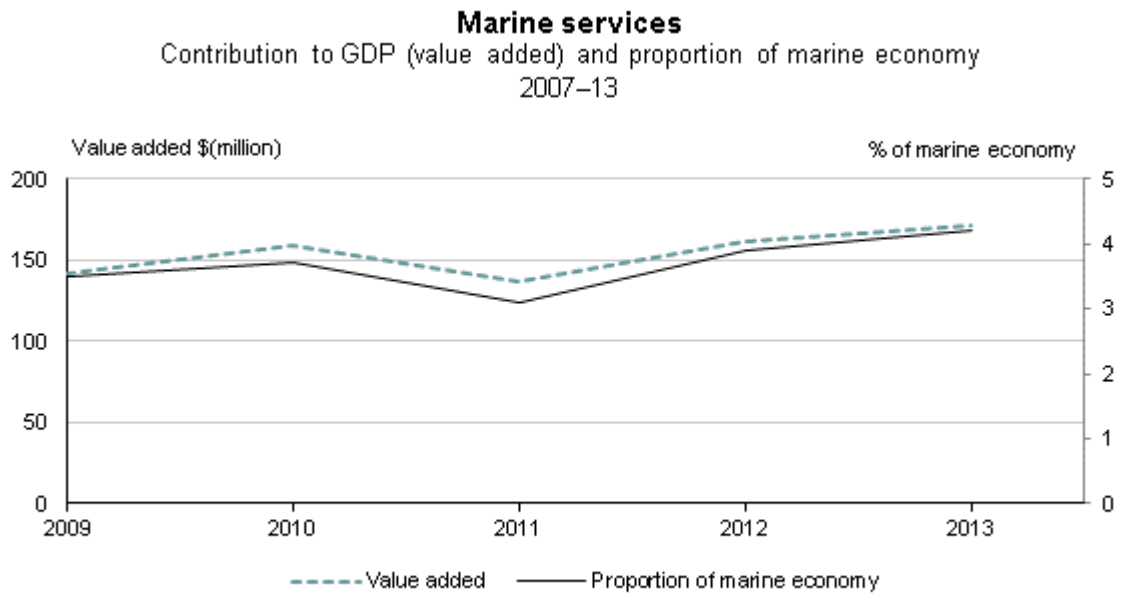
Marine services

The contribution of marine services increased over 2009–13, measured in terms of both its contribution to GDP and its proportion of the marine economy (figure 8). In 2013, marine services contributed \$171 million to GDP (4 percent of the marine economy and 0.1 percent of the national economy). On average, 1,820 filled jobs were within marine services, with a total earnings (before tax) contribution of \$31 million in 2013. This represented 1.8 percent of filled jobs and 2 percent of earnings for the total marine economy in 2013.

[A sample redesign of the Annual Enterprise Survey](#) in 2009 had an impact on some industries' time-series figures published for the 2008 financial year compared with the 2009 financial year. As marine services is published below the AES sample design level, the time-series break had a significant impact; for this reason 2007 and 2008 values are suppressed for this category.

The scope of marine services includes marine surveying/mapping and marine business/consulting services in addition to services to water transport. Marine services is under-represented as a contribution to the marine economy as only one ANZSIC class is included – I521900 other water transport support services. This class includes units engaged in services such as lighthouse, navigation, pilotage, towing and tugboat services, and ship registration and agency services. It is considered to be predominantly marine based. In the case of surveying/mapping and marine business/consulting services, the split between units engaged in marine and non-marine activity could not be identified. The sample errors for marine services are above 50 percent for all years. This is a result of data being used below survey design level. Data are indicative only and should be interpreted cautiously.

