

**Cost Benefit Analysis and  
Economic Impact Analysis  
of the  
Kiribati Marine Training Centre**

**Nimmo-Bell &  
Market Economics**

***Final***

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**A report prepared by:**

**Dr Brian Bell**  
**Director**  
**Nimmo-Bell & Company Ltd**

**and**

**Dr Garry McDonald**  
**Director**  
**Market Economics Limited**

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## Executive Summary

1. As the Kiribati Marine Training Centre nears its 50<sup>th</sup> anniversary it is timely to assess the impact it has had on the Kiribati economy. Since its inception in 1967 the Centre has provided education and skill development for seafarers providing much needed employment on foreign merchant ships. It is by far the most important source of private sector employment for I-Kiribati generating significant foreign exchange earnings.
2. Since 1984 almost 3,500 trainees have entered courses with 2,100 graduating representing a pass rate of 60%. This has created over 27,000 jobs<sup>1</sup> with the German shipping line South Pacific Maritime Service (SPMS) with an average of 936 jobs filled per year.
3. The Kiribati government and people can be justly proud of the Centre as it has the distinction of being the only institution in the Pacific to achieve White List status under the Maritime Labour Convention 2006, thus facilitating future employment opportunities for seafarers.
4. New Zealand has been a long running supporter of the Centre through provision of a continuous source of aid since 1984. Over the period 1995 to 2012 New Zealand has invested A\$9.1 million (in the 2012 money terms) representing 25% of the total cost of running the Centre over that time frame. Other major funding has come from the Government of Kiribati (51%), SPMS (20%) and the Australian government (4%).
5. Remittances from wages earned while overseas provide a much needed source of foreign exchange for the economy and support to the extended families and communities of seafarers. On average over the last 18 years seafarers have earned in wages A\$10.2 million per year in 2012 money terms, much of which is remitted home.
6. Wages paid by SPMS to seafarers peaked in 2002 at \$<sub>2012</sub>14.7 million<sup>2</sup> since declining to reach \$6.2 million in 2012. This decline is largely due to an overall decline in ship positions and intense competition for positions on ships from other nations.
7. A cost benefit analysis shows that the net benefit to the economy in Net Present Value terms at a discount rate of 5% over the 18 years is A\$32.7 million. Discounted gross benefits amount to A\$56.3 million and total cost A\$23.7 million, representing a benefit to cost ratio of 2.4. This represents an excellent return on the investment in the MTC with a return of \$2.4 for every \$1 invested.
8. Input-output analysis is used to measure the economic impact of the MTC on the Kiribati the economy over the period 1995 to 2012. A marine training sector was constructed within the model to measure the impact of expenditure by the MTC and the impact of seafarer remittances on the economy. The combined value added of remittances and the operation of the MTC amounted to 3.4% of Kiribati's GDP. This is a very significant contribution given that much of the money economy is based on aid flows.
9. In strict economic impact terms, remittances, which embody the facilitated effects of the MTC through employment training, have a significantly larger economic effect which is 6.75 times greater than the impact and the operational impacts of the Centre itself.
10. The MTC's cumulative undiscounted value added impact for Kiribati is estimated as \$93 million (equivalent to contribution to GDP). This equates to an average value added impact of \$2.4 million per year. Importantly, of the total value added impact estimated for the study period, 8%

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<sup>1</sup> In this case a job is a contract position on a ship of up to one year

<sup>2</sup> \$<sub>2012</sub> refers to dollars in 2012 terms i.e. years prior to 2012 figures are indexed up for inflation to 2012 values

is derived from the operational and capital expenditures of the MTC itself, and the remaining 92% comes from remittances that are facilitated by the MTC.

11. When benefits and costs are discounted in the future and inflated in the past, taking into account of the time value of money, the cumulative value added at a discount rate of 5% is \$116 million and the average annual value added is \$3.0 million. Given the very limited opportunity for employment outside the public sector this represents an important contribution to the economy.
12. The type I multiplier (direct and indirect effect) for the Kiribati economy is 1.98. Thus for every one dollar of value-added generated by remittance expenditure and expenditure by the MTC an additional \$0.98 of value-added is generated in the Kiribati economy as a result of upstream supply chains. Taking into account direct, indirect effects and also induced effects as increased wages are spent on consumer goods (type II multiplier) gives a multiplier of 2.07. This means that for every \$1 generated through the operation of the MTC and remittances that flow directly from the jobs created on overseas ships there is a \$2.07 boost to the economy through the indirect and induced effects as described above. These multipliers appear on the low side because much of domestic consumption is derived from imported goods rather than goods created in the economy.
13. The MTC fills a vital role in the Kiribati economy by providing highly skilled graduates who earn overseas funds that are remitted back to families and communities. By supplementing the government's expenditure on the Centre New Zealand, SPMS and Australia ensure that the Centre has the resources it needs to maintain a high standard of training and provide opportunities for future employment of E-Kiribati seafarers.
14. The current merger of MTC and the Kiribati Fisheries Training Centre signals a new era for the future prosperity of Kiribati by extending the range of opportunities for trainees in the maritime industry.

## 1. Introduction

### 1.1 Rationale for the analysis

Kiribati is a country facing numerous economic, social, demographic and environmental challenges. It is a country with limited natural resources. Infertile soils, severely restricted land and water resources coupled with limited economic prospects renders Kiribati a developing nation. Kiribati's population are geographically spread across 32 dispersed and isolated atolls and one raised coral island. Increased urbanization and internal migration from the outer islands are creating their own problems in terms of provisioning and increased crowding. Permanent overseas migration, while offering economic opportunities does not solve the development needs of Kiribati. Temporary overseas migration, such as through seasonal migrant work programs and employment opportunities on foreign owned sea vessels, allows for remittances to enter the Kiribati economy. Such remittances, along with development aid play an important role, making significant contributions to the Kiribati economy.

The Marine Training Centre (MTC) at Betio, Tarawa is instrumental in the preparation of graduates in obtaining employment on sea vessels. A gap in information on the economic contribution of the MTC to the Kiribati economy was identified. It is also timely that such an analysis be done with the approach of the 50<sup>th</sup> anniversary of the opening of the MTC.

### 1.2 The Kiribati economy

With a Gross Domestic Product (GDP) of AU<sub>2010</sub>\$148m, Kiribati is classified by the United Nations as a least developed country. This GDP figure includes the formal or monetary sector and the informal or subsistence sector, which is an important component of the economy (National Statistics Office, 2011; ADB, 2009). All references to GDP in this report refer to both formal and informal sectors. Kiribati traditionally exports fish, copra and seaweed, but the value of total exports is dwarfed by the value of imports. The negative balance of payments highlights the current dependence of Kiribati on outside sources. There is little manufacturing undertaken on the island, signifying an undiversified base to the economy.

The remittances obtained from Kiribati's living overseas and working on the seas provide benefits to families and communities at home (Borovnik, 2006). In particular, the MTC, founded in 1967, educate and train young men (and in recent times some young women) for seafaring careers, and is seen as a critical institution for Kiribati. The Centre holds the distinction of the only institution in the Pacific to achieve Germanischer Lloyd (GL) Certification of Compliance to confirm International Maritime Organisation (IMO) White List status, under the Maritime Labour Convention 2006, and ISO Standards. Now that the Kiribati Fisheries Training Centre (FTC) is to be merged with the MTC, which takes place in 2013, it is timely to conduct an analysis of the impact of the MTC on the Kiribati economy.

