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Climate Change Risk Assessment for Nauru

Technical Report

June 2025

Inherent Limitations

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Because of the inherent limitations of any internal control structure, it is possible that errors or irregularities may occur and not be detected. The matters raised in this report are only those which came to our attention during the course of performing our procedures and are not necessarily a comprehensive statement of all the weaknesses that exist or improvements that might be made.

Our work is performed on a sample basis; we cannot, in practice, examine every activity and procedure, nor can we be a substitute for management's responsibility to maintain adequate controls over all levels of operations and their responsibility to prevent and detect irregularities, including fraud.

Any projection of the evaluation of the control procedures to future periods is subject to the risk that the systems may become inadequate because of changes in conditions, or that the degree of compliance with them may deteriorate.

Recommendations and suggestions for improvement should be assessed by management for their full commercial impact before they are implemented.

We believe that the statements made in this report are accurate, but no warranty of completeness, accuracy, or reliability is given in relation to the statements and representations made by, and the information and documentation provided CSIRO and SPREP personnel. We have not attempted to verify these sources independently unless otherwise noted within the report.

Limitation of Use

This report is intended solely for the information and internal use for CSIRO and SPREP in accordance with our subcontract to provide service to CSIRO dated 27 February 2024, and is not intended to be and should not be used by any other person or entity. No other person or entity is entitled to rely, in any manner, or for any purpose, on this report. We do not accept or assume responsibility to anyone other than CSIRO and SPREP for our work, for this report, or for any reliance which may be placed on this report by any party other than CSIRO and SPREP.

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1 Introduction

1.1 Background

The Secretariat of the Pacific Regional Environment Programme (**SPREP**) is an inter-governmental organisation charged with promoting cooperation among Pacific Island countries and territories to protect and improve their environment and ensure sustainable development. SPREP comprises 21 members and includes metropolitan members: Australia, New Zealand, France, the United Kingdom, and the United States of America.

SPREP is currently supporting Nauru to undergo a national adaptation planning process and the development of a National Adaptation Plan under the Green Climate fund (**GCF**), that will form a sustainable platform for future adaptation investments.

The adaptation planning process consists of:

- Capacity and institutional strengthening
- Adaptation planning governance and institutional conditions
- Evidence-based adaptation solutions for maximum impact
- Adaptation Framework, and
- Concept notes to advance the implementation of the National Adaptation Plan (**NAP**).

To support evidence-based adaptation solutions for maximum impact, SPREP has requested Climate Impact Vulnerability Risk Assessments (**CIVRA**) for the four participating countries to inform the prioritisation of climate action and investment in adaptation. SPREP have engaged the Commonwealth Scientific and Industrial Research Organisation (**CSIRO**) to conduct CIVRAs for Nauru.

1.2 Purpose of this Report

Deloitte supported the CSIRO team to conduct a national scale climate change risk assessment for Nauru. The risk assessment has integrated climate hazards, its associated impacts on key sectors/domains of Nauru and inherent exposure and vulnerability of these systems following a risk-based approach, consistent with international best practice approaches.

This Report, the *Risk Assessment Technical Report,* is informed by, and aligned to, the findings presented in the following two accompanying reports:

- The *Assessment of Climate Hazards and Associated Sectoral Impacts for Nauru Under Current and Future Conditions* Report, conducted by CSIRO (hereafter referred to as the 'Hazard Report'), and
- The first draft of the *Nauru Climate Vulnerability Assessment*, conducted by the University of Melbourne (hereafter referred to as the 'Climate Vulnerability Report').

This Report presents an overview of the approach that was followed throughout the risk assessment process, lists key climate change projections for Nauru that were considered in the risk assessment process, and then presents detailed risk profiles for key priority sectors/domains of Nauru. By delving further into the present-day and future hazards, exposure, vulnerability, and impact variations, as well as the emissions variation, the detailed climate risk profiles in this Report facilitate the identification of dominant hazards for each sub-sector/domain and inform the consequence scoring process. For further detailed information on hazard, impacts, exposure, and vulnerability, refer to the aforementioned reports.

1.3 Structure of this Report

This Risk Assessment Technical Report is structured as follows:

Table 1: Structure of this Report

Chapter	Content description
Chapter 1: Introduction	This chapter presents the overview of the background and objectives of the Nauru Climate Change Risk Assessment, and how the report is structured.
Chapter 2: The Risk Assessment Process	This chapter presents the summary of the risk assessment approach.
Chapter 3: Climate Change in Nauru	This chapter presents a summary of the climate change projections and vulnerability assessments for Nauru that informed the risk assessment.
Chapter 4: Summary of the Results	This chapter will present the summary of the final results of the risk assessment.
Chapter 5: Risk Statements and Profiles	This chapter presents detailed risk profiles and associated scores for the key sectors/domains of Nauru.
Appendices	Supplementary information.
References	Citations used throughout this Report.

2 Approach

2.1 Context

This chapter presents a high-level overview of the climate change risk assessment approach that was adopted for Nauru. The completion of the risk assessment required a combination of research methods, including literature review, climate change data analysis and some stakeholder engagement. The outcomes of this process have been used to inform the analysis and results of the risk assessment.

The below sections present the key components of the risk framework used throughout this process.

2.2 Guiding principles

To develop a risk assessment that is fit-for purpose in the context of climate risk management and decision-making in Nauru, eight guiding principles have been adopted (Figure 1). These principles assisted in developing a comprehensive risk assessment with Nauru at the centre, focusing on collaboration with key stakeholders, alignment with existing climate risk bodies of work and use the evidence-based data and best practice approaches.

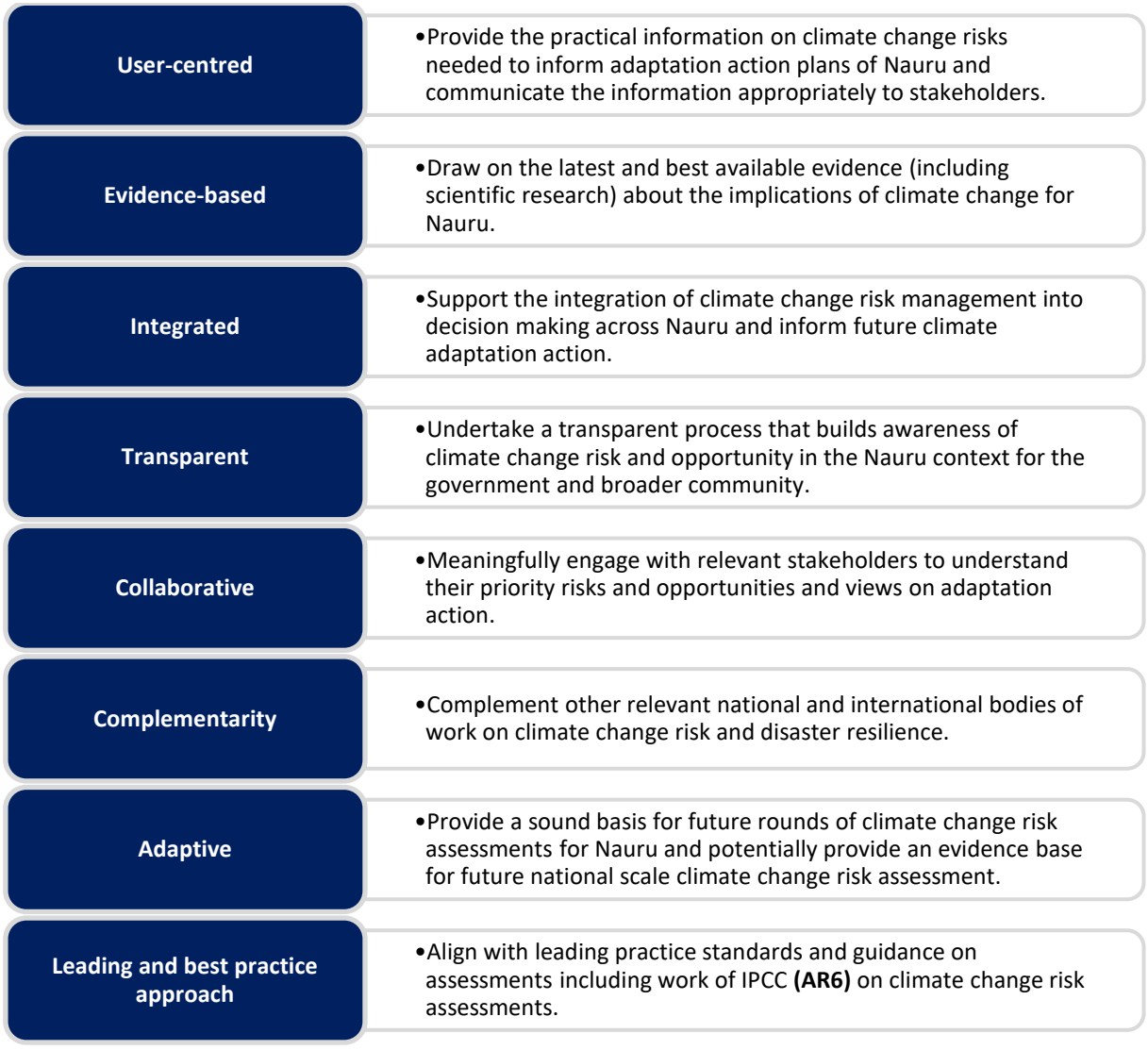


Figure 1: Guiding principles

2.3 Risk framework overview

The climate change risk framework used for this project incorporates guidance from the Intergovernmental Panel on Climate Change (**IPCC, AR6**), the National Climate Change Risk Assessment of Australia (**NCRA**), the UK Climate Change Risk Assessment, and the New Zealand Climate Change Risk Assessment. The framework defines risk as a function of a climate 'hazard', 'exposure' of a system to that hazard, and any underlying 'vulnerabilities' of the system (Figure 2).

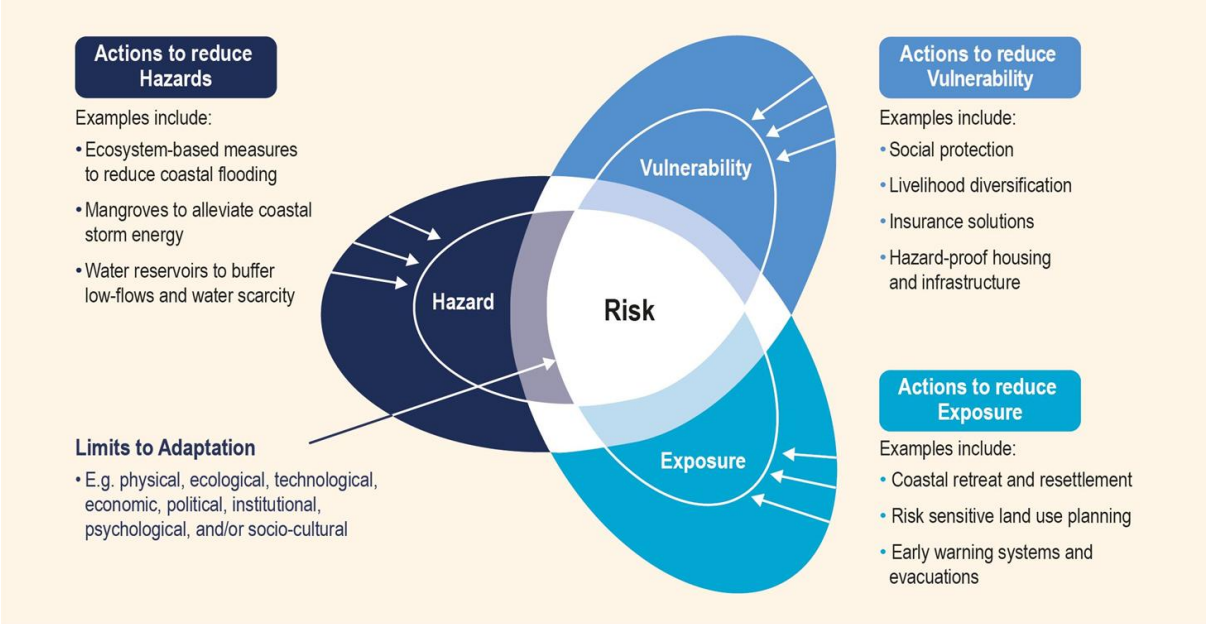


Figure 2: Risk framework presented in IPCC AR6 along with actions to reduce the hazards, vulnerability, and exposure. Three propellers show three key components of risk (for example, hazard, exposure, and vulnerability) and arrows show response across each component. (Source: Adapted from IPCC AR6)

2.4 Key parameters for the risk assessment

The risk assessment process was based on a series of parameters and climate change scenarios. The below table presents the summary of the key parameters for the assessment. Further detailed discussion on climate change projections is available in CSIRO hazard assessment report.

Table 2: Summary of key parameters for the Nauru Risk Assessment

Risk assessment parameters	Adopted features	
Climate risk framework	• IPCC AR6/AR5 • ISO31000 • ISO14091	• NCRA • NZCCRA • UKCCRA
Time horizons	• Present-day • 2030, and • 2050	
Greenhouse gas emissions scenarios	CMIP6 global climate models (GCMs) for: • Low emissions scenario: SSP1-2.6 • High emissions scenario: SSP5-8.5	

Acute and Chronic climate hazards	**Acute hazards** • Extreme heat • Drought • Extreme rainfall • Marine heatwaves • Extreme sea level events, and • Remote cyclone generated activity (extreme wind, waves, surges, swells)	**Chronic hazards** • Sea level rise • Increase in annual-average air/ocean temperature, • Ocean acidification • Increase in annual-average rainfall, and • Intensification of the easterly trade winds and Southern Ocean storm belt
Sectors/ domains	The Nauru CIVRA has prioritised nine sectors/domains which have been used to frame this risk assessment, as illustrated below in Figure 3. In order to ensure the risk assessment for Nauru takes into consideration the unique perspectives and experiences of Nauru, the sectors/domains used by this risk assessment were informed by, and aligned to, the Republic of Nauru Framework for Climate Change Adaptation and Disaster Risk Reduction (**RoNAdapt**). This was to ensure consistency with the existing framework used in Nauru to prioritise adaptation decisions.	
Exposure	A comprehensive hazard and impact report for Nauru conducted by CSIRO, and vulnerability assessment conducted by the University of Melbourne, identified exposed systems of Nauru for different climate change hazards and used as an input to the risk assessment.	
Vulnerability	The following two documents used as an input to the risk assessment: • The RoNAdapt, and • The Nauru Climate Vulnerability Assessment (First Draft), University of Melbourne 2024.	
Scale	National scale for Nauru.	

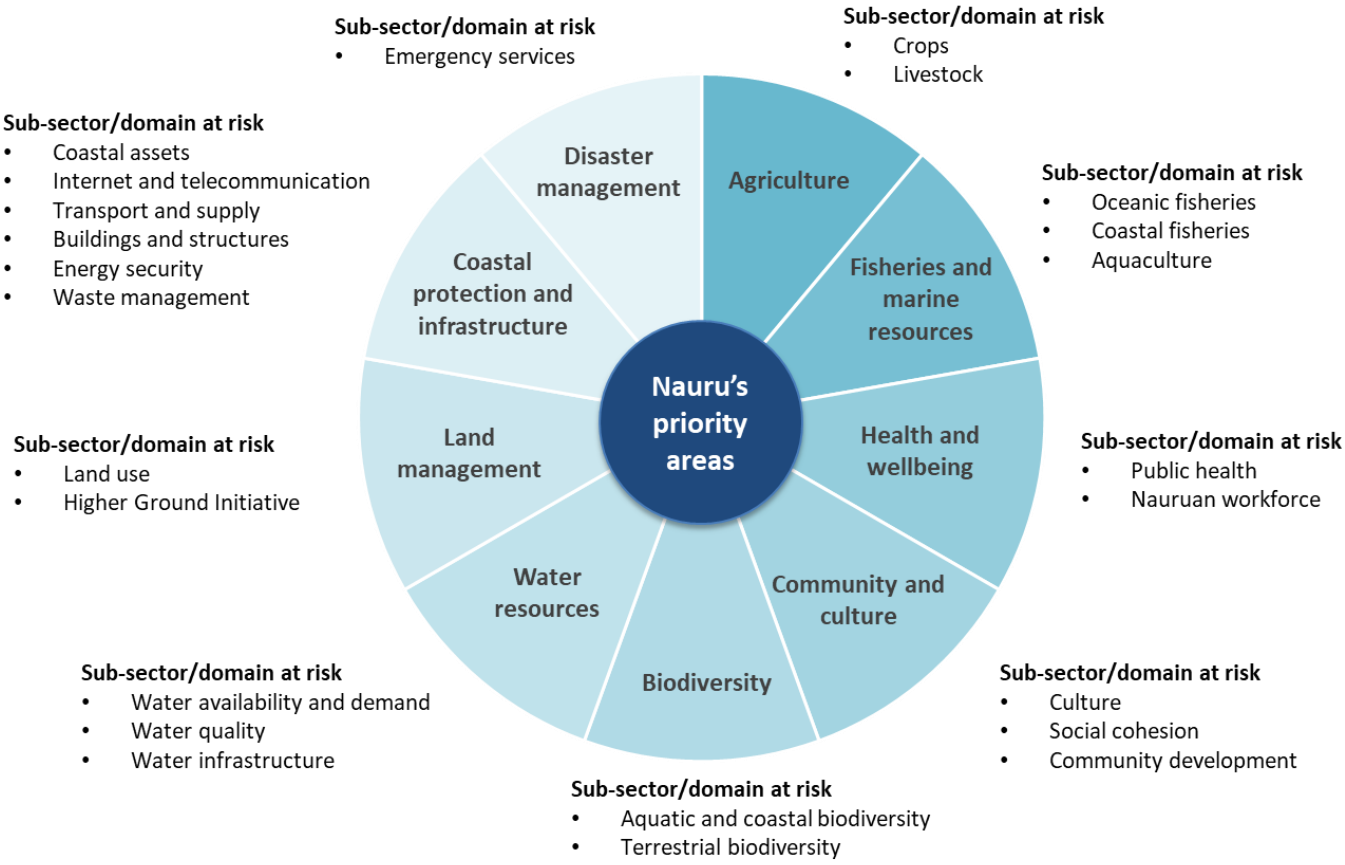


Figure 3: Sectors/domains and sub-sectors/sub-domains that were covered in the risk assessment.

2.5 Methodology overview and process

Methodology

The integrated climate risk assessment covered in this report is the first step in the Nauru National Adaptation Plan (**NAP**) which is being developed separately with input from the findings of this assessment. A high-level overview of the risk assessment approach is presented on the following page at

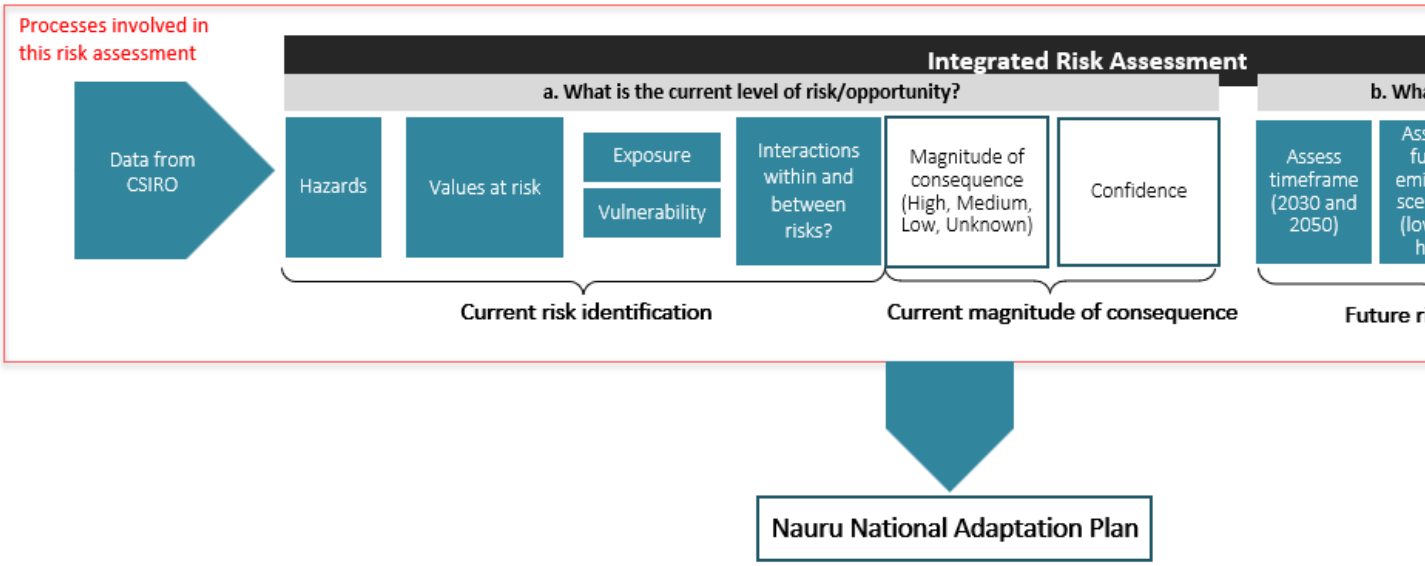


Figure 5: Overview of the risk assessment process

. This process follows leading practice in multi-sectoral/domain risk assessments at the state and national scale with key aspects tailored to Nauru. Described below, at a high-level, is the risk assessment process aligned to the methodology.

Overview of the risk assessment process

The risk assessment process for Nauru followed the aforementioned methodology, and its high-level overview is depicted in Figure 4 below. It is noted that the information which this Report relied upon to inform the risk assessment was obtained from the accompanying Hazard Report and Climate Vulnerability Report.

First, risk statements were formulated for each prioritised sector/domain. These risk statements provided information on how climate hazards, exposure, and vulnerability could affect the sector/domain, along with the likely consequences and impacts for Nauru.

