

the power of
where
drives NZ's success



**Presented at the FIG Working Week 2016,
May 2-6, 2016 in Christchurch, New Zealand**



Pacific Regional Navigation Initiative (PRNI)

Adam Greenland | National Hydrographer



Maritime Safety in the Pacific





NEW ZEALAND
MINISTRY OF FOREIGN AFFAIRS & TRADE
Aid Programme

New Zealand Aid Programme
Ministry of Foreign Affairs and Trade
p 64 4 439 8000 f 64 4 439 7156

Nga Hoi Toputupu-mai-tawhiti
www.aid.govt.nz

Level 18, 163-175 Featherston Street
Private Bag 18901
Wellington 6160
New Zealand

MEMORANDUM OF UNDERSTANDING (MOU) *South-west Pacific Regional Hydrography Programme*

between

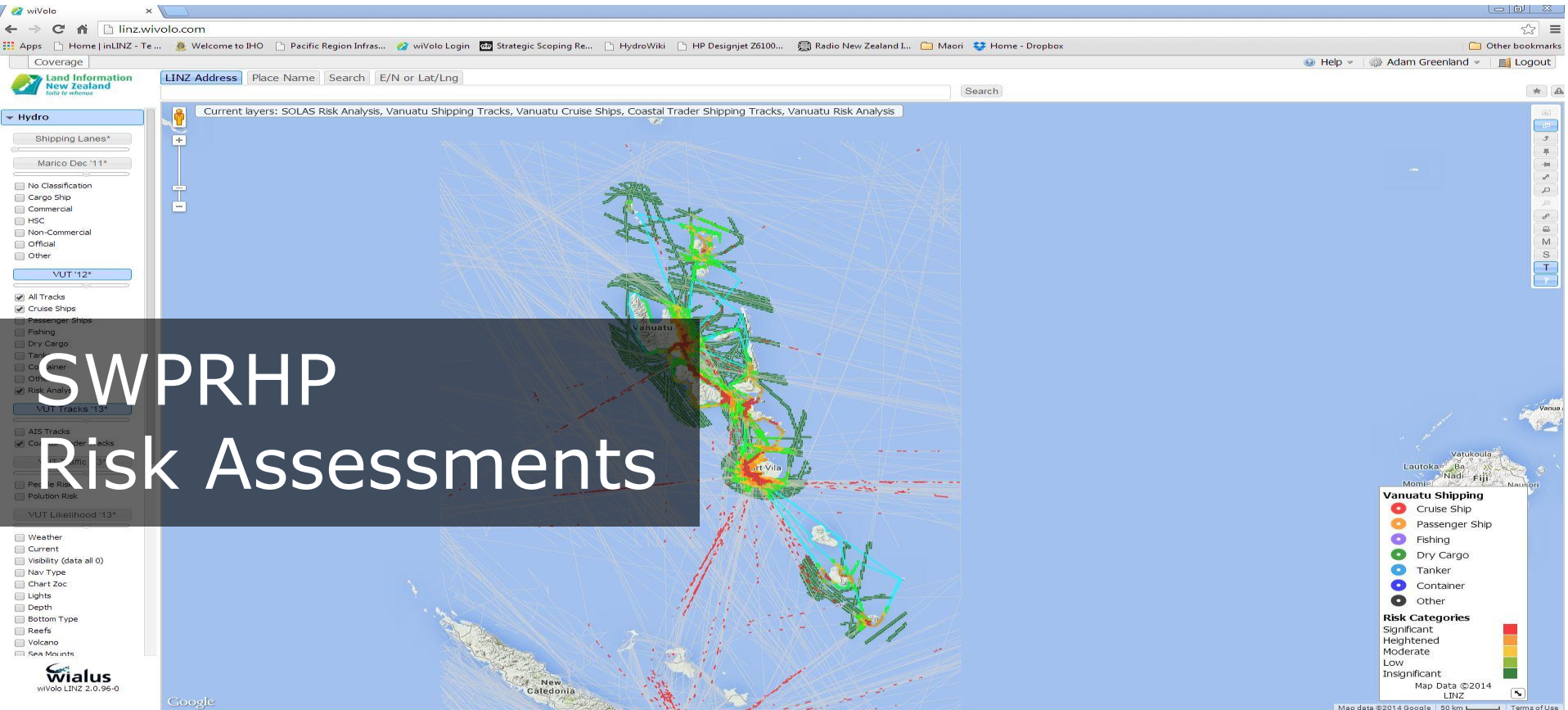
Ministry of Foreign Affairs and Trade
195 Lambton Quay
Wellington 6011

New Zealand
(MFAT)

Land Information New Zealand
NZ Hydrographic Authority
160 Lambton Quay
Private Box 5501
Wellington 6145
New Zealand

(Partner Agency or LINZ)

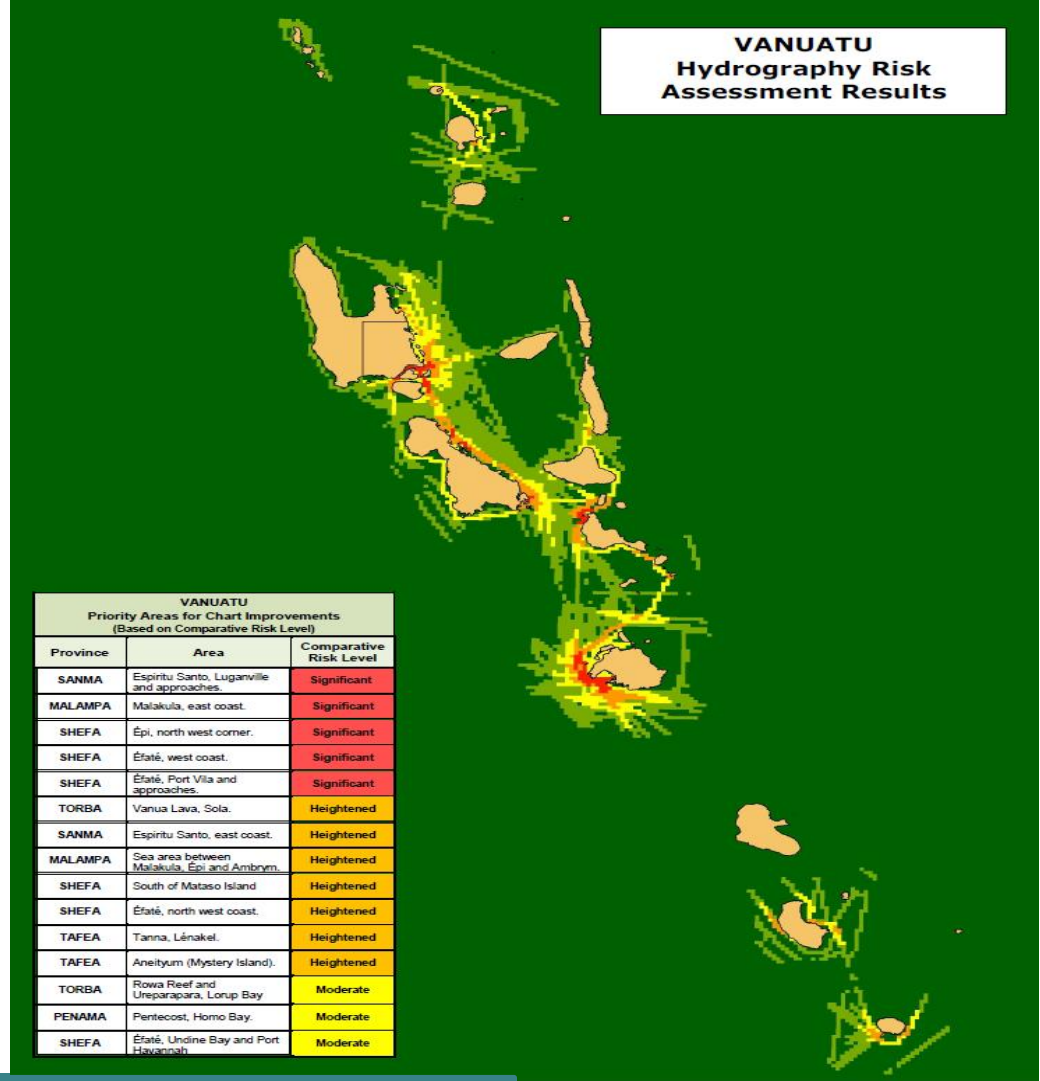
SWP Regional Hydrography
Programme (SWPRHP)