Figure 8

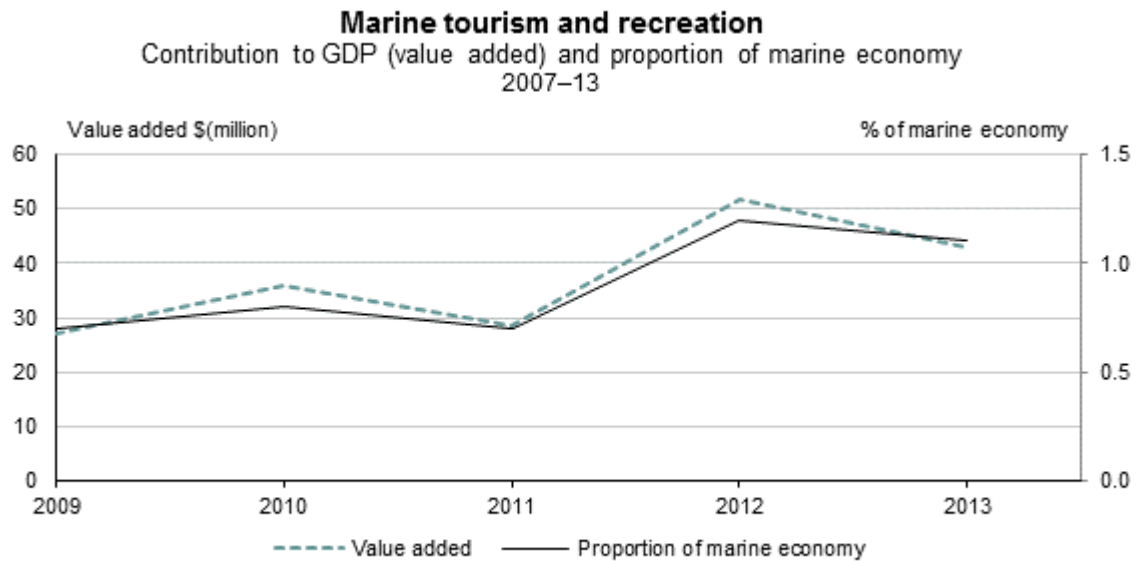


Marine tourism and recreation

From 2009 to 2013, the contribution of marine tourism and recreation increased, both in its contribution to GDP and its proportion of the marine economy (figure 9). In 2013, this category contributed \$43 million to GDP (1 percent of the marine economy and 0.02 percent of the national economy). On average, 960 filled jobs were in marine tourism and recreation, with a total earnings (before tax) contribution of \$9.4 million in 2013. This represented 0.9 percent of filled jobs and 0.6 percent of earnings for the total marine economy in 2013. A sample redesign of the Annual Enterprise Survey in 2009 affected some industries' time-series figures published for the 2008 financial year compared with the 2009 year. As marine tourism and recreation is published below the AES sample design level, this time-series break had a significant impact; for this reason values for 2007 and 2008 are suppressed for this category.

The scope of marine tourism and recreation includes recreational fishing, coastal and marine tourism, cruise ships, leisure craft services, marinas, and marine equipment retailing. Restaurants, lodgings, and recreation or tour services dependent on the marine environment for their operation is also within scope. The marine tourism and recreation category is under-represented as a contribution to the marine economy because it includes only one ANZSIC06 class, G424500 marine equipment retailing. This class includes units engaged in yacht, boat, and boat-trailer retailing and retailing of other sailing or nautical accessories, and is considered to be predominantly marine based. For all other recreational and marine tourism activities, the split between units engaged in marine and non-marine activity could not be identified. The release of a single ANZSIC06 class is below survey-design level and the sample errors for marine tourism and recreation are above 50 percent for all years. Data are indicative only and should be interpreted cautiously.

Figure 9



Source: Statistics New Zealand

Supplementary information

This section presents supplementary information on marine construction, research and education, and marine tourism and recreation. This data is intended to give an indication of the scale of these activities; it is not consistent with the estimates we provided in the previous section.

For this report we have not included estimates consistent with those in the previous sections for research and education, government and defence, marine manufacturing, and marine construction. The marine component of these industries could not be isolated from the non-marine component.

See [Appendix: Marine industry activity categories](#) for more information on the activities considered to be within scope but not able to be included.

Marine construction

New Zealand's ports are essential economic assets. They are vital to our transport network and are critically important to the fishing industry. Statistics NZ produces monthly building consents statistics on the number and value of residential dwellings, and the number and value of non-residential buildings by region and building type.