Next, detailed risk profiles were created for each risk statement to capture the potential effects of different climate hazards, exposure, and vulnerability on the sector/domain, both at present and in the future. To facilitate comparison, the risk profiles are used to determine and assess the most dominant climate pressure for the sub-sector/domain based on how the hazard, exposure and vulnerability contribute to observed impacts and future risks. A magnitude of consequence rating is then assigned to the dominant climate pressure for each sub-sector/domain based on criteria adapted from international climate change risk assessments and further customised for Nauru. These ratings are included in the individual risk profiles and serve as important inputs for the NAP. Refer to Appendix 1 for the consequence criteria. Different sectors have different levels of sensitivity and vulnerability for a given hazard, as a result different sectors may have different consequence ratings for the same dominant hazard. For example, the water resources sector is currently more sensitive to drought than terrestrial biodiversity, resulting in a higher current-day consequence rating.

Note that consequences are different to impacts. Consequences consider how the impacts of climate hazards will affect the sector/sub-sector. For example, an impact of marine heatwaves is damage to critical marine habitat, with the consequence of reduced fisheries revenue for Nauru.

Additionally, a confidence score was assigned to each risk statement, considering the strength of the supporting evidence that is currently available for the risks assessed. The criteria used for developing these scores can be found in Appendix 1.

Finally, this Risk Assessment considers complex risks by assessing the connections between domains and risks at a high level. Within each risk profile in this report, there is individual and nuanced discussion regarding the most relevant complex risks. Complex risk results from multiple climate hazards occurring concurrently, and from multiple risks interacting, compounding the overall risk and resulting in risks transmitting through interconnected systems and across regions. Understanding these risks is crucial for effective climate adaptation and resilience planning.

There are three categories of complex risks:
Aggregating risk: Aggregation occurs when risks with unrelated causes – including those not directly related to the climate – occur simultaneously.
Compounding risk: Risks that arise from the unilateral and/or bilateral interaction of hazards, which can be characterised by single extreme event or multiple coincident or sequential events that interact with exposed systems or sectors.
Cascading risk: One event or trend triggering others; interactions can be one way (e.g., domino or contagion effects) but can also have feedbacks. Cascading risk is often associated with the vulnerability component of risk, such as critical infrastructure.

During the second in-country mission in Nauru, key stakeholders were presented with the preliminary results of the risk assessment and given the opportunity to provide their input on the draft risk scores. The feedback received from stakeholders was collected and incorporated into the final results presented in this Report, as well as the Summary Report.

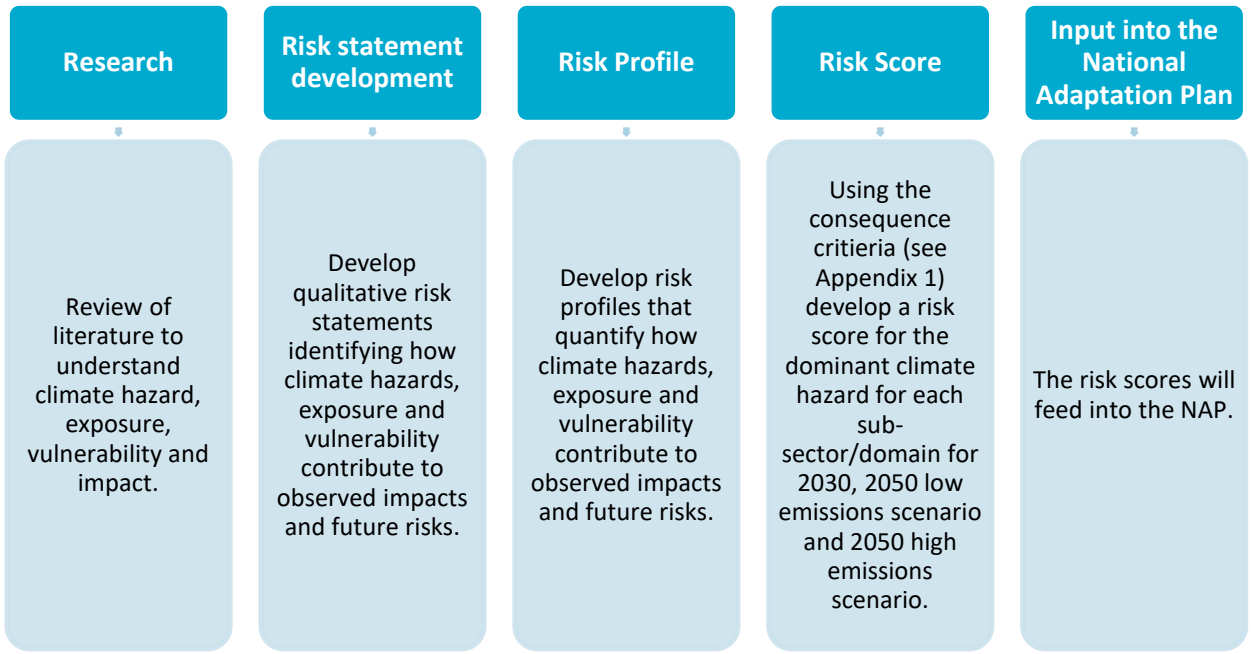


Figure 4: High-level overview of the information flow from risk assessment stage to NAP

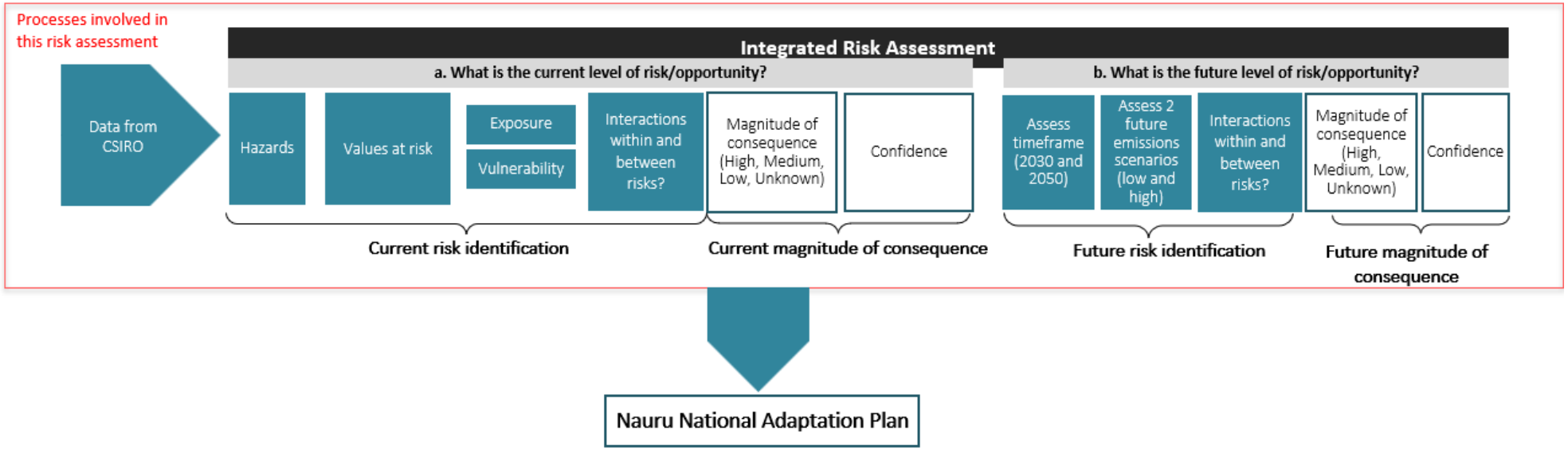


Figure 5: Overview of the risk assessment process

3 Climate change in Nauru

3.1 Background

As previously discussed, this Integrated Risk Assessment draws from two crucial pieces of work detailing the climate hazards, impacts and vulnerabilities Nauru is exposed to:

- The Climate Hazard Assessment, and
- The Vulnerability Assessment.

These two reports provide necessary climate context and vulnerability of different sectors within Nauru and informed this risk assessment. The Hazard Report specifically has identified how different climate variables can impact Nauru sectors/domains. A summary of that assessment is provided in Appendix 2.

A succinct summary of climate change projections is presented in this Report. Refer to the Hazard Report for more detailed information.

3.2 Future climate change projections for Nauru

Climate change in Nauru is characterised by the projected increase in intensity and frequency of numerous climate hazards as global temperatures continue to rise. Climate change in Nauru has significant implications as the intensity and frequency of numerous climate hazards are projected to increase with rising global temperatures. The island nation is particularly vulnerable due to its small size, low-lying coastal areas, and limited resources. Sea-level rise, more frequent and severe heatwaves, changes in precipitation patterns, and coastal erosion are key concerns. These climate hazards can threaten communities, infrastructure, agriculture, and food security. Table 4 below further provides a high-level summary of sector related impacts that Nauru may face because of climate change.

Projections have been prepared under two emissions scenarios (a low and high) to examine future changes in climate-related hazards. It is noted that some uncertainty surrounding future climate change arises from three main sources:

- Greenhouse gas emissions pathways
- Regional climate responses to global change, and
- Natural climate variability due to factors such as El Niño and La Niña.

Table 3 summarises the findings from the Hazard Report, which illustrates historical climate data (20 years centred on 2005) and projected climate change for 2030 and 2050, relative to the 2005 baseline. These projections are based on simulations from CMIP6 global climate models (**GCMs**) for low (**SSP1-2.6**) and very high (**SSP5-8.5**) emissions scenarios.

Table 3: Historical climate (20-years centred on 2005) and projected climate change for 20-year periods centred on 2030 and 2050, relative to a 20-year period centred on 2005. Changes are based on simulations from CMIP6 global climate models (GCMs) for low (SSP1-2.6) and high (SSP5-8.5) greenhouse gas emissions scenarios. Uncertainty estimates (in brackets) are based on the 10-90 percentile range. For some variables, the Nauru Exclusive Economic Zone (EEZ) region is assessed, rather than the island, as indicated. Confidence ratings are based on the IPCC framework [2] involving an assessment of the amount of evidence and the degree of agreement between lines of evidence. Drought projections are for SPI 3-month between –1.0 and –1.5 (moderate drought).

Nauru		**Projected change**			
20-years centred on 2005		**2030**	**2050**	**2050**	**Confidence**
		Low/High Emissions*	**Low emissions**	**High emissions**	
	ATMOSPHERIC VARIABLES				
28.0 °C	Annual average temperature (°C)	+0.7 (0.3-1.3)	+1.0 (0.9-1.2)	+1.5 (1.2-2.0)	high
15 (6 to 34) days	Annual hot days (days > 32 °C) [a]	N/A	+120 (44 to 169)	+193 (69 to 242)	high
2100 mm	Annual average rainfall (%)	+11 (-19 to 39)	+13 (-1 to +52)	+24 (-6 to +63)	medium
105 mm/day	Annual maximum daily rainfall (mm/day)	N/A	+48	+54	medium
3 (0 to 5) events per 20 years	Average drought frequency (%) [d]	-33 (-77 to +100) %	-33 (-77 to +67) %	0 (-73 to +107) %	medium
	OCEAN VARIABLES				
0	Annual average sea level (cm)	+10 (7-14)	+21 (15-28)	+25 (19-33)	high
28.6 °C	Sea surface temperature (°C) over EEZ	+0.2 (-1.5 to +1.6)	+0.5 (-1.2 to +2.0)	+1.0 (-0.9 to +2.3)	high
16 days per year	Marine heatwave frequency (days/year) [b]	N/A	+105 to 140	+180 to 270	high
6.3 days per year	Degree heating weeks (ave days per year) [c]	N/A	+92 to 236	+107 to 344	high
8.04	Annual average ocean pH over EEZ[e]	8.00 (7.96 to 8.05)	7.97 (7.92 to 8.02)	7.92 (7.87 to 7.98)	high
3.8	Annual average aragonite saturation[e]	~3.7 (3.3 to 4.0)	3.5 (3.1 to 3.98)	3.2 (2.8 to 3.7)	high

[a] number of days over the 95th percentile of 1995-2014 daily temperatures

[b] Future values are reported, not changes.

[c] Exceed coral bleaching Alert level 2.

[d] Further information on projections for drought intensity, frequency and duration can be found in Chapter 7

[e] Future values shown, not changes compared to historical.

* Little difference between low and high emissions at 2030

Table 4: High-level summary of the climate change impacts for Nauru

Associated impacts of projected climatic changes in Nauru	
Higher temperatures and increased frequency of heatwaves	• Increasing water demand, heat stress in livestock (e.g., pigs and chickens). • Heat-related illness, loss of workforce productivity and impacted health and wellbeing of community. • Power outages, damage to infrastructure, increased maintenance requirements, of essential services
Drought and water scarcity	• Freshwater storage capacity and functionality is limited in Nauru, and there are limits to the supply of desalinated water (RO) due to inefficient delivery systems. In addition, the groundwater system is not of an adequate standard for potable consumption due to salinity and pollution issues. Despite projected increasing rainfall and reducing drought, increasing security of water supply and quality remain critical actions for Nauru, particularly given projected increasing temperatures.
More extreme rainfall and higher annual rainfall	• Reduced water quality, increased pollution, and increased water-borne diseases due to localised flooding and water pooling • Damage to infrastructure, loss of power and connectivity, increased demand for emergency services • Reduced road access
More ocean acidification	• Reduced integrity of calcifying organisms • Damage to marine infrastructure
Increased sea surface temperature	• Coral bleaching and damage to coastal and oceanic marine habitats • Sea surface temperatures (SSTs) significantly affect fisheries, with variability of fish stock affected by the El Niño southern Oscillation (ENSO). During El Niño events, for example, fish follow warm water into the central Pacific, so higher purse-seine catches occur near Nauru. In future, overall increases to SST may also affect commercial and subsistence catches due to shifting fisheries' locations.
More extreme sea level events and coastal inundation	• Contamination of freshwater lens and potential damage to water infrastructure • Threats to physical safety, mental stress • Reduced land for agriculture, damage to terrestrial fauna and flora • Damage to property and infrastructure, increased demand for emergency services

4 Summary of results

The risk assessment process discussed in Chapter 2 is applied using climate change projections for Nauru to understand key risks for different sectors/domains. This chapter presents the summary consequence ratings for key sectors/domains across different timeframes (Table 5).

Each sector/domain is divided into key sub-sectors/sub-domains that are relevant for Nauru. For each of these sectors were then analysed for different hazards (all that are covered in the Hazard report) to understand potential consequence of climate change to the sector under different climate futures. Vulnerability Report by the Melbourne University have contributed to this analysis. To summarise results in a table, a dominant hazard for each of the sub-sector/sub-domain is determined associated ratings are presented in Table 5. Detail discussion on how all hazards interact with a given sector are presented in respective risk profiles throughout the report.

The consequence for each timeframe and emission scenario are scored using the magnitude of consequence criteria (see Appendix 1). Different sectors have different levels of sensitivity and vulnerability for a given hazard, as a result different sectors may have different consequence ratings for the same dominant hazard. For example, the water resources sector is currently more sensitive to drought than terrestrial biodiversity, resulting in a higher current-day consequence rating. This consequences table is different to Table 03 in the Hazards Report as it only considers the dominant hazard for each sub-sector and considers consequences, not impacts. Consequences consider how the impacts of climate hazards will affect the sector/sub-sector. For example, an impact of marine heatwaves is damage to critical marine habitat, with the consequence of reduced fisheries revenue for Nauru.

For detailed discussion of all identified risks for each sector/domain, refer to Chapter 5.

Table 5: Scorecard of consequence of climate hazards to Nauru's 7 key sectors/domains by 2030 (low and high emissions), 2050 (low emissions), and 2050 (high emissions)

Sector/domain	Sub-systems being assessed *Sub-sector/sub-domain*	Key climate drivers and associated impacts	Baseline *Current*	Future magnitude of consequence score 2030 Low/ high emissions	 2050 Low emissions	 2050 High emissions
Water resources	Water availability and demand	Increased annual **rainfall** is likely to increase water supply if delivery and storage infrastructure is maintained and improved. However, water demand is likely to increase with a larger population living under more extreme temperature conditions. Therefore, while drought may occur less frequently, water availability will still be limited during these times, affecting community health, industry and agricultural production.	Major	Major	Major	Major
	Water quality	Extreme **rainfall** can cause flooding and pollution (including sewage, industrial, domestic, and mining waste) to enter ground and surface water catchments. This occurs when drainage, septic and water storage systems are overwhelmed. Poor water quality affects community and ecosystem health.	Moderate	Moderate	Major	Major
	Water infrastructure	Water infrastructure is damaged through saline intrusion, erosion and sediment movement from **sea level rise** and coastal inundation, and extreme rainfall related flooding.	Moderate	Moderate	Major	Major
Health and wellbeing	Public health	**Heat-related** illnesses will continue to affect more people, including increasing electricity demand for refrigeration and cooling. Conditions will be more favourable for food-borne disease, infectious, and vector-borne diseases, placing pressure on public health services, threatening community health and increasing economic costs.	Moderate	Moderate	Major	Extreme
		While Nauru has low rates of diarrheal disease (potentially due to the reliance on desalinated water), water-borne diseases and enteric infections are still prevalent, particularly after **heavy rainfall**, which can be exacerbated by a lack of maintenance of rainwater tanks, poor drainage, and overflow of septic systems.	Moderate	Major	Extreme	Extreme
	Nauruan workforce	**Heatwaves** and hot days can reduce workforce productivity with major effects on the economy, business continuity, water security, food security, infrastructure development, and both physical and mental health.	Moderate	Moderate	Major	Major

Agriculture	Crops	Saline intrusion and extreme sea level events may encroach on arable land and reduce soil quality, affecting crop productivity and cultural practices in Nauru	Moderate	Moderate	Moderate	Major
		Increased **annual-average rainfall** will increase fresh-water access if delivery and storage infrastructure is maintained and improved. However, demand for water resources is likely to increase with higher evaporation due to more extreme temperature conditions. Therefore, while drought may occur less frequently, water availability will still be limited when drought occurs, affecting crop production.	Moderate	Moderate	Major	Major
	Livestock	Increased **annual-average rainfall** will increase fresh-water supply if delivery and storage infrastructure is maintained and improved. However, livestock demand for water resources is likely to increase under more extreme temperature conditions. Therefore, while **drought** may occur less frequently, water availability will still be limited when drought occurs, affecting livestock production.	Moderate	Moderate	Major	Major
Fisheries and marine resources	Oceanic fisheries	**Increases in SST** will displace tuna fishing grounds, affecting the availability of tuna species that support the Nauru economy through fishing access fees, with consequences for the provision of essential services and community wellbeing.	Minor	Moderate	Moderate	Major
	Coastal fisheries	**Marine heatwaves** and associated coral bleaching will compound the impacts of overfishing, reducing the resilience of coastal fish stocks and reef ecosystems, with negative consequences for the food security and livelihoods of Nauruans. Extreme rainfall may increase pollution run-off into coastal waters	Moderate	Major	Major	Extreme
	Aquaculture	Increased **average and extreme rainfall** will increase runoff (and potential pollution) to Buada Lagoon. While **droughts** may occur less frequently, evaporation is likely to be higher due to more extreme temperatures, potentially increasing lagoon salinity levels. During droughts therefore the ability to farm milkfish may be negatively impacted.	Moderate	Moderate	Major	Major
Disaster management	Emergency services	Worsening c**oastal inundation, extreme rainfall, high temperatures, fire-risk** and high community vulnerability to natural disasters threatens emergency response infrastructure. This places significant pressure on emergency services to protect human health, property, infrastructure, and livelihoods.	Moderate	Moderate	Moderate	Major

Coastal protection and infrastructure	Coastal assets and flood defenses	Wave energy can damage and destroy sea walls, creating debris and exposing some communities and infrastructure to extreme sea level related coastal inundation and coastal erosion.	Moderate	Moderate	Major	Major
	Fisheries infrastructure	Wave energy from large swells can damage fishing infrastructure and equipment	Minor	Minor	Moderate	Moderate
	Internet and telecommunications	ICT connectivity in Nauru is disrupted **by flooding** and clouds which interrupt satellite connections and damage ICT infrastructure, affecting provision of essential services, such as education, health care and disaster risk management (including early warning systems), economic development and community wellbeing.	Moderate	Moderate	Moderate	Moderate
	Transport and supply chains	Coastal **inundatio**n from king tides and storm surge	Moderate	Moderate	Major	Major
	Energy	**Extreme heat** can disrupt power supply by causing transformers to overheat, inhibit critical maintenance, and increase electricity demand for air conditioners, refrigeration, and fans, with cascading impacts across a wide range of sectors and communities, including disrupting critical services (including health services, ICT connection and disaster response activities) and businesses.	Moderate	Moderate	Major	Major
	Buildings and structures	**Extreme sea level** and coastal inundation may impact buildings in some areas	Moderate	Moderate	Moderate	Major
	Health infrastructure	Health care facilities are in low-lying areas, making them vulnerable to direct damage and disruptions to critical infrastructure, accessibility, and supply chains during **floods**, with major consequences for community health, disaster response activities and the provision of health services.	Moderate	Moderate	Major	Major
	Waste management	**Flooding** can impact drainage systems and cause septic tanks to overflow with significant impacts on water quality and community health.	Moderate	Moderate	Major	Major
Biodiversity and environment	Aquatic and coastal biodiversity	**Marine heatwaves** and **sea surface temperature** will cause coral bleaching (exacerbated by **ocean acidification**) and compound the impacts of overfishing to damage, deplete and reduce the resilience of aquatic and reef ecosystems with major consequences for the aquatic and coastal biodiversity of Nauru.	Moderate	Major	Major	Extreme
	Terrestrial biodiversity	While **drought** may occur less frequently, plant water use is likely to increase under more **extreme temperature** conditions and higher evaporative demand. Therefore, when drought does occur, terrestrial biodiversity will be more adversely affected, resulting in the depletion of important ecosystem services.	Moderate	Moderate	Major	Major

Land management and rehabilitation	Land use and rehabilitation	In future, increasing temperatures and extreme rainfall may make any land rehabilitation more difficult. Projected increases to average rainfall, along with fewer droughts, may improve options for any terrestrial biodiversity improvements and agricultural pursuits.	Moderate	Moderate	Major	Major
		Projected increases to **average rainfall**, along with **fewer droughts**, may improve options for any terrestrial biodiversity improvements and agricultural pursuits. When **droughts** occur, they will be experienced along with more extreme temperature conditions	Moderate	Moderate	Moderate	Major
Community and Culture	Community development	Heat stress due to **extreme temperatures** affect communities. Flooding due to **extreme rainfall,** and coastal inundation due to **extreme sea level** events, may impact cultural sites.	Moderate	Moderate	Major	Major

5 Risk statements and profiles

This chapter presents detailed findings of the risk assessment. Information is presented as a form of 'risk profiles' for each of the risk statements highlighting current and future exposure, vulnerability, and consequences across different timeframes. Table 6 below provides an overview of the nine risk statements assessed as part of the risk assessment for Nauru.