### 1.3 Aim and Scope of the study

The aim of this report is twofold: firstly, to determine the extent to which the benefits of running the MTC exceed the costs using a Cost Benefit Analysis framework and secondly, to measure the impact of the MTC in terms of economic activity – as measured by value added, which is equivalent to Gross

Domestic Product. This impact results from both a 'core' impact - the MTC operation itself, which is a net addition to the economy; and a 'facilitated' impact - the MTC enables its graduates to secure employment and wages which enter the Kiribati economy in the form of remittances.

For its part, the New Zealand Ministry of Foreign Affairs and Trade is interested in the efficiency and effectiveness of its aid to Kiribati<sup>3</sup>. It requested a cost benefit analysis (CBA) and Economic Impact Analysis (EIA) of New Zealand's assistance to the Marine Training Centre and its contribution to the economy of Kiribati. As New Zealand is not the only contributor to the running of the Centre it is not possible to single out New Zealand's contribution. Instead, the analysis looks at all the costs of running the Centre against the benefits derived from remittances of seafarers who have been trained at the Centre, the Cost Benefit Analysis. The results of this analysis are presented as the Net Present Value (NPV) of discounted benefits minus costs. The cashflows of the CBA are then used in the EIA to generate the economic multipliers, Gross Output and Value added for the wider economy.

Initially the assignment was to undertake the analysis from 1984 until the present day (the period of New Zealand's assistance) however lack of data led to a revision of the project life to the period from 1995 to 2012. Prior to 1995 manual record keeping meant that most of the information required had been lost or difficult to retrieve within the timeframe allowed.

## 2. Cost Benefit Analysis

### 2.1 Trainee Numbers

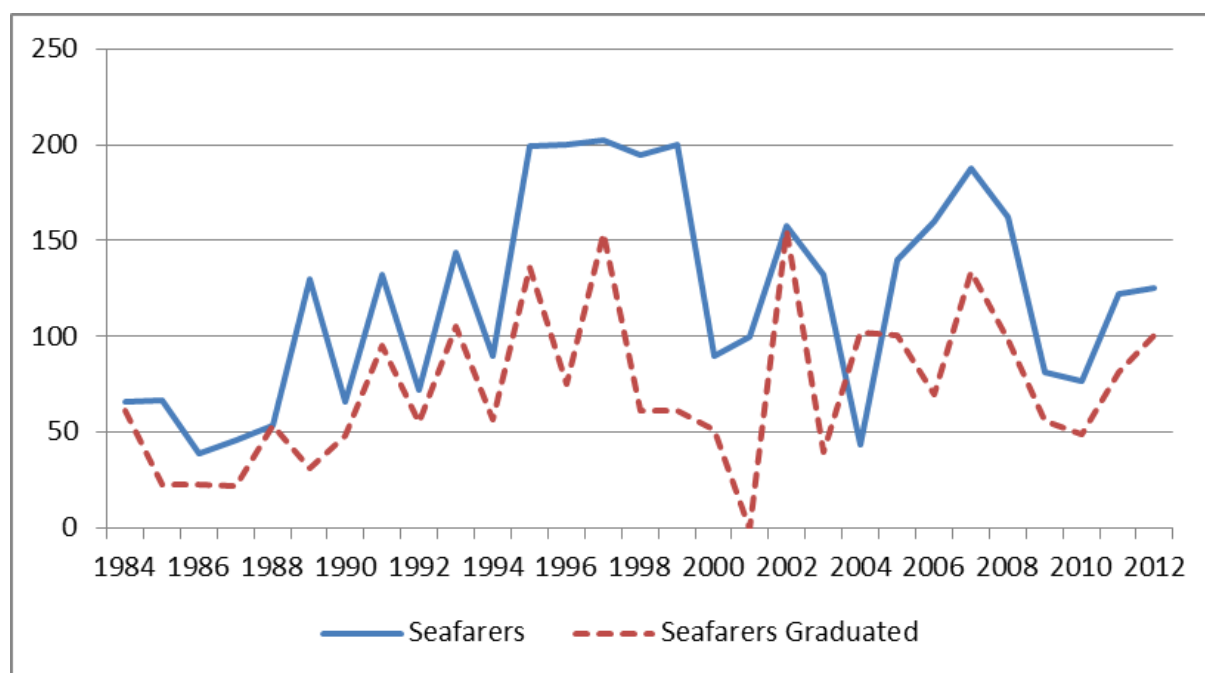
During the period of New Zealand's assistance from 1984 to 2012 the number of seafarers starting mainstream courses at MTC has totalled 3,562. In any one year trainee numbers have averaged 127 and varied from a low of 39 in 1986 to a high of 202 in 1997. Over the same period the number of graduates has totalled 2,127, which is a pass rate of 60%. The average number passing per year is 76, with a low of zero in 2001 and a high of 155 in 2002. Figure 1 highlights the trends over time. While numbers graduating grew strongly over the period from 1984 to 1997 since then average numbers have remained relatively constant although year-to-year variation is quite large.

The number of trainees per staff member varies from around 4 to 6 based on a core staffing level of 36.

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<sup>3</sup> Efficiency relates to the monetary returns from the investment in aid, while effectiveness relates to how well the assistance has delivered on its objectives.

**Figure 1. Trainees attending<sup>4</sup> and graduating from the mainstream courses**



Source: MTC

In addition to the main courses, from 2003 a number of special courses have been run for stewards, both male and female and refresher courses (see Figure 2).

**Figure 2. Numbers of trainees Graduating from Special courses run by MTC**



Source: MTC

<sup>4</sup> Seafarers refers to the number of trainees starting training



## 2.2 CBA Assumptions

The approach used is to compare the marginal benefits provided by remittances from seafarers trained at the Centre with the marginal costs of running the Centre. The full costs of running the Centre are taken into account in the cash flows over the period 1995 to 2012 including the Kiribati government's contribution through the national budget, New Zealand's assistance over the period, Australia's more recent assistance from 2009 to 2012 and the assistance provided by South Pacific Marine Services (SPMS), the German shipping line which employs the graduates from the Centre on merchant ships throughout the world.