Over 2007–13, the value of consents issued each year averaged \$18.8 million for wharves and \$590,000 for wharf sheds (table 2). These figures are not equivalent to the value added estimates given in [marine economy GDP](#) and [results by activity category](#). When we calculate value added within the national accounts, we subtract intermediate consumption from gross output. Building consents are an estimate – at the time of applying for the consent – of the value of the work to be put in place. This value forms part of the output of the units engaged in the eventual construction of the consented work.

Table 2

Value of consents issued for wharves and wharf sheds 2007–13				
Year ended March	Wharves⁽¹⁾		Wharf sheds⁽²⁾	
	Value	Number	Value	Number
2007	19,647,907	53	82,500	4
2008	20,262,304	60	521,000	3
2009	30,340,298	44	147,300	4
2010	5,455,647	45	1,842,505	8
2011	15,311,584	42	470,000	1
2012	10,661,006	27	970,000	4
2013	29,578,742	28	98,010	2

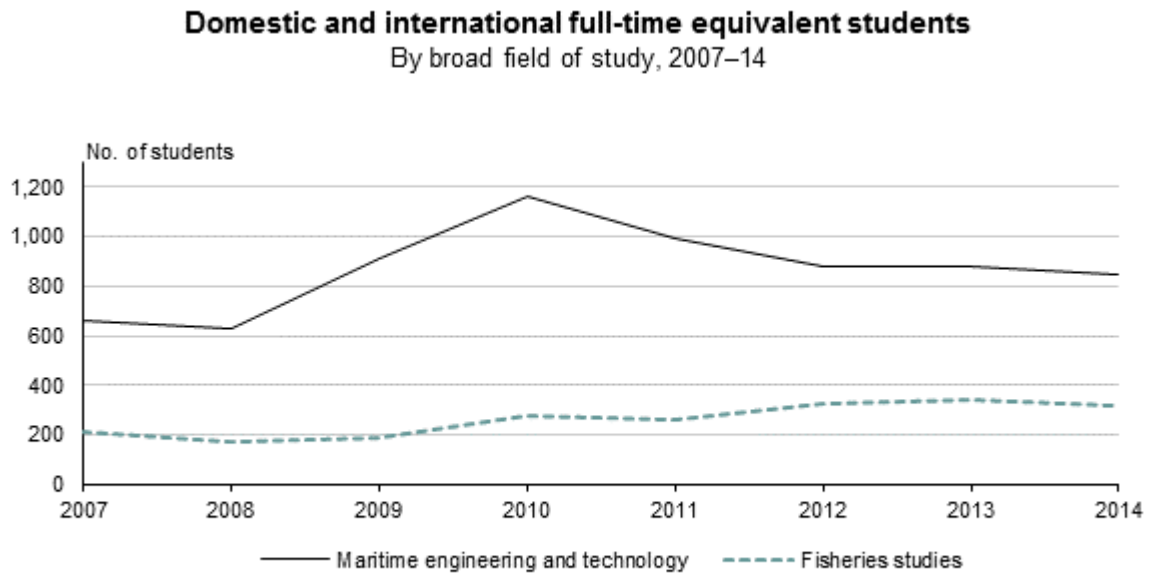
1. Wharves total (building consents issued, new plus altered, excludes demolition).
2. Wharf sheds total (building consents issues, new plus altered, excludes demolition).
Source: Statistics NZ

Research and education

Universities, institutes of technology and polytechnics, wānanga, and private training establishments provide marine education. The universities of Auckland, Victoria, Canterbury, and Otago have marine labs (Leigh, Wellington, Kaikoura, and Portobello, respectively). Aoraki Polytechnic (Timaru), Otago, Nelson, Hutt Valley, Bay of Plenty, and Tairāwhiti (Gisborne) polytechnics offer maritime training programmes, as do many private training establishments. In 2013, the education and training industry as a whole contributed \$10.181 million to national GDP.

The Ministry of Education reported that in 2014, 850 domestic and international students participated in maritime engineering and technology studies, and 320 domestic and international students participated in fisheries studies at all levels (figure 10). These figures represent 0.4 percent of all tertiary enrolments. Also, as at March 2013, 433 industry trainees and 179 modern apprentices were being trained in boatbuilding and repair services (Ministry of Education, 2016).