Table 6: Nauru risk statements

Sector	Risk number	Risk statement
Water resources	**R1**	Risks to water availability and demand, quality and infrastructure.
Health and wellbeing	**R2**	Risks to public health and the Nauruan workforce.
Agriculture	**R3**	Risks to crops and livestock.
Fisheries and marine resources	**R4**	Risks to commercial oceanic and coastal fisheries and aquaculture.
Disaster management	**R5**	Risks to emergency services.
Coastal protection and infrastructure	**R6**	Risks to coastal assets, internet and telecommunications, transport and supply, energy, buildings and structures, and waste management.
Biodiversity and environment	**R7**	Risks to aquatic, coastal and terrestrial flora and fauna.
Land management and rehabilitation	**R8**	Risks to land use and rehabilitation.
Community and culture	**R9**	Risks to culture, social cohesion, community development.

Each detailed risk profile follows the following structure, as described below in Table 7.

Table 7: Risk profile structure

Heading	Overview
Sector Summary	• Overview of the sector, including key components, and context in Nauru
Risk Statement	• Sector-specific risk narrative statement and summary of key climate impacts, vulnerabilities, and consequences
Exposure to current and future hazards	• Establish key climate hazards impacting sector • Consider how the key components of the sector (for example, crops and livestock for agriculture) have already been impacted by these hazards • Consider future exposure and impacts of climate pressures on key components based on future hazard projections
Vulnerability	• Summarise the key sources of vulnerability relevant to the risk
Complex Risks	• Establish how the risk and its consequences is impacted by interaction with other climate risks/compounding factors
Consequence	• Determine the current consequences of dominant climate change hazard for the sector • Determine the future consequences of dominant climate change hazard for the sector under both scenarios for 2030 and 2050 (low and high emissions)
Confidence	• Describe the quality and amount of evidence supporting the risk assessment
Knowledge Gap	• Recognise information and data gaps

5.1 Water resources

Summary of this Sector

The main sources of potable water in Nauru are rainfall and reverse osmosis of seawater. Water delivery and storage is an issue, particularly during drought. Groundwater is used for washing and gardens but varies according to exposure to drought and local circumstances and community awareness about water quality risk.

There are three major components of Nauru's water resources sector:

Table 8: Significant sub sectors in the water resources sector of Nauru.

Sub sector	Importance
Water availability and demand	• Due to the lack of permanent fresh surface water, potable water is primarily provided by RO and rainfall catchment. RO water is transported by truck from the desalination plant to individual storage tanks where required. • There are three natural sources of water available in Nauru – rainwater, seawater, and groundwater. • Groundwater is generally brackish and reliant on rainfall for recharge of the thin freshwater lens. The use of groundwater varies according to season and circumstances. • Water demand is driven by weather conditions and population growth.
Water quality	• Water from most groundwater wells in Nauru does not meet World Health Organisation drinking water standards for Total Dissolved Solids, depending on location and rainfall. Groundwater is often saline and contaminated by sewage systems, mining, and dumping of industrial and domestic waste. • Households are exposed to potential water quality issue at water collection points due to the quality of the exposed surface, contamination of the surface (for example, from phosphate dust), maintenance of water tanks and water tankers. • The condition of water delivery trucks and privately owned rain water tanks affects water quality.
Water infrastructure	• Six official delivery trucks and six private-contractor delivery trucks are currently available to deliver RO water. Whilst the RO facility can produce enough water, only 70% of water deliveries can be made in a given month that they are ordered by customers due to delivery challenges. • Currently only 8% of the population have access to piped water although there are plans to develop a piped water system. • 96.3% of households in Nauru have some form of water storage, primarily water tanks which store both rainwater and RO water deliveries. Privately owned rainwater tanks and collection systems in varying state of repair. • Six desalination units at two sites. • Groundwater wells.

R1: Risks to water resources

The below risk statement (**R1**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for water security that have been identified and analysed.

Table 9: R1 risk statement and information

Concise risk statement
Chronic and acute climate hazards compounded with changing demographic profile and poor infrastructure will increasingly affect water security which is important for the public health, agricultural productivity, and environment of Nauru.
Hazards affecting this domain
• Drought • Extreme heat events • Average rainfall and extreme rainfall events • Sea level rise, extreme sea level events and coastal inundation
Impacts on this domain
• Saline intrusion of groundwater • Increased heat and evaporation increase water demand • Ongoing reliance on de-salination to provide potable water • Increasing cost of maintenance for water infrastructure • Reduction of water table and increased reliance on saline groundwater during drought • Projections indicate fewer droughts in future • Damages to water pumps • Sewage, industrial, domestic, and mining waste contaminates groundwater • Potential increase in water availability with increased average rainfall
Vulnerability factors relevant to this domain in Nauru (No particular order)
• There currently are too few delivery trucks to distribute water adequately, particularly in times of drought • Limited water storage capability reduces water availability and quality especially during drought, with 64% households main water supply prone to drying up. Nearly three-quarters of all households reported that their water supply dries up, with 8.4 percent of households reporting that this occurs frequently • Limited maintenance of water tanks and gutters • Poor groundwater quality and no monitoring of groundwater resources to assess volume of extraction or salinity. • Households are exposed to potential water quality issue at water collection points due to the quality of the exposed surface, contamination of the surface (for example, from phosphate dust), maintenance of water tanks and water tankers • Increasing population is increasing demand for water resources • Desalination is expensive in terms of energy consumption and needs expertise for its maintenance, with spare parts shipped from Australia • *Escherichia coli* outbreaks are frequent due to degraded and variable quality of both groundwater extraction and septic systems • Truck delivery requires road access, which is not available to a few properties in Nauru, particularly newer houses on informal roads • Complete dependency on electricity from diesel generator for desalination increases vulnerability

- RO water used for firefighting due to saline groundwater affecting the pipes and pumps of the fire truck

Consequence to Nauru

- Increased **annual rainfall** will increase water supply if delivery and storage infrastructure is maintained and improved. However, water demand is likely to increase with a larger population living under more **extreme temperature** conditions. Therefore, while **drought** may occur less frequently, water availability will still be limited during these times, affecting community health, industry and agricultural production.
- Public health issues due to poor sanitation, low water quality and community stress
- Loss of vegetation during drought exacerbating loss of biodiversity
- Limitation to potential for agricultural productivity
- Inability to carry out water-intensive activities and disruption to RO supply, affecting water accessibility for consumption and firefighting

Current and future hazard exposure and impacts

Extreme temperature

- Extreme heat places pressure on Nauru's limited water supply by increasing demand for freshwater for both domestic consumption and other uses such as home gardens, including food crops.
- Extreme heat events can also cause power outages and machinery to overheat, potentially disrupting desalination operations with related implications for human health, livelihoods, and potential for improved agricultural productivity, particularly during concurrent periods of drought.
- An increase in annual hot days (over 32°C) of 44-242 days per year by 2050 (across low and high emissions scenarios) will place more severe pressure on limited water resources with implications for public health and wellbeing.

Drought

- Drought frequency is projected to decline (compared to the baseline), however the benefit of less frequent drought may be offset by population increase, existing poor water infrastructure, limited capacity to store rainwater, higher evaporation and rising sea levels so the net impact on water security is uncertain
- Drought reduces surface water storage (although surface water is limited in Nauru) and prevents groundwater recharge, increasing the salinity of groundwater whilst also increasing the demand for groundwater. During prolonged dry periods, some communities access this groundwater for cooking/boiling and livestock watering, even in areas where the total dissolved solids content is very high, or even resorting to drinking saline seawater in drought, increasing the risk of health issues. Nauru has relied on international assistance during extended dry periods.
- Drought-induced water scarcity increases reliance on RO water for domestic and agricultural use and can cause declines in community health, productivity (WHO, 2024). In the most recent 2023 census, 62.7% of households reported being affected by drought in the previous 10 years. Schools are also often closed due to lack of water due to poor water delivery system which can further exaggerate water related challenges.
- A hotter climate, combined with increased saline intrusion and a growing population, will raise water demand during periods of scarcity and high evaporation. At the same time, it will decrease the efficiency of desalination plants and reduce groundwater replenishment, worsening water availability challenges.
- In addition to the negative effects on biodiversity, due to a lack of freshwater resources, communities are also likely to face negative impact on physical health and mental wellbeing.

Sea level rise and coastal inundation

- The ground water quality is declining with saltwater intrusion, driving greater reliance on desalination units.
- Sea level rise threatens Nauru's already fragile water sector by increasing saltwater intrusion into its scarce groundwater supplies. With limited freshwater sources and reliance on rainwater and desalination, higher sea level is likely to further strain infrastructure, reduce potable water availability, and increase health risks from waterborne diseases and poor sanitation.
- Sea level rise and related coastal inundation can cause increased coastal erosion that damages wastewater infrastructure and reduces the efficiency of stormwater systems.
- Sea level rise of 15-33cm by 2050 (across low and high emissions scenarios) will cause more frequent and widespread coastal inundation. Saline intrusion of groundwater reservoirs will add complexity to already stretched water resource of Nauru. Severe flooding combined with coastal inundation may overwhelm wastewater infrastructure (especially septic tanks), treatment plants, drains and pumps, inhibiting community access to clean water with severe consequences for community health.

Winds

- Wind-blown phosphate dust can pollute water sources now and in the future by contaminating rainwater tanks, reducing water quality and posing health risks.

Extreme rainfall

- Extreme rainfall degrades water quality by overflowing septic tanks and overwhelming water storage, treatment, and drainage systems. It also washes land-based pollutants—such as sewage, domestic waste, and mining runoff—into groundwater and surface water catchments.
- Water security and community health are both affected with increasing risk of water-borne disease transmission. It is suspected that across pacific island countries rising cases of rotavirus for infants are caused by playing in water/ mud following heavy rainfall.
- Projected 48 to 54 mm/day increase in annual maximum daily rainfall by 2050 (across low and high emissions scenarios) may cause increased run-off and flooding that may pollute catchments and reduce water quality. Damage to septic systems and water storage, treatment, and drainage systems, as well as potential disruption in desalination operations, may further impact water quality. Human health can be threatened by disrupted access to potable water through increasing risk of water-borne disease transmission.

Vulnerability

The below table (Table 10) presents sources of water resource vulnerability to hazards in Nauru.

Table 10: Water resources vulnerability summary

Hazard	Factor relevant for vulnerability
All hazards	• Complete dependency on electricity from diesel generator for desalination increases vulnerability to power outages during disasters • Increasing population is increasing demand for water resources • People are highly reliant on RO water, including for firefighting due to saline groundwater affecting the pipes and pumps of the fire truck • People with disabilities face accessibility issues when accessing water infrastructure and services • No monitoring of underground water resources to assess extraction or salinity

	• Groundwater in central part of Topside is particularly low quality, considered brackish at the surface and seawater quality at 20m Proposed improvements for water reticulation and sanitation are currently unfunded
Average temperature and extreme temperature	• Extreme temperatures can strain Nauru's water sector by increasing evaporation rates, reducing rainwater collection, and intensifying water demand. Higher temperatures can also lower desalination efficiency, accelerate pipeline wear, and worsen saline intrusion into groundwater. These challenges further stress Nauru's limited water infrastructure, affecting supply reliability and community well-being.
Drought	• Limited water storage capability reduces water availability and quality especially during drought, with 64% households main water supply prone to drying up. Nearly three-quarters of all households reported that their water supply dries up, with 8.4 percent of households reporting that this occurs frequently. • Coastal plants, such as coconut and pandanus, are not resilient to extended periods of drought • There currently are too few delivery trucks to distribute water adequately in times of drought, with 48.6% of Nauruans depending on RO water supply from tanker trucks for drinking water • 22.7% of households report being able to use relatives' or neighbours' water resources during drought, reducing vulnerability • Roughly one third of households have no guttering with 15% of households in need of guttering repair, reducing ability to harvest rainwater • Limited maintenance of water tanks and gutters
Extreme rainfall and average rainfall	• Degraded and variable quality of both groundwater extraction and septic systems can increase exposure to *E. coli* outbreaks and other diseases. • Land-based pollution, mining run-off and sediment movement increases the vulnerability of water catchments and drains to flooding events • Poorly maintained gutters contribute to water pooling and potential breeding grounds for disease vectors such as mosquitos

Complex risks

Water security risks can interact with and compound other risks with significant consequences for community health in Nauru.

- **Infrastructure:** Extreme heat events will increase demand for desalinated water, whilst potentially increasing the risk of power outages that disrupt desalination plants.
- **Human health and wellbeing:** Droughts reduce water quality while also causing a decline in community hygiene and sanitation practices, leading to high disease and infection rates.
- **Agriculture:** Extreme heat events and droughts can significantly impact kitchen gardens and agriculture because water is prioritised for the community during these events, whilst heat-stress can harm livestock and crops.

Consequence

Current

Table 11: Water resources current-day consequences

Component	Dominant hazard	Risk rating	Comments
Water availability and demand	**Drought** Drought-induced water scarcity is causing significant declines in community health, outdoor worker productivity, and kitchen garden production.	**Major**	In the most recent 2023 census, 62.7% of households reported being affected by drought in the previous 10 years. Poor groundwater quality and reliance on RO water for domestic use during drought increases vulnerability to prolonged dry periods. Limited agricultural production is further reduced in drought due to the expense of RO water, with implications for access to nutritious food.
Water quality	**Extreme rainfall** Extreme rainfall can reduce water quality and threaten human health by overwhelming septic systems, water storage, treatment, and drainage infrastructure. It also washes land-based pollutants—such as sewage, industrial waste, domestic waste, and mining runoff—into groundwater and surface water catchments, increasing contamination risks.	**Moderate**	Extreme rainfall can result in poor water quality due to high sediment and pollution load in run off. Cases of rotavirus for infants are linked to by playing in water/mud following heavy rainfall.
Water infrastructure	**Coastal inundation from high spring tides and storm surges** Water infrastructure is damaged through saline intrusion, erosion and sediment movement from **sea level rise and coastal inundation**, and **extreme rainfall** related flooding.	**Moderate**	Water quality of reservoirs is declining with saltwater intrusion, driving greater reliance on desalination units. Flooding can damage water tanks and wastewater infrastructure. Significant impacts on water security, community health and agricultural productivity.

2030 Low and high emissions scenario

Table 12: Water resources 2030 consequences (low and high emissions scenarios)

Component	Dominant hazard	Risk rating	Comments
Water availability and demand	**Compound effect of drought and hotter climate** The benefits of less frequent drought (compared to the baseline) may be offset by a hotter climate increasing water demand and contributing to water scarcity is causing significant declines in community health, productivity, and agricultural yield.	**Major**	A hotter climate will increase water demand and evaporation during periods of water scarcity, whilst also reducing desalination plant efficiency and groundwater replenishment. Physical and mental health of communities may be threatened by reduced water availability. Potential agricultural productivity and biodiversity will be affected as even hardy species, such as pandanus, dieback.
Water quality	**Extreme rainfall** Extreme rainfall can reduce water quality and threaten human health by damaging and overwhelming septics systems and water storage, treatment, and drainage systems, and causing land-based pollution, including sewage, industrial, domestic, and mining waste, to enter ground and surface water catchments.	**Moderate**	Run-off and flooding during extreme rainfall events will reduce the water quality of surface and ground water catchments. Water security and community health will both be affected with increasing risk of water-borne disease transmission.
Water infrastructure	**Coastal inundation from high spring tides and storm surges** Water infrastructure is damaged through saline intrusion, erosion and sediment movement, and flooding.	**Moderate**	More frequent coastal inundation will continue to increase the salinity of groundwater reservoirs and cause erosion and flooding that damages water infrastructure including water tanks, wastewater, and stormwater systems. Increased risk of infections and waterborne diseases.

2050 Low emissions scenario

Table 13: Water resources 2050 consequences (low emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Water availability and demand	**Drought** The benefits of less frequent drought (compared to the baseline) may be offset by a hotter climate increasing water demand and contributing to water scarcity is causing significant declines in community health, productivity, and agricultural yield.	**Major**	A hotter climate with more significant saline intrusion and higher population may worsen water security during periods of water scarcity. Public health and agricultural productivity will be threatened as some communities turn to poor-quality groundwater for domestic and agricultural uses, threatening community health. Projections for increased rainfall may reduce these effects improving water capacity provided there is sufficient and efficient water catchment capacity.
Water quality	**Extreme rainfall** Extreme rainfall reduces water quality and threatens human health by damaging and overwhelming septics systems and water storage, treatment, and drainage systems, and causing land-based pollution, including sewage, industrial, domestic, and mining waste, to enter ground and surface water catchments.	**Major**	Significant increases in annual maximum daily rainfall (increase of 48 mm/day) will cause run-off, flooding and inundation that can pollute catchments and reduce water quality. Damage to and overflow of septic systems and water storage, treatment and drainage systems may further impact water quality. Human health may be threatened, with increasing risk of water-borne disease transmission.
Water infrastructure	**Coastal inundation from high spring tides and storm surges** Water infrastructure is damaged through saline intrusion, erosion and sediment movement, and flooding.	**Major**	Sea level rise of 15-28 cm will increase the frequency and severity of coastal inundation events. The capture, storage and treatment of potable water and fresh groundwater may be disrupted. Septic tanks and wastewater systems will be increasingly overwhelmed, causing sewage pollution. Community access to clean water may be disrupted with severe consequences for community health.

2050 High emissions scenario

Table 14: Water resources 2050 consequences (high emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Water availability and demand	**Drought** The benefits of less frequent drought (compared to the baseline) may be offset by a hotter climate increasing water demand and contributing to water scarcity is causing significant declines in community health, productivity, and agricultural yield.	**Major**	A hotter climate with increased saline intrusion and higher population may worsen water security during periods of water scarcity with widespread and prolonged consequences for community health, livelihoods and food security including increased infection rates and reduced yield. Projections for increased rainfall may reduce these impacts by improving water capacity provided there is sufficient and efficient water catchment capacity.
Water quality	**Extreme rainfall** Extreme rainfall reduces water quality and threatens human health by damaging and overwhelming septics systems and water storage, treatment, and drainage systems, and causing land-based pollution, including sewage, industrial, domestic, and mining waste, to enter ground and surface water catchments.	**Major**	Significant increases in annual maximum daily rainfall (increase of 48 mm/day) will cause run-off, flooding and inundation that can pollute catchments and reduce water quality. Damage to and overflow of septic systems and water storage, treatment and drainage systems may further impact water quality. Human health may be threatened, with increasing risk of water-borne disease transmission.
Water infrastructure	**Coastal inundation from high spring tides and storm surges** Water infrastructure is damaged through saline intrusion, erosion and sediment movement, and flooding.	**Major**	Sea level rise of 19-33 cm will cause frequent and widespread coastal inundation. Saline intrusion of groundwater reservoirs will reduce water security. Severe flooding and coastal erosion may overwhelm water tanks, wastewater infrastructure (especially septic tanks), treatment plants, drains and pumps. Flooding-induced power outages and direct inundation may impact the operation of desalination plants, with severe consequences for community health.

Confidence

Table 15: Water resources confidence ratings

Component	Hazard	Confidence score	Comments
Water availability and demand	**Drought**	**Medium**	• Although high confidence in future impacts and consequences, confidence is reduced by uncertainty in the net impact of future drought, population growth, rising sea levels and increased rainfall
Water quality	**Extreme rainfall**	**High**	• Strong strength of evidence only marginally reduced by lack of annual maximum daily rainfall (mm/day) projection for 2030
Water infrastructure	**Coastal inundation from king tides and storm surges**	**Medium**	• Although high confidence in future exposure and high-level consequences, confidence is reduced because there is limited information regarding water infrastructure systems, location, processes, and vulnerability

Knowledge Gaps

- Limited information regarding the exposure of Nauru's critical water infrastructure to extreme sea level events, saline intrusion, and erosion.

5.2 Health and wellbeing

Summary of this Sector

Climate-related impacts on public health include direct impacts (for example, heat stress and injuries from extreme weather events), indirect impacts on water security and safety (for example, water-borne diseases), food security and safety (for example, malnutrition and food-borne diseases), vector-borne diseases, respiratory illness, eye, ear and skin disorders and diffuse impacts through mental/psycho-social disorders. The Republic of Nauru Hospital provides free health care and dental treatment to Nauru citizens. Speciality treatment for diabetes and obesity-related illness is available at the Naoero Public Health Centre, however serious illnesses and injuries need to be evacuated to Australia for treatment.

There are two major subsectors in the health and wellbeing sector:

Table 16: Significant sub sectors in the health and wellbeing sector of Nauru.