## 2.3 Benefits

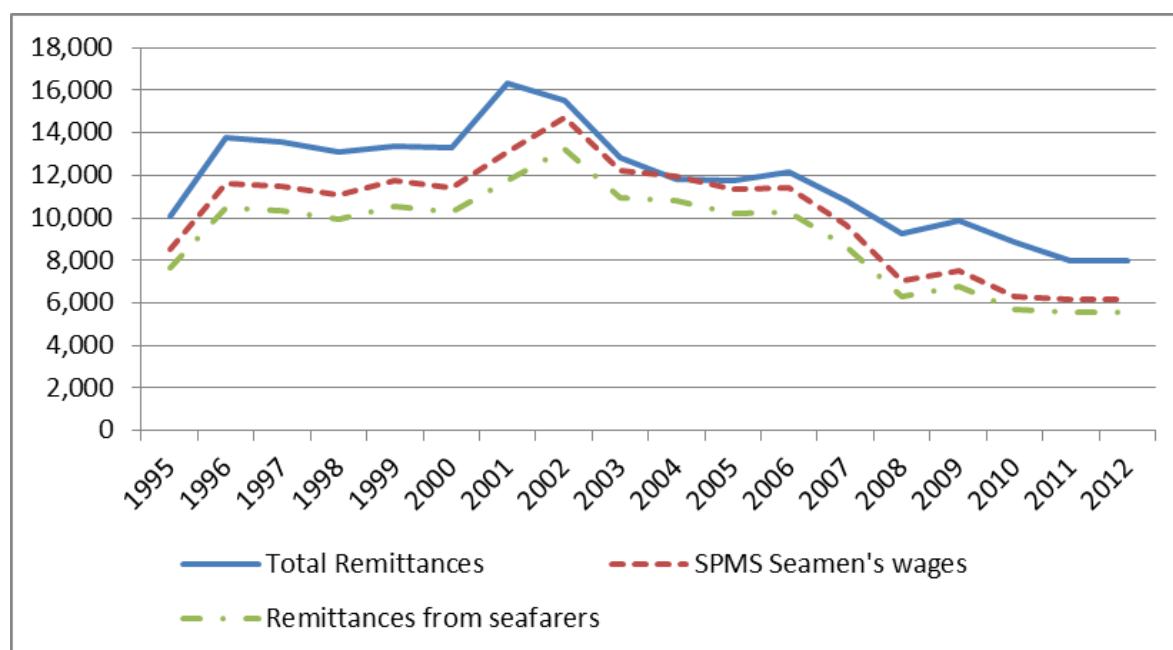
The approach to estimating marginal benefits is to assume that the average time in service of a graduate from the Centre is 20 years<sup>5</sup>. This allows the estimation of marginal benefits by taking an estimate of the total remittances each year based on a proportion of the annual aggregate wages of seafarers employed by SPMS who have been trained over the period 1995 to 2012. Thus for graduates of the 1995 year there are no benefits in 1995. In 1996 the benefit from those graduates is equal to 1/20 of total remittances. In 1997 the marginal benefit is 1/20 of those who graduated in 1995 plus 1/20 of those who graduated in 1996. In 1998 marginal benefit is 1/20 of those who graduated in 1995, plus 1/20 of those who graduated in 1996, and 1/20 of those who graduated in 1997.

This process continues until 2014 when it is assumed that the seafarers who graduated in 1995 retire. In each succeeding year remittances decline by 1/20 until the graduates of 2012 are assumed to have retired, which is in 2033. Annual remittances for the period from 2013 to 2033 are assumed to equal remittances in 2012 in real terms. The difference between total seafarer remittances and the marginal benefit is that remittances from seafarers trained prior to 1995 and after 2012 are not counted. In a similar way the costs of running the Centre prior to 1995 and after 2012 are also not counted.

Figure 3 shows the total remittances recorded by the Department of Statistics, aggregate wages paid by SPMS and estimated annual remittances of seafarers. The difference between total remittances and remittances from seafarers is assumed to be remittances from other categories including fishers on overseas fishing vessels, people working in the region including people on seasonal employment in Australia and New Zealand.

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<sup>5</sup> This estimate is based on records from SPMS on the number of active seamen in service by age group.

**Figure 3. Remittances (AU\$'000 in 2012 money terms)**

Source: Kiribati Department of Statistics, SPMS, study estimates

In addition to official figures on remittances provided by the Kiribati Statistics Office there are end of contract payments plus cash and gifts bought back by seafarers at the end of each contract. These amounts are estimated to be about 20% of official annual remittances based on anecdotal evidence provided to Maria Borovnik (2006) and study team undertaking the feasibility design for New Zealand's assistance to the MTC (NZMS and APMI 2003). As seafarer contracts are less than one year, it would seem reasonable to add 20% to the official remittances figure each year to take account of these benefits to the Kiribati economy. However, we have not been able to reconcile the amounts produced this way with the total amount of wages paid by SPMS, which is the main employer of MTC trainees. Given this, the estimates of remittances due to MTC trainees may be conservative, but there is no quantitative evidence to support this view as there are no records of trainees employed by other shipping lines or other employers such as on fishing boats.

Seafarers will no doubt retain some of their wages for out-of-pocket expenses while overseas. Again, there is no quantitative information as to how much this would be on average or are people in the industry prepared to hazard a guess as to what this is likely to be. In the absence of information, quantitative or anecdotal, the assumption is made that on average 90% of wages is remitted back to Kiribati.

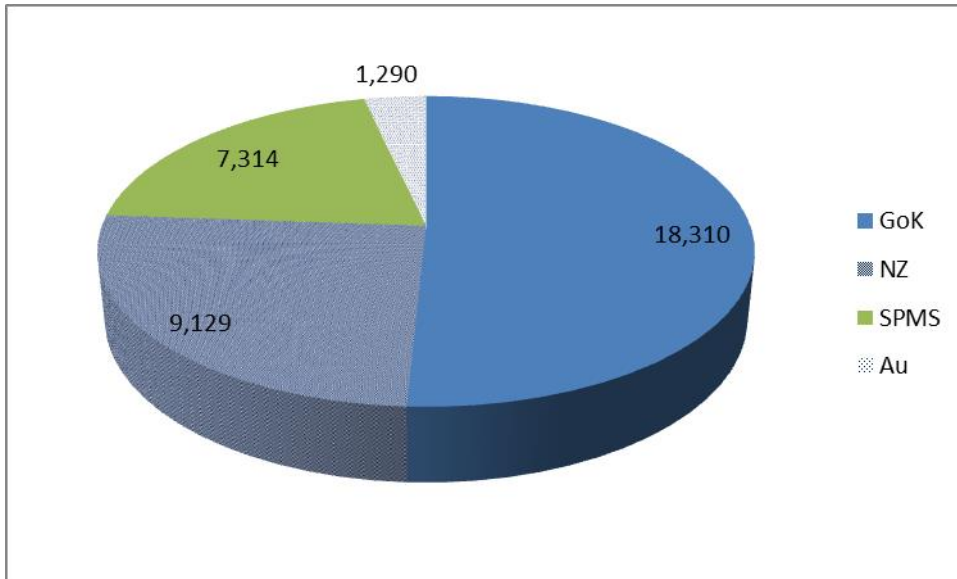
The MTC has also been receiving revenue from course fees associated with refresher courses since 2007 and these are added to the benefits.

## 2.4 Costs

The total cost of running the MTC, including both operating and capital expenditure over the period 1995 to 2012 has been \$36.0m in 2012 dollar terms of which \$18.3m (51%) was

contributed by the Kiribati Government, \$9.1m (25%) by the New Zealand Government, \$7.3m by SPMC (20%) and \$1.3m (4%) by the Australian Government (see Figure 4).

