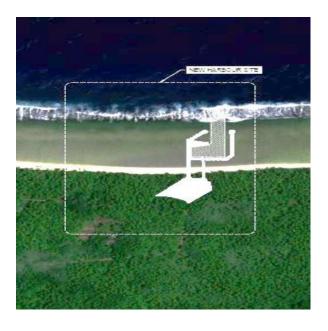
ECONOMIC AND FINANCIAL ANALYSIS: SUPPLEMENTARY APPENDIX

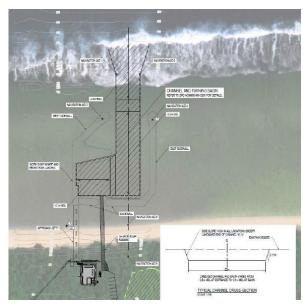
A. Location Maps and Drawings

Figure 1: Nuitao Island and location of proposed harbour



Figure 2: Option 1: a wharf for small crafts/workboats





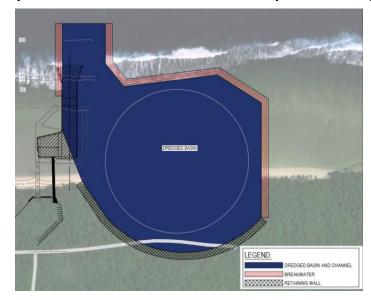


Figure 3: Option 2- a wharf at the same site as Option 1 for large vessels

B. Key assumptions used in Economic Analysis

- All costs and benefits expressed in 2018 constant prices;
- World Price Numeraire used to convert financial values to border equivalent economic prices;
- A Shadow Wage Rate Factor (SWRF) of 0.8 used to convert unskilled labour to border equivalent values:
- Skilled labour considered as a traded cost and assumed to be valued at its border price;
- A 70:30 split between materials and labour and also a 70:30 split between skilled and unskilled labour;
- A Standard Conversion Factor of 0.9 used to convert non-traded costs to their border equivalent value. Non-traded items are unskilled labour in the project capital expenditure (materials and skilled labour are traded) and vessel operating costs saved. Unskilled labour has been converted to its border equivalent value by applying the SCF and the SWRF to the proportion of unskilled labour in the capital cost. Vessel operating costs excluding fuel costs have been adjusted by the SCF since they are non-traded. The fuel component in the vessel operating cost has not been adjusted by SCF;
- Project economic lifetime of 50 years with no residual value thereafter;
- An Economic Opportunity Cost of Capital of 9% in real terms;
- Physical contingencies of 10% on base cost;
- Annual operations and maintenance cost at 3% of capital costs and in addition 2% of capital costs on an annualized basis to provide for maintenance dredging as a result of siltation caused by post-cyclone activity.
- Nivaga III annual recurrent expenditure: AUD 1,153,697
- Manufolau annual recurrent expenditure: AUD 1,123,549
- Total shipping expenditure: AUD 2,277,246, of which fuel cost: AUD 940,000
- Operating hours: 80% of time.
- Hourly ship operating cost: 325 AUD/h
- Hourly ship operating cost (excluding fuel): 191 AUD/h

Hourly ship operating cost (fuel): 134 AUD/h

Hourly ship operating cost (fuel) (economic price): 114 AUD/h

Total hourly ship operating cost: 285 AUD/h

D. Ministry of Communication and Transport Budget Projections

Table: Ministry of Communication and Transport Budget Projections (AUD'000s)

Item	2014a	2015f	2016f	2017b	2018p	2019p	2020p	2021p
Revenues	7,021	9,578	9,585	8,865	9,041	9,223	9,333	9,445
Taxes	48	58	88	198	202	206	208	211
Fees & charges	6,973	9,520	9,497	8,667	8,839	9,017	9,125	9,234
Marine Dept.	1,389	1,619	1,930	1,435	1,463	1,493	1,511	1,529
.TV	5,514	7,734	7,411	7,051	7,192	7,336	7.424	7,512
Other charges	70	167	156	181	184	188	190	193
Expenditures	4,428	6,359	5,253	5,520	5,648	5,760	6,565	6,634
Recurrent								
expenditures	4,383	5,122	5,243	5,253	5,358	5,465	6,267	6,333
Staff (incl.								
travel & comm.)	2,241	2,342	2,988	2,960	3,020	3,080	3,117	3,154
Goods and								
services	365	444	320	389	397	405	410	415
Fuel and oil	1,034	761	1,339	1,044	1,065	1,086	1,099	1,112
Maintenance	627	1,475	481	694	708	722	731	739
Other	116	100	115	166	168	172	174	176
Non-recurrent								
expenditures	45	1,237	10	267	272	277	280	284
Project								
expenditures					18	18	<i>755</i>	<i>7</i> 55
Maintenance							737	737
Land lease					18	18	18	18
Ministry								
Balance	2,593	3,219	4,332	3,345	3,393	3,463	2,768	2,810

b = budget, e = estimate, p = projection.