Sub sector	Importance
Public health	• While Nauru has low rates of diarrheal disease, potentially due to the reliance on desalinated water, water-borne diseases and enteric infections are still prevalent, particularly after heavy rainfall, due to a lack of maintenance of rainwater tanks, poor drainage, and overflow of septic systems. • Reliance on highly processed food imports has reduced the quality of food available. For example, a lack of fresh and healthy foods, with associated impacts on health such as high incidences of obesity, diabetes, and non-communicable diseases (**NCDs**) • No fully formed mental health policy or act exists in Nauru at the time of writing, although a draft mental health policy has been developed. • Low international travel and tourism numbers have reduced Nauru's exposure to communicable and vector-borne diseases. • Heat-related illnesses directly impact local communities, causing increased morbidity particularly in the absence of a cool refuge. • All pharmaceuticals are imported from Australia or the Netherlands and are vulnerable to supply disruptions
Nauruan workforce	• Workforce skills, operation and productivity is vulnerable to hazards, particularly among outdoor workers and those without a cool refuge

R2: Risks to health and wellbeing

The below risk statement (**R2**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for health and wellbeing that have been identified and analysed.

Table 17: R2 risk statement and information

Concise risk statement
Chronic and acute climate hazards will increasingly impact public health issues and the health, safety, and productivity of the Nauruan workforce, placing strain on the highly limited health services and impacting the economy of Nauru.

Hazards affecting this domain

- Increased annual rainfall and extreme rainfall
- Rising temperatures and extreme heat
- Drought
- Sea level rise, extreme sea level events and coastal inundation
- Wind

Impacts on this domain

- Increased demand for health services, particularly during extreme events, placing pressure on an already strained health system
- Increased incidences of water-borne disease and enteric infections
- Increased risk of mental health-related morbidity
- Increased risk of heat-related illnesses and morbidity
- Increased future risk of vector-borne disease
- Increased risk to the physical health, safety, and wellbeing of the community
- Increased risk of respiratory illnesses, such as asthma, from exposure to wind and dust, particularly when a hot dry period is followed by rain. Fires in the waste dump facility can also cause toxic air pollution
- Reduction in the health and productivity of outdoor workers and indoor workers where cooling is inadequate
- Reduced participation in outdoor exercise and associated health impacts from reduced opportunity to exercise, such as NCD incidences
- Increase in food insecurity – malnutrition, increase in obesity and NCDs
- Increase in water insecurity
- Increased impacts to medical supply chains, and medications and medical equipment that are electricity-dependant (for example, insulin requiring refrigeration).

Vulnerability factors relevant to this domain in Nauru

- Large households and households with inadequate cooling
- Coastal communities are more exposed to sea level rise impacts
- Lower socio-economic demographic often more at risk of to water and food insecurity and extreme heat
- Variable household ownership of refrigerators and freezers
- High number of vulnerable groups, including children, older persons, those with pre-existing chronic health conditions
- Large percentage of households unable to afford healthy food, poor nutrition and high rate of NCDs, including nearly one in three of the population with Type 2 diabetes
- Low capacity of health sector workforce and dependence on expatriate contractors and expertise
- Isolation from specialised medical services only available overseas
- Frequent E. coli outbreaks due to degraded and variable quality of both groundwater extraction and septic systems
- Phosphate deposits in Nauru contain high levels of heavy metals which can leach into the soil and water
- No early warning system for communicable diseases
- Proposed improvements for water reticulation and sanitation are unfunded

Consequence to Nauru

- Increasing strain on very limited health services
- Loss in workforce productivity and reduced outdoor physical activities
- Increases in health problems resulting in lower wellbeing
- Impacts to the Nauru economy

Current and future hazard exposure and impacts

Average and extreme temperature

- Extreme heat directly impacts local communities by causing increased morbidity and exacerbating existing human health conditions, such as respiratory and cardiovascular diseases and diabetes.
- Temperature influences vector-borne diseases, with vectors for dengue fever and chikungunya present in Nauru. High temperatures are also linked with some enteric infections and can create food safety issues due to limited cold storage.
- Extreme heat and rising temperatures can cause mental health-related morbidity and increase NCD incidences due to a reduction in outdoor exercise and fresh food availability.
- Hot and dry conditions are associated with fires in the waste dump facility which can cause toxic pollution that affects air quality and human health, as well as contaminating water, soil, and food resources.
- Medical equipment, pharmaceuticals and supply chains can be impacted by power outages during extreme heat events, for example due to the loss of refrigeration for insulin supplies.
- The health and productivity of workers is reduced, particularly for those working outdoors or indoors with temperatures elevated above 26°C.
- An increase in annual hot days (over 32°C) of 44-242 days per year and a rise in annual average temperature of 0.9-2°C by 2050 (across low and high emissions scenarios) will increase the demand for health services and threaten community health by worsening all heat-related health impacts, including heat-related illness, vector-borne diseases, food safety issues, NCD incidence, toxic smoke, and disruption to medical supply chains and operations. For each 1°C increase in temperature, there also exists a statistically significant increase in the risk of mental health-related morbidity.
- Workforce safety and productivity will be impacted. In general across Oceania, the heat associated with 2 °C global warming is projected to cause a 12.9 % reduction in labour productivity for agriculture, a 4.24 % reduction for manufacturing, and a 0.12 % reduction for services. Reduced workforce productivity will affect business continuity, water security, food security, economics and infrastructure development, and health in Nauru.

Drought

- Drought-induced water scarcity that occurs in a hotter climate with a higher population will increase the risk of infection, malnutrition, mental health-related impacts, and respiratory illness with major impacts for community health and wellbeing. Increased pressure will be placed on Nauru's stressed health system.
- During prolonged dry spells, vulnerable communities tend to use low quality groundwater which is contaminated by leakage from domestic sewage pits into the subsoil and increased salt concentration, increasing the risk of infection and disease.
- The risk of infection during droughts may be reduced in the future if plans for a new sewage system are implemented.
- Despite relying on imports, Nauru's food security remains vulnerable to drought and climate change. Rising temperatures and erratic rainfall reduce local crop yields and strain household gardens. Increased droughts limit freshwater for irrigation, while climate-related disruptions to global supply chains can drive up food costs and reduce availability. This can contribute to health and wellbeing of communities.
- Lack of access to reliable water can cause anxiety and related mental health impacts.
- Increased risk of respiratory illness such as asthma from exposure to wind and dust, particularly when a hot dry period is followed by rain.

Sea level rise and coastal inundation

- Extreme sea level events and coastal inundation can cause injuries, as well as contaminating water resources, increasing food insecurity, causing anxiety and mental stress, and disrupting medical supply chains and community access to health services.
- In the absence of strong and effective mitigation and adaptation measures, sea level rise of 15-33cm by 2050 (across low and high emissions scenarios) may increase threats to physical safety, contributing to increases in mental health-related illness and strain or exceed health service capacity.

Wind and associated storms

- Storms can cause damage and disruption to health infrastructure and services.
- Winds also increase phosphate pollution which can cause a variety of health issues, including mineral and bone disorders associated with chronic kidney disease and cardiovascular system issues. Phosphate pollution is particularly significant in Nauru because phosphate deposits contain high levels of heavy metals such as cadmium, lead, and arsenic which can leach into the soil and water.
- In conjunction with rising temperatures, wind may exacerbate health risks caused by airborne debris, disruptions to health services and phosphate pollution of the air and water resources.

Extreme rainfall

- Extreme rainfall can cause flooding and inundation that threatens the physical safety of communities and causes a range of health risks including disruptions to health services (especially Republic of Nauru Hospital) and contamination of water resources due to poor drainage and overflow of septic systems. There have been recent anecdotal reports of increasing cases of rotavirus in infants suspected to be related to children playing in puddles or mud along the roadside following heavy rainfall.
- Flood-related disruptions to critical infrastructure, such as electricity, also impacts the provision of health services.
- Projected 48 to 54 mm/day increase in annual maximum daily rainfall by 2050 (across low and high emissions scenarios) will threaten community safety and increase demand for health services by causing worsening flood damage to health infrastructure and increasing the risk of water-borne and vector-borne diseases.

Vulnerability

The below table (Table 18) presents sources of health and wellbeing vulnerability to hazards in Nauru.

Table 18: Health and wellbeing vulnerabilities

Hazard	Factor relevant for vulnerability
All hazards	• It is difficult for the hospital to manage triage if more than five people are admitted at once. • Lower socioeconomic demographics and vulnerable groups such as the elderly, children, and people with pre-existing health conditions, are often more exposed to disaster events and water/food security. • 49% of households have been unable to eat healthy or nutritious food due to a lack of financial or other resources. 90% of Nauru's food is imported, with highly processed foods prevalent due to lower cost and longer preservation periods. • High rate of NCDs. For example, nearly one in three Nauruans have Type 2 diabetes • Inadequate housing can lead to physical safety risks during disasters.

	• Poor groundwater quality and no monitoring of groundwater resources increases risk of waterborne illnesses during disasters when there is insufficient access to freshwater resources. • Ongoing waste management and biosecurity issues increases risk of disease during disasters. • Low capacity of health sector workforce and dependence on expatriate contractors and expertise. • Isolation from specialized medical services only available overseas. • Phosphate deposits in Nauru contain elevated levels of heavy metals such as cadmium, lead, and arsenic which can leach into the soil and water. • Nauru does not have arrivals surveillance for disease upon entry into the country.
Average temperature and extreme temperature	• Large households, often with inadequate cooling, are vulnerable to extreme heat events. • 21.8% of households do not have air-conditioning
Sea level rise and coastal inundation	• Coastal location of many communities increases exposure to sea level rise and coastal inundation impacts.
Extreme rainfall and average rainfall	• Degraded and variable quality of both groundwater extraction and septic systems increases exposure to *E. coli* outbreaks and other diseases, particularly during flooding and inundation events. • Roadside drainage is via soak pits, and it can take about half a day for water to subside, or longer if it's a period of heavy rain. • Nauru's main hospital experiences regular flooding due to poor maintenance of the drainage system.

Complex risks

Human health and wellbeing risks can interact with and compound other risks with significant consequences for community health and livelihoods in Nauru.

- **Infrastructure:** Disruptions and breakdowns in the infrastructure sector such as disrupted power supply and damage to the hospital, roads, airstrip, or port, will have flow-on consequences for health service provision, health infrastructure and public health.
- **Agriculture/Fisheries:** Problems arising in the agriculture and fisheries sector will have flow-on consequences for the health of the population through food security causing malnutrition and non-communicable disease.
- **Water resources:** Reduced water security will have large consequences to the health of the population through disease outbreaks, and the level of sanitation of water used in health facilities.

Consequence

Current

Table 19: Health and wellbeing current-day consequences

Component	Dominant hazard	Risk rating	Comments
Public health	**Heatwaves and extreme temperatures** Heat-related illnesses will continue to affect more people, whilst conditions will be more favourable for food-borne, infectious, and vector-borne diseases, placing pressure on public health services, threatening community health and driving economic costs.	**Moderate**	Extreme heat is causing increased morbidity and affecting NCDs such as diabetes where indoor temperatures are above 26°C. Hot days and heat waves are also associated with heat-stress related mental health impacts.
	Extreme rainfall Increasing water contamination and health impacts associated with poor water quality will affect vulnerable communities and result in significant costs.	**Moderate**	Flood-related water-borne disease and sanitation issues, including rotavirus, are arising due to limitations and exposure of wastewater and sewage treatment plants. Exposure to inundation impacts mental wellbeing and disrupts health services with increasing costs.
Nauruan workforce	**Extreme heat events** Heatwaves and hot days can cause heat-related illness and reduce workforce productivity with major effects on the economy, business continuity, water security, food security, infrastructure development, and both physical and mental health.	**Moderate**	Extreme heat events are increasing incidence of heat-related illness, such as heat stroke and heat stress, in the Nauruan workforce particularly in outdoor workers, including at the airport. Workforce productivity is reduced by heatwaves and hot days with adverse effects on economic development and livelihoods.

2030 Low and high emissions scenario

Table 20: Health and wellbeing 2030 consequences (low and high emissions scenarios)

Component	Dominant hazard	Risk rating	Comments
Public health	**Heatwaves and extreme temperatures** Heat-related illnesses will continue to affect more people, whilst conditions will be more favourable for food-borne, infectious, and vector-borne diseases, placing pressure on public health services, threatening community health and driving economic costs.	**Moderate**	Higher temperatures and heatwaves can lead to increase hospital admissions and affect NCDs. Food handling in households may become a significant food safety issue due to increasing air temperatures and limited cold storage. Increased pressure and costs for health service delivery.
	Extreme rainfall Increasing water contamination and health impacts associated with poor water quality will affect vulnerable communities and result in significant costs.	**Major**	Worsening flooding and inundation will increase exposure to water-borne diseases and contamination Hospital infrastructure will also be damaged with significant consequences for vulnerable communities and rising costs and pressure on the health system.
Nauruan workforce	**Extreme heat events** Heatwaves and hot days can cause heat-related illness and reduce workforce productivity with major effects on the economy, business continuity, water security, food security, infrastructure development, and both physical and mental health.	**Moderate**	More severe heatwaves and hots days will continue to reduce productivity and threaten the wellbeing of the Nauruan workforce. Significant flow-on effects for the economy and provision of essential services, such as education and healthcare, and resources, such as food and water.

2050 Low emissions scenario

Table 21: Health and wellbeing 2050 consequences (low emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Public health	**Heatwaves and extreme temperatures** Heat-related illnesses will continue to affect more people, whilst conditions will be more favourable for food-borne, infectious, and vector-borne diseases, placing pressure on public health services, threatening community health and driving economic costs.	**Major**	44-169 more hot days (over 32°C) per year will increase heat-related illnesses. NCDs will also increase with reliance on imported foods. Risks of vector-borne and diarrheal diseases will increase in a hotter mean climate. These impacts will have significant effects on community health, the public health system, economy, and livelihoods.
	Extreme rainfall Increasing water contamination and health impacts associated with poor water quality will affect vulnerable communities and result in significant costs.	**Extreme**	Increasing extreme rainfall (increase of 48 mm/day annual maximum daily rainfall) will be compounded by sea level rise (15-28cm) to significantly increase the risk of water contamination and vector-borne diseases. Widespread mental and physical health impacts will place pressure on exposed health infrastructure and affect community wellbeing and productivity.
Nauruan workforce	**Extreme heat events** Heatwaves and hot days can cause heat-related illness and reduce workforce productivity with major effects on the economy, business continuity, water security, food security, infrastructure development, and both physical and mental health.	**Major**	An increase in annual hot days (>32°C) of 44-169 days will have major effects on worker health and productivity as it becomes too hot to work outdoors at certain times of day and year. Physical and mental health of vulnerable communities will be adversely affected by the reduction in livelihoods, food security, economic development, and infrastructure development.

2050 High emissions scenario

Table 22: Health and wellbeing 2050 consequences (high emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Public health	**Heatwaves and extreme temperatures** Heat-related illnesses will continue to affect more people, whilst conditions will be more favourable for food-borne, infectious, and vector-borne diseases, placing pressure on public health services, threatening community health and driving economic costs.	**Extreme**	69-242 more hot days (over 32°C) will significantly increase incidence of heat-related illness and morbidity from heat stroke. Existing health conditions and NCDs will be exacerbated, placing both chronic and acute pressure on public health services with widespread effects on physical and mental health, and economic productivity.
	Extreme rainfall Increasing water contamination and health impacts associated with poor water quality will affect vulnerable communities and result in significant costs.	**Extreme**	Increasing extreme rainfall (increase of 54 mm/day annual maximum daily rainfall) will be compounded by sea level rise (19-33cm) to cause widespread flooding and inundation that increases the risk of disease and health impacts associated with poor water quality (for example, diarrhea). Vector-borne diseases may also increase in wetter conditions. Vulnerable communities, particularly in exposed coastal locations, will face extreme threats to physical and mental wellbeing, with significant pressure and costs for health services.
Nauruan workforce	**Extreme heat events** Heatwaves and hot days can cause heat-related illness and reduce workforce productivity with major effects on the economy, business continuity, water security, food security, infrastructure development, and both physical and mental health.	**Major**	An increase in annual hot days (over 32°C) of 69-242 days will have major effects on worker health and productivity. For the Oceania region, heat associated with a 2°C global warming is projected to cause a 12.9% reduction in labour productivity for agriculture, a 4.24% reduction for manufacturing, and a 0.12% reduction for services. There will be widespread impacts on workers' physical and mental health, with potential loss or disruptions to the economy, essential services, business continuity, water security, food security, and infrastructure development.

Confidence

Table 23: Health and wellbeing confidence ratings

Component	Hazard	Confidence score	Comments
Public health	**Heatwaves and extreme temperatures** **Sea level rise and extreme rainfall**	**Medium**	• Despite high confidence in overall health consequences, confidence is reduced because there is limited information available on water-borne disease and the effects of poor water quality on the population. • There is also llimited Nauru-based projections for public health pressures and information regarding the quantitative impact of extreme heat.
Nauruan workforce	**Extreme heat events**	**Medium**	• Although strong confidence in future exposure and high-level impacts, confidence is reduced due to the limited Nauru-specific information available on the impacts of extreme heat on worker health and wellbeing.

Knowledge Gaps

- Limited Nauru-specific information regarding the potential future impact of hazards on health and productivity of workforce.
- There is limited information available with regards to how mental health related issues are likely to unfold under future climate in Nauru.
- No specific record of heat-stress related hospital admissions

5.3 Agriculture

Summary of this Sector

Agriculture in Nauru is mainly for domestic consumption, grown in kitchen gardens with some households producing root crops, in addition to bananas and coconuts, mostly on a subsistence basis. Formal agriculture in Nauru mainly revolves around breadfruit trials. The growth of 'wild food species', such as mango, is confined to the rich, black soils of the Buada district. Pigs and chickens are also farmed for domestic consumption.

Past reliance on mining income has reduced agricultural production and capability in Nauru, with reintroduction limited by water availability and quality, combined with soil fertility, land and capability constraints. As a result, Nauruans remain heavily dependent on expensive imports for up to 90% of food.

There are two major components of Nauru's agriculture sector:

Table 24: Significant sub sectors in the agriculture sector of Nauru.

Sub sector	key components of the sub-sector
Crops	• Breadfruit, bananas, and coconuts, some root crops • Home gardens
Livestock	• Pigs and chickens

R3: Risks to agriculture

The below risk statement (**R3**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for agriculture that have been identified and analysed.

Table 25: R3 risk statement and information

Concise risk statement
Chronic and acute climate hazards will increasingly impact the suitability of crop and livestock agriculture on the island, which is important for food security and the culture of Nauru.
Hazards affecting this domain
• Drought • Rising temperatures and extreme heat • Sea level rise, extreme sea level events and coastal inundation • Extreme rainfall
Impacts on this domain
• More water required to upkeep agriculture practices due to extreme heat • Saltwater contamination impacts freshwater lens • Reduced land available for farming • Outdoor worker productivity and health impacted by extreme heat • Potential for increased invasive species, pests, and diseases • Increased **annual rainfall** will increase water supply if delivery and storage infrastructure is maintained and improved. However, water demand is likely to increase with a larger population living under more **extreme temperature** conditions. Therefore, while **drought** may occur less frequently, water availability will still be

limited during these times, affecting community health, industry and agricultural production. Flood damage and reduced access to farms
- Waterlogging and inundation of crops
- Coastal inundation of home gardens

Vulnerability factors relevant to this domain in Nauru

- Proximity of limited arable land to the coast
- Low soil carbon and limited soil moisture retention capacity
- Thin layer of topsoil increases vulnerability to soil loss through runoff and erosion
- Historical phosphate mining and dependence on imported foods diverted labour and investment in agriculture
- Limited access to fresh water

Consequence to Nauru

- Increasing competition for water
- Public health impacted by decreased food security and poor diets (relying on imported, processed food)
- Loss of culture and income

Current and future hazard exposure and impacts

Average and extreme temperature

- Rising mean temperatures and extreme heat events both affect the suitability for agricultural production in Nauru. Extreme heat causes stress for crops and livestock, with associated increase in water demand. Higher air temperatures may change invasive species, pests, and disease dynamics..
- Extreme heat can also affect agricultural productivity by causing heat stress for farm and garden workers, reducing labour productivity.
- An increase in annual hot days (over 32°C) of 44-242 days per year and a rise in annual average temperature of 0.9-2°C by 2050 (across low and high emissions scenarios) will compound the impact of rising sea levels to reduce the productivity of crops, home gardens, livestock, and workers with significant implications for the food security, livelihoods, public health, and culture of Nauru.

Drought

- Water availability is a key limiting factor for agricultural productivity in Nauru. Drought thins the freshwater lens of groundwater reservoirs and reduces the availability of freshwater sources for agricultural purposes, including crop irrigation and animal husbandry, decreasing crop and livestock suitability.
- Droughts that occur in a hotter mean climate with more significant saline intrusion and a higher population will increase vulnerability and place increasing pressure on freshwater resources. This will cause more significant impacts including reducing crop and livestock suitability and productivity. Communities will be affected by the loss of important sources of nutrition and cultural heritage.
- Droughts have led to reduced ground water and associated death of many coconut trees in the past. This has meant that coconut seedlings had to be imported from the Solomon Islands. This increases the risk of diseases being introduced from another country leading to a decline in production of coconuts while trees mature.

Sea level rise and coastal inundation

- Extreme sea level events are reducing crop productivity by contaminating the groundwater, reducing the amount of arable land available for cropping, and causing saline intrusion of soil. This is compounding the impact of drought and extreme heat events by reducing available land and water.

- Sea level rise of 15-33cm by 2050 (across low and high emissions scenarios) threatens to inundate up to 14% of remaining arable land and salinise groundwater reservoirs and soil with significant implications for the suitability breadfruit, pandanus, and coconut crop production, with flow on effects for the food security, public health, and culture of Nauru.
- Figure 6 below shows coconut crops (a proxy for productive land) exposed to king-tide inundation both currently and after 50cm of sea-level rise (expected around 2070). The colours indicate whether land elevation beneath coconut crop feature is below static water level elevation (red indicated exposure).