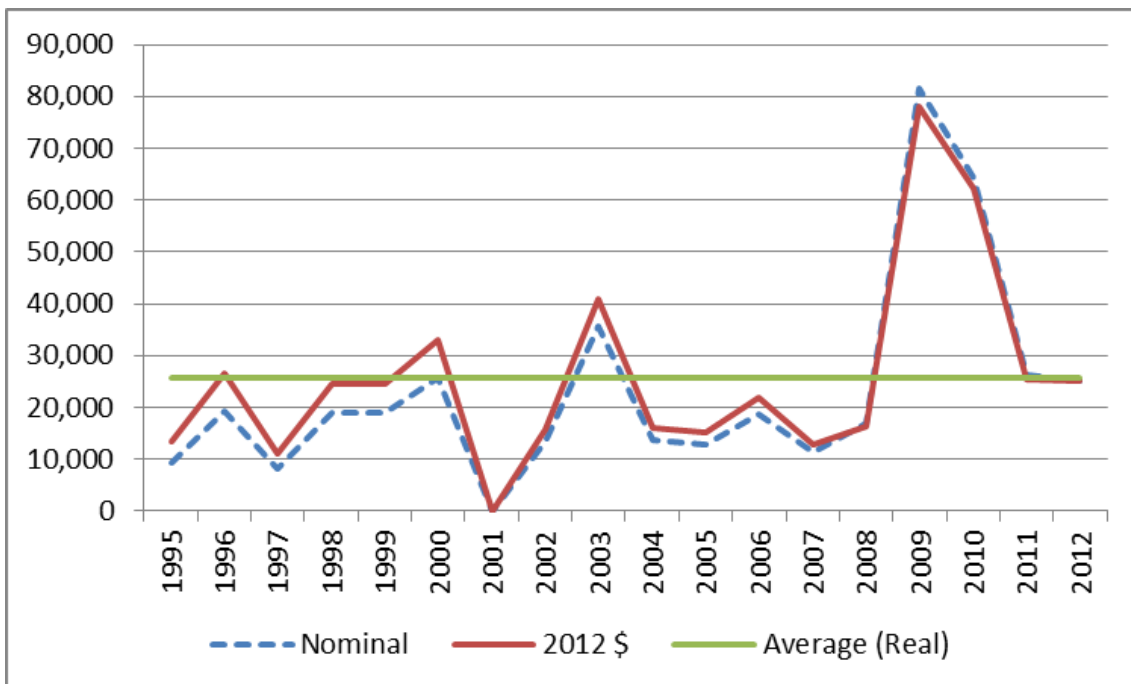
**Figure 4. Cost of Running the MTC by Main Contributor 1995-2012 (2012 AU\$'000)**



Source: Governments of Kiribati, New Zealand and Australia plus SPMS

The average cost per trainee graduating amounts to \$25,723 per year (in 2012 dollar terms). Overall costs each year varies significantly depending on whether there is an injection for refurbishment or capital improvements (see Figure 5).

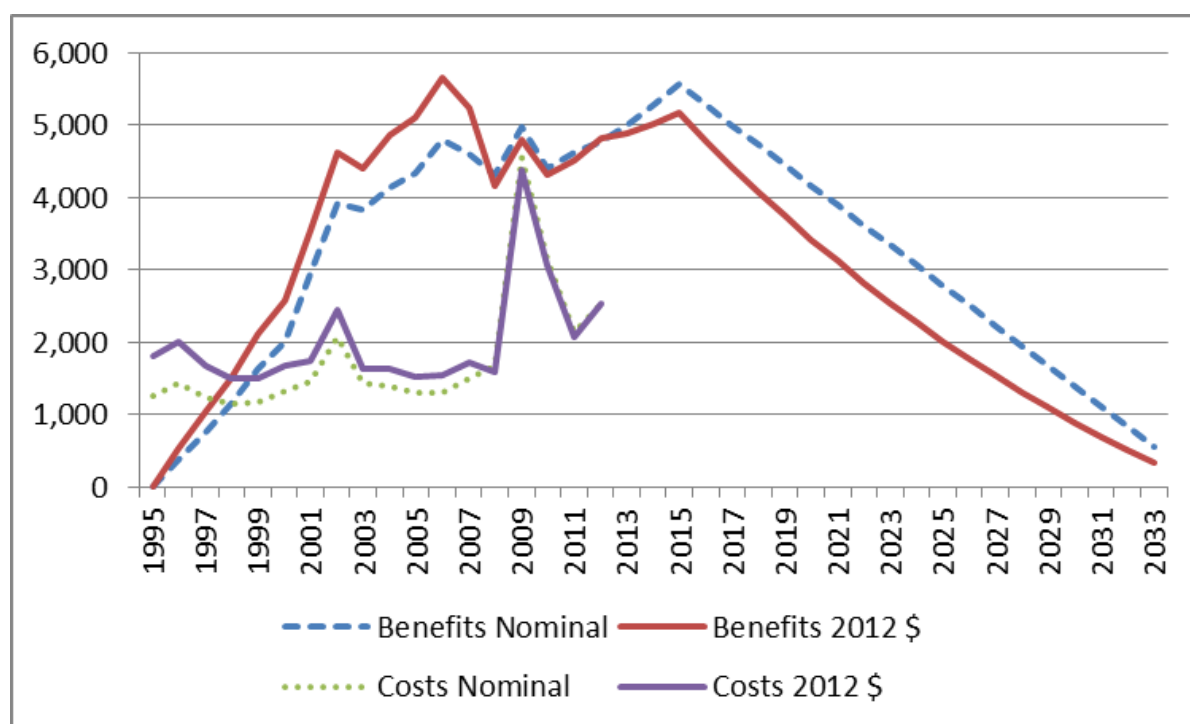
**Figure 5. Annual cost per Trainee Graduating (AU\$ Nominal and 2012 dollar terms)**



Source: MTC, Governments of Kiribati, New Zealand and Australia plus SPMS

The profile of the cost and benefit cashflows is shown in Figure 6. This shows how benefits build up over time peaking in 2006 and then declining from 2016 to 2033. On the other hand costs are relatively stable throughout the period until 2008 when large injections of capital were made under the New Zealand program. Note that costs are counted from 1995 to 2012, while benefits start from a very small base in 1996 and rise over the next 20 years from the steady stream of new graduates entering the workforce. After 2015 the benefits start to decline as seafarers graduating since 1995 begin to retire. By 2033 all graduates trained between 1995 and 2012 have retired. Costs incurred after 2012 will have a benefit for future generations of graduates and are not counted in this analysis.

**Figure 6. Benefits and Costs AU\$'000 (nominal and 2012 dollar terms)**



Source: MTC, Governments of Kiribati, New Zealand and Australia plus SPMS

## 2.5 Results

Total costs (in 2012 dollar terms) over the period amount to \$36.0 million with the total benefits amounting to \$120.2 million resulting in a net benefit of \$84.1 million and a benefit cost ratio of 3.3. When the benefit and cost cashflows are discounted to take into account of the time value of money, at a 5% discount rate, total costs amount to \$23.7 million and total benefits \$56.3 million brought resulting in a net benefit (NPV) of \$32.7 million and a benefit cost ratio of 2.4. Discount rates of 2%, 5% and 8% have been used to straddle a range moving from a social discount rate to one that is more attuned to the return expected on capital investments in the private sector (see Table 1).