Vanuatu

VANUATU Hydrography Risk Assessment Results

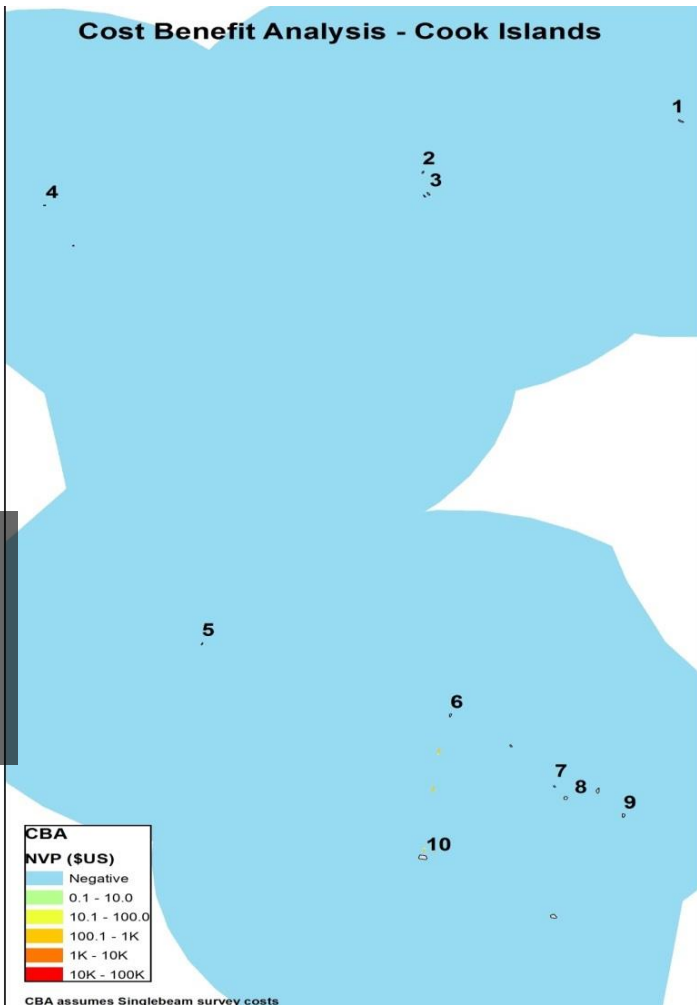
VANUATU Priority Areas for Chart Improvements (Based on Comparative Risk Level)		
Province	Area	Comparative Risk Level
SANMA	Espiritu Santo, Luganville and approaches.	Significant
MALAMPA	Malakula, east coast.	Significant
SHEFA	Epi, north west corner.	Significant
SHEFA	Éfaté, west coast.	Significant
SHEFA	Éfaté, Port Vila and approaches.	Significant
TORBA	Vanua Lava, Sola.	Heightened
SANMA	Espiritu Santo, east coast.	Heightened
MALAMPA	Sea area between Malakula, Epi and Ambrym.	Heightened
SHEFA	South of Matsio Island	Heightened
SHEFA	Éfaté, north west coast.	Heightened
TAFEA	Tanna, Lénakel.	Heightened
TAFEA	Anelitym (Mystery Island).	Heightened
TORBA	Rowa Reef and Ureparapara, Lorup Bay	Moderate
PENAMA	Pentecost, Homo Bay.	Moderate
SHEFA	Éfaté, Undine Bay and Port Havannah.	Moderate



Hydrographic Risk - Cook Islands

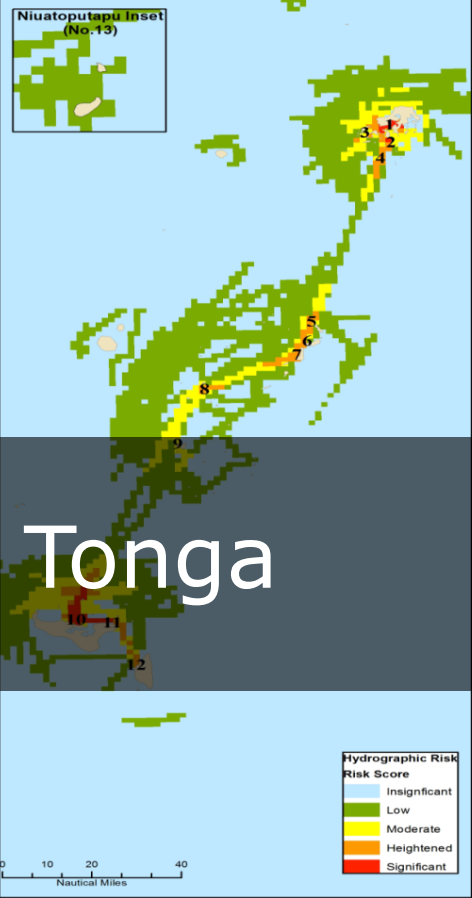


Cost Benefit Analysis - Cook Islands

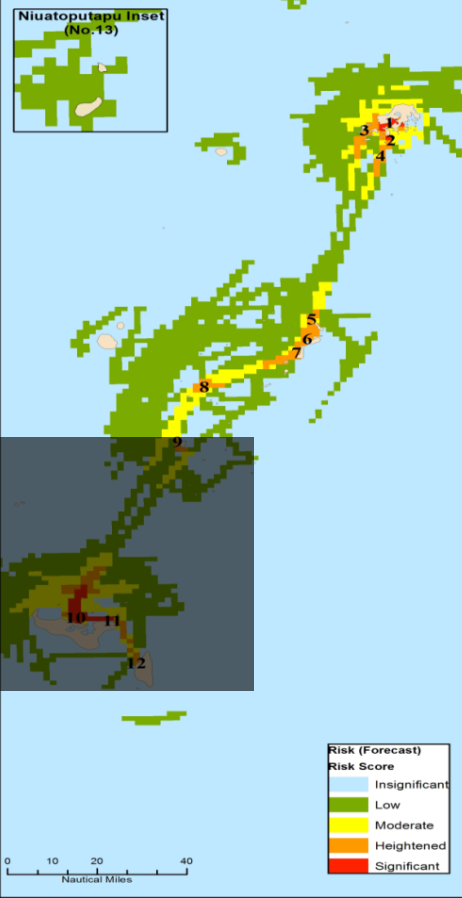


No.	Region	Hydrographic Risk Result	CBA - NPV Result (\$US)
1	Penhryn Tarua Passage and North West Coast of Penhryn	Heightened	Negative
2	Rakahanga West Coast of Rakahanga	Moderate	Negative
3	Manihiki Manihiki Anchorage, North Point and their Approaches	Moderate	Negative
4	Pukapuka Sea area East and West of Pukapuka	Moderate	Negative
5	Palmerston Lagoon and Sea Area North of Palmerston	Moderate	Negative
6	Aitutaki Arutanga Harbour Entrance and Approaches	Heightened	Negative
7	Takutea West and East Coast of Takutea	Moderate	Negative
8	Atiu North West Coast of Atiu	Moderate	Negative
9	Mauke Mauke	Moderate	Negative
10	Rarotonga Avatiu Harbour Entrance and Approaches	Significant	Negative

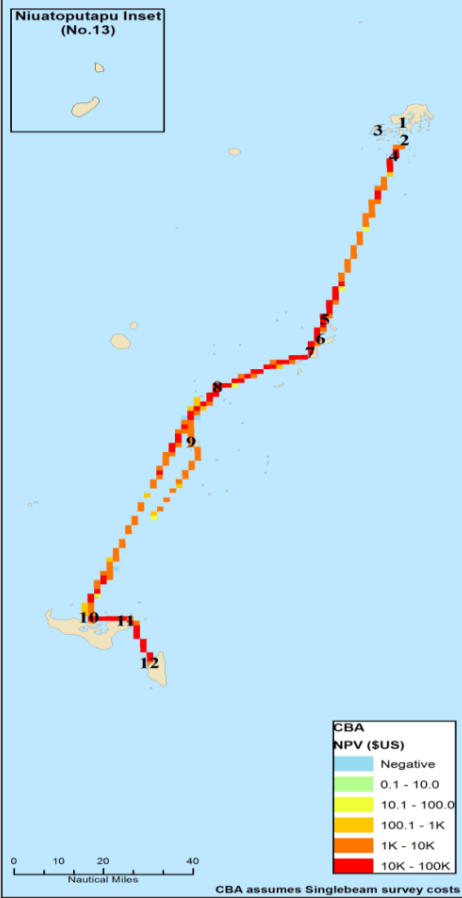
Hydrographic Risk - Tonga



Hydrographic Risk - Tonga Traffic Forecast (Ha'apai)



Cost Benefit Analysis - Tonga



Tonga

No.	Region / Area	Risk (Hydro)	Risk (Forecast)	CBA (\$US)
1	Vava'u Island and Neiafu Harbour	Significant	Significant	Insignificant
2	Sea area South of Kapa Island	Significant	Significant	Insignificant
3	VAVA'U Passage between Fofoa Island and Ovaka Island	Moderate	Moderate	Insignificant
4	Sea area between 'Eua'kafa Island and Richards Patches	Moderate	Moderate	Moderate
5	HA'APAI Ha'ano Island	Moderate	Moderate	Significant
6	Foa Island	Moderate	Moderate	Significant
7	Lifuka Island and Pangai Harbour	Moderate	Moderate	Significant
8	Ha'afeva Island	Moderate	Moderate	Significant
9	Nomuka Island	Moderate	Moderate	Moderate
10	TONGATAPU Nuku'alofa Harbour and approaches	Significant	Significant	Significant
11	Piha Passage and coastal transit to 'Eua	Significant	Significant	Significant
12	EUA Nafanua Harbour	Moderate	Moderate	Significant
13	NIUAS Niuatoputapu Harbour Entrance	Moderate	Moderate	Insignificant