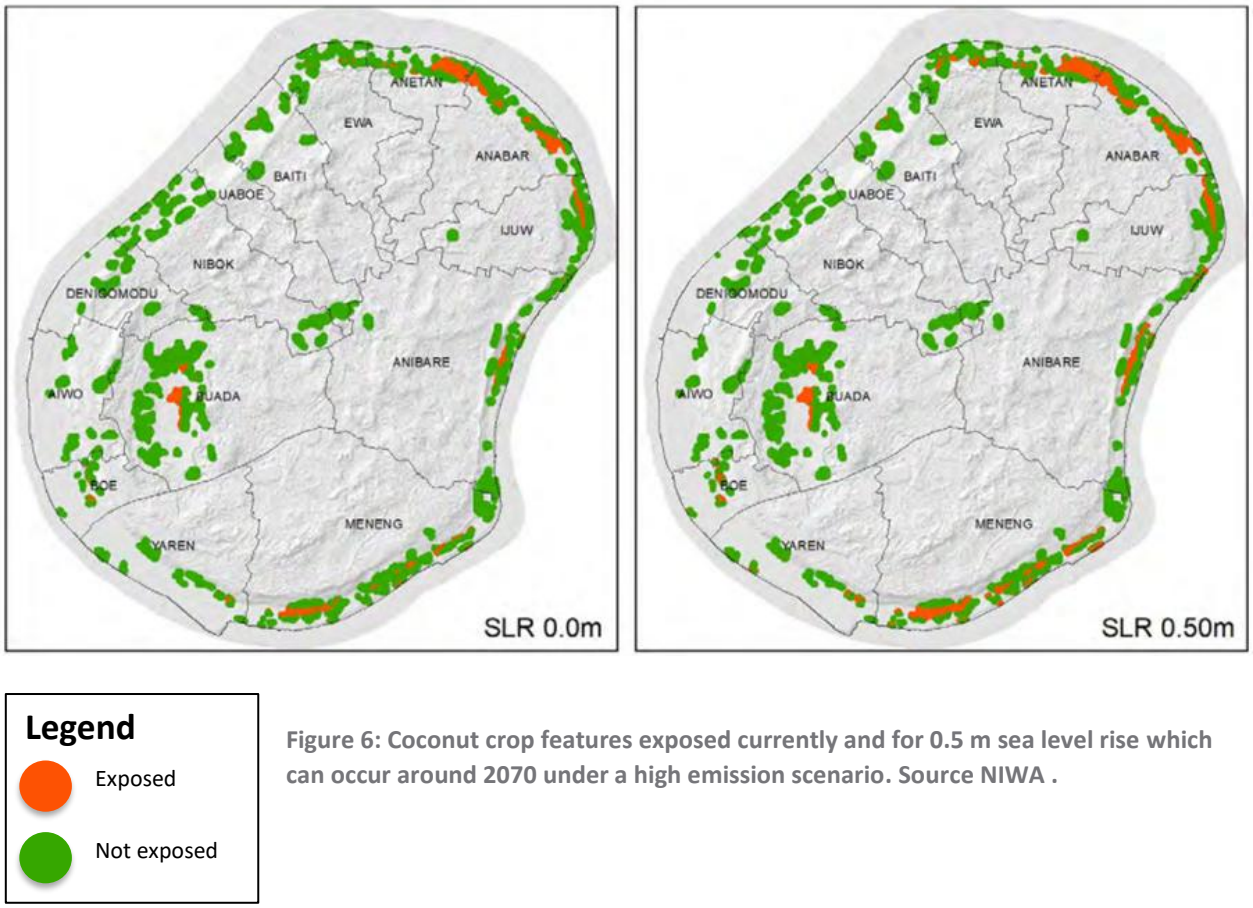


Figure 6: Coconut crop features exposed currently and for 0.5 m sea level rise which can occur around 2070 under a high emission scenario. Source NIWA .

Extreme rainfall

- Extreme rainfall can affect crops and reduce land productivity through direct damage, waterlogging, increased disease pressure, soil erosion and reduced access to farms.
- Projected 48 to 54 mm/day increase in annual maximum daily rainfall by 2050 (across low and high emissions scenarios) may increase damage to crops, as well as exacerbating exposure to disease e.g., by the fungi *Phytophthora palmivora* which causes rot in breadfruit. Reduced agricultural productivity through increasing impacts to crops and arable land threatens the food security of Nauruan communities.

Vulnerability

The below table (Table 26) presents sources of agriculture vulnerability to hazards in Nauru.

Table 26: Agriculture vulnerability summary

Hazard	Factor relevant for vulnerability

All hazards	• Yellow crazy ants have been found in Nauru which eat crops (SPC 2015) • Historical phosphate mining and dependence on imported foods has diverted labour and investment away from agriculture • No bees for pollination, instead relying on wasps, flies, moths, butterflies and hand pollination • Reliance on international aid and imports inhibits community-based adaptation efforts, such as community gardens, by reducing incentive to grow food • Population density and limited farmland in the bottom side region reduces potential for any large scale livestock or cropping activities • Less than 10% of households maintain some sort of vegetable garden and no major livestock farming • Higher population and increasing demand for food and increasing competition for water resources
Average temperature and extreme temperature	• Water is prioritised for human consumption during extreme heat and drought events, reducing water availability for livestock and crops • Pigs and chickens (integral to self-sufficiency) are prone to heat stress
Drought	• Limited water storage capacity reduces water availability and water quality for livestock and kitchen gardens during drought
Sea level rise and coastal inundation	• Land degradation due to phosphate mining has isolated remaining arable land to coastal regions vulnerable to inundation
Extreme rainfall and average rainfall	• Lack of vegetation can result in soil erosion during heavy rainfall

Complex risks

Agricultural risks can interact with and compound other risks with significant consequences for community health and livelihoods in Nauru. For example:

- **Water security:** Extreme heat and drought, coupled with potential water scarcity will have major impacts affecting both agriculture and domestic use of potable water. Water is prioritised for people first, reducing water access for livestock and kitchen gardens.
- **Social cohesion:** Rising sea levels will pose problems for agriculture in terms of competing land for agriculture activities.
- **Human health and wellbeing:** Despite relying on imports, Nauru's food security remains vulnerable to drought and climate change. Rising temperatures and erratic rainfall reduce local crop yields and strain household gardens. Increased droughts limit freshwater for irrigation, while climate-related disruptions to global supply chains can drive up food costs and reduce availability., placing a higher burden on public health.
- **Infrastructure**: Increased risk of power outages will affect the agricultural sector through inability to access water supply from desalination units.

Consequence

Current

Table 27: Agriculture current-day consequences

Component	Dominant hazard	Risk rating	Comments
Crops	Increased annual-average rainfall will increase fresh-water access if delivery and storage infrastructure is maintained and improved. However, demand for water resources is likely to increase with higher evaporation due to more extreme temperature conditions. Therefore, while drought may occur less frequently, water availability will still be limited when drought occurs, affecting crop production.	**Moderate**	Drought is causing scarce water resources to be prioritised for domestic use, reducing the potable water available for agricultural uses.
	Sea level rise Saline intrusion and extreme sea level events erode arable land and reduce soil quality, affecting crop productivity and cultural practices in Nauru.	**Moderate**	Sea level rise is inundating and salinising arable coastal land, potentially reducing the productivity of breadfruit and coconut crops (8% exposed to king tide inundation) which can have some implications on food security and cultural practices including traditional medicine. Rising sea levels are also salinising Buada Lagoon, affecting food resources such as bananas, pineapples, vegetables, pandanus and indigenous hardwoods.
Livestock	**Drought** Water availability is a key limiting factor for raising livestock, especially pig production, thus drought is limiting agricultural productivity and potentially affecting the public health, food security and economy of Nauru.	**Moderate**	Drought is causing scarce water resources to be prioritised for domestic use, reducing the potable water available for agricultural uses.

2030 Low and high emissions scenario

Table 28: Agriculture 2030 consequences (low and high emissions scenarios)

Component	Dominant hazard	Risk rating	Comments
Crops	**Sea level rise** Saline intrusion and extreme sea level events erode arable land and reduce soil quality, affecting crop productivity and threatening food security and cultural practices in Nauru.	**Moderate**	Sea level rise of 10-18cm will see 8-10% of productive land (using coconut crops as a proxy) exposed to king-tide inundation as well as increasing salinity in Buada Lagoon and groundwater. Lower crop productivity will reduce agricultural productivity, affecting food and economic security, health, and cultural practices.
Livestock	**Drought** Water availability is a key limiting factor for raising livestock, especially pig production, thus drought is reducing agricultural productivity and affecting the public health, food security and economy of Nauru.	**Major**	Water scarcity will cause increasingly saline groundwater to be used for livestock rearing activities such as watering pigs Communities will be impacted by lost livelihoods and reduced public health and productivity.

2050 Low emissions scenario

Table 29: Agriculture 2050 consequences (low emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Crops	**Sea level rise** Saline intrusion and extreme sea level events erode arable land and reduce soil quality, affecting crop productivity and threatening food security and cultural practices in Nauru.	**Moderate**	Sea level rise of 15-28cm will see 8-14% of productive land (using coconut crops as a proxy) exposed to king-tide inundation as well as increasing salinity in Buada Lagoon and groundwater. Increased reliance on imported foods can have direct impacts on public health and wellbeing. Cultural practices involving coconut and pandanus crops will also be affected.

Livestock	**Drought** Water availability is a key limiting factor for raising livestock, especially pig production, thus drought is reducing agricultural productivity and affecting the public health, food security and economy of Nauru.	**Major**	Increased annual-average rainfall will increase fresh-water supply if delivery and storage infrastructure is maintained and improved. However, livestock demand for water resources is likely to increase under more extreme temperature conditions. Therefore, while drought may occur less frequently, water availability will still be limited when drought occurs, affecting livestock production. Adverse effects on livestock may lead to economic challenges for communities' leading to reduction in mental wellbeing.

2050 High emissions scenario

Table 30: Agriculture 2050 consequences (high emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Crops	**Sea level rise** Saline intrusion and extreme sea level events erode arable land and reduce soil quality, affecting crop productivity and threatening food security and cultural practices in Nauru.	**Major**	Sea level rise of 19-33 cm will see 10-14% of productive land (using coconut crops as a proxy) exposed to king-tide inundation as well as increasing salinity in Buada Lagoon and groundwater. Increased reliance on expensive and processed imported foods will have significant direct impacts on public health and wellbeing Cultural practices involving coconut and pandanus crops will also be affected.
Livestock	**Drought** Water availability is a key limiting factor for raising livestock, especially pig production, thus drought is reducing agricultural productivity and affecting the public health, food security and economy of Nauru.	**Major**	Nauru will be more vulnerable to future periods of water scarcity due to a hotter climate with more significant saline intrusion and higher population. As a result, drought will significantly reduce water available for livestock rearing. Widespread, lasting impacts on the food security, health, and economic productivity of vulnerable communities.

Confidence

Table 31: Agriculture confidence scores

Component	Hazard	Confidence score	Comments
Crops	**Sea level rise**	**Medium**	• Limited information regarding location of crop plantations and the resilience to salinity reduces the high confidence in inundation projections
Livestock	**Drought**	**Medium**	• Moderate confidence due to some uncertainty in the net impact of future drought and increases in temperature, sea level and population on water availability.

Knowledge Gaps

- Limited quantitative information on how different emissions scenarios will affect livestock.
- Limited information on tolerance levels of crops to salinity.

5.4 Fisheries and marine resources

Summary of this Sector

The primary objective of the fisheries sector in Nauru is to protect food security and maximise significant revenue for Nauru. The revenue earned from oceanic fisheries underpins significant government investment in health, education, and related services. Fisheries also have cultural significance for Nauru.

There are three major subsectors in the Nauru fisheries sector, as described in the below table.

Table 32: Significant Sub sectors in the fisheries sector of Nauru.

Sub sector	Importance
Oceanic fisheries	Important for revenue security. Tuna access fees currently total US$29.6million annually, providing roughly 31% of government revenue.
Coastal fisheries	Important for food security. Gillett (2016) recorded coastal commercial fisheries production at 163 tonnes, and coastal subsistence fisheries production at 210 tonnes, for a total of 373 tonnes in 2016, worth $2,036,713 USD. 72.3% of Nauruan households engage in fishing for home consumption.
Aquaculture	Important for food security and cultural significance. Aquaculture provides food and income for Nauruans. The primary aquaculture species is milkfish “ibiya” (*Chanos chanos*) farmed in Buada Lagoon. Milkfish farming is a tradition and already established at the time of European arrival on Nauru.

R4: Risks to fisheries and marine resources

The below risk statement (**R4**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for fisheries that have been identified and analysed.

Table 33: R4 risk statement and information

Concise risk statement
Chronic and acute climate hazards will increasingly impact the viability of oceanic and coastal fisheries and aquaculture, which are important for both economic and food security, and hold cultural significance in Nauru.
Hazards affecting this sector
• Extreme temperature • Drought • Sea surface temperature, marine heatwaves, and ocean acidification • Sea level rise, extreme sea level events and coastal inundation • Extreme rainfall

Impacts on this sector
• Damage to critical marine habitat reducing fish stocks • Decreased sustainability of coastal fisheries • Changing capacity for aquaculture • Eastward shift relative to current position of oceanic fish stocks • Potential fish spoilage • Reduced resilience of reefs and coastal fisheries to runoff pollution, marine heatwaves, ocean acidification
Vulnerability factors relevant to this sector in Nauru
• Some reliance on coastal resources for food security • High reliance on fishing licences for national revenue • Limited drainage facilities increase exposure to phosphate mining and run-off that affects coral reefs • Overfishing has depleted coastal fish stocks, reducing fisheries resilience to climate hazards • Lack of implementation and enforcement of traditional or legislative restrictions on coastal fishing
Consequence to Nauru
• Significant loss of key revenue sources and livelihoods • Increased food insecurity and flow-on effects for public health • Loss of cultural practices

Current and future hazard exposure and impacts

This section discusses the exposure to, impact of, climate hazards on the fisheries sector in Nauru.

Extreme temperature

- Extreme temperature can affect fisheries operations by increasing the rate of fish spoilage and reducing worker productivity.
- With the number of annual hot days (over 32°C) expected to increase by 44 to 242 days per year (across low and high emissions scenarios) by 2050, the impacts of extreme heat will become more severe. It may be too hot for fishers to work at certain times of the day and year. This will affect the food security and livelihoods of local communities.

Drought

- Drought can reduce aquaculture operations in the rainfall-dependent Buada Lagoon. Lower water levels reduce milkfish farming capacity, and the lack of groundwater recharge can increase the salinity of groundwater sources.
- Water shortages can also cause salt build-up on fishing equipment and infrastructure.
- Whilst drought projections are uncertain (e.g., less drought under a low emission scenario but similar to baseline under a high emission scenario), prolonged dry spells that occur in a hotter environment with increased demand for aquaculture will place significant stress on aquaculture operations. This will threaten important sources of food, income, and cultural significance.
- Rising water temperatures can compound the impacts of reduced water and increased demand due to population growth can, cause chronic stress in juvenile milkfish (Hanke et al. 2019).

Sea surface temperature

- Sea surface temperature impacts the location of prime fishing grounds because different species of oceanic fish have limited ranges of sea surface temperature in which they live. As a result, east-west displacements of skipjack tuna are correlated with ENSO leading to large fluctuations in catches. During La Niña events, there are lower catches in Nauru as fish follow warm water further west. During El Niño events, higher purse-seine catches are made in the central pacific, such as Nauru.
- As sea surface temperatures continue to increase, good fishing grounds could be displaced further eastward along the equator or shift to higher latitudes, with a projected 6.5% decrease in tropical tuna biomass in the Western Central Pacific Ocean by 2050 in a high emissions scenario (Bell et al 2021). This will significantly affect a critical source of revenue for Nauru. There is high uncertainty in ENSO projections and the timing and magnitude of tuna redistributions for Nauru.
- In conjunction with other climate impacts, sea surface temperature also directly and indirectly effects the distribution and production of coastal fish and invertebrates.
- .

Marine heatwaves

- Marine heatwaves are already causing coral bleaching in Nauru, damaging reef ecosystems and coastal fisheries.
- Marine heatwaves also impact the migration, spawning and viability of fish and other aquatic species, such as hawksbill turtles.
- By 2050, it is projected that the number of annual marine heatwave days will increase from 16 to 105-270 days (across low and high emissions scenarios), resulting in an increase in coral bleaching days per year from 6.3 to 92-344 days. Compounded by overfishing, this could lead to the collapse of reef ecosystems and coastal fisheries, especially given the low coral diversity and low potential for recruitment due to the distance from other islands, threatening a critical source of food, income, coastal protection, and cultural significance for Nauruans.
- Threaten a critical source of food for Nauruans.

Ocean acidification

- Ocean acidification and aragonite saturation pose a significant global threat to the long-term viability of corals, shellfish, and fish. Ocean acidification compounds the impacts of increasing sea surface temperatures and marine heatwaves, negatively affecting coral growth and decreasing chlorophyll concentrations (an indicator of phytoplankton biomass which supports the marine food chain). Lower pH may also affect sound attenuation, creating a noisier environment, impact the metabolic demands of fish and stunt growth during the larval stage.
- Habitat loss, shifting fisheries and reduction in fish size reduces commercial and subsistence catches and adversely impacts biodiversity.
- Decrease in aragonite saturation from 3.8 to 3.5-3.2 by 2050 (across low and high emissions scenarios) will cause coral growth to enter a marginal state, continuing to compound the impacts of other hazards to alter fish distribution and physiology, reduce the productivity of coastal and oceanic fisheries and degrade coral reefs. Subsistence catches and commercial coastal fishing will be impacted with implications for food security and livelihoods.

Sea level rise and coastal inundation

- Sea level rise is impacting fisheries by changing the coral makeup of reef habitats and reducing the physical protection of Nauru provided by coral reefs. The highly sensitive nature of coral reef ecosystems makes parts of these habitats vulnerable to changes in sea level which can limit access to sunlight, causing some coral species to die and changing the structure of reefs.
- Damage to reef habitats is placing pressure on coastal fish stocks and reducing the ability of reefs to protect Nauru from wave incursion, potentially exposing communities, infrastructure, and turtle nesting sites to wave related damage and inundation.
- Sea level rise of 15-33cm by 2050 (across low and high emissions scenarios) threatens coral reefs. Combination of rising sea levels, increased ocean temperatures, and ocean acidification poses significant threats to coral health. These factors can lead to coral bleaching, reduced growth rates, and ultimately, reef degradation. If sea levels rise too quickly or if environmental conditions worsen significantly, it can stress coral ecosystems, making them less resilient and more susceptible to mortality, potentially leading to the loss of coral reefs over time. Increased wave energy with rising sea levels may damage and destroy already stressed reef ecosystems, reducing fish stocks, and exposing coastal communities to erosion and inundation.

Heavy swells

- In Nauru, the conditions of “safe fishing days” require windspeeds below 25 knots. High winds and associated swells threaten the small boats used for coastal fisheries.
- Future high waves from remote tropical cyclones may reduce the number of “safe fishing days”, lowering productivity and potentially endangering fishers.

Extreme rainfall

- Extreme rainfall can cause nutrient, waste, and sediment runoff directly into coastal marine habitats, with pollutants potentially harming ecosystems and impacting fisheries.
- Projected 48 to 54 mm/day increase in annual maximum daily rainfall by 2050 (across low and high emissions scenarios) will cause worsening run off and pollution of coral reefs and coastal marine ecosystems. This damage to already-stressed ecosystems threatens the productivity of coastal fisheries and thus the food security and livelihoods of local communities.

Vulnerability

The below table (Table 34) presents sources of fisheries vulnerability to climate related hazards in Nauru.

Table 34: Fisheries vulnerability summary

Hazard	Factor relevant for vulnerability
All hazards	• Overfishing and limited protected areas have depleted fish stocks, reducing fisheries resilience to climate hazards • Higher population relates to increasing demand for fish and aquaculture • Lack of implementation and enforcement of traditional or legislative restrictions on coastal fishing
Average temperature and extreme temperature	• Limited cooling infrastructure available for local fishers
Drought	• • Drought increases the vulnerability of Nauru’s fisheries by reducing freshwater availability, which can affect aquatic habitats, particularly inshore ecosystems

	like lagoons and coral reefs. Lower freshwater input can lead to higher salinity, disrupting fish populations and local biodiversity. This, in turn, threatens food security and livelihoods reliant on fishing.
Sea surface temperature	• Reliance on oceanic fishing licences for the country's revenue increases vulnerability to changes in sea surface temperature that may displace fish stocks
Marine heatwaves, sea level rise and ocean acidification	• Reliance on coastal fisheries for community's food supply can result in overfishing and increases vulnerability to marine heatwaves, sea level rise and ocean acidification that threaten coastal fisheries
Heavy swells	• Local use of small fishing boats that are not safe during high wind/wave days
Extreme rainfall and average rainfall	• Limited drainage facilities increase exposure to phosphate mining run-off that may affect coral reefs

Complex risks

Fisheries climate-related risks can interact with and compound other risks with significant consequences for community health and livelihoods in Nauru. For example:

- **Cross-cutting:** Loss of income from reduced catch and lower fish availability in ocean fisheries will have significant consequences for the Nauruan economy, with flow on effects across the nation.
- **Human health and wellbeing:** Reduced productivity of coastal fisheries and aquaculture catch will have flow on consequences for the health sector, creating nutrient deficiencies and other health impacts.
- **Community and culture:** Disruption to coastal fishing and aquaculture will have flow on consequences for cultural practices, resulting in a loss of shared identity, values, and beliefs.