Figure 10



Source: Tertiary Education Commission

Marine tourism and recreation

Maritime New Zealand (2014) reported that in the 2013/14 year, 1 million people took to the water on 900,000 recreational craft and cruise ships, making over 500 visits to our ports. Additionally, cruise tourism generated about 155,000 international visitors to New Zealand during the 2011/12 season (Coker, 2012; Worley, 2012).

Since 1996, Cruise New Zealand has been commissioning yearly or two-yearly studies on the economic role of the cruise sector in New Zealand. These and other studies have shown that the sector creates significant inflows of foreign expenditure with positive impacts on the New Zealand economy (Worley, 2012). Cruise New Zealand maintains an industry-activity dataset of passenger and crew numbers, voyages, and port calls. This information and industry expenditure data has been used to create an estimate of direct expenditure and by taking this amount and using it in an input-output model. Market Economics has produced estimates of the flow-on effects generated by cruise lines, and their passengers and crew while in New Zealand. This study found that the cruise industry generated \$411.8 million in direct spending during the 2011/12 season. About 63 percent of this remains within the New Zealand economy and 37 percent flows offshore on purchases of imports (eg fuel and airfares).

The value of recreational fishing

Of adults aged 16 years and over in New Zealand, 19.7 percent participated in recreational fishing (marine and fresh water) during the 2013/14 year. This proportion is up 0.9 percent from the 2007/8 rate of 18.8 percent (Sport New Zealand, 2015).

Some work has been done to estimate the value of marine recreational fishing. For example, Kerr and Latham (2011) discounted the commercial value of recreationally caught species at 9 percent (based on Statistics NZ, 2010) and found an annual value of about \$180 million. They also reported on other New Zealand studies that estimated the annual value of recreational marine fishing to be between \$65 million to \$130 million or between \$247 million and \$495 million depending on the participation rate used. Holdsworth et al (2016) found that total direct spending on trips, equipment, and larger

spend items (such as boats, vehicles, and holiday homes) by New Zealand resident and visiting fishers for the purposes of marine fishing was \$946 million in 2014/15.

3 Methodology

The marine economy is a function of both industry and geography. It is the sum of the economic activities that take place in, or use the marine environment, or produce goods and services necessary for those activities, and make a direct contribution to the national economy.

This report follows [New Zealand's Marine Economy 1997–2002](#) released in 2006. In both reports we calculated information using internationally accepted methodology and used the following Statistics NZ data:

- [Annual Enterprise Survey](#) (AES) and [national accounts](#) to derive value added
- [overseas merchandise trade](#), [construction statistics](#), and [LEED](#) for complementary information on exports, consents related to marine construction, and the number of jobs and earnings in marine-related industries.

Methods

To produce an estimate of the marine economy, we compiled data on those industries identified as engaged in marine-based economic activities according to the definition of the marine economy accepted for this study. After identifying and categorising the industries of interest, we identified the industrial classifications that contained these industries based on ANZSIC06.

Reports by Colgan (2003), Kildow and McIlgorm (2010), and Surís-Regueiro et al (2013) highlight the four principles for developing a methodology:

- comparability across industries and space
- comparability across time
- theoretical and accounting consistency
- ability to be replicated.

We met these principles by using ongoing Statistics NZ economic and labour market collections and associated accounting rules and classifications.

Direct value added

Direct economic impacts result from the flow of money between an organisation and its stakeholders. This also describes the direct contribution to the economy when this flow of money is estimated at industry level.

We estimated direct value added by using data from Statistics NZ's AES and from the annual [national accounts](#). It is preferable to use national accounts estimates where possible, as these include conceptual adjustments. However, the national accounts are not compiled at the level of industry detail sufficient to provide data on the marine economy. Therefore, we used detailed AES data to provide ratios to split the national accounts data into the categories of interest.