CBA assumes Singlebeam survey costs



NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Aid Programme



New Zealand Ministry of
Foreign Affairs and Trade
Manatū Aorere

195 Lambton Quay
Private Bag 18-901
Wellington 5045
New Zealand

T +64 4 439 8000

MEMORANDUM OF UNDERSTANDING (MOU)

Pacific Regional Navigation Initiative

between

Ministry of Foreign Affairs and Trade

195 Lambton Quay

Wellington 6011

New Zealand

(MFAT)

and

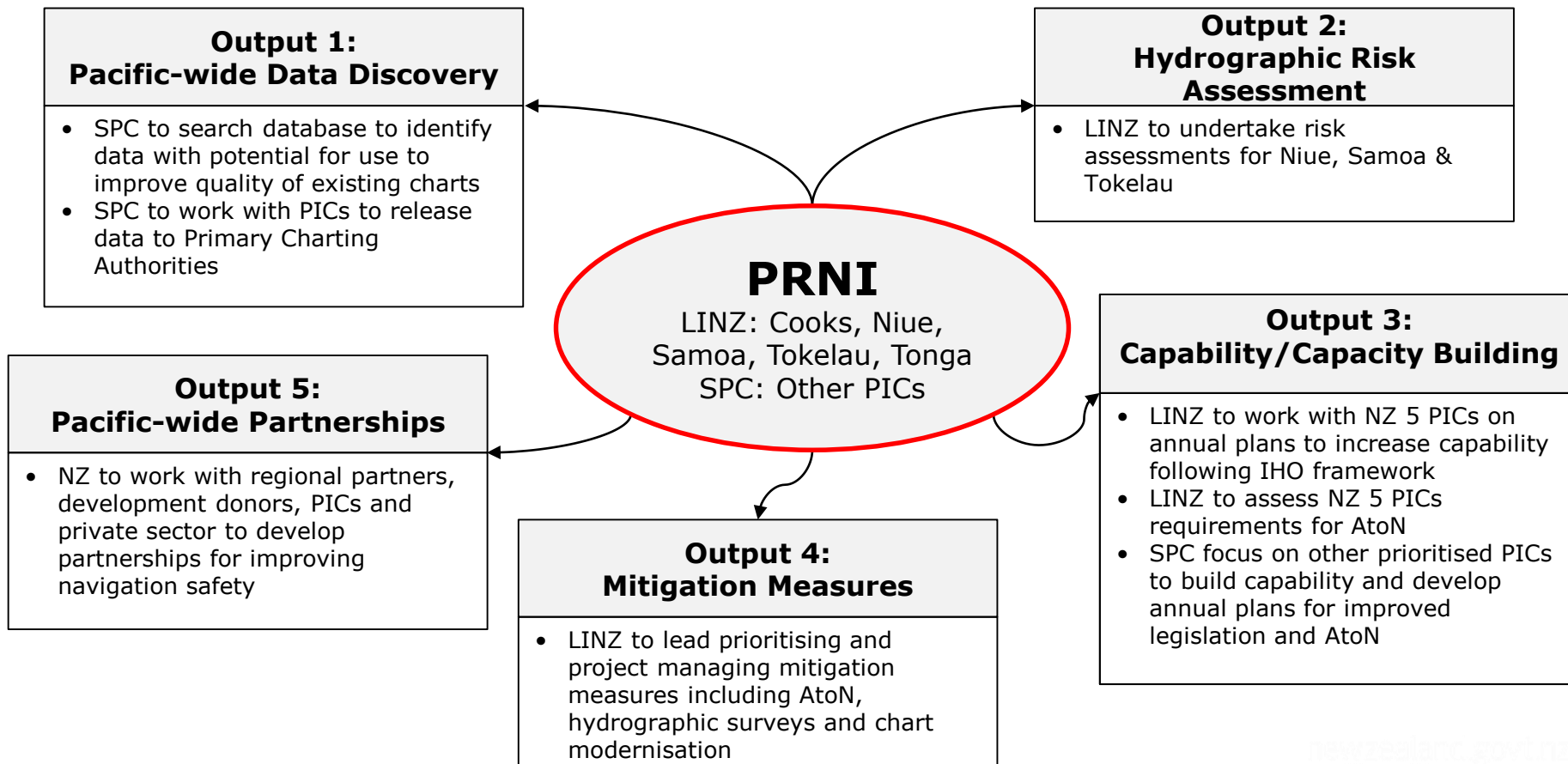
Land Information New Zealand

NZ Hydrographic Authority

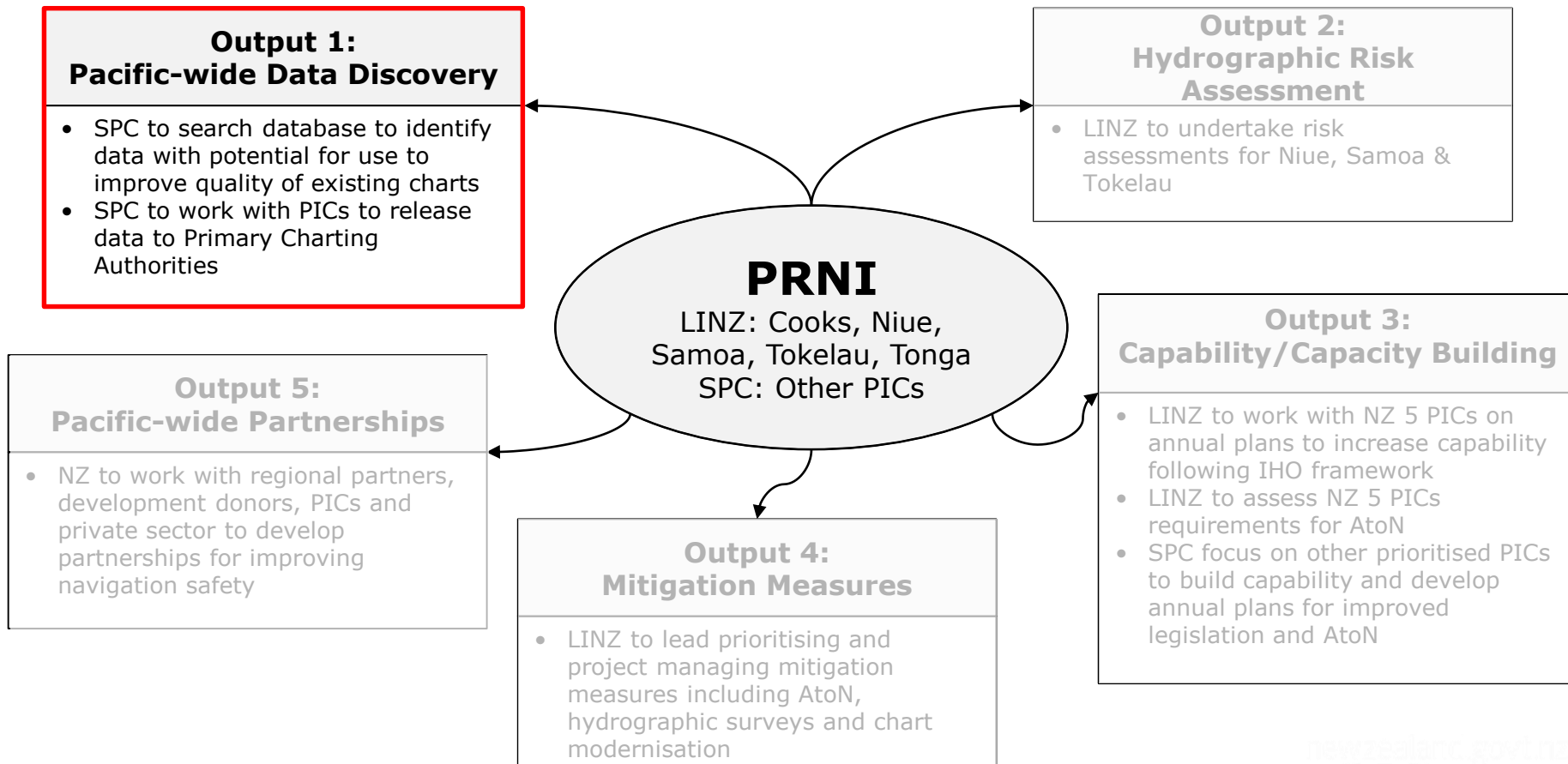
Level 7, Radio New Zealand House

Pacific Regional Navigation Initiative (PRNI)