The Kiribati government provided 51% of total costs, New Zealand government 25%, SPMS 20% and the Australian government 4%.

**Table 1. Result of the CBA at varying discount rates (A\$m, 2012 prices)**

Discount rate	0%	2%	5%	8%
Total costs	36.0	30.1	23.7	19.1
Total Benefits	120.2	86.7	56.3	38.8
NPV	84.1	56.6	32.7	19.6
B/C ratio	3.3	2.9	2.4	2.0

The criterion of a positive net benefit to the economy is that the NPV is greater than zero and the benefit cost ratio is greater than one. Clearly the MTC has a positive net benefit to the economy. The cost benefit analysis provides an indicator of the efficient use of scarce resources. In contrast the economic impact analysis highlights where in the benefits and costs are distributed in the economy.

The cashflows and results are provided in Table 2.

## **2.6 Limitations of the analysis**

The key area of uncertainty in the analysis is around remittance levels due to a lack of consistent data over the period of analysis. This is also a factor in the estimation of costs.

**Table 2. Kiribati Marine Training Centre: Cashflows of Operations 1995 – 2012 (A\$'000)**

Year		%	TOTAL	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2033
Project year				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1
Inflation index				0.69	0.72	0.74	0.77	0.77	0.78	0.84	0.85	0.87	0.85	0.85	0.85	0.88	1.04	1.04	1.03	1.03	1.00	1.03	1.68
Trainees starting No.			2575	199	200	202	195	200	90	100	158	132	44	140	160	188	162	81	77	122	125		
Passed		59.2%	1,525	136	75	154	61	61	51	0	155	40	102	101	70	134	98	56	49	81	101		
Dismissed		30.1%	776	26	24	46	62	32	122	41	47	16	39	67	17	71	57	21	32	16	40	13	
Employed No.																							
South Pacific Maritime Services (SPMS) *		<b>Average</b>	<b>1,055</b>	1,201	1,248	1,205	1,395	1,445	1,067	1,015	1,065	976	1,050	1,064	970	921	919	915	848	911	783		
Seafarers employed on other ships				240	250	241	279	289	213	203	213	195	210	213	194	184	184	183	170	182	157		
Wages paid by SPMS				5,917	8,340	8,459	8,496	9,066	8,932	10,935	12,458	10,614	10,234	9,621	9,689	8,468	7,336	7,838	6,472	6,359	6,175		
Per employee \$				4,926	6,683	7,020	6,090	6,274	8,371	10,773	11,698	10,875	9,747	9,042	9,989	9,194	7,983	8,566	7,632	6,980	7,886		
2012 \$		<b>Average</b>	<b>10,185</b>	7,102	9,303	9,529	7,928	8,117	10,730	12,900	13,786	12,491	11,416	10,648	11,784	10,460	7,658	8,211	7,423	6,778	7,886		
<b>Benefits</b>																							
Total Benefits from remittances				<b>5,325</b>	<b>7,506</b>	<b>7,613</b>	<b>7,647</b>	<b>8,159</b>	<b>8,039</b>	<b>9,842</b>	<b>11,212</b>	<b>9,553</b>	<b>9,211</b>	<b>8,659</b>	<b>8,720</b>	<b>7,621</b>	<b>6,602</b>	<b>7,054</b>	<b>5,825</b>	<b>5,723</b>	<b>5,557</b>	<b>5,557</b>	<b>5,557</b>
Revenue from fees																18	25	28	35	37	52		
2012 \$																20	24	27	34	36	52		
<b>Costs</b>																							
GoK		Nominal	49.8	15,965	614	658	606	644	632	822	916	1451	842	798	831	873	901	983	1015	996	1135	1248	
2012 \$		Real	50.8	18,310	885	916	823	838	818	1,054	1,097	1,710	967	935	979	1,030	1,025	943	973	969	1,102	1,248	
NZ MSC		Nominal	26.7	8,565	222	354	310	150	184	176	150	202	193	248	164	168	283	268	2,177	1,772	623	919	
2012 \$		Real	25.3	9,129	320	493	421	195	238	225	179	238	222	291	193	198	322	257	2,087	1,723	605	919	
Au		Nominal	4.2	1,337															950	86.6	150	150	
2012 \$		Real	3.6	1,290															911	84	146	150	
SPMS Total		Nominal	19.2919	6,183	419	424	323	361	343	317	382	428	388	352	298	262	319	414	421	289	219	224	
2012 \$		Real	20.3	7,314	604	590	438	470	444	406	457	504	446	412	351	309	363	397	404	281	213	224	
Total cost /Trainee graduating																							
Nominal				9,229	19,151	8,048	18,930	19,003	25,782			13,424	35,573	13,707	12,804	18,617	11,219	16,994	81,489	64,155	26,263	25,162	
Real		<b>Average</b>	<b>25,732</b>	13,306	26,661	10,925	24,641	24,586	33,046			15,820	40,859	16,054	15,078	21,962	12,763	16,302	78,111	62,395	25,502	25,162	
				25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	25,732	
<b>Cashflow Totals</b>																							
Nominal			<b>TOTAL</b>																				
TOTAL COSTS			32,050	1,255	1,436	1,239	1,155	1,159	1,315	1,448	2,081	1,423	1,398	1,293	1,303	1,503	1,665	4,563	3,144	2,127	2,541		
TOTAL BENEFIT			125,914		375	761	1,147	1,632	2,010	2,952	3,924	3,821	4,145	4,329	4,796	4,591	4,317	4,966	4,404	4,615	4,776	5,001	556
NET BENEFIT			93,864	-1,255	-1,061	-478	-8	473	695	1,505	1,844	2,398	2,747	3,036	3,493	3,087	2,651	403	1,260	2,488	2,234	5,001	556
Benefit Cost Ratio (B/C)			3.9																				
<b>Present Values</b> (at discount rate of:)																							
Real		2%	5%	8%	<b>TOTAL</b>																		
TOTAL COSTS		30,130	23,659	19,146	36,044	1,810	2,000	1,682	1,503	1,500	1,685	1,733	2,452	1,634	1,638	1,523	1,537	1,710	1,598	4,374	3,057	2,066	2,541
TOTAL BENEFIT		86,743	56,324	38,782	120,157	0	522	1,033	1,493	2,111	2,576	3,535	4,625	4,389	4,855	5,098	5,658	5,243	4,165	4,787	4,317	4,518	4,828
NET BENEFIT		56,612	32,665	19,636	84,113	-1,810	-1,477	-649	-10	612	891	1,802	2,173	2,754	3,217	3,575	4,121	3,533	2,567	413	1,259	2,452	2,286
Benefit Cost Ratio (B/C)		2.9	2.4	2.0	3.3																		
% SPMS wages remitted		90%																					

## 3. Economic Impact Analysis

### 3.1 Economic impact of the Marine Training Centre

To measure the economic impact of the MTC on the Kiribati economy for the period between 1995 to 2012 Input-Output (IO) analysis was used. A Marine Training sector was constructed within the model to measure the impact of expenditure by the MTC and the impact of seafarer remittances on the economy. The combined value added of remittances and the operation of the MTC amounted to 3.4 per cent of the Kiribati's GDP for 2010.<sup>6</sup> It should be noted that in strict economic impact terms, remittances, which embody the facilitated effects of the MTC through employment training, have a significantly larger economic effect (6.75 times greater impact) than the operational impacts of the MTC. As training generates income streams for the graduates throughout their working lives, the benefits or effects of training in the period up to 2012 will continue into the future, for the duration that the graduates have a seafaring career. These time lags were factored into the analysis. This report presents a summary of the method used to calculate the economic impact of the MTC along with the results of the study.