Consequence

Current

Table 35: Fisheries current-day consequences

Component	Dominant hazard	Risk rating	Comments
Oceanic fisheries	**Sea surface temperature** Present day impacts of sea surface temperature is minimal but can change in future.	**Minor**	Minor disruptions and impacts to government revenue and employment.
Coastal fisheries	**Marine heatwaves and sea surface temperature** Coral bleaching and rising SSTs is compounding with the impacts of overfishing resulting in reduced resilience of coastal fish stocks and reef ecosystems.	**Moderate**	In 2005, Nauru experienced a 'mysterious' fish kill speculated to be caused by algal bloom and/or heat shock triggered by prolonged elevated water temperature, or an upwelling of de-oxygenated water from depth.
Aquaculture	**Drought** Rainfall is a key limiting factor for aquaculture in Nauru because Buada Lagoon is rainfall dependent and sensitive to drought affecting the ability to farm milkfish, a culturally important source of food and revenue for local communities.	**Moderate**	Water scarcity is already affecting aquaculture, with up to half of Buada Lagoon drying up during long periods of drought, significantly reducing the milkfish farming capacity. This has affected communities' food, livelihoods, and cultural practices.

2030 Low and high emissions scenario

Table 36: Fisheries 2030 consequences (low and high emissions scenarios)

Component	Dominant hazard	Risk rating	Comments
Oceanic fisheries	**Sea surface temperature** Changes in SST may displace good fishing grounds, affecting the availability of tuna species that support the Nauru economy	**Moderate**	No specific projection of Tuna fish displacement is available for 2030. However, studies (Bell et al 2021) have

	through access fees with consequences for the provision of essential services and community wellbeing.		shown potential tuna displacement in 2050. See 2050 timeframe for more information.
Coastal fisheries	**Marine heatwaves and sea surface temperature** Coral bleaching and rising SSTs will compound the impacts of overfishing to deplete and reduce the resilience of coastal fish stocks and reef ecosystems with major consequences for the food security and livelihoods of Nauruans**.**	**Major**	Severe coral bleaching may occur on an annual basis by 2035 under RCP8.5, with significant impact to coral reefs and dependant coastal fisheries. Reduced catch from fishing will significantly impact food security and commercial fishing, threatening community health, wellbeing, and livelihoods.
Aquaculture	**Drought** Rainfall is a key limiting factor for aquaculture in Nauru because Buada Lagoon is rainfall dependent and sensitive to drought affecting the ability to farm milkfish, a culturally important source of food and revenue for local communities.	**Moderate**	Milkfish farming can be impacted in drought periods. Although drought is likely to become less frequent in 2030 compared to baseline other factors such as saline intrusion, higher temperature can potentially impact aquaculture. This threatens the livelihoods, culture, and food security of local communities.

2050 Low emissions scenario

Table 37: Fisheries 2050 consequences (low emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Oceanic fisheries	**Sea surface temperature** Changes in SST may displace good fishing grounds, threatening the availability of tuna species that support the Nauru economy through access fees with consequences for the provision of essential services and community wellbeing.	**Moderate**	Although the average purse-seine catch of tuna is projected to increase by 5.7% by 2050 under RCP4.5, with a 1.7% increase in revenue, significant uncertainty in SST projections reduce confidence in these projections. Good fishing grounds could be displaced further eastward along the equator or shift to higher latitudes, with significant effects on government revenue.
Coastal fisheries	**Marine heatwaves and sea surface temperature** Coral bleaching and rising SSTs will compound the impacts of overfishing to deplete and reduce the resilience of coastal fish	**Major**	Rising SSTs, 105-140 marine heatwave days per year and 92-236 coral bleaching days per year will cause widespread and significant coral mortality.

	stocks and reef ecosystems with major consequences for the food security and livelihoods of Nauruans.		Coastal fish habitats will be extensively damaged causing significant reductions in coastal fish stocks. Food security and commercial fishing will be severely impacted with widespread effects on community wellbeing and livelihoods in Nauru.
Aquaculture	**Drought** Rainfall is a key limiting factor for aquaculture in Nauru because Buada Lagoon is rainfall dependent and sensitive to drought affecting the ability to farm milkfish, a culturally important source of food and revenue for local communities.	**Major**	While droughts might be fewer in Nauru, when they occur, Nauru will be more vulnerable to these as they will occur in a hotter climate, and with increasing demand for aquaculture, there may be increased pressure on aquaculture in Buada Lagoon. Rising water temperatures can compound the impacts of reduced water during drought, causing chronic stress in juvenile milkfish. Communities will lose an important source of revenue and food, as well as cultural practices.

2050 High emissions scenario

Table 38: Fisheries 2050 consequences (high emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Oceanic fisheries	**Sea surface temperature** Changes in SST may displace good fishing grounds, threatening the availability of tuna species that support the Nauru economy through access fees with consequences for the provision of essential services and community wellbeing.	**Major**	Under RCP8.5, by 2050 the average purse-seine catch is projected to decline by 21.6%, with a 6.5% decrease in revenue. The loss of critical government revenue will have widespread flow on effects for the wellbeing of the community, affecting the provision of essential services, critical infrastructure, and development projects.

Coastal fisheries	**Marine heatwaves and sea surface temperature** Coral bleaching and rising SSTs will compound the impacts of overfishing to deplete and reduce the resilience of coastal fish stocks and reef ecosystems with major consequences for the food security and livelihoods of Nauruans**.**	**Extreme**	By 2050, increasing SSTs will cause coral reef fish biomass to decrease by 20% under a high emissions scenario. 180-270 marine heatwave days and 107-344 coral bleaching days per year will cause severe, widespread, and potentially irreversible damage to fragile reef ecosystems. The potential impact on coastal fisheries will impact food security and commercial fishing.
Aquaculture	**Drought** Rainfall is a key limiting factor for aquaculture in Nauru because Buada Lagoon is rainfall dependent and sensitive to drought affecting the ability to farm milkfish, a culturally important source of food and revenue for local communities.	**Major**	Aquaculture will be significantly impacted by periods of water scarcity occurring in a hotter climate with higher demand as the milkfish farming capacity of Buada Lagoon is reduced. Rising water temperatures can compound the impacts of reduced water, causing chronic stress in juvenile milkfish. Communities will lose an important source of revenue and food, as well as cultural practices.

Confidence

Table 39: Fisheries confidence ratings

Component	Hazard	Confidence score	Comments
Oceanic fisheries	**Sea surface temperature**	**Medium**	• Despite high confidence in impacts, confidence is reduced because there is considerable uncertainty in the timing and magnitude of tuna redistributions in Nauru due to the influence of ENSO on east-west displacements of skipjack tuna and the lower confidence in SST projections for the Pacific

Coastal fisheries and lagoons	**Marine heatwaves and sea surface temperature**	**Medium**	• Although there is high confidence in future impacts and consequences, confidence is reduced by the lack of specific coastal fisheries projections • There is also a lack of spatial uniformity in future coral bleaching reduces confidence
Aquaculture	**Drought**	**Medium**	• Moderate confidence due to some uncertainty in the net impact of projected changes in drought, demand, and water temperature

Knowledge Gaps

- No quantitative projections for changes to coastal fisheries stocks in different scenarios.

5.5 Disaster Management

Summary of this Sector

There are numerous examples of disasters causing significant loss of property and disruption to services in Nauru, often requiring impact assessments and financial compensation for loss and damage to individual landowners, businesses, and public entities. The Meteorology Service (**Met Service**) and Fire Service conduct awareness campaigns in schools, including annual fire and tsunami evacuations conduct for all 10 schools. School children are taught to follow designated evacuation pathways to higher ground, but the effectiveness of these Met Service sessions is limited because information is outdated, and evacuation is impeded by new houses that have been built on two of the evacuation pathways.

For Nauru, several components of the early warning system in 2024 were assessed as being at a moderate to low level of development. Currently, alert messages are also broadcast by telecoms for extreme sea levels, king tides and droughts. It has been recommended that Nauru seek to adopt the Climate Risk Early Warning Systems (**CREWS**) initiative which involves sensor-loaded wave buoys to strengthen their ocean monitoring and coastal inundation warning services. The development of the Division of National Disaster Management will (**DNDM**) will improve resilience and preparedness and ensure emergency services can operate in future scenarios.

Emergency services are crucial in disaster management in Nauru:

Table 40: Key features of emergency services in Nauru.

Sub sector	Key features
Emergency Services	• Early warning systems • Disaster response activities including four fire trucks • Disaster recovery initiatives and resources including international aid • Disaster management workforce (Division of National Disaster Management (DNDM), Meteorology and Hydrological Service, Ambulance, Lifeguard, National Disaster Risk Management Office)

R5: Risks to disaster management

The below risk statement (**R5**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for disaster management that have been identified and analysed.

Table 41: R5 risk statement and information

Concise risk statement
Chronic and acute climate hazards will increasingly impact disaster risk management and emergency services, which are important for reducing the impacts of disasters and protecting human health, essential services, and infrastructure in Nauru.
Hazards affecting this domain
• Extreme temperatures • Extreme rainfall • Sea level rise, extreme sea level events and coastal inundation • Drought • Fires

Impacts on this domain
• Coastal erosion exposing unexploded World War 2 unexploded ordnances • Increased risk of black-outs and cascading impacts for cooling, lighting, refrigeration, business, telecommunication, and transport which affects disaster response initiatives and coordination • Damage and disruption to property and infrastructure • High demand for emergency response and recovery services • Reliance on international aid
Vulnerability factors relevant to this domain in Nauru
• Lack of quality data to inform disaster risk reduction planning • Reverse Osmosis (RO) water is used for fire-fighting due to saline groundwater affecting the pipes and pumps of the fire truck, and limited water storage • Limited RO water delivery capabilities • Limited road network makes firefighting and other disaster response efforts vulnerable to disruptions • DNDM unit is a couple of years old and still establishing communication processes and emergency alerts • Early warning systems are not integrated, reducing effectiveness and efficiency of communication • Reliance on international aid • Low adaptive capacity with many households lacking resources and knowledge to deal with disasters • Extreme temperatures and drought increase the risk of fires • Two-thirds of households across Nauru reported having been impacted by a natural disaster in the last decade • There is greater than a 10 % chance of a potentially damaging tsunami occurring in the next 50 years. The whole of Nauru's coastline will be impacted during a tsunami, with the coastal road and some villages residences in the tsunami inundation zone • Proposed initiatives for coastal retreat are unfunded and require negotiations regarding land tenure.
Consequence to Nauru
• Risks to public health and safety both during and after disasters • Interruptions to essential services such as health, education, and transport • Loss of economic and agricultural productivity

Current and future hazard exposure and impacts

Extreme temperature

- Extreme temperatures can increase the demand for emergency services, including emergency water, power, health services and cooling, whilst also impeding disaster response activities by reducing labour productivity and causing black outs that disrupt telecommunications, reverse osmosis (RO) water production in the desalination plant, health services, transport, cooling, and lighting.
- An increase in annual hot days (over 32°C) of 44-242 days per year by 2050 (across low and high emissions scenarios) will place significant pressure on emergency services to both meet demand for services and carry out disaster response activities, with significant effects on community health and wellbeing.

Fires

- Increased risk of fire in a hotter climate will test Nauru's fire-fighting capacity, particularly during dry periods when water resources are limited. Managing fire risk will be crucial to protecting public safety, agriculture, infrastructure, biodiversity, and cultural sites.
- Fires during hot and dry seasons are likely to place pressure on emergency services given the limited water storage available in Nauru and the reliance on RO water for firefighting. Groundwater is not used in fire-

engines as it is too saline and can affect the integrity of machinery. Fires can also damage and disrupt the critical infrastructure (such as electricity, roads, and telecommunications) that underpin emergency services.

Drought

- Drought is a prominent climate hazard for households in Nauru, affecting 62.7% of households in the past ten years. Disaster management services provide both emergency water and financial support to the people of Nauru during drought. There are two thresholds to trigger emergency management activities. The first one triggers partial funding for vulnerable people for water delivery. While the second one triggers full amount funding for vulnerable people for water delivery, including subsidising road maintenance to enable water supply and boost generation of reverse osmosis water.
- The increased demand for desalinated water during drought, generally through water tanker deliveries, places pressure on disaster response services because existing tankers do not have capacity to deliver all orders within the schedule and some houses cannot be accessed by tankers, particularly on informal roads.
- Droughts which occur in a hotter climate with a higher population will place increasing pressure on emergency services and disaster response initiatives, including higher risk of fires, with increasing recovery costs and demand for RO water supply. This will have significant implications for public safety, agriculture and the economic wellbeing of individuals and the Nauruan government.

Sea surface temperature, marine heatwaves, and ocean acidification

- The damage and loss of coral reef ecosystems caused by rising sea surface temperatures, marine heatwaves and coral bleaching, and ocean acidification will continue to, expose coastal regions to more severe inundation. This may increase the demand for emergency services, including shelter and emergency resources, and damages critical disaster response infrastructure, threatening the safety of coastal communities and the provision of essential services.

Sea level rise and coastal inundation

- Extreme sea level events threaten infrastructure, property, agriculture, human health, and water security, increasing the demand for emergency response and recovery services, including shelter, basic resources, and compensation.
- Coastal inundation also disrupts disaster response initiatives by inundating roads and disrupting critical infrastructure such as ports, hospitals, power, and ICT systems.
- Unexploded ordnances (**UXO**) from World War II are also increasingly exposed by coastal erosion, creating significant public safety hazards that require Australian Defence Force to discharge.
- Sea level rise is projected to be 15-33cm (across low and high emissions scenarios) by 2050. When superimposed on king tides and wave actions, higher sea levels can be expected to cause worsening coastal erosion, wave inundation, freshwater contamination, and risks to human safety that will increase the demand for disaster management and emergency services. In addition to significant recovery costs, emergency response infrastructure and assets may be exposed to damage from coastal inundation, inhibiting response activities with implications for public safety, livelihoods, and essential services in Nauru.
- Nauru has a medium tsunami hazard level (a greater than a 10 % chance of a potentially damaging tsunami occurring in the next 50 years). Sea level rise will exacerbate tsunami risk (pg 68 HA)

Extreme rainfall

- Floods increase demand for emergency services by damaging property and infrastructure, disrupting essential services, ICT connection (and the provision of emergency messages) and threatening public safety. In addition to providing shelter, emergency power and health services, flood responses also involve the provision of potable water as water catchments are affected by sediment and pollution.

- Increasingly severe extreme rainfall events (increase of 48-54 mm/day annual maximum daily rainfall by 2050 across low and high emissions scenarios) will drive high demand for emergency response and recovery services, with major impacts on the Nauruan economy and public safety, and increased reliance on international aid.

Vulnerability

The below table (Table 42) presents sources of disaster management vulnerability to hazards in Nauru.

Table 42: Disaster Management vulnerability summary

Hazard	Factor relevant for vulnerability
All hazards	• Increasing population is increasing demand for water resources and energy • People are highly reliant on RO water • Lack of quality data to inform disaster risk reduction planning • RO water used for firefighting due to saline groundwater affecting the pipes and pumps of the fire truck. • No monitoring of underground water resources to assess extraction or salinity. Groundwater in central part of Topside is particularly low quality, considered brackish at the surface and seawater at 20m • DNDM unit is a couple of years old and still establishing communication processes and emergency alerts • Complete dependency of desalination plant on diesel generator makes it vulnerable to any disruption to supply of diesel due to disaster events. •
Drought	• Limited water storage capability reduces water availability and quality especially during drought, with 64% households main water supply prone to drying up. Nearly three-quarters of all households reported that their water supply dries up, with 8.4 percent of households reporting that this occurs frequently. • Coastal plants, such as coconut and pandanus, are not resilient to extended periods of drought • There currently are too few delivery trucks to distribute water adequately in times of drought, with 48.6% of Nauruans depending on RO water supply from tanker trucks for drinking water • 22.7% of households report being able to use relatives' or neighbours' water resources during drought, reducing vulnerability • Roughly two-thirds of households having guttering, of which one-third was reported as needing repair or replacement., reducing ability to harvest water
Average temperature and extreme temperature	• Extreme temperatures and drought increase the risk of fires • 21.8% of households do not have air-conditioning
Extreme rainfall and average rainfall	• Degraded and variable quality of both groundwater extraction and septic systems increases exposure to *E. coli* outbreaks and other diseases • Land-based pollution, mining run-off and sediment movement increases the vulnerability of water catchments and drains to flooding events

Sea level rise and coastal inundation	• Proximity of 93% population and infrastructure to the coast increases vulnerability to sea level rise and coastal inundation

Complex risks

Risks to disaster risk management can interact with and compound other risks with significant consequences for community health and livelihoods in Nauru.

- **Infrastructure:** Extreme heat events increase demand for emergency water and air-conditioned refuges while also causing power and ICT outages and disruptions to infrastructure and communication that inhibits desalination operations, the provision of emergency resources and communication of emergency messages.

Consequence

Current

Table 43: Disaster Management current-day consequences

Component	Dominant hazard	Risk rating	Comments
Emergency services	**Coastal inundation from king tides and storm surges** Worsening inundation and high community vulnerability to natural disasters threatens emergency response infrastructure and places significant pressure on emergency services to protect human health, property, infrastructure, and livelihoods.	**Moderate**	Coastal inundation events damage infrastructure and drive community demand for coastal protection infrastructure, early warning systems and access to emergency resources such as RO water. Post-disaster recovery assistance is required to repair damage. Unexploded ordnances from WWII are increasingly exposed by coastal erosion.

2030 Low and high emissions scenario

Table 44: Disaster Management 2030 consequences (low and high emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Emergency services	**Coastal inundation from king tides and storm surges** Worsening inundation and high community vulnerability to natural disasters threatens emergency response infrastructure and places significant pressure on emergency services to protect human health, property, infrastructure, and livelihoods.	**Moderate**	Continued sea level rise (7-14cm) in the near-term will drive coastal inundation events, threatening infrastructure, property, agriculture, human health and water security, and exposing unexploded ordnances. Major demand and pressure on emergency services to prepare and manage impacts of coastal inundation events. Disruptions to critical infrastructure supporting emergency services will affect the ability to carry out emergency response activities, threatening public health and safety.

2050 Low emissions scenario

Table 45: Disaster Management 2050 consequences (low emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Emergency services	**Coastal inundation from king tides and storm surges** Worsening inundation and high community vulnerability to natural disasters threatens emergency response infrastructure and places significant pressure on emergency services to protect human health, property, infrastructure, and livelihoods.	**Moderate**	Sea level rise (15-28cm) and storm events is likely to cause some damage and destruction to coastal regions, including exposing unexploded ordnances, increasing demand for emergency services, especially early warning systems and response activities. Disruptions and damage to critical infrastructure such as roads, ports, hospitals, power, and ICT systems will impact emergency response infrastructure and reduce the ability of emergency services to respond to events, threatening the safety of vulnerable communities.

2050 High emissions scenario

Table 46: Disaster Management 2050 consequences (high emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Emergency services	**Coastal inundation from king tides and storm surges** Worsening inundation and high community vulnerability to natural disasters threatens emergency response infrastructure and places significant pressure on emergency services to protect human health, property, infrastructure, and livelihoods.	**Major**	Continued sea level rise (19-33cm) and storm events will increase the severity of coastal inundation, causing damage, erosion, and exposing unexploded ordnances. Demand for emergency services, especially early warning systems, will also increase as the risk to infrastructure and human health becomes extreme. Disruptions and damage to critical infrastructure such as roads, ports, hospitals, power, and ICT systems will impact emergency response infrastructure and reduce the ability of emergency services to respond to events, threatening the health and wellbeing of the population.

Confidence

Table 47: Disaster Management confidence ratings

Component	Hazard	Confidence score	Comments
Emergency Services	**Coastal inundation from king tides and storm surges**	**Medium**	• Despite high confidence in exposure, confidence is reduced because it is unclear to what extent development of DNDM unit will improve resilience and preparedness, and ensure emergency services can operate in future scenarios

Knowledge Gaps

- Lack of information regarding local disaster response and impact assessment processes.
- Lack of information on how vulnerable demographics, such as the elderly and those with disabilities, are being explicitly targeted or planned for in emergency management processes and operations.

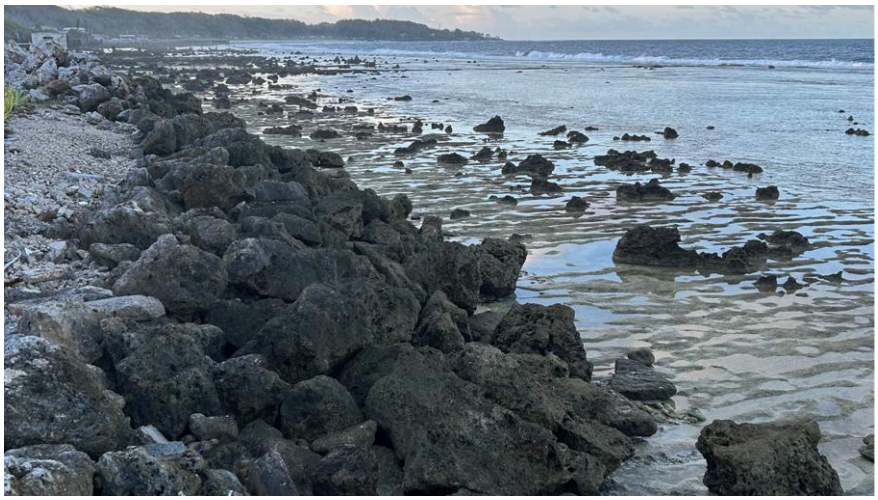
5.6 Coastal protection and infrastructure

Summary of this Sector

Currently, 93% of the Nauruan population live within 1km of the coast, and infrastructure within 100m of the coast accounts for 34% of the total asset number and 40% of the total infrastructure replacement value. The coastal proximity of Nauru's people and infrastructure is somewhat driven by the land degradation caused by historical phosphate mining which has made the "Topside" of Nauru largely uninhabitable.

For the purposes of this climate risk assessment, Nauru's infrastructure sector has been divided into the six sub-sectors as described in the below table:

Table 48: Significant sub sectors in the coastal protection and infrastructure sector of Nauru.