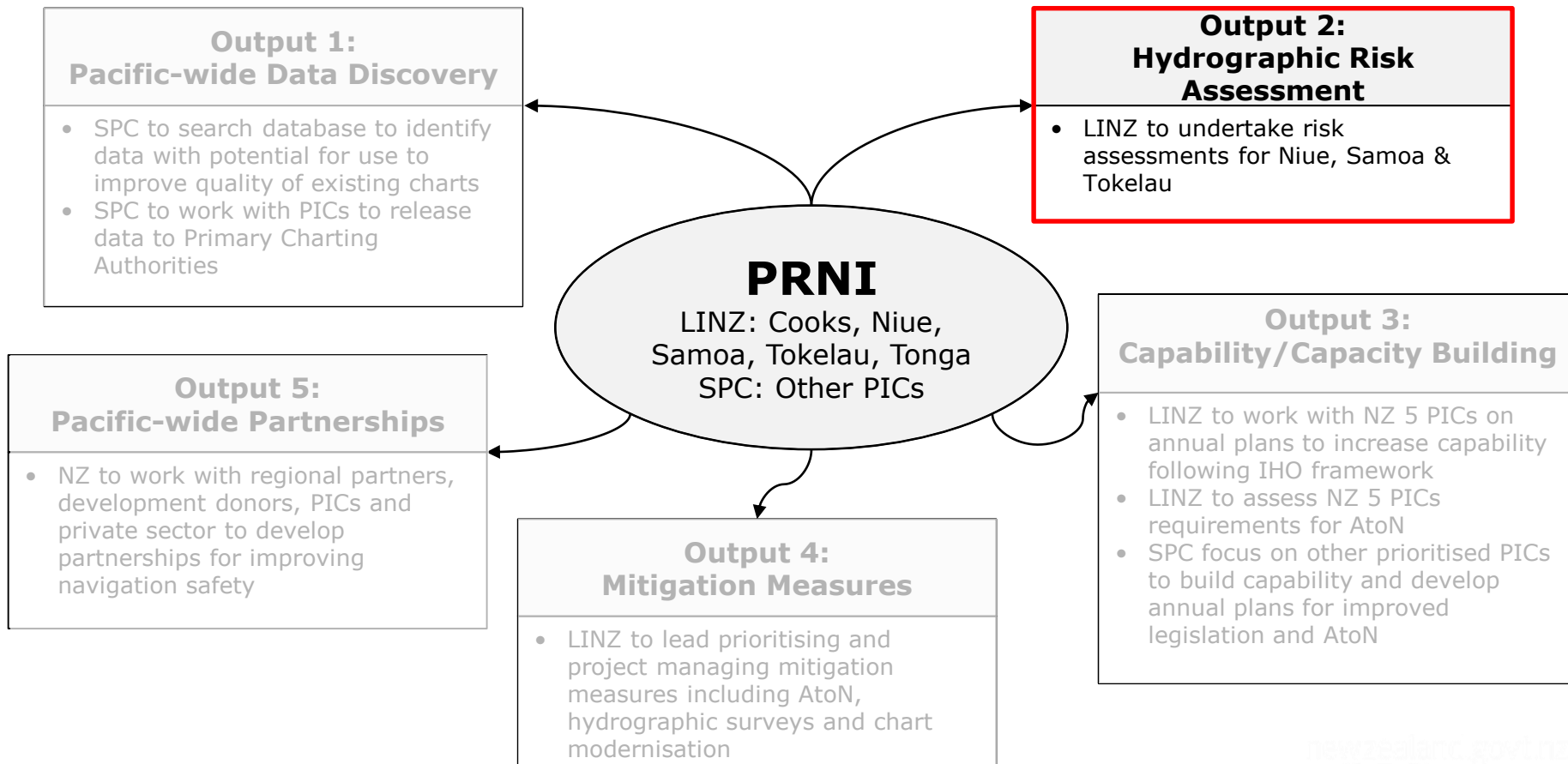
PRNI Activity Outputs

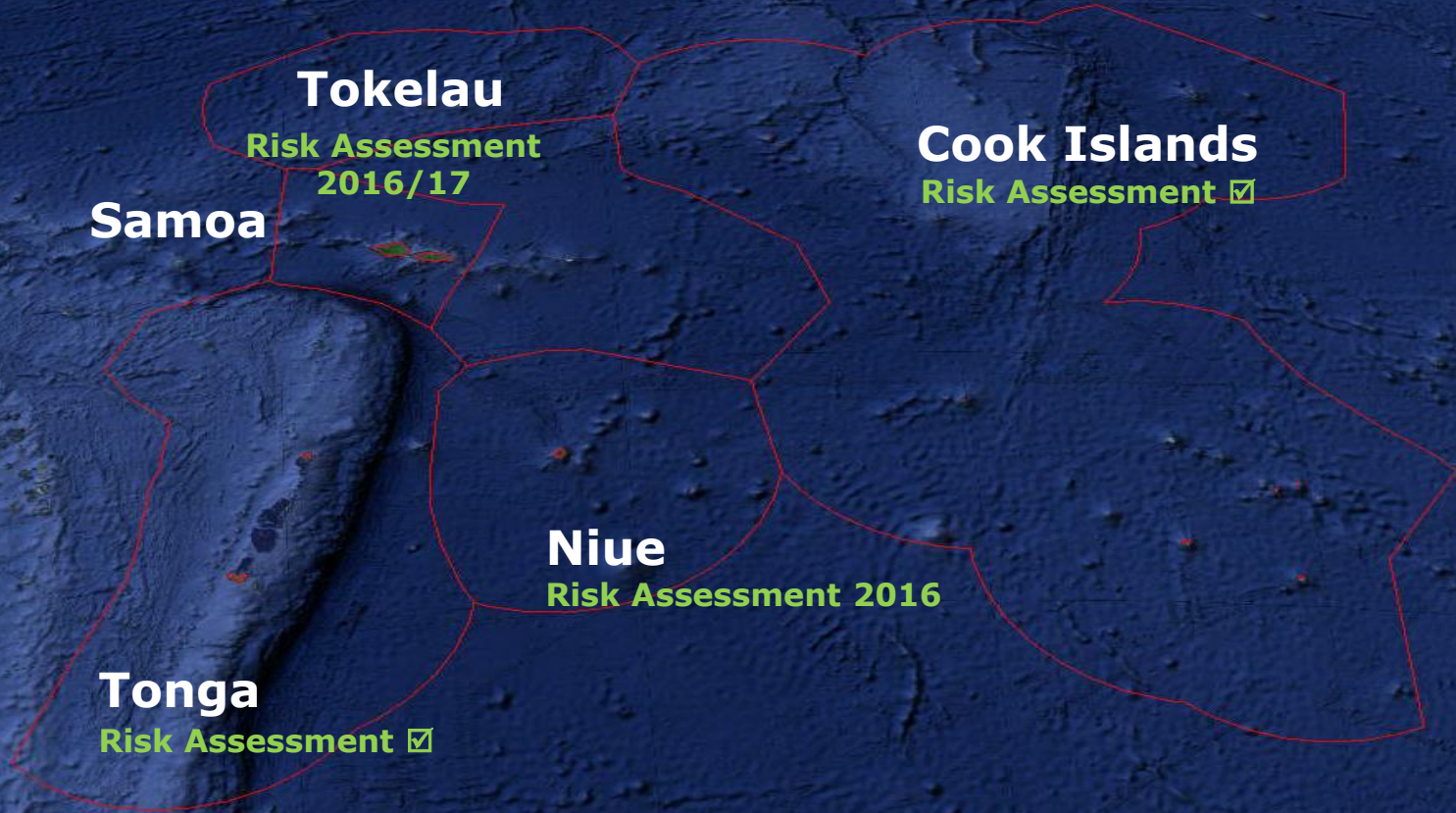


PRNI Activity Outputs



PRNI Activity Outputs





Samoa

**Risk Assessment
2016/17**

Tokelau

Niue

Risk Assessment 2016

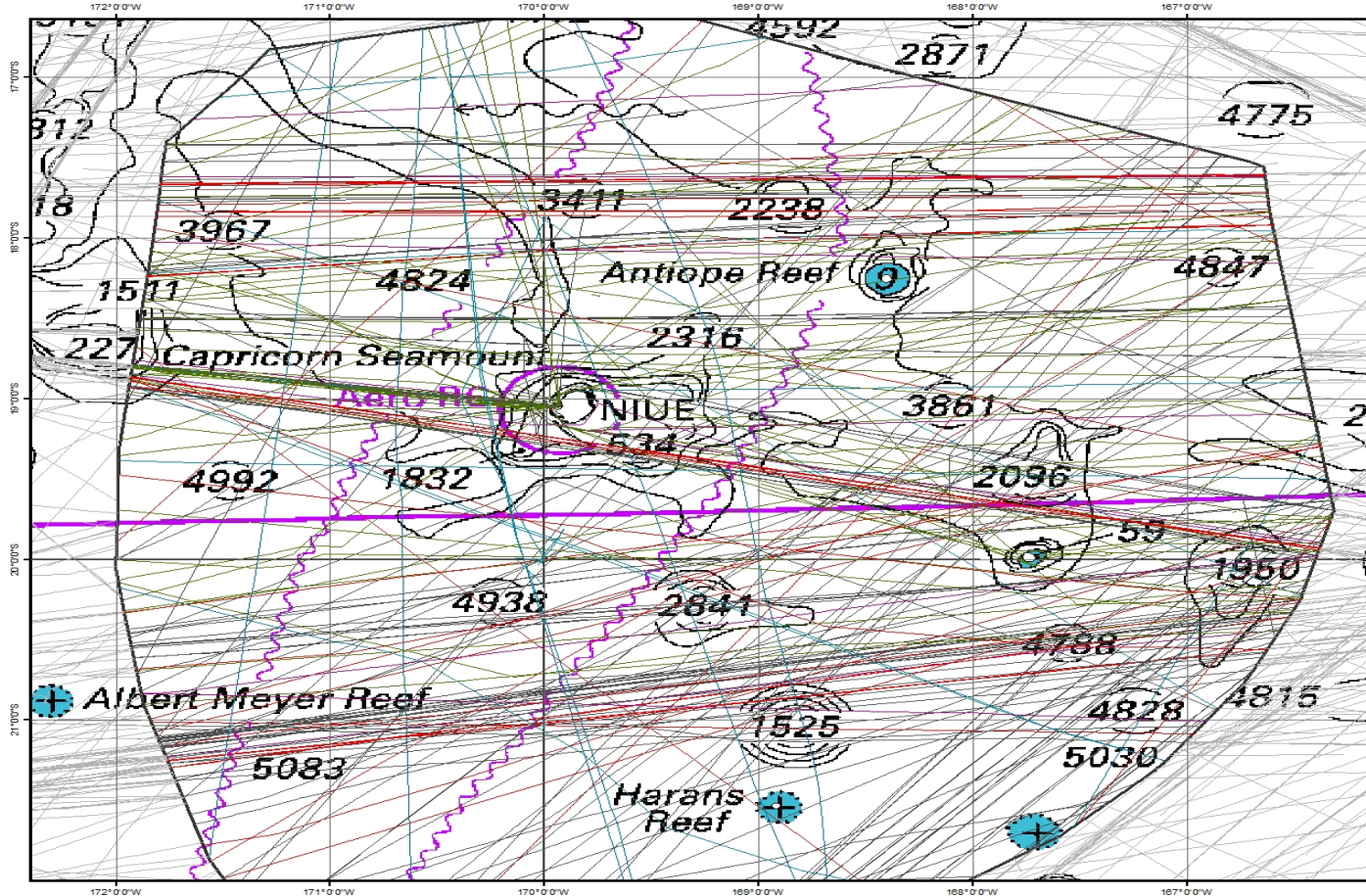
Tonga

Risk Assessment

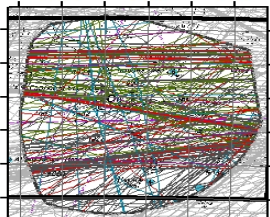
Cook Islands

Risk Assessment

Niue Risk Assessment



All Vessel Tracks by Type



Legend

- Cargo
- Fishing
- Passenger
- Recreational/Superyacht
- Tanker

Scale at A3:
1:2,113,000


0 5 10 20 30 40 50
Nautical Miles

Data Source:
Satellite AIS (S-AIS) vessel track dataset recorded:
January - March 2012
July - October 2013
December 2013 - January 2014
Charts NZ 845 and NZ 14061 supplied by LINZ.
S-AIS supplied by Mariview.


Coordinate System:
WGS 1984 UTM Zone 2S

Produced by:
Land Information New Zealand
Wellington Office, Level 7,
Radio New Zealand House,
155 The Terrace PO Box 5501,
Wellington 6145, New Zealand.
T 0800 665 463 | W www.linz.govt.nz
| E customer.support@linz.govt.nz

**SW Pacific Hydrography
Risk Assessment**



NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Aid Programme



Land Information
New Zealand
Toitū te whenua

Risk model – low traffic areas (SWP)

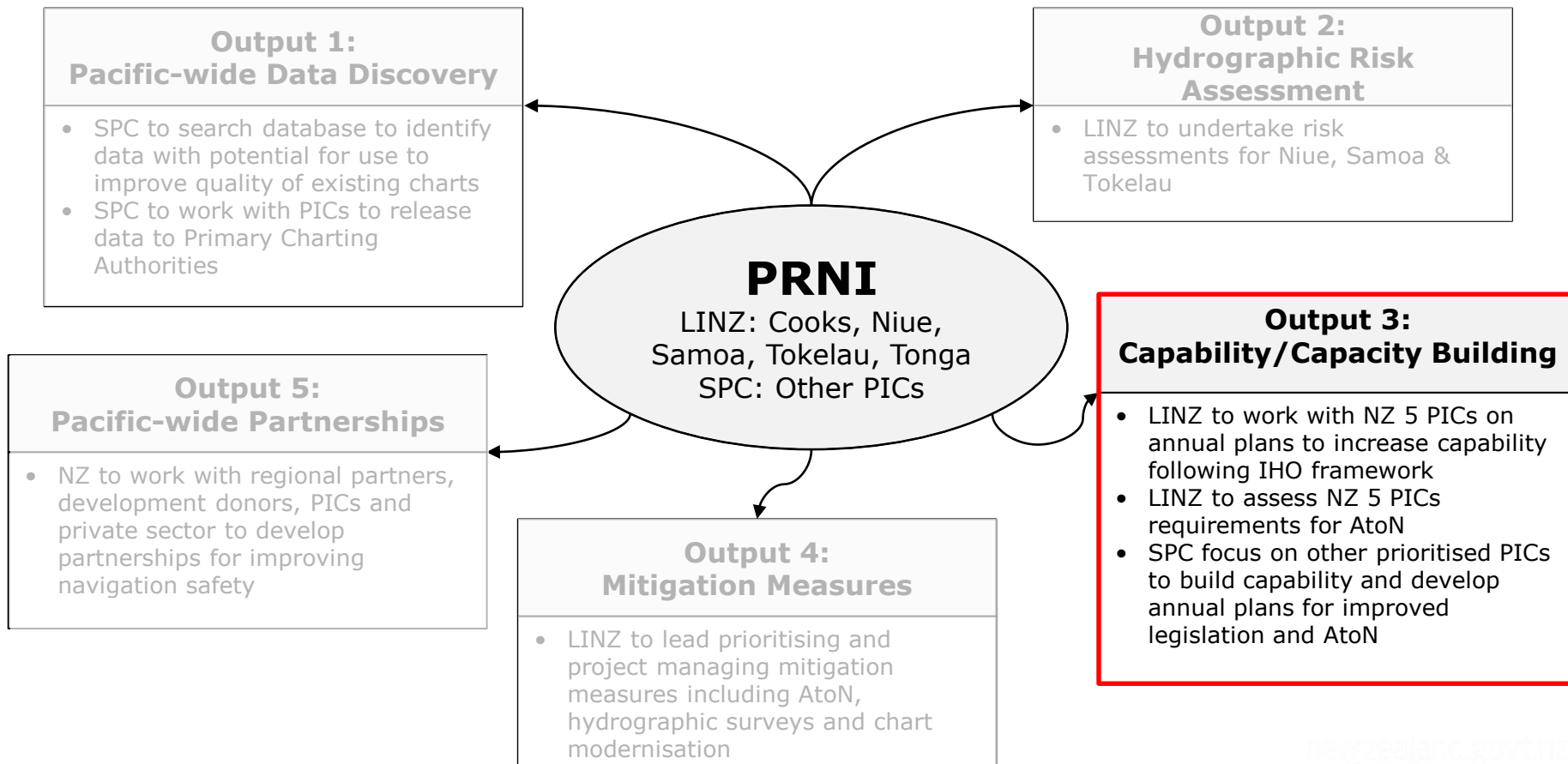
		Risk Scores					Weights		TotalModel		
		0	1	2	3	4	5	Factor		Category	
Traffic	Vessel Traffic										
	Potential Loss of Life		Insignificant	Low	Moderate	High	Catastrophic			0.5000	
	Pollution Potential		Insignificant	Low	Moderate	High	Catastrophic			0.5000	
Likelihood Risk Criteria	Met/Ocean Conditions										
		Prevailing Conditions Exposure		Sheltered at most times	Mainly Sheltered	Moderate Exposure	Mainly Exposed	Exposed on most days	3		0.1500
		Spring Mean Current Speed	Open Sea (insignificant)	1-2 knots	2-3 knots	3-4 knots	>5 knots	>5 knots	2	0.3	0.1000
		Visibility	Unknown	Poor Visibility Very Unlikely	Poor Visibility Unlikely	Occasional Poor Visibility	Often Poor Visibility	Poor Visibility Common	1		0.0500
	Navigational Complexity										
		Type of Navigation Required		Open Sea >10nm	Offshore Navigation (5-10nm)	Coastal Navigation (1-5nm)	Port Approaches	Constrained Navigation (Within 1nm)	3	0.15	0.1500
	Aids to Navigation										
		Chart/Zoc		A	B	C	D	U	3		0.1800
		Proximity to Non Working ATO/Ns	No Lights	100% effective range	80% effective range	70% effective range	60% effective range	Within 50% effective range	2	0.3	0.1200
	Bathymetry										
		Depth of Water 15m Contour Bottom Type	>10nm	5-10nm Soft	2.5-5nm	1.5 to 2.5nm	1 to 1.5nm	Within 1nm Hard/Rocky	3		0.0600