Due to data limitations employment impacts are not able to be estimated. Available employment data only covers the formal (cash) economy and is therefore incompatible with the IO which covers both the formal and informal (subsistence) sectors. Also, the employment breakdown is even more aggregated than the IO sectors (8 vs 13); so, the aggregation bias would be very significant – leading to substantial over-estimation of the employment impacts (probably 20-40%). So, overall, the data is really not up to any analysis.

### 3.2 Methodology

#### 3.2.1 Input-Output Analysis

This analysis of the economic impacts of the MTC is undertaken through a modelling framework that is primarily based on Input-Output (IO) analysis (Miller and Blair, 2009). One of the core strengths of IO analysis is that it captures the complex interactions and interdependencies occurring between different sectors within an economy. An IO model has a set of data that measures the flows of money or goods among various sectors or industrial groups within an economy, for a given year. This means that it is possible to consider the vast number of the 'indirect' and 'induced' flow-on effects that occur throughout an economy as a result of economic change. In this study, we use IO analysis to measure how expenditure by the MTC impacts and flows onto other industries, either:

- Directly – i.e. by creating employment and other value added within the MTC itself, and by funding additional demands for goods and services through remittances;
- Indirectly – i.e. by leading to economy-wide increases in the production of goods and services in order to support the supply chains of those industries impacted directly;

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<sup>6</sup> Note, this figure is significantly less than the previously reported (ADB, 2000) remittances constituting 15 per cent of GDP. The Asian Development Bank figure represents the total nominal monetary value of remittances as a proportion of GDP, rather than the value added component of the remittances. Value added is calculated as output minus intermediate consumption (refer to National Statistics Office and Ministry of Finance, (2011) for details on the construction of the Kiribati National Accounts).

- By way of induced impacts – i.e. by leading to increased money (incomes) within the economy, which is then re-spent on more goods and services produced by the economy.

It is important to note that only crude input-output tables could be constructed for Kiribati given the available data and budgetary constraints. Market Economics are globally leading experts in the application of Input-Output methods. This includes publication of several internationally recognised peer reviewed journal publications and practical experience in undertaking more than 200 Economic Impacts Assessment for major public and private clients. This includes completion of several of the largest nationally significant EIAs undertaken within the New Zealand: the 1999, 2003 America's Cup official assessments, 2011 Rugby World Cup official assessment, and assessment of the Christchurch earthquake series. Based on this experience Market Economics has endeavoured to develop input-output 1995, 2000, 2005 and 2010 tables for the Kiribati economy based on representative technical coefficients. These tables must, however, be treated as tentative estimates due to the severe paucity of national account data available to construct the tables.

### 3.2.2 Multiplier Analysis

A major extension of EIA and input-output analysis is the derivation of multipliers. The concept of a multiplier is that it is possible to effectively measure how a particular sector or industry is integrated with the rest of the economy. Multipliers can be seen as a set of simple mathematical relationships between one industry and the rest of the economy, and are used to measure the effects of a change in one industry on the overall economy. For example, if the demand for training increases significantly, the MTC (when unconstrained) will respond to this demand, by increasing training. This will require an increase in the inputs to the industries that supply the MTC, perhaps more labour input, hiring of equipment, and supply of building maintenance services. It may also require increasing or diversifying the labour market where graduates find employment (e.g. labour supply to different shipping companies). If the additional remittances provided by facilitated employment allow for Kiribati residences to, say, purchase more goods from food retailers this generates additional demand from agricultural suppliers, and so on. There are different types of impacts making up the multiplier effects, and are also categorised into three different types – direct, indirect and induced. Multipliers are based on coefficients derived from the input-output transactions table.<sup>7</sup> The set of multipliers for the Kiribati economy can thus show the effect on the economy if there were changes to either the level of funding given to the MTC or to the wages that are repatriated from graduates of the MTC, once they secure employment.

A type I multiplier measures the ratio of direct and indirect backward linkage impacts relative to the direct impacts:

$$\text{Type I Multiplier} = \frac{\text{Direct Effect} + \text{Indirect Effect}}{\text{Direct Effect}}$$

A Type II multiplier captures the direct, indirect and *induced* impacts taking into account consumer expenditure in the economy, stimulated by increased incomes. Again these impacts are expressed relative to the direct impact:

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<sup>7</sup> Input-output analysis is based on average impacts. It maintains a set of assumptions about constant and uniform proportions of expenditure in the different sectors, and these are reflected in the multipliers.



$$\text{Type II Multiplier} = \frac{\text{Direct Effect} + \text{Indirect Effect} + \text{Induced effect}}{\text{Direct Effect}}$$

The greatest challenge for this report was obtaining data on the Kiribati economy to construct the IO model from which the multipliers are derived. Technical details of how the Kiribati IO was constructed are given in Appendix 1, but a number of salient points and assumptions underpinning our analysis are detailed here.

### 3.3 Key Assumptions

The basis of an IO model is the Transactions Table for the economy, showing what each industry buys from the other industries. No official Transactions Table was available for Kiribati, so one was constructed assuming that the Kiribati economy is structurally similar to that of Samoa (Appendix 1), that is, the industries purchase goods from each other in a similar manner, although the size and scale of the industries may be different. A quadratic program was used to balance the transactions table, ensuring that inputs equated with outputs for the Kiribati economy. Official figures on GDP from the Kiribati National Accounts are used in the analysis. Unfortunately reliable time-series data on employment was not available, so this analysis reports on GDP or value added figures only.

As the number of sectors or industries by which the Kiribati economy is defined is relatively few, our IO model is subject to aggregation bias.<sup>8</sup> The typical result of aggregation bias is some overestimation in the size of multipliers derived from an IO model. For this reason the results of the economic impact will be overstated, and we believe this to be in the order of between 10 and 20 per cent. An adjustment was made to eliminate this aggregation bias. To more accurately eliminate the problem of aggregation bias would require significant work, beyond the scope of this project.

Within the system of national accounts for Kiribati, the National Statistics Office classifies the economy into the formal or monetary sector and the informal or subsistence/non-formal sector. The formal sector includes all entities whose output is sold in the market. However, a significant proportion of output comes from the informal or subsistence sector (Kiribati National Statistics Office, 2011). The model developed for this study includes both formal and informal sectors. We feel this strengthens the model, given the importance of the informal sector. Data triangulation, using Kiribati's Household Expenditure Survey, enabled us to verify the expenditure within the informal sector.

Historical expenditure by the MTC was used to create a Marine Training Sector within the IO model for Kiribati. That expenditure was subtracted from the totals of the parent industry (e.g. education, health and other Community, Social and Personal Services), where it would have appeared in the original Kiribati IO model. In so doing, the impacts of that sector can be isolated, enabling an economic impact assessment.