In this way we are able to provide a dataset consistent with and directly comparable with the national accounts annual GDP series while using, where possible, the individual ANZSIC06 classes that fall within the scope of the marine economy. We aggregated these classes to category level and summed them to produce an overall estimate of the New Zealand marine economy and its contribution to national GDP.

AES is New Zealand's most comprehensive source of financial statistics. It provides annual information on the financial performance and financial position for industry and sector groups operating within New Zealand, and is the primary source data for GDP, which is used to calculate detailed annual national accounts.

Value added is calculated as the value of output (the value of goods and services produced) less the value of intermediate consumption (the value of goods and services used to produce that output). Marine economy estimates are in current prices (or the prices current at the time the production takes place), so changes in estimates for a particular activity may come from:

- movements in prices or volumes of goods and services produced
- movements in prices or volumes of goods and services used in production.

Indirect value added

Indirect marine economy value added is derived as a residual item. We calculated the total value added of the marine economy by using the table of industry-by-industry total requirements from national account's input-output tables for the March 2013 year (the most-recent total requirements table available) and the direct value added estimates. We then calculated indirect estimates as the total less direct marine economy value added. This approach is consistent with that used in the tourism satellite account. (An input-output table shows how much extra output is required from every industry if a particular industry is to produce more of its own output, defined as direct requirements. These contributing industries would then need further input into their own production processes or indirect requirements. The table shows total (direct and indirect requirements). For more information about these tables, see [National accounts input-output tables: Year ended March 2013](#).

The input-output method used to estimate indirect effects assumes the inter-industry coefficients are stable over time. It captures the first round of indirect supply, but does not account for contributions further down the value chain.

An alternative approach is to use a computable general equilibrium (CGE) model to allow for input constraints, changes in prices, and reallocation of input resources across sectors. CGE models can be used to identify the economy-wide impacts of a shock to marine sectors, distinguishing direct from indirect impacts.

The indirect effects presented here are treated as experimental. We welcome your feedback on the indirect effects methodology and estimates. Please send your feedback by emailing environmentalreporting@stats.govt.nz.

Contribution to GDP

It is important to note the difference between GVA and GDP. GVA is defined as the value of output less the value of intermediate consumption and is a measure of the contribution to GDP made by an individual producer, industry, or sector. The GDP of a country, viewed as an aggregate measure of production, is equal to the sum of the GVA of all resident institutional units engaged in production (plus any taxes and minus any subsidies on products not included in the value of their outputs). As taxes less subsidies will generally be positive, any industry breakdown compared with GDP will be a lower percentage than the same breakdown compared with GVA.

Employment and earnings

Information on jobs and earnings is from [LEED](#). LEED uses existing administrative data from the taxation system together with business data from Statistics NZ's Business Frame to provide statistics on filled jobs, job flows, worker flows, mean and median

earnings for continuing jobs and new hires, and total earnings. This information gives an insight into the operation of New Zealand's labour market.

The term 'jobs' refers to a unique employer-employee pair present on an Employer Monthly Schedule in the reference quarter. Note that self-employed individuals are not included in these figures. The values presented are total earnings (before tax) paid in the reference quarter. LEED information in this report is presented for the year ended March 2007–13.

A job is defined as an employee-employer relationship where employer is a geographical location (or workplace). A person could belong to the same enterprise but work in different locations during the year. Wage and salary earners can also have multiple jobs within the marine economy or elsewhere; hence, the LEED figures presented should not be used to calculate average annual earnings.

For this report we calculated LEED data on a kind-of-activity unit (KAU) basis to be consistent with the collection unit used for AES. This means there may be some differences in comparing these LEED estimates with published LEED series, which use the geographic unit (GEO) structure. By definition, a KAU is engaged in predominantly one activity for which a single set of accounting records is available. The Business Frame is a database of all known individual private and public sector businesses and organisations engaged in producing goods and services in New Zealand that meet significant criteria. The structure of each business on the Business Frame consists of an enterprise, a KAU, and a geographic unit. Collectively, they are referred to as statistical units. Larger or more complex businesses may have a number of statistical units. We give each statistical unit an industry classification based on its predominant activity. Different divisions of a company may be spread across several industries, depending on how the company is structured. See [Linked Employer-Employee Data](#) for more information.