									2	0.1	0.0400
	Navigational Hazards										
		Proximity to Known Reefs	>10nm	5-10nm	2.5-5nm	1.5 to 2.5nm	1 to 1.5nm	Within 1nm	2		0.0333
	Proximity to Volcano	>10nm	5-10nm	2.5-5nm	1.5 to 2.5nm	1 to 1.5nm	Within 1nm	2		0.0333	
	Proximity to Known SeaMounts	>10nm	5-10nm	2.5-5nm	1.5 to 2.5nm	1 to 1.5nm	Within 1nm	1		0.0167	
	Proximity to WW2 Military Sites	>2.5nm	2-2.5nm	1.5-2nm	1-1.5nm	500m-1nm	Within 500m	1	0.15	0.0167	
	Proximity to Charted Tidal Hazard (Overfalls/Race)	>2.5nm	2-2.5nm	1.5-2nm	1-1.5nm	500m-1nm	Within 500m	3		0.0500	
Consequence Risk Criteria	Environmental Impact										
		Proximity to Large Reef (High Quality / or Isolated Shoreline)	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	3		0.0789
		Proximity to Key Offshore Reef	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	2		0.0526
		Proximity to Large Wetlands Resource (Mangroves) (Large Volume or Small Volume)	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	3		0.0789
		Proximity Small Wetlands Resource (Mangroves) (Large Volume or Small Volume)	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	2	0.5	0.0526
		Proximity to Important Breeding Grounds	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	3		0.0789
		Proximity to World Biological Protected Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	3		0.0789
		Proximity to Regional Biological Protected Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	2		0.0526
		Proximity to Local Biological Protected/Important Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	1		0.0263
	Culturally Sensitive Areas										
		Proximity to World Cultural Protected/Important Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	3		0.0750
		Proximity to Regional Cultural Protected/Important Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	2	0.15	0.0500
		Proximity to Local Cultural Protected/Important Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	1		0.0250
	Economically Sensitive Areas										
		Proximity to Sites of High Economic Contribution	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	3		0.1000
		Proximity to Sites of Moderate Economic Contribution	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	1	0.35	0.0333
		Proximity to Key Infrastructure (Ports)	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	3		0.1000
	Proximity to Tourist Diving Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	1.5		0.0500	
	Cruise Ship Stops	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	Within 1nm	2		0.0667	