The impacts of the Marine Training Sector result from the operation of the MTC itself, which include the effects of the operating costs in the economy, and the facilitated effects of MTC graduates securing employment and wages. It is assumed that these would not be secured in the absence of the MTC, and remittances would not be returned to Kiribati. The economic impact was measured for the years 1995 to 2012, although the MTC has been in operation since 1967. The reason for choice

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<sup>8</sup> Refer to Miller and Blair (2009, p160) for further explanation.

of years was pragmatic, due to availability of data for the construction of the accounts. It is noted that the remittances currently being returned to Kiribati may result from graduates that completed their training prior to 1995. Adjustments were made, based on the assumption that graduates have a 20 year working life. Therefore, the 2012 graduates are assumed to return remittances to Kiribati until 2032. As with the practice with cost benefit analysis, the value of future income or benefit streams are discounted, to reflect the present value of money earned in the future. As the choice of discount rate is somewhat arbitrary, a range of discount rates were calculated to assess the variability or sensitivity of the analysis to the rate used.

It is assumed that the remittances from seafarers are spent by households, in accordance with the patterns of expenditure that were reported in the Kiribati Household Expenditure Survey.

### **3.4 Results**

Table 3 presents a summary of the cumulative (i.e. summed across all study years) and average (i.e. cumulative divided by number of study years) gross output and value added impacts of the MTC, for the period 1995 to 2012. Note that these impacts are those created from operational and capital expenditures of the MTC over the period 1995 to 2012, along with remittances produced from persons graduating from the MTC during that period. It therefore includes, for example, remittances for the next twenty years from 2012 graduates.

The gross output impact is the total value of goods and services, the demand for which is created by the MTC. The cumulative gross output impact of the MTC (including all direct, indirect and induced impacts) over the study period is estimated as AU\$<sub>2012</sub>279mil. Note, however, that value added is typically considered a more meaningful measure for evaluating economic impacts than gross output. It includes the value of income-related impacts (e.g. additional wages and salaries, business profits) but excludes the value of additional intermediate goods and services. The MTC's cumulative value added impact for Kiribati is estimated as <sub>2012</sub>AU\$93m. This equates to an average value added impact of AU\$<sub>2012</sub>2.4mil per year. To place these results in context, the average value added impact is estimated to be around 1.0 per cent of GDP in 2010. Importantly, of the total value added impact estimated for the study period, 8 per cent is derived from the operational and capital expenditures of the MTC itself, and the remaining 92 per cent from remittances that are facilitated by the MTC. Note also that if we are to assume an aggregation bias effect of around 15 per cent, the average value added impact drops from AU\$<sub>2012</sub>2.4mil to AU\$<sub>2012</sub>1.9mil

**Table 3. Cumulative and Average net Economic Impacts of the Marine Training Centre, 1995 to 2012 (without discounting)**

	Cumulative Net		Average Net	
	Gross Output <sup>1</sup>	Value Added <sup>1</sup>	Gross Output <sup>1</sup>	Value Added <sup>1</sup>
	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil
<b>Direct</b>	141	45	3.6	1.2
<b>Indirect</b>	126	44	3.2	1.1
<b>Induced</b>	13	4	0.3	0.1
<b>TOTAL</b>	<b>279</b>	<b>93</b>	<b>7.2</b>	<b>2.4</b>

1. This includes the economic impacts of both the operation of the MTC and the seafarer remittances for MTC graduates. Note it is assumed that remittances are received from seafarer's for the 20 years following graduation. Thus, a seafarer graduating in 2012 is assumed to receive remittances for the period 2013 through 2033.

*It is standard practice in assessing economic benefits and costs to discount benefits and costs that occur in the future, and inflate benefits and costs occurring in the past.* This accounts for the lower perceived value of benefits occurring in the future, compared with benefits occurring today, due to factors such as risk. Additionally, benefits (incomes) can be invested to earn interest, and so the earlier a benefit is obtained the better. Table 4 shows the discounted cumulative and average net economic impacts of the Marine Training Industry, for the period 1995 to 2012. Three discount rates are investigated, 2 percent, 5 per cent and 8 per cent. The preferred discount rate is 5 per cent. Note that the discounted net impacts are greater than the net economic impacts (Table 1) because a significant proportion of our study period occurs in the past, leading to inflated benefits. Applying the 5 per cent discount rate, the average value added impact is estimated as AU\$<sub>2012</sub>3.0mil, or AU\$<sub>2012</sub>2.4mil assuming an aggregation bias effect of 15 per cent.

Table 4 additionally shows the way in which gross output and value added impacts of MTC are distributed through time. As already stated, the system boundary for our analysis includes remittances generated out to the end of the working life of 2012 graduates, but only includes operational and capital expenditures of the MTC from 1995 to 2012. Not surprisingly, the year with the highest impact is 2012, as it this point there are a significant number of MTC graduates and we are also capturing direct activities of the MTC itself.

**Table 4. Discounted Cumulative and Average Net Economic Impacts of the Marine Training Centre, 1995 to 2012**

	Cumulative Net		Average Net	
	Gross Output <sup>1</sup>	Value Added <sup>1</sup>	Gross Output <sup>1</sup>	Value Added <sup>1</sup>
	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil
<i>2% Discount rate</i>				
<b>Direct</b>	177	60	4.5	1.5
<b>Indirect</b>	135	49	3.5	1.3
<b>Induced</b>	15	5	0.4	0.1
<b>TOTAL</b>	<b>327</b>	<b>114</b>	<b>8.4</b>	<b>2.9</b>
<i>5% Discount rate</i>				
<b>Direct</b>	180	61	4.6	1.6
<b>Indirect</b>	136	50	3.5	1.3
<b>Induced</b>	15	5	0.4	0.1
<b>TOTAL</b>	<b>331</b>	<b>116</b>	<b>8.5</b>	<b>3.0</b>
<i>8% Discount rate</i>				
<b>Direct</b>	183	62	4.7	1.6
<b>Indirect</b>	138	51	3.5	1.3
<b>Induced</b>	15	5	0.4	0.1
<b>TOTAL</b>	<b>336</b>	<b>118</b>	<b>8.6</b>	<b>3.0</b>

1. This includes the economic impacts of both the operation of the MTC and the seafarer remittances for MTC graduates. Note it is assumed that remittances are received from seafarer's for the 20 years following graduation. Thus, a seafarer graduating in 2012 is assumed to receive remittances for the period 2013 through 2033.