Sub sector	Importance
Coastal assets	Coastal defence structures made of concrete or large boulders sourced from broken-down pinnacles. Although some of Nauru's coastline is without seawalls, the overall length of seawalls increased from 2014 to 2020, with most new seawall sections built in Uaboe, Ewa and Ijuw. The quality of sea wall condition varies across the island: • Very good: 1 wall • Good: 11 walls • Fair: 11 walls, and • Poor: 4 walls. Fisheries infrastructure including boats, two boat ramps and fishing equipment.  **Figure 7: Coral sea wall in Nauru (Dave Rissik, Pers. Comms.)**
Internet and telecommunications	Cenpac Corporation and Digicel (owned by Telstra) are the telecommunication providers in Nauru. Internet and communications infrastructure will be upgraded with the implementation of the East Micronesia Cable that will provide quality, secure and reliable telecommunications connectivity via a submarine cable.
Transport and supply	A new port facility is currently under construction and will service shipping (including Nauru's main shipping vessel, the 'Micronesian Pride') and fishery industries, as well as supporting local business opportunities. Currently there are 72.5km of roads in Nauru. The longest section

	circumnavigates the island, while a few gravel roads access the topside area from different points around the island. Nauru's airport is located on the southwest corner of the island. Some land was reclaimed at the southern edge to accommodate the runway.
Energy security	Nauru Utilities Corporation, located adjacent to the port, provides both power and water to the community. Power is primarily provided by generators with maximum power demand 5-6MW each month. Currently 1.6MW of solar power is operating, with another 6MW anticipated to be online by the end of 2024.  **Figure 8: Electricity pole in Nauru (Dave Rissik, Pers. Comms.)**
Building and structures	Nauru's 2471 residential, commercial, government, industrial, education and health buildings are concentrated in coastal regions. Major infrastructure including the main Reverse Osmosis (**RO**) plant, hospital, government offices, and fire services are located in the Aiwo district which has higher elevation than the low-lying districts in the south and east of the island. Republic of Nauru (**RoN**) Hospital is located in Yaren and provides basic medical care. Special treatment is limited to diabetes and other obesity-related diseases at the Naoero Public Health Centre, run by the Department of Public Health.
Waste management	Waste is collected from households, government facilities, and businesses then transported to the Nauru Dump Site for disposal. There is no existing recycling process or disposal route for hazardous waste, however there are proposals for the implementation of the Nauru National Recycling Plan.

Figure 7: Dump site in Nauru (Dave Rissik, Pers. Comm.)

R6: Risks to coastal protection and infrastructure

The below risk statement (**R6**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for infrastructure that have been identified and analysed.

Table 49: R4 risk statement and information

Concise risk statement
Chronic and acute climate hazards will increasingly impact built infrastructure and hinder coastal protection, which are crucial for the livelihood and safety of Nauruan communities and economic development of Nauru.
Hazards affecting this domain
• Extreme rainfall • Wind and storm conditions • Extreme temperature • Drought • Sea level rise, extreme sea level events, changing wave direction and coastal inundation • Sea surface temperature, marine heatwaves, and ocean acidification
Impacts on this domain
• Damage to critical infrastructure and buildings from salt spray build-up, ocean acidification, rust, coastal inundation and erosion, flooding, overheating, and windborne debris • Reef loss • Power outages • Road and runway integrity affected by melting tar and potholes • Disruptions to port operations • Sediment and debris in drainage systems • Fallen trees disrupting transport infrastructure • Disruption and damage to port infrastructure and services due to extreme waves and flooding

- Loss of connectivity and transmission of critical internet services such as emergency weather updates
- Fires in the waste disposal area

Vulnerability factors relevant to this domain in Nauru

- Limited capability for repairing/maintaining equipment and infrastructure
- Proximity of communities and infrastructure to the coast increases vulnerability to extreme sea level events
- Poor condition of housing, construction materials, overcrowding, and limited household commodities leading to increased exposure to extreme temperature
- Ineffective drainage system and underdeveloped guttering
- Frequent, unplanned power outages
- Inconsistency in sea walls and potential changes in wave direction
- Land tenure requires negotiation for infrastructure development including relocation away from coastal areas

Consequence to Nauru

Coastal assets (Coastal defence structure, fisheries infrastructure)

- Damage to coastal defence infrastructure increases community and infrastructure exposure to inundation and requires increased spending to prevent further consequences to other sectors.
- Damage of fisheries equipment decreases productivity

Internet and telecommunications (Telecommunications towers, internet infrastructure)

- Disruption of internet and telecommunications affects the livelihood of Nauruans who access weather forecasts, tide information, and market prices through internet, access telemedicine consultation for medical advice or text blasts for emergency notifications.

Transport and supply (Roads, airport, and ports)

- Economic cost of the disruption and damage of roads, ports and airports assets, and services
- Impacts to Nauruan livelihoods as most food and medicine are imported.
- Health impacts from interrupted access to/for emergency services

Energy (Electricity poles, wires, generators)

- Loss of power can affect critical infrastructure such as transport, telecommunications, and wastewater, with disruption to services such as early warning systems for natural disasters, lighting and cooling, education, commerce, shops and hospitals.
- Health and safety consequences as blackouts disrupt critical health services and air conditioning during heatwaves and hot days.
- Disruption of reverse osmosis water supply. This water is used for consumption and firefighting.

Building and structures (Residential, commercial, Government, industrial, education buildings, health infrastructure)

- Health, safety, and productivity consequences as blackouts disrupt critical services and air conditioning during heatwaves and hot days.
- Flooding damage to buildings, including hospitals, houses, and schools, disrupts critical services and incurs major recovery costs.
- Implementation of digital clinical processes results in high reliance on internet connectivity

Waste management (Rubbish tips, wastewater management facilities, septic tanks)

- Contamination of water catchments, lagoon, and freshwater lens
- Contamination of coastal fisheries which supplement food security
- Fires in the waste dump impact air quality
- Sewage overflow into populated areas

Current and future hazard exposure and impacts

Extreme temperature

- Heatwaves and hot days increase electricity demand for cooling purposes whilst also disrupting power supply by potentially causing transformers to overheat and inhibiting critical maintenance (human heat stress). Loss of power can affect critical infrastructure, such as transport, telecommunications, and disrupt services such as early warning systems for natural disasters, lighting and cooling, education, commerce, shopping, reverse osmosis, and hospitals.
- Generators and batteries can provide back-up power for a few hours, but multi-day outages can cause major problems.
- Extreme heat can contribute to the deterioration of road surfaces, which is made worse by a lack of resurfacing.
- In future, an increase in annual hot days (over 32°C) of 44-242 days by 2050 (across low and high emissions scenarios) will significantly increase energy demand for thermal control (compared to present-day), whilst also disrupting critical maintenance and causing energy infrastructure (such as transformers) to overheat. The loss of power will threaten community health and livelihoods with cascading effects across multiple sectors, businesses, and communities.

Drought

- Prolonged dry periods, particularly during hot weather, can increase the risk of fires in the waste dumpsite. Toxic fumes can significantly impact human health and place pressure on emergency services.
- Drought can also cause salt spray build up on energy, fishing, and telecommunications infrastructure, reducing the productivity and connectivity of communities.
- Droughts which occur in a hotter climate with a higher population will increase the risk of landfill fires and cause worsening salt to build up on critical infrastructure, threatening the health, safety, productivity and connectivity of Nauruans.

Sea surface temperature, marine heatwaves, and ocean acidification

- Rising sea surface temperatures, marine heatwaves, and ocean acidification are damaging reef ecosystems. This weakens the coastal protection that coral reefs provide, reducing their ability to absorb the impact of extreme waves and coastal flooding, which puts communities and infrastructure at greater risk.
- Rising ocean acidification will continue to affect port and fishing infrastructure, particularly fixings such as nails, rivets, and bolts.
- By 2050, significant increases in sea surface temperature (up to 2.3 °C), marine heatwaves (increase from 16 to 105-270 days per year across low and high emissions scenarios) and ocean acidification (change in aragonite saturation from 3.8 to 3.5-3.2) will cause widespread, potentially irreversible damage to coral reefs, exposing coastal regions of Nauru to extreme sea level events and wave power. Inundation will threaten coastal-based infrastructure including roads, the airport and port, housing, schools, electricity poles and fishing infrastructure with widespread impacts on the public health, economy, and development of Nauru.

Sea level rise and coastal inundation

- Rising sea levels, king tides and storm surge threatens Nauru's critical infrastructure, with 34% of the total asset number and 40% of the total infrastructure replacement value currently located within 100 m of the coast. Estimated economic losses from coastal inundation will be USD 4.2-7.4 million by 2100 in the very high emissions scenario with health, safety and housing of community members compromised across the region.

- Coastal defence structures are threatened with overtopping and erosion from wave action. Continuing sea level rise and any change in wave direction can cause worsening erosion and rock displacement of sea walls, especially in aging walls with insufficient rock armour, exposing communities and coastal infrastructure to inundation, potential rock displacement and hazardous debris.
- The port is considered unsafe if swell over 0.5m washes in the narrow dock, with a storm event in January 2024 disrupting port development. Sea level rise of 15-33cm by 2050 (across low and high emissions scenarios) will cause the port to be increasingly exposed to extreme sea level events and wave damage, impacting trade and the provision of essential services.
- Transport and supply is also impacted by inundation of roads and the airport which, in addition to flooding, involves the movement of sand and debris which can impede safe travel and require extensive efforts to clear. Currently, 2.7km of roads are exposed to a 1-in-5-year inundation event and 382m of roads are below the current king tide level, with the lowest point of the paved runway only 0.3m above current king tide levels. By 2040, 624m of roads will be below the king tide level. Parts of the runway may become inundated for future sea level rise scenarios in timeframes well beyond 2050 e.g., a 0.5-2.0m rise. As a result, human health and wellbeing will face major threats during extreme sea level events as access to vital transport, food, water, and medical supplies is disrupted, essential services (including health care and disaster response initiatives) interrupted, and economic activities suspended.
- Inundation and flooding can damage and destroy private, government, commercial, education, health, and industrial buildings, with widespread impacts on community health, the economy and essential services. Continued sea level rise will increase the exposure of coastal buildings, with 49 buildings below the king tide level by 2060, and 16.7% of buildings inundated by a 1-in-5-year coastal inundation event by 2100. In total, 154 of 2471 buildings would be exposed under a 1.0m sea level rise scenario (which is likely to occur around 2120 under a high emission scenario), with the bulk of these being residential buildings. Flooding damage from inundation will have severe and widespread impacts on public safety, the provision of essential services and community development.

- Power supply is at risk from coastal inundation with electricity poles around the low-lying coastal fringe exposed to sea level rise. ICT connectivity can also be impacted by salinisation of the soil from sea level rise and spring tide inundation that affects the existing underground copper wire network. Sea level rise of 15-33cm by 2050 (across low and high emissions scenarios) will increase the exposure of electricity poles, particularly in the southern districts of Meneng and Yaren. Introduction of the East Micronesia Cable will reduce the risk of ICT disruptions by decreasing reliance on the copper network.

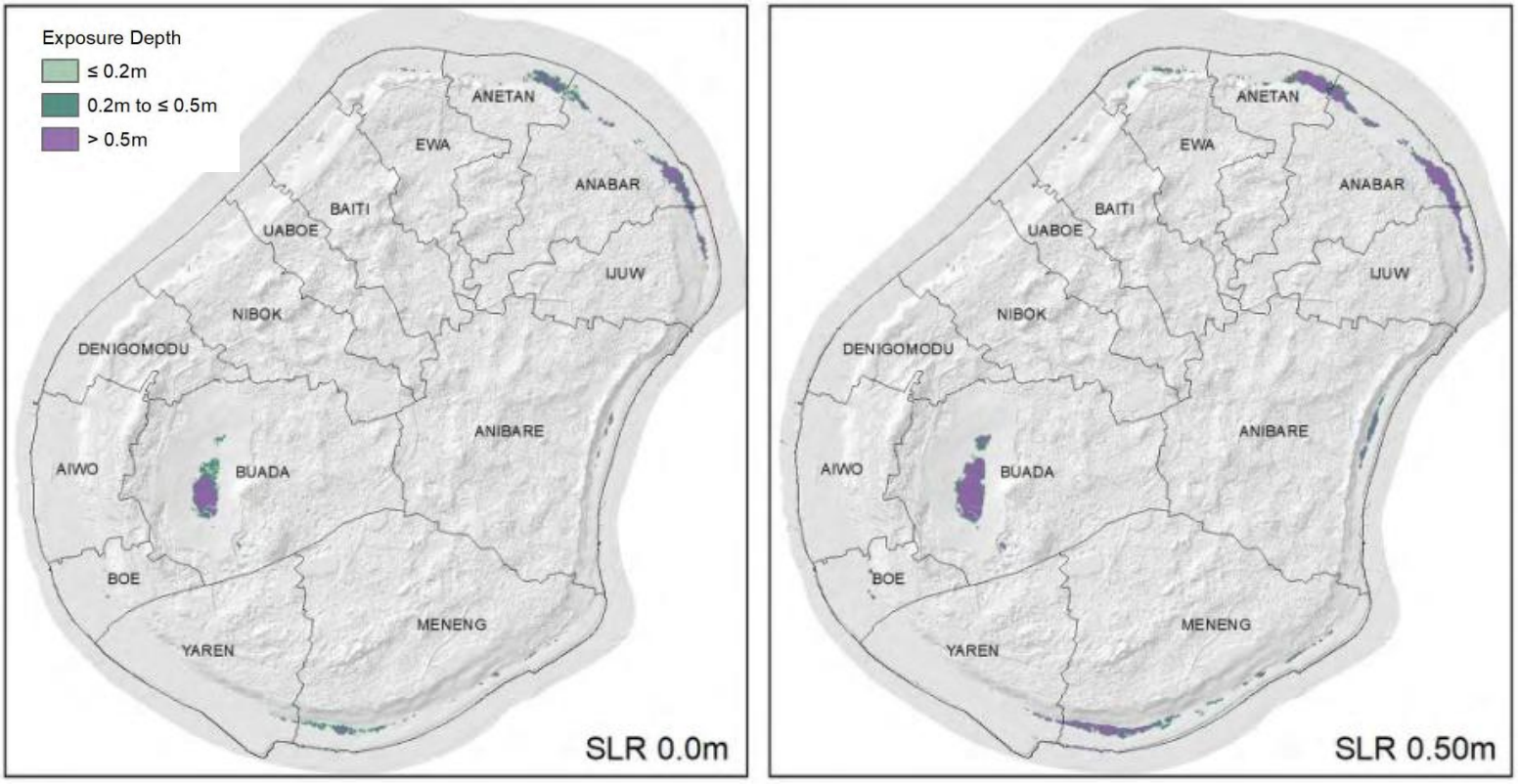


Figure 10: Nauru land area exposed to coastal inundation for current sea levels and 0.5 m sea level rise which can occur around 2070 under a high emission scenario.
Source: NIWA (2020)

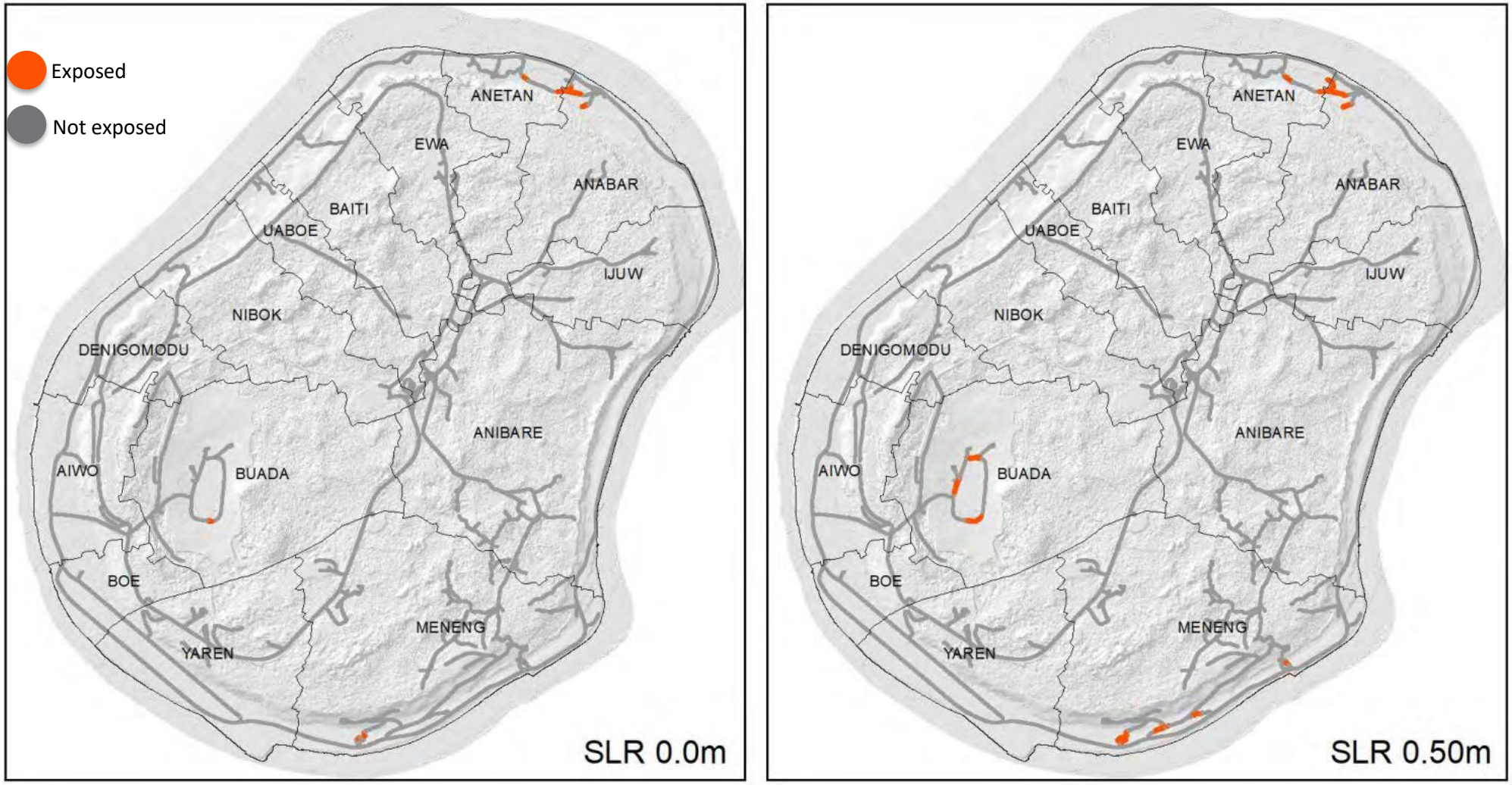


Figure 11: Nauru road network exposed to coastal inundation for current sea levels and 0.5m sea level rise which can occur around 2070 under a high emission scenario. Source: NIWA (2020)

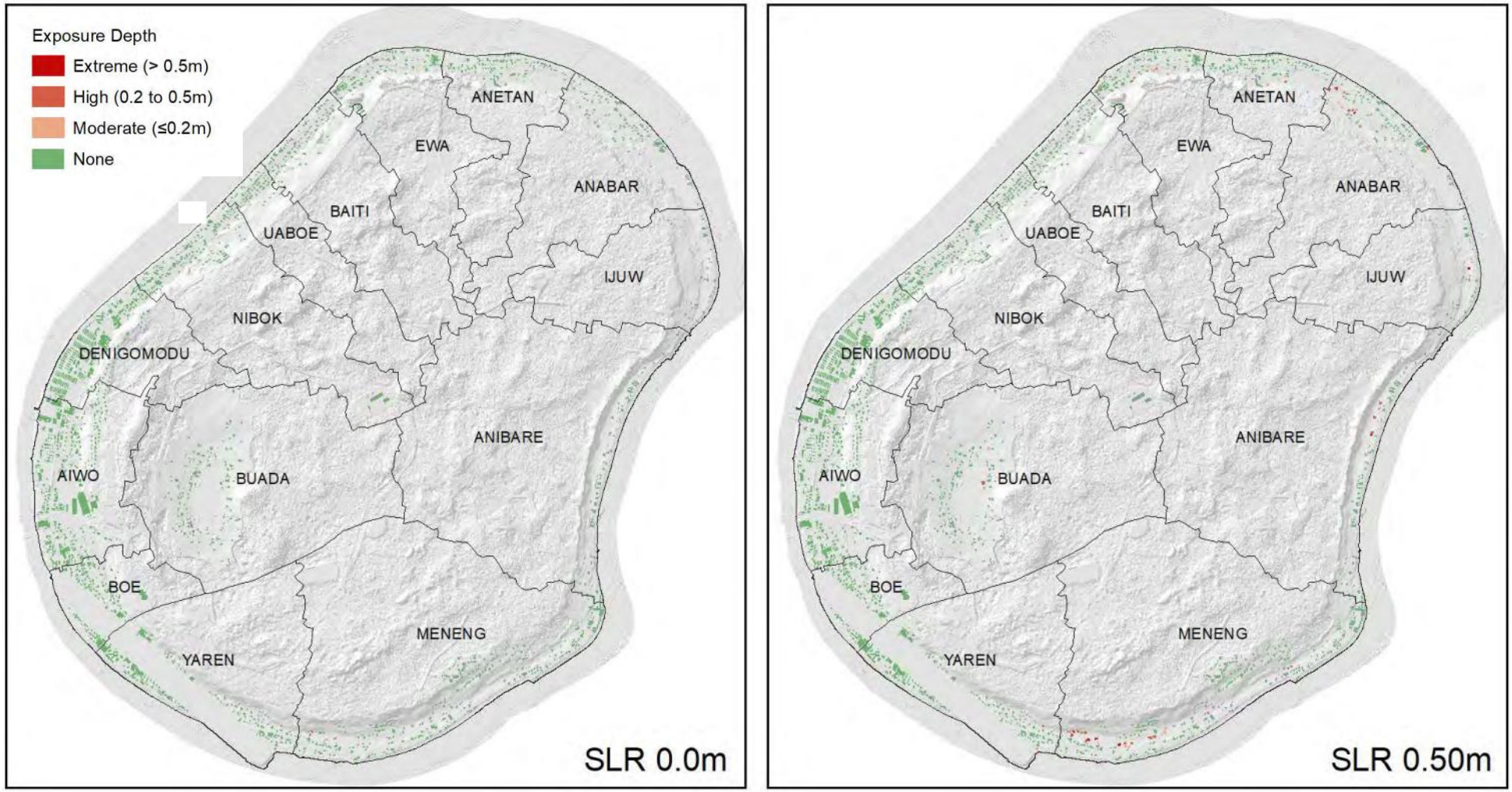


Figure 12: Nauru buildings exposed to coastal inundation for current sea levels and 0.5 m sea level rise which can occur around 2070 under a high emission scenario. Source: NIWA (2020)

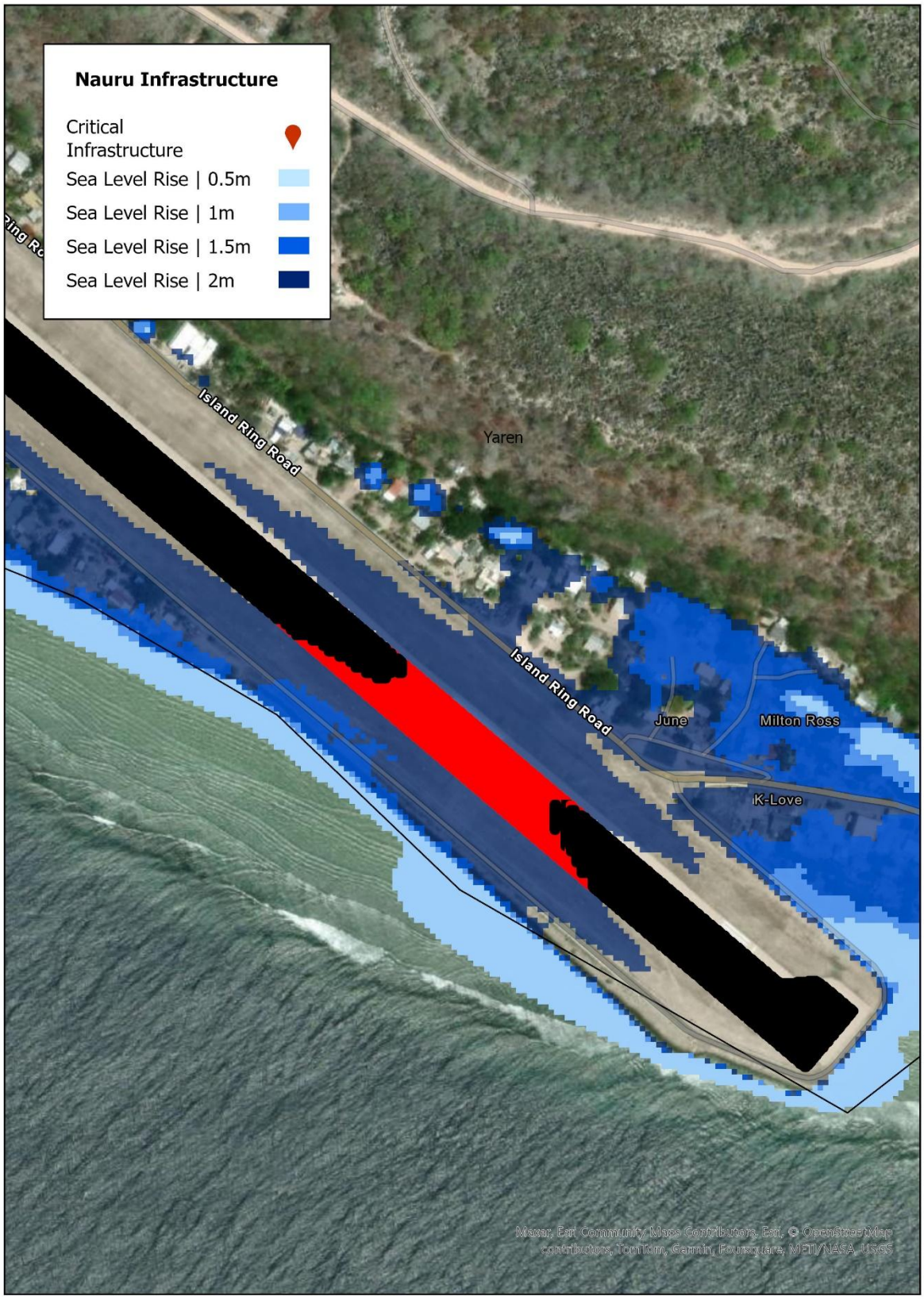


Figure 13: The Nauruan Airport as affected by different increments of sea level rise. Note that 0.5m sea level rise is projected to occur around 2070 for high emissions (RCP8.5). The 2.0 m rise may not occur until around 2190 for high emissions.

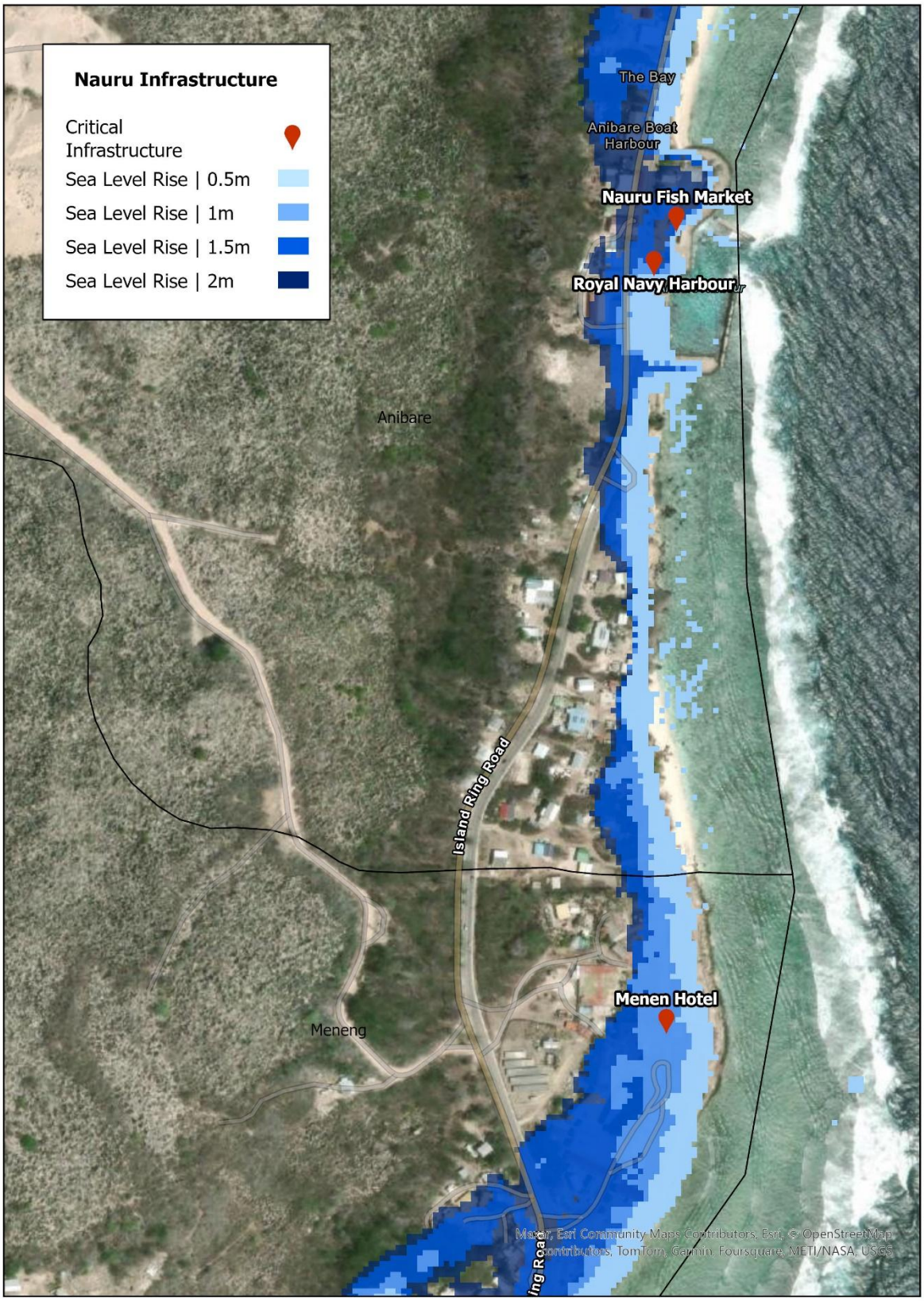


Figure 14: Some roads throughout Nauru will be affected by different increments of sea level rise. Note that 0.5m sea level rise is projected to occur around 2070 for high emissions (RCP8.5). The 2.0 m rise may not occur until around 2190 for high emissions.

Extreme rainfall

- Flooding can affect water quality and public health by causing the dumpsite to overflow and leak into soil, , and water catchments, as well as impacting drainage systems and causing septic tanks to overflow into water catchments and populated areas. Sediment and debris in drainage systems can also flood roads, buildings, electricity, and ICT infrastructure, with significant impacts on community safety and the provision of essential services.
- Health care facilities are located in low-lying areas, making them vulnerable to direct flooding damage and disruptions to critical infrastructure, accessibility and supply chains during floods and inundation, with major consequences for community health, disaster response activities and the provision of health services. Republic of Nauru (**RoN**) Hospital is regularly flooded due to poor drainage maintenance.
- Port operations can be disrupted due to safety risks (looking up at mechanical crane activity) during extreme rainfall.
- ICT connectivity can also be affected by heavy cloud during extreme rainfall events.
- Increasingly severe extreme rainfall events (increase of 48-54 mm/day annual maximum daily rainfall by 2050 across low and high emissions scenarios) will cause more severe impacts on infrastructure. Compounding increasing waste from population growth and the high reliance on imported goods, overflow from landfill and septic systems will cause worsening pollution of water catchments, terrestrial and marine ecosystems. RoN Hospital will experience severe flooding and critical power, ICT, transport and building infrastructure will be more exposed to extreme rainfall events. The installation of the EMC may reduce reliance on satellite data and existing fibre cables for internet connectivity, increasing ICT resilience during flooding events.

Vulnerability

The below table (Table 50) presents sources of infrastructure vulnerability to hazards in Nauru.

Table 50: Coastal protection and infrastructure vulnerability summary

Hazard	Factor relevant for vulnerability
All hazards	• Frequent, unplanned power outages can impact essential services including ICT, disaster response, surgery, and hospital equipment • ICT generator installation in Feb 2024 reduces vulnerability • Reliance on imported diesel and PV systems for power generation increases vulnerability to supply disruptions during and after disaster-events • Nauru airport runway hasn't been re-surfaced for more than 30 years despite recommendations to re-surface every 15 years • 20% of households are reported not having access to the internet and ICT outages occurring during severe weather • Housing shortage across Nauru creating overcrowding issues • No building code in Nauru • Limited capability for repairing/maintaining equipment and infrastructure • Ongoing waste management and biosecurity issues increases risk of disease during disasters • Land tenure requires negotiation for infrastructure development including relocation away from coastal areas • Increasing population is increasing demand and competition for services and resources

Average temperature and extreme temperature	• Land clearing for urbanisation is reducing space available for large trees and reducing natural shade coverage • Limited cooling infrastructure increases community vulnerability to extreme heat events. 21.8% of households do not have air-conditioning
Drought	• Proximity of transmission lines to the ocean increases vulnerability to dry periods when salt build up on crossarms can cause outages
Sea surface temperature, marine heatwaves, and ocean acidification	• Reliance on coral reefs for coastal defence against strong waves increases vulnerability to hazards impacting reefs
Sea level rise and coastal inundation	• A large portion of Nauru's infrastructure currently located within 100m of the coast which accounts for 34% of the total asset number and 40% of the total infrastructure replacement value. As sea level rises inundation and erosion can increase vulnerability of these infrastructure especially given a large part of Nauru's coastline is still without seawalls. • Access to limestone boulders reduce vulnerability by increasing Nauru's ability to domestically produce coastal defence infrastructure • Sea walls are constructed with varying quality and different materials. • A 5-year ARI inundation event directly impacts 46% of Nauru's population and 154 of 2471 buildings would be exposed under a 1.0m SLR scenario (which is projected to occur after 2100), with the bulk of these being residential buildings • Only 15.4% households are connected to piped sewage with degraded groundwater extraction and septic systems increasing the risk of *E. coli* outbreaks and other diseases
Heavy swells	• Local use of small fishing boats that are not safe during high wind/wave days
Extreme rainfall and average rainfall	• Drains are often poorly maintained and were designed to soak water into the ground to prevent wash into the reef, delaying drainage times during extreme rainfall events and requiring pit maintenance • Hospital regularly floods due to poor drain maintenance • Roughly one third of households have no guttering with 15% of households in need of guttering repair • The dump site is unlined, so heavy rainfall can cause increased pollution

Complex risks

Infrastructure risks can interact with and compound other risks with significant consequences for community health and livelihoods in Nauru.

- **Agriculture/Fisheries:** Extreme heat events can disrupt storage, cooling and transport infrastructure whilst also reducing agricultural and fisheries productivity, threatening food security in Nauru.
- **Biodiversity:** Flooding that causes waste to overflow or leach into soil, terrestrial habitats and marine ecosystems affects water quality, public health, and fisheries productivity, as well as causing significant biodiversity loss.
- **Water resources/Health and wellbeing:** Electricity and ICT disruption has cascading and compounding impacts on transport supply chains, telecommunications, waste management, health care and water supply, with serious implications for service delivery and human safety.

- **Coastal protection and infrastructure:** Infrastructure disruptions will affect workplaces and residential buildings with flow on consequences for social cohesion as people experience workforce and home duties disruption, as well as migration to less exposed regions or higher ground.

Consequence

Current

Table 51: Coastal protection and infrastructure current-day consequences

Component	Dominant hazard	Risk rating	Comments
Coastal defence structures	**Rising sea levels** Wave energy can damage and destroy sea walls, creating debris and exposing communities and infrastructure to inundation and coastal erosion.	**Moderate**	Erosion and rock displacement from rising sea levels is placing increasing pressure on sea walls, reducing the size and effectiveness of sea walls in some regions with flow on effects for coastal communities and infrastructure.
Fisheries infrastructure	**Storm conditions** Large swells can damage fishing infrastructure and equipment through salt spray, wave damage, reducing workforce productivity and safety, and increasing maintenance costs with impacts to the livelihoods, safety and food security of communities.	**Minor**	Salt spray is increasingly a problem for the maintenance of fisheries equipment, particularly during dry periods when rainfall does not wash the salt away. Storm conditions can reduce safe fishing conditions and damage equipment, reducing productivity and threatening human safety.
Internet and telecommunications	**Extreme rainfall and storms** ICT connectivity in Nauru is disrupted by flooding and clouds during storms which interrupt satellite connections, cause black outs and damage ICT infrastructure, with widespread effects on the provision of essential services, such as education, health care and disaster risk management (including early warning systems), economic development and community wellbeing.	**Moderate**	Clouds and heavy rain during storms cause the loss of satellite data and internet connectivity. Flooding of electricity infrastructure can cause power outages that disrupt ICT connections. Salt spray damages transmission towers and the fibre cable network and support strand, causing loss of connectivity. The lack of reliable ICT connection interrupts the development of Nauru and threatens community safety during disasters.
Transport and supply	**Coastal inundation from king tides and storm surge** Sea level rise, combined with extreme weather conditions like storm surges and high waves, can severely impact port development., inundating roads, and threatening the airport	**Moderate**	Extreme sea level events are threatening the airport, which is on the low-lying coastal plain, with the lowest point of the paved runway only 0.3m above current king tide levels.

	runway, disrupting critical transport networks and supply chains with widespread affects on community health and economic productivity.		Critical road networks are also affected by king tides with 2.7km of roads exposed to 1-in-5-year inundation event and 382m of roads below the current king tide level. There was a storm that disrupted the port development in 2024. In future, once the port is built, under a 0.5m rise of sea level (expected after 2070 under a high emission scenario), higher swell coming into the berthing area may compromise its safe use. As a result, coastal inundation is impacting the key transport and supply networks supporting the Nauru economy and providing essential food and medical resources.
Energy security	**Extreme heat events** Heatwaves and hot days can disrupt power supply by causing transformers to overheat, inhibiting critical maintenance, and increasing electricity demand for air conditioners, refrigeration, and fans, with cascading impacts across a wide range of sectors and communities, including disrupting critical services (including health services, RO water supply, ICT connection and disaster response activities) and businesses.	**Moderate**	High temperatures can cause transformers to overheat up lose capacity/operate at reduced efficiency, especially on the eastern side of network. High electricity demand on hot days is causing blackouts with implications for community health, essential services, and productivity.
Buildings and structures	**Coastal inundation from king tides and storm surge** A large portion of Nauru's infrastructure is located close to the coast with 40% of total infrastructure replacement value located within 100m of the coast. As a result under present-day conditions, some degree of inundation and flooding can damage private, government, commercial, education, health, and industrial buildings.	**Moderate**	6.2% of Nauru's buildings are currently exposed to a 1-in-5-year coastal inundation event and 13 buildings are below the king tide elevation level. Annual economic losses caused by coastal inundation are USD 1.3 million (model estimate based on expected replacement costs), with impacts on human health, livelihoods, and essential services.
Health infrastructure	**Extreme rainfall** Health care facilities are in low-lying areas, making them vulnerable to direct damage and disruptions to critical infrastructure, accessibility, and supply chains during floods, with major consequences for community health, disaster response activities and the provision of health services.	**Moderate**	Republic of Nauru (**RoN**) Hospital is regularly flooded due to poor drainage maintenance. Storms disrupt the supply of pharmaceuticals and affect critical infrastructure such as power supply and ICT connectivity.

Waste management	**Extreme rainfall** Flooding can cause the dumpsite to overflow and leak into soil, coastal areas, and water catchments, as well as impacting drainage systems and causing septic tanks to overflow with significant impacts on water quality and community health.	**Moderate**	Extreme rainfall events cause pollution and waste from septic systems, drains and the unlined dumpsite to enter terrestrial and marine habitats, and ground and surface waters. Adverse effects on biodiversity, fisheries and water quality have implications for community health, livelihoods, and food security.

2030 Low and high emissions scenario

Table 52: Coastal protection and infrastructure 2030 consequences (low and high emissions scenarios)

Component	Dominant hazard	Risk rating	Comments
Coastal defence structures	**Rising sea levels** Wave energy can damage and destroy sea walls, creating debris and exposing communities and infrastructure to inundation and coastal erosion.	**Moderate**	Sea level rise of 7-14cm will cause worsening erosion and rock displacement, especially in aging walls with insufficient rock armour. Communities and coastal infrastructure will be threatened by potential rock displacement, hazardous debris, and inundation.
Fisheries infrastructure	**Storm conditions** Large swells can damage fishing infrastructure and equipment through salt spray, wave damage, reducing workforce productivity and safety, and increasing maintenance costs with impacts to the livelihoods, safety, and food security of communities.	**Minor**	Salt spray, airborne debris and waves will continue to damage fishing infrastructure and equipment and threaten the safety of coastal fishers. Community safety, food security and livelihoods will continue to be affected.
Internet and telecommunications	**Extreme rainfall and storms** ICT connectivity in Nauru is disrupted by flooding and clouds which interrupt satellite connections, cause black outs and damage ICT infrastructure, with widespread effects on the provision of essential services, such as education, health care and disaster risk management (including early warning systems), economic development and community wellbeing.	**Moderate**	Heavy rain and winds during storms will continue to disrupt satellite ICT connections and damage fibre cable networks. The provision of education, health care and disaster risk management services may be affected by the loss of ICT connection during extreme weather events. Resilience of ICT infrastructure to storms will be improved by the submarine East Micronesia Cable (EMC), as well as the replacement of wooden crossarms with fibreglass that reduces the impact of salt build up on transmission lines.

Transport and supply	**Coastal inundation from king tides and storm surge** Rising sea levels are disrupting port development, inundating roads, and threatening the airport runway, disrupting critical transport networks and supply chains with widespread effects on community health and economic productivity.	**Moderate**	By 2040, 624m of roads will be below the king tide level. More severe storm surges may cause overtopping events that inundate the southern section of runway (expected beyond 2100 under a high emission scenario). Port infrastructure will face worsening impacts from inundation and wave impacts. The movement of people and resources such as food, building materials and medical supplies will be restricted during inundation events, with widespread adverse effects on the health and livelihoods of vulnerable communities.
Energy security	**Extreme heat events** Heatwaves and hot days can disrupt power supply by causing transformers to overheat, inhibiting critical maintenance, and increasing electricity demand for air conditioners, refrigeration, and fans, with cascading impacts across a wide range of sectors and communities, including disrupting critical services (including health services, RO water supply, ICT connection and disaster response activities) and businesses.	**Moderate**	More severe heatwaves and hot days will place pressure on energy infrastructure and lead to increasing energy demand for fans, air-conditioning and refrigeration. Power outages will disrupt hospital and desalination operations, disaster response activities and internet and communications connectivity with implications for community health, productivity, and wellbeing.
Buildings and structures	**Coastal inundation from king tides and storm surge** With 40% of total infrastructure replacement value located within 100m of the coast, inundation and flooding can damage and destroy private, government, commercial, education, health, and industrial buildings, with widespread impacts for community health, the economy and essential services.	**Moderate**	By 2040, 31 buildings will be below the king tide level. Nauru's 'Bottomside' residents will be particularly affected, with some of the residential property, critical health buildings and transport structures in that area at risk of inundation.
Health infrastructure	**Extreme rainfall