Risk model – high traffic areas (NZ)



		0	1	2	3	4	5	Rating	Category Weighting	Model Weighting	Overall Weighting	
		CONTINUOUS SCALES										
Traffic	Potential Loss of Life		Insignificant	Low	Moderate	High	Catastrophic		42.0%		25%	
	Survey Age		<5 years	5-10 years	10-20 years	20-30 years	>30 years		38.0%			
	Vessel Damage + Salvage Costs		Insignificant	Low	Moderate	High	Catastrophic		5.0%			
		LIKELIHOOD SCALES										
Causation Risk Criteria	Charting	Chart Quality	A	B	C	D	U	3	30.0%	15.00%	25%	
	Chart Adequacy	Excellent	Good	Moderate	Poor	Unacceptable	1	5.00%				
	Route Characteristics	Navigational Complexity	Open Sea >10nm	Offshore Navigation (5-10nm)	Coastal Navigation (1-5nm)	Port Approaches	Constrained Navigation (<1nm)	3	8.75%			
		Depth of Water 15m Contour	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	2	17.5%	5.83%		
	MetOcean	Traffic Density	Insignificant	Low	Moderate	High	Catastrophic	1	2.92%			
		Prevailing Wave/Wind	Sheltered at Most Times	Mainly Sheltered	Moderate Exposure	Mainly Exposed	Exposed on Most Days	3	5.83%			
		Longwave/Surge	Very Unlikely	Unlikely	Occasional	Often Poor	Frequent	3	17.5%	5.83%		
	Navigational Hazards	Poor Visibility	Very Unlikely	Unlikely	Occasional	Often Poor	Frequent	2	3.89%			
		Sea Mounts	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	1	1.94%	2.19%		
		Isolated Dangers - Rocks/Wrecks/etc.	>5nm	2.5-2nm	1.5-2	1-1.5nm	500m-1nm	2	17.5%	4.38%		
Mitigation	Charted Tidal Hazards	>2nm	2.5-2nm	1.5-2	1-1.5nm	500m-1nm	2	4.38%				
	Breaking Reefs	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	3	6.56%				
Bathymetry	Harbour Risk Mitigation Resources	Available	Pilotage	Low	Moderate	High	No Pilotage	2	10.0%	4.00%		
	Dynamic Seabed - Estuarial Seismic/Volcanic Factors	>10nm	Insignificant	Low	Moderate	High	Significant Within 1nm	3	7.5%	4.50%		
		CONSEQUENCE SCALES										
Consequence Risk Criteria	Loss of Life	Response Complexity	100.0%	102.5%	105.0%	107.5%	110%	N/A	N/A			
	Property	Salvage Complexity	100.0%	102.5%	105.0%	107.5%	110%	N/A	N/A			
		Formal Reserves - World Heritage	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	3	17.65%		
	Environmental Impact	Marine Reserves	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2.5	14.71%		
		Coastal Reserves	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2	11.76%		
		Wetland Resources	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	1.5	8.82%		
		Aquaculture/Fishing Grounds/Shellfish Harvest Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2	N/A	11.76%	
		Tourism	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2	11.76%		
		Cultural (Iwi)/Treaty History Sites	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2	11.76%		
	Economic Impact	Recreational/Social Amenity	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2	11.76%		
		Port Access Channels	>2.5nm	2.5-2nm	1.5-2nm	1 to 1.5nm	500m to 1nm	<500m	3	25.00%		
		Critical Infrastructure (Berths) - Economic Contribution	Absent	Very Low	Low	Moderate	High	Critical	1	8.33%		
Proximity to Sites of High Economic Contribution		>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	2	N/A	16.67%		
Economic Impact	Proximity to Sites of Moderate Economic Contribution	>20nm	10-20nm	5-10nm	2.5-5nm	1-2.5nm	<1nm	1	8.33%			
	Cruise Ship Stops	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	<1nm	2	16.67%			
	Pipelines/Cables	>10nm	5-10nm	2.5-5nm	1.5-2.5nm	1-1.5nm	Within 1nm	3	25.00%			

PRNI Activity Outputs



PHASES OF DEVELOPMENT OF HYDROGRAPHIC SURVEYING AND NAUTICAL CHARTING CAPABILITY

Phases of Development

National Activity

PHASE 1

Collection and circulation of nautical information, necessary to maintain existing charts and publications

- Form National Authority (NA) and/or National Hydrographic Coordinating Committee (NHCC).
- Create/improve current infrastructure to collect and circulate information.
- Strengthen links with charting authority to enable updating of charts and publications.
- Minimal training needed.
- Strengthen links with NAVAREA Coordinator to enable the promulgation of safety information

PHASE 2

Creation of a surveying capability to conduct:
Coastal projects
Offshore projects

- Establish capacity to enable surveys of ports and their approaches.
- Maintain adequate aids to navigation.
- Build capacity to enable surveys in support of coastal and offshore areas.
- Build capacity to set up hydrographic databases to support NA/NHCC.
- Provide basic geospatial data via MSDI.
- Requires funding for training, advising and equipment or contract survey.

PHASE 3

Produce paper charts, ENC and publications independently.

- The need shall be thoroughly assessed. Requires investment for production, distribution and updating
- Alternatively, bi-lateral agreements for charting can provide easier solutions in production and distribution (of ENC through RENCs) and rewards.
- Further development of MSDI.

Hydrography Governance

Assist PICs to deliver on SOLAS V/9 international treaty obligations for hydrographic services (governance, policy, resources, oversight)

IHO CB Phase 1

- Establish National Hydrographic Authority
- Establish National Hydrographic Coordinating Committee
- Establish National MSI Coordinator position

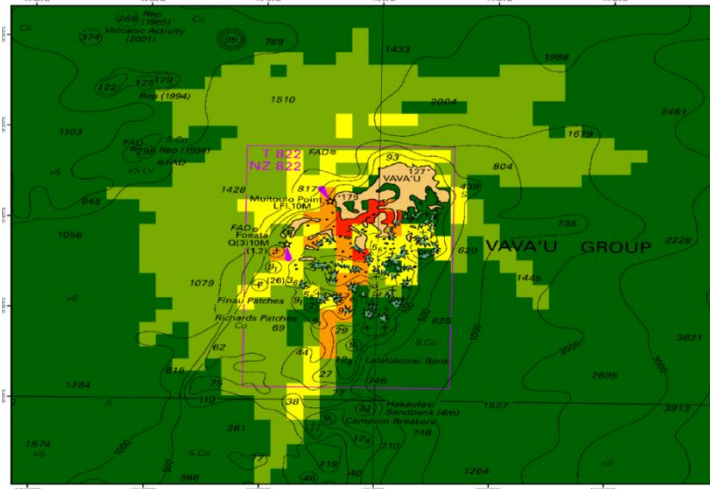
Capability building & training

- Formal training
 - Cat A/B Hydrographic Surveyor
 - Cat B Nautical Cartographer
 - MSI Coordinator
 - AtoN
- Work placements
 - Cartography
 - Surveying
 - MSI/NtM
- Available through
 - PRNI
 - SWPHC
 - IHO/IMO/IALA
 - Donor programmes