**Table 5. Economic Impacts of the Marine Training Centre for Selected Years**

	1995	2000	2005	2010	2012	2015 <sup>1</sup>	2020 <sup>1</sup>	2025 <sup>1</sup>	2030 <sup>1</sup>
	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil	\$ <sub>2012</sub> AU mil
<i>Gross Output</i>									
<b>Direct</b>	0.9	3.7	6.1	5.7	6.0	5.1	3.4	2.0	0.9
<b>Indirect</b>	0.6	1.7	3.8	6.0	6.3	5.8	3.8	2.3	1.0
<b>Induced</b>	0.1	0.3	0.4	0.6	0.6	0.5	0.3	0.2	0.1
<b>TOTAL</b>	<b>1.6</b>	<b>5.6</b>	<b>10.4</b>	<b>12.3</b>	<b>12.9</b>	<b>11.4</b>	<b>7.6</b>	<b>4.5</b>	<b>2.0</b>
<i>Value Added</i>									
<b>Direct</b>	0.4	1.4	2.0	1.8	1.9	1.5	1.0	0.6	0.3
<b>Indirect</b>	0.3	0.7	1.5	2.1	2.2	1.9	1.3	0.8	0.3
<b>Induced</b>	0.0	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.0
<b>TOTAL</b>	<b>0.7</b>	<b>2.2</b>	<b>3.6</b>	<b>4.0</b>	<b>4.3</b>	<b>3.5</b>	<b>2.4</b>	<b>1.4</b>	<b>0.6</b>

1. The years 2015, 2020, 2025 and 2030 represent only the impacts associated with seafarer's remittances received from seafarer's graduating in, or before, 2012.

Economic multipliers are used to measure how expenditure in one economic industry sets in motion or stimulates activity in parts of the economy. The Type I Value Added multiplier for the MTC calculated from Table 3 above is 1.98. That means, for every \$1 of value added generated by remittance expenditure and expenditure by the MTC, an additional \$0.98 of value added is generated in the Kiribati economy as a result of the upstream supply chains. The Type II Value Added multiplier from Table 1 (which is a Type I plus the induced effects) is calculated as 2.07. These multipliers are consistent with those calculated for other sectors of the Kiribati economy (mainly ranging between 1 and 2).

Another way to consider the economic impact of the MTC is to compare the value added impact of the MTC with the costs of running the MTC. This is similar to the measures provided in the last paragraph except that the direct measure is all operational and capital expenditures rather than just value added. Furthermore, remittances are excluded from the direct impacts as these are facilitated out of the operational and capital expenditure of the MTC. Over the entire study period, it is estimated that for every AU\$<sub>2012</sub>1 invested in operating the MTC, on average AU\$<sub>2012</sub>4.9 (or AU\$<sub>2012</sub>4.0 accounting for aggregation bias) is generated in value added through direct, indirect and induced impacts, including the impacts from remittances.

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## Appendix 1. Technical Construction of Input Output Tables for Kiribati

In order to analyse the economic impact of the Marine Training Centre, the following data sources were used:

- Kiribati National Accounts: The Production Account and GDP, 2011.
- Kiribati Household Income and Expenditure Survey 2006.
- Asian Development Bank's Balance of Payments for Kiribati
- International Labour Organisation employment data (although lack of detailed time series data limited the usefulness of this data)
- Samoa Tables for 1995, 2000, 2005 and 2010

All figures in the analysis were converted to current 2012 Australian dollar terms.

To undertake the economic impact analysis, the following steps were undertaken:

*Step 1. Derivation of representative coefficients for 1995, 2000, 2005 and 2010 by 25 economic sectors in current \$US 000s*

- a. These tables were created as part of a global research initiative to calculate trade, environmental footprints and conduct multi-regional input-output studies. However, these tables are only indicative of actual economic transactions. As a starting point for our work the Samoa tables for 1995, 2000, 2005 and 2010 were used. As these tables were unbalanced (i.e. inputs and outputs by industry were not in balance as required for input-output analysis). A quadratic program was used to balance the transactions. This approach was used as it makes the least possible change to the base table in producing the balanced table. In technical terms, the quadratic program represents as an objective function of a least squares optimization with total input and output by sector acting as constraints.
- b. Aggregate to 13 sectors. Aggregation from 25 to 13 sectors was required to ensure compatibility with data from the Kiribati National Statistical Office.

*Step 2. Create Kiribati Input-Output Tables for 1995, 2000, 2005 and 2010 by 13 economic sectors in current \$US 000s*

While the Samoa table was used as a starting point, significant adjustments were made to create a unique Kiribati input-output table for the reference years.

- a. Create Samoa technical coefficients from Step 1.
- b. Create Kiribati technical coefficients using a GRIT approach (refer to Jensen and West, 1986). Use Simple Location Quotients (SLQs) to adjust technical coefficients from Samoa to Kiribati equivalents. SLQs were calculated for each of the 13 sectors, based on GDP series for both countries. SLQs are calculated by measuring the proportion of Kiribati GDP in an industry over total Kiribati GDP (all industries), divided by the proportion of Samoan GDP in an industry over total Samoan GDP (all industries). Assumption, by industry, is if the  $SLQ < 1$  then relative to Samoa, the Kiribati is unable to meet domestic requirements and therefore the technical coefficients were adjusted downwards.

- c. Estimate Gross Output for Kiribati by assuming the GDP to Gross Output ratio by industry, based on the Samoan tables.
- d. Create 1<sup>st</sup> unbalanced transaction table.
- e. Create 2<sup>nd</sup> unbalanced transactions table including insertion of superior Kiribati specific data taken from Kiribati National Statistical Office and other reports, NZ government MFAT data.

In particular, official data was available for :

- a. Kiribati imports and exports by total and commodity structure,
- b. Kiribati household consumption by total and commodity purchase structure based on 2006 HIES data,
- c. Kiribati Government Expenditure and Income,
- d. Kiribati GDP by 13 sectors,
- e. Kiribati imputed rents from owner-occupied dwellings,
- f. Kiribati government transfers to households and non-profit institutions.

NB: Scaling to relevant year was undertaken by accounting for population change, price change based on CPI, and any conversion from \$US to \$AU using exchange rates.

- f. Create balanced transactions table using a quadratic program. As above this ensured that the transactions tables balanced using the least degree of change from the unbalanced transactions, as necessary to ensure inputs equated with outputs.

### *Step 3. Economic Impact Assessment*

- a. Convert 13 sector Kiribati IO table created in Step 2 into \$AU 000s.
- b. Create a Marine Training Industry within the table, by coding MTC operation costs by accounting category to IO13 sector and insert into 13 sector IO table.
- c. Include MTC as a sector directly in derived IO table, by subtracting totals from parent industry (Education, Health, and Other Community, Social and Personal Services). The MTC had a total budget of Au\$1.25m in 2012, a doubling from the Au\$0.6m budget in 1995. In 2012, this expenditure paid for Primary Inputs (35%), was spent on Wholesale and Retail trade (29%), Electricity, Gas and Water (11%), Education Health and Other Community Services (9%), Imports (7%), Transport and Storage (5%), Financial Intermediation and Business Services (3%) and Communications (1%). There were no links between the MTC and (or purchases from) the primary industries of Agriculture and Fishing, nor any links to the secondary industries of Manufacturing and Construction.
- d. Remittances from graduates of the MTC contributed significantly more to the Kiribati economy than the operation of the MTC itself.
- e. Derive input-output inverses and multipliers.
- f. Derive net final demand vectors for the years 1995 to 2032. These include operation of the MTC 1995 through to 2012, and the seafarer's remittances for the period 1995 – 2033.

NB: As per Nimmo Bell it is assumed that seafarer's provide remittances throughout their working lives. A 20 year working life is assumed i.e. the 2012 graduates will continue to provide remittances until 2033.

Using net final demand, calculate gross output and value added impacts (direct & indirect –