Source: Consultant estimates based on the Tuvalu National Budget.

D. Macro-economic context

Tuvalu is considered a fragile micro-state due to its remoteness, lack of economies of scale and vulnerability to climate change. Although it has a land size of only 26km² it has a large exclusive economic zone of almost 800,000 km² with substantial fish stocks and revenue from fishing licences accounts for 48% of its national revenue. The most recent population estimate was 11,300 and population growth rate of 1.2% per annum with 8% of the population over 65 years. Real Gross Domestic Product (GDP) growth was 2.2% and 2.6% respectively in 2014 and 2015, and increased to 3.0% in 2016 due to large scale infrastructure projects for recovery from Cyclone Pam.² Growth is estimated at 3.2% in 2017 and is projected to ease slightly to and 3.0% through 2018 and 2019³. Inflation, as measured by the consumer prices index (CPI) has remained within the 1%-3% range over the last five years but increased to 3.5% in 2016 with increased economic activity post Cyclone Pam and is expected to stabilise thereafter. Government finances reported budget surpluses from 2012–2015, due to strong revenue from fishing licenses, despite significant increases in recurrent expenditure with rising overseas medical treatment costs, overseas education scholarships and salaries and wages of the civil service. IMF forecasts that small budget deficits will arise in 2016 and 2017 due to reduced

¹ ADB Key Indicators, 2017

² IMF Article IV Consultation, 2016

³ Government of Tuvalu, National Budget 2017, Asian Development Outlook, ADB, 2018

income from fishing licences and notes the fiscal challenge of managing revenue volatility coupled with long term costs associated with climate change. In order to manage revenue volatility, the Tuvalu Trust Fund (TTF) was created in 1987 by GoT and its development partners with an initial fund of AUD 27 million. This has grown to AUD 148 million at September 2015 and is over 300% of GDP. Although the TTF is not available to finance the budget, the Consolidated Investment Fund (CIF) which is funded by the excess of TTF's market value to a pre-determined "maintained value" can be used for budget support. Debt sustainability is an issue for Tuvalu with debt at 58% of GDP. While some of the debt is concessionary with multilateral lending agencies, debt amounting to 35% of GDP is on non-concessionary terms for two fisheries related joint ventures and is guaranteed by GoT.

D. Detailed tables for the cost effectiveness analysis

OPTION 1 (wharf for workboats)

			for workboats)	
	Discounte	ed Cost	(AUD'000's)	
	Capex		Орех	Total Cost
2018		4,222		4,222
2019		9,852		9,852
2020			704	704
2021			704	704
2022			704	704
2023			704	704
2024			704	704
2025			704	704
2026			704	704
2027			704	704
2028			704	704
2029			704	704
2030			704	704
2031			704	704
2032			704	704
2033			704	704
2034			704	704
2035			704	704
2036			704	704
2037			704	704
2038			704	704
2039			704	704
2040			704	704
2041			704	704
2042			704	704
2043			704	704
2044			704	704
2045			704	704
2046			704	704
2047			704	704
2048			704	704
2049			704	704
2050			704	704
2051			704	704
2052			704	704
2053			704	704
2054			704	704
2055			704	704
2056			704	704
2057			704	704
2058			704	704
2059			704	704
2060			704	704
2060			704	704
2062			704	704
2062			704	704
2063			704	704
2064			704	704 704
2065			704	704
2066			704 704	704 704
2068			704	704
2069			704	704
PV of Cost	PV of Costs OPTION 1 (workboats) 16,283			

OPTION 2 (wharf for vessels)
Discounted Cost (AUD'000's)