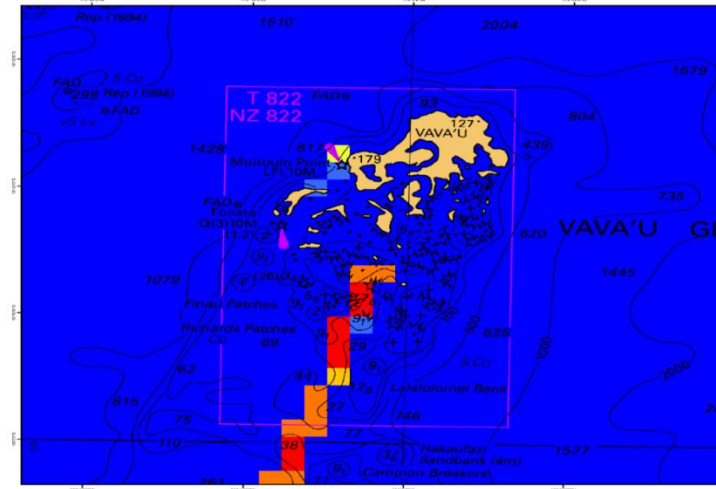
IHO Capacity Building Strategy

5.3.3 Risk Assessment

A risk assessment provides a robust basis for prioritising a national/regional charting programme. The risk analysis methodology is evidence-based and objective against set criteria. It includes AIS traffic analysis and an economic assessment. The main output is a risk heat map which allows governments, charting authorities and other interested parties to come to a conclusion about the nature and scope of charting improvements and related maritime safety initiatives. A GIS is used for the analysis and to display the results. This allows complex data to be easily accessed and understood by key stakeholders to aid decision making and presents a compelling case for action.



Risk result



Cost Benefit Analysis

Open source risk assessment

- how the concept of an evidence led hydrography risk assessment has been adopted as part of the International Hydrographic Organization Capacity Building Strategy and embraced by the international maritime community



The screenshot shows the International Hydrographic Organization (IHO) website. The header features the IHO logo and name in English and French. A navigation bar includes links for Home, Letters & Documents, Standards & Publications, Committees & WG, Capacity Building, ENCs, ECDIS & S-100, Meetings, External Liaisons, IHO Membership, and World Bathymetry. The main content area is titled "Risk Assessment" and is split into two columns: English and Français. The English column lists a "South West Pacific Regional Hydrography Programme - Methodology and Risk Assessment Results" with a numbered list of seven items. The Français column provides a French translation of the same content. A search bar is located on the right side of the page. The footer indicates the page was last updated on 12 April 2016.

International Hydrographic Organization
Organisation Hydrographique Internationale

ENGLISH / FRANÇAIS

Home Letters & Documents Standards & Publications Committees & WG Capacity Building ENCs, ECDIS & S-100 Meetings External Liaisons IHO Membership World Bathymetry

Website Content Alert Service
» Website Content Alert Service

Capacity Building
» Capacity Building Management
» Capacity Building Assessment
» Capacity Building Training

Upcoming Public Events/Événements publics à venir
» Upcoming Events/Événements à venir

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You are here: Home >Capacity Building >CB & Formation >CB & Formation >Risk Assessment

English
Risk assessment, methodology and tools

South West Pacific Regional Hydrography Programme - Methodology and Risk Assessment Results (available for download in English only):

1. Risk Assessment Methodology
2. Executive Summary for Vanuatu
3. Final report for Vanuatu and the Annexes
4. Report Synopsis for Tonga
5. Final report for Tonga
6. Report Synopsis for Cook Islands
7. Final report for Cook Islands

Français
Méthodes et outils d'évaluation des risques

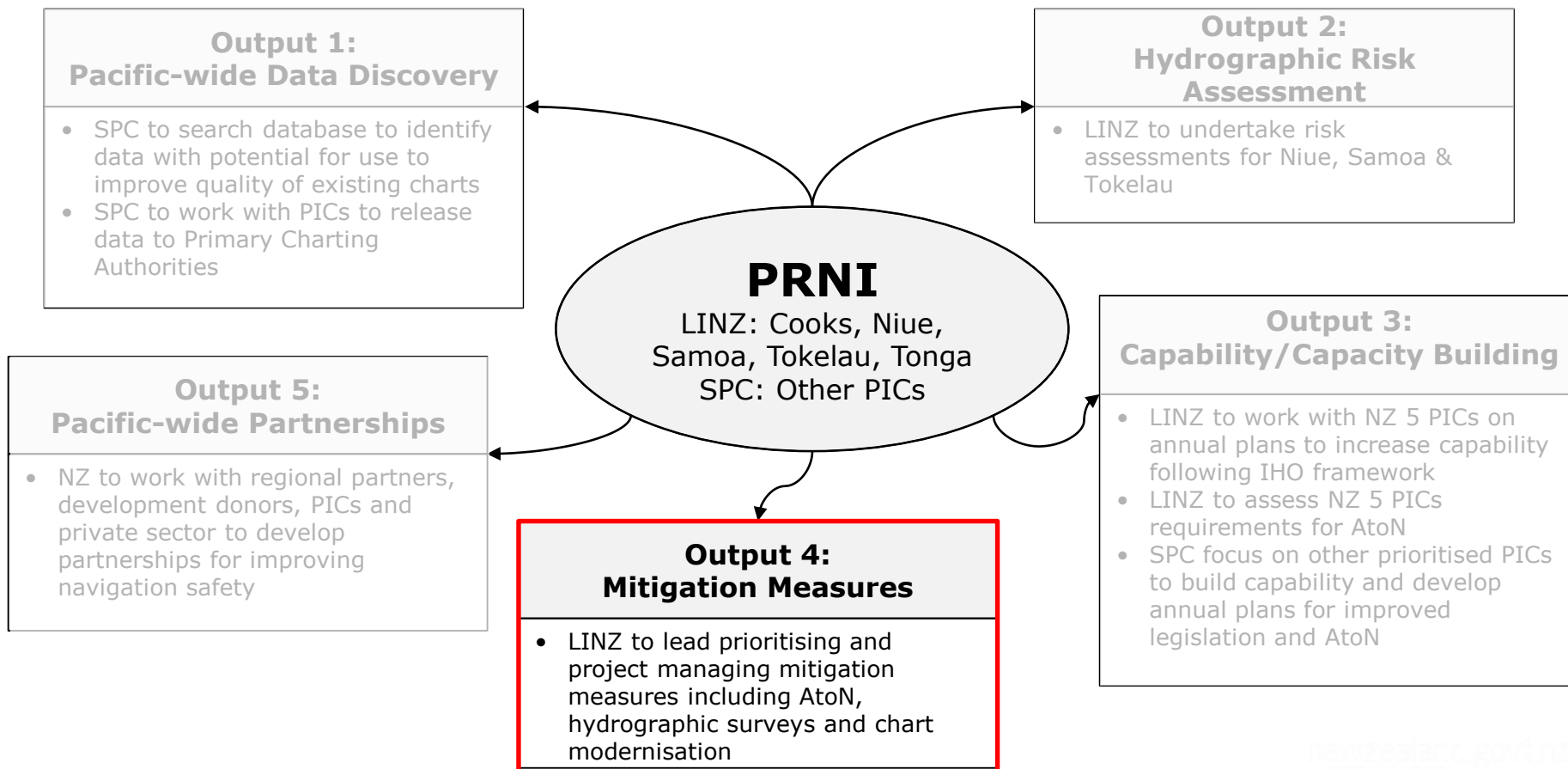
Programme régional d'hydrographie pour le Pacifique sud-ouest – Méthodologie et résultats de l'évaluation des risques (peuvent être téléchargés en anglais seulement):

1. Méthodologie de l'évaluation des risques
2. Résumé analytique au Vanuatu
3. Rapport final au Vanuatu et les Annexes
4. Sommaire du rapport au Tonga
5. Rapport final au Tonga
6. Sommaire du rapport aux Iles Cook
7. Rapport final aux Iles Cook