Classification of activities

We classified all marine activities included in this report into nine categories, following international studies in other Asia-Pacific Economic Cooperation economies (McIlgorm, 2004, 2016; Kildow & McIlgorm, 2010). The nine categories are the same as those used in *New Zealand's Marine Economy 1997–2002*. We placed industries or sectors in the appropriate category following international best practice and with regard to New Zealand's economic structure. However, some marine studies have grouped their marine sectors differently or use different terminology (eg AIMS, 2014; Morrissey & O'Donoghue, 2012). There is a recent European proposal to use a similar breakdown, but with a living and non-living resources breakdown in a framework that groups activities as completely marine based, mainly marine, and partially marine. This proposal (Surís-Regueiro et al, 2013) was developed for use by European Union economies using the [Statistical classification of economic activities in the European Community \(NACE\)](#). An initial examination of this proposal showed it will not easily concord with ANZSIC06.

[Appendix: Marine industry activity categories](#) lists the industries or sectors that fall within the nine categories for the purposes of valuing the marine economy.

Using national accounts data reduces the risk of double-counting any economic activity. However, the industrial classifications used by Statistics NZ to produce the national accounts were not designed to separate marine from land-based economic activity.

See the appendix for a list of the industrial classifications we used to measure the marine economy and those that we excluded.

The nine categories are:

1. offshore minerals

2. fisheries and aquaculture
3. shipping
4. government and defence
5. marine tourism and recreation
6. marine services
7. research and education
8. manufacturing
9. marine construction.

Although the limitations of using national accounts data in these valuations are well known, it is essential in reducing the risk of double-counting, and it aids comparability (McIlgorm, 2016).

Data quality

We made every effort to evaluate the accuracy of the time series; however, trends are considered to be indicative and using absolute figures requires care. We have erred on the side of caution when activity boundaries are blurred. In most cases, where the marine component of an activity could not be isolated from its non-marine component, we excluded that activity from the analysis.

Sample errors

Estimates of the economic contribution of the offshore minerals, fisheries and aquaculture, and shipping categories are deemed to be relatively robust due to the availability of data and the relative ease of deriving the marine component of that data. The marine tourism and recreation and the marine services categories are only partly represented and the sample errors for these categories are above 50 percent for all years. Be cautious when interpreting these estimates.

Excluded activities

GDP is measured as the value added from production by industry, where GDP equals the sum of value added for all producers, plus taxes on production and imports. To isolate the marine component of GDP, this report cuts across traditional industry boundaries and uses information from industries that specifically use the marine environment. This leads to an estimate of the marine economy's direct contribution to New Zealand's economy. Note that the methodology we used could not capture some activities that take place in the marine environment. Because some activities could not be included, the value of the marine economy and its contribution to the total economy is understated.

Although some marine categories in this report are underestimated and others are partly represented, the final figure for the New Zealand marine economy is deemed to be a good but conservative estimate. Because the marine economy crosses a broad range of 'conventional' industries, problems arise when attempting to isolate the marine component of industries without a clear land/marine split. For example, fish retailing could not be included as it is covered in an industrial classification that also includes fresh meat and poultry retailing (G412100). Overall, we anticipate that except for government and defence and marine tourism and recreation, the industries not measured would not have made up a major component of the marine economy.

Marine tourism

Marine tourism is difficult to measure. Although Statistics NZ produces a tourism satellite account that measures the sector's contribution to the economy, no attempt has yet been made to estimate the marine component of tourism.

Government and defence

New Zealand's marine economy 1997–2002 included partial estimates for the government and defence category, which we have not updated for this report. These estimates were based on data provided directly from a selected group of units but this approach was not directly comparable with the official estimates in the national accounts. Due to changes in [industrial classification](#) from ANZSIC96 to ANZSIC06, government-owned units have moved from ANZSIC96 division M government administration and defence to one that records the type of service delivered. ANZSIC06 prioritises a production function concept, where ownership is not a criterion for classification; therefore, only units engaged in providing public administration and safety (some of which are private sector units) are recorded in ANZSIC06 division O public administration and safety.

Central government administration, which includes units whose primary activities are policy and administration, is recorded in a separate ANZSIC06 (O751000); defence is recorded in O760000. However, it is not possible to separate the marine component from the non-marine component of these activities with any precision. For example, armed forces are included within O760000 but includes naval as well as ground and other support forces. The primary source of information for the government sector accounts is the Crown's Financial Information System, which is not set up to classify expenditure in terms of activities. It may be possible to develop proportions based on expenditure or employee numbers as reported in relevant organisations' annual reports. If this approach is considered feasible, we will include estimates for the government sector accounts in the future.

Timeliness

While it is preferable to provide these statistics over a longer time period, the data available is limited due to significant industry reclassification. This has restricted the report to an analysis of the period 2007–13. The most-recent set of complete national accounts data for this work is for the year ended June 2013; we calculated the total contribution of the marine economy to that date. Any background information in this report may be provided for different time periods.

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Appendix: Marine industry activity categories

Offshore minerals

ANZSIC classification: B07000 oil and gas extraction

Primary activities (ANZSIC06): natural gas extraction; oil shale mining; petroleum gas extraction

ANZSIC classification: B10110 petroleum exploration

Primary activities (ANZSIC06): natural gas and petroleum exploration

General comments: Does not include refining or blending materials into petroleum fuel or manufacturing fuel from liquefied petroleum gases. Oil and gas field support services, a primary activity or B10900 other mining support services, are not included.

Fisheries and aquaculture

ANZSIC classification: A04110 rock lobster and crab potting

Primary activities (ANZSIC06): crab fishing or potting; rock lobster fishing or potting; saltwater crayfish fishing

ANZSIC classification: A04120 prawn fishing

Primary activities (ANZSIC06): prawn fishing; scampi fishing

ANZSIC classification: A041300 line fishing

Primary activities (ANZSIC06): bottom long-line fishing; line fishing; ocean trolling; squid jigging; surface long-line fishing

ANZSIC classifications: A04140 fish trawling, seining and netting

Primary activities (ANZSIC06): beach seining, fishing; bottom gill netting, fishing; Danish seining, fishing; finfish trawling; pair trawling; purse seining, set netting, fishing; surface netting, fishing

ANZSIC classifications: A04190 other fishing

Primary activities (ANZSIC06): abalone/paua fishing; freshwater eel fishing; freshwater fishing nec; marine water fishery product gathering; oyster catching (except from cultivated oyster beds); pearling (except pearl oyster farming); seaweed harvesting; spat catching; turtle hunting

ANZSIC classifications: A02010 longline and rack (offshore) aquaculture

Primary activities (ANZSIC06): mussel farming (longline), offshore longline or rack aquaculture, oyster farming (rack), paua farming (longline or rack), pearl oyster farming (rack), seaweed farming (longline or rack)

ANZSIC classifications: A02020 caged (offshore) aquaculture

Primary activities (ANZSIC06): farming of caged finfish, salmon, trout, and tuna

ANZSIC classifications: C11200 seafood processing

Primary activities (as defined by ANZSIC 2006): crustaceans processed mfg (including cooked/frozen) nec; fish cleaning or filleting; fish fillet manufacturing; fish loaf or cake manufacturing; fish pate and paste manufacturing; dried, smoked, and canned fish manufacturing; molluscs processed mfg (incl shelled); oyster shelling, freezing, or bottling in brine; scallops preserved mfg; seafoods preserved and canned mfg; seafood canned manufacturing

ANZSIC classifications: F36040 fish and seafood wholesaling

Primary activities (ANZSIC06): crustaceans wholesaling (incl processed, except

canned); fish wholesaling; molluscs wholesaling (incl processed, except canned); seafoods fresh or frozen wholesaling

General comments: A020300 onshore aquaculture is excluded as by definition these activities take place on land. All subdivision A041 fishing is included. Some units in A04190 other fishing may be involved in freshwater fishing (longfin and shortfin eels). However, this is a small-value fishery compared with commercial capture fisheries as a whole.

Shipping

ANZSIC classifications: C23910 shipbuilding and repair services

Primary activities (ANZSIC06): drydock operation, hull cleaning, ship repairing, ship wrecking, shipbuilding, submarine constructing

ANZSIC classifications: C23920 boatbuilding and repair services

Primary activities (ANZSIC06): boat repairing; boat building; canoe, dinghy, and inflatable boat manufacturing; jet boat building, motorboat, inboard, and outboard building; powerboat building; sailboat manufacturing; yacht construction

ANZSIC classifications: I48100 water freight transport

Primary activities (ANZSIC06): coastal sea freight transport service between domestic ports, freight ferry service; harbour freight transport service; international sea freight transport service between domestic and international ports; river freight transport service; ship freight management service (ie operation of ships on behalf of owners); water (river, sea, and lake) freight transport service

ANZSIC classifications: I48200 water passenger transport

Primary activities (ANZSIC06): boat charter, lease or rental with crew for passenger transport; ferry operation including vehicular; passenger ferry service; passenger ship management service (ie operation of ships on behalf of owners); ship charter, lease or rental, with crew, for passenger transport; water passenger transport service; water taxi service

ANZSIC classifications: I52110 stevedoring services

Primary activities (ANZSIC06): ship loading or unloading service (provision of labour), stevedoring service

ANZSIC classifications: I52120 port and water transport terminal operations

Primary activities (ANZSIC06): coal loader operation (water transport); container terminal operation (water transport); grain loader operation (water transport); port operation; ship mooring service; water freight terminal operation; water passenger terminal operation; wharf operation

General comments: C23920 boatbuilding and repair services excludes the manufacturing of boats from fibreglass (included in C19190 other polymer product manufacturing) and manufacturing of surfboards and sailboards (included in C25920 toy, sporting, and recreational product manufacturing). Sea freight forwarding services are included in C52920 freight forwarding services and not included in this report. Leasing, hiring, or chartering ships without crew are also excluded (a primary activity of C66190 other motor vehicle and transport equipment rental and hiring). The operating of charter fishing boats and whale-watching cruises are excluded as they could not be separated from I50100 scenic and sightseeing transport. Constructing and planning port facilities are not included in port and water transport terminal operations. Some activities may be operated on fresh water rather than the marine environment, but is included as the majority of primary activities are marine based.

Marine tourism and recreation

ANZSIC classifications: G42450 marine equipment retailing.

Primary activities (ANZSIC06): boat retailing (including used); boat trailer retailing; marine accessories retailing nec; outboard motors retailing; sailing or nautical accessories retailing; yacht retailing

General comments: The scope of this section would be all units providing services to tourists and all retail products and services aimed to be used within the marine environment. It was not possible to identify tourism and recreation ANZSIC classes that primarily dealt with marine activity except marine equipment retailing. Retailing sailboards, canoes, or wetsuits are included in G42410 sport and camping equipment retailing. Hiring of pleasure craft (without crew) are not included as these activities are recorded in the rental, hiring, and real estate services industry.

Marine services

ANZSIC classifications: I52190 other water transport support services.

Primary activities (ANZSIC06): lightering service; navigation service (water transport); pilotage service; salvage service, marine; ship registration and agency service; towboat and tugboat operation; water vessel towing service

General comments: Marine conservation. Many units whose activities include marine conservation will be included within ANZSIC S95500 other interest group services. Many of these will also be non-profit organisations.

Government and defence

General comments: Relevant output classes for government agencies cannot be readily identified.

Marine construction

General comments: The scope of this section would include construction of wharves and port facilities and also coastal defences and restoration. It was not possible to identify construction ANZSIC classes identified that primarily dealt with marine construction.

Marine manufacturing

General comments: The scope of this section would be all equipment used in the marine environment not already included within the shipping category and all marine manufactures, for example, medicines or health products not already covered within fisheries and aquaculture. It was not possible to identify manufacturing ANZSIC classes that primarily dealt with marine manufacturing.

Research and education

General comments: The scope of this section would be all research and education relevant to the marine environment. It was not possible to identify education and research ANZSIC classes that primarily dealt with marine manufacturing.