	Capex	Opex	Total Cost
2018	26,985		26,985
2019	62,965		62,965
2020		4,497	4,497
2021		4,497	4,497
2022		4,497	4,497
2023		4,497	4,497
2024		4,497	4,497
2025		4,497	4,497
2026		4,497	4,497
2027		4,497	4,497
2028		4,497	4,497
2029		4,497	4,497
2030		4,497	4,497
2031		4,497	4,497
2032		4,497	4,497
2033		4,497	4,497
2033		4,497	4,497
2035		4,497	4,497
2035		4,497	4,497
2037		4,497	4,497
2037		4,497	4,497
2039		4,497	4,497
2040		4,497	4,497
2040		· ·	-
2041		4,497 4,497	4,497 4,497
2042			
		4,497	4,497
2044 2045		4,497	4,497
2045		4,497	4,497
2046		4,497	4,497
2047		4,497	4,497
		4,497	4,497
2049		4,497	4,497
2050		4,497	4,497
2051		4,497	4,497
2052		4,497	4,497
2053		4,497	4,497
2054		4,497	4,497
2055		4,497	4,497
2056		4,497	4,497
2057		4,497	4,497
2058		4,497	4,497
2059		4,497	4,497
2060		4,497	4,497
2061		4,497	4,497
2062		4,497	4,497
2063		4,497	4,497
2064		4,497	4,497
2065		4,497	4,497
2066		4,497	4,497
2067		4,497	4,497
2068		4,497	4,497
2069		4,497	4,497
PV of Costs O	PTION 2 (vess	els)	104,063

Option : Existing
Discounted Values (AUD'000s)
Travel Time Vessel Opex

Option 1 (wharf for workboats)
Discounted Values (AUD'000s)

Option 2 (wharf for vessels)
Discounted Values (AUD'000s)

	Travel Time	Vessel Opex
2018		
2019		
2020	3	428
2021	3	427
2022	3	427
2023	3	426
2024	3	426
2025	3	426
2026	3	425
2027	3	425
2028	3	424
2029	3	424
2030		423
2031	3	423
2032	3	423
2033	3	423
	3	
2034	3	423
2035		423
2036	3	423
2037	4	423
2038	4	423
2039	4	423
2040	4	423
2041	4	423
2042	4	423
2043	4	423
2044	4	423
2045	4	423
2046	4	423
2047	4	423
2048	4	423
2049	4	423
2050	4	423
2051	4	423
2052	4	423
2053	4	423
2054	4	423
2055	4	423
2056	4	423
2057	4	423
2058		423
2059	4	423
2060		423
2061	4	423
2062	4	423
2063	5	423
2063		423
2065		423
2065		423
2067		423
2068		423
2069	5	423
PV	27	3,531

Discounte	Travel Time	Vessel Opex
2018	Haver Hille	Vessel Opex
2019		
2020	2	246
2020	2	245
2021	2	245
2023	2	245
2024	2	245
2025	2	244
2026	3	244
2027	3	244
2028	3	243
2029	3	243
2030	3	243
2031	3	243
2032	3	243
2033	3	243
2034	3	243
2035	3	243
2036	3	243
2037	3	243
2038	3	243
2039	3	243
2040	3	243
2041	3	243
2042	3	243
2043	3	243
2043	3	243
2044	3	243
2045	3	243
2046		
	3	243
2048	3	243
2049	3	243
2050	3	243
2051	3	243
2052	3	243
2053	3	243
2054	3	243
2055	3	243
2056	3	243
2057	3	243
2058	3	243
2059	3	243
2060	4	243
2061	4	243
2062	4	243
2063	4	243
2064	4	243
2065	4	243
2066	4	243
2067	4	243
2067	4	243
2069	4	243
2009	4	243
PV	21	2,027

	Travel Time	Vessel Opex
2018		
2019		
2020	1	123
2021	1	245
2022	1	123
2023	1	122
2024	1	122
2025	1	122
2026	2	122
2027	2	122
2028	2	122
2029	2	122
2030	2	121
2031	2	121
2032	2	121
2033	2	121
2034	2	121
2035	2	121
2036	2	121
2037	2	121
2038	2	121
2039	2	121
2040	2	121
2041	2	121
2042	2	121
2043	2	121
2044	2	121
2045	2	121
2046	2	121
2047	2	121
2048	2	121
2049	2	121
2050	2	121
2051	2	121
2052	2	121
2053	2	121
2054	2	121
2055	2	121
2056	2	121
2057	2	121
2057	2	121
2059	2	121
2039	2	121
2061	2	121
2062	2	121
2063	2	121
2064	2	121
2065	2	121
2065	2	121
2067	2	121
2067	2	121
2069	2	121
2009		141
PV	13	1,111

PV of Travel + Vessel Opex

3,558

PV of Travel + Vessel Opex 2,048

Improvement in PV Travel

+ vessel Opex

1,509

. . . .

PV of Travel + Vessel Opex

1,124

Improvement in PV Travel + vessel Opex

2,434

Cost per \$ saved 10.8 Cost per \$ saved

42.8