Search
Search ... Go

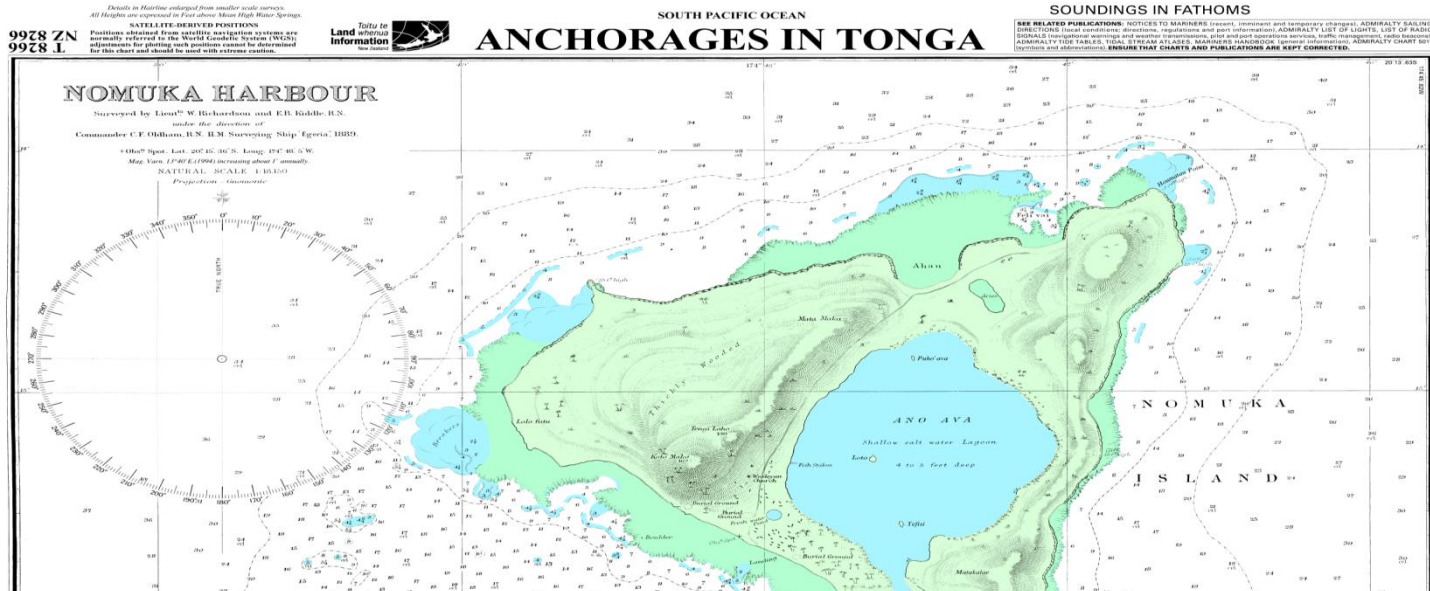
Last Updated: 12 April 2016

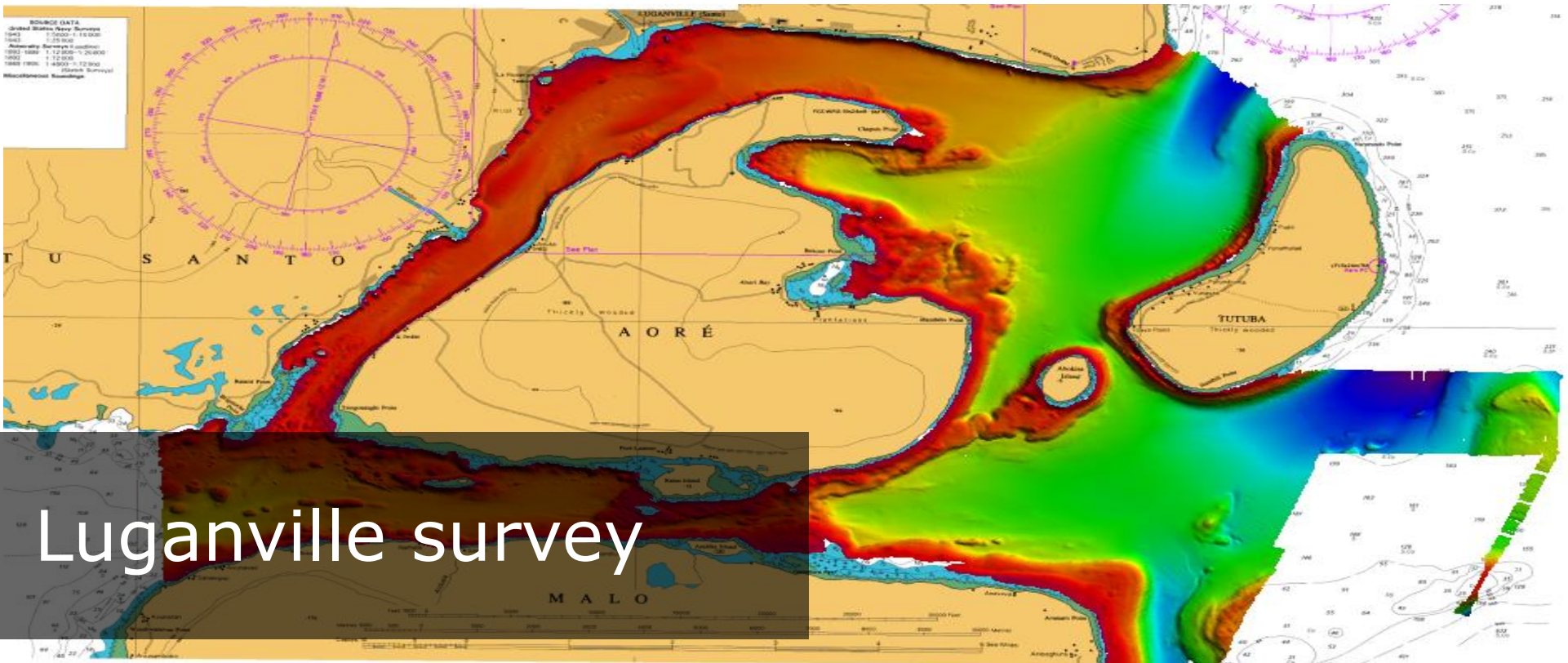
PRNI Activity Outputs



Mitigation measures

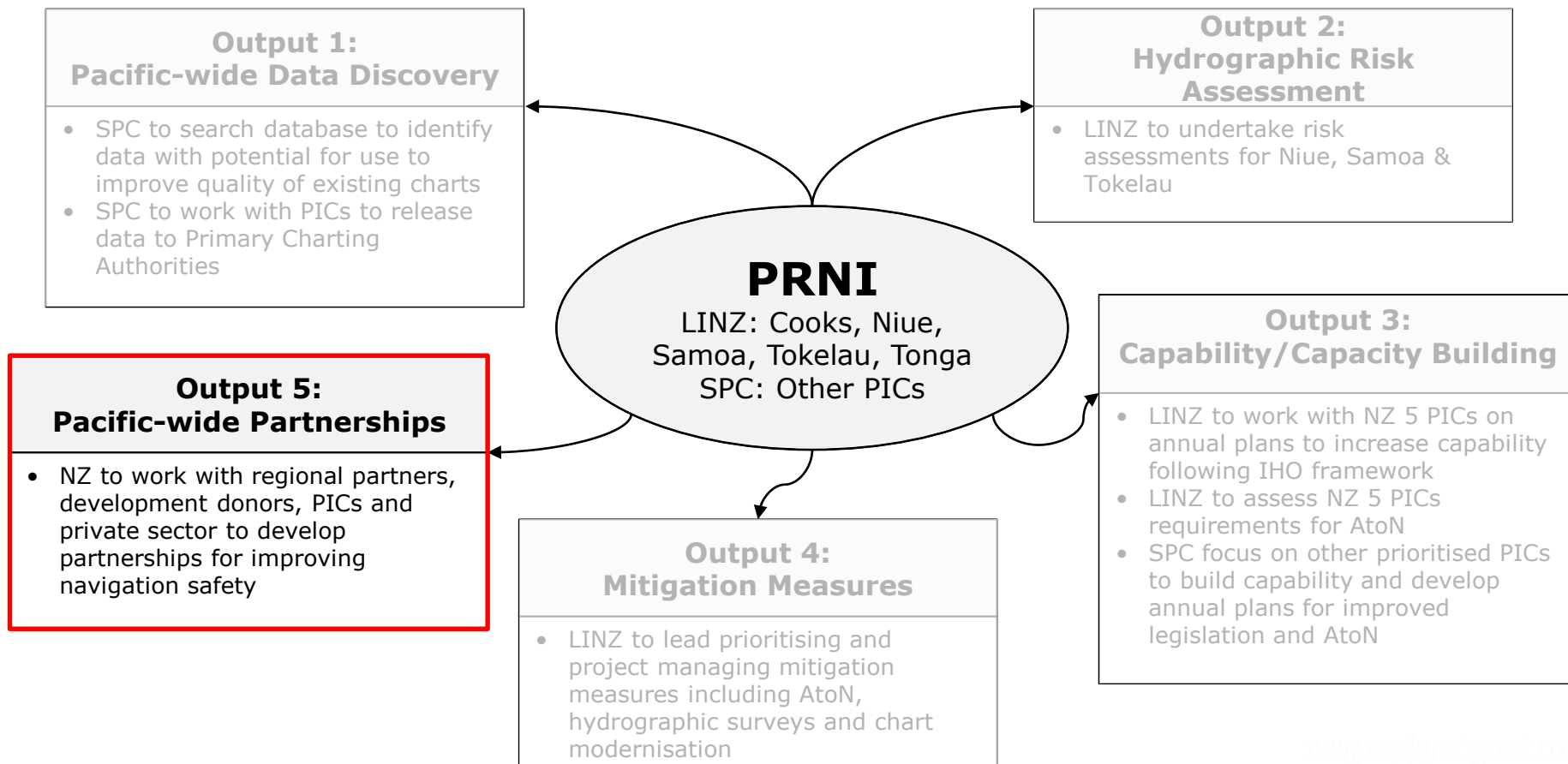
- Hydrographic surveys
- Chart modernisation programme
- Aids to Navigation (AtoN) assessment





Luganville survey

PRNI Activity Outputs





Thank you &
any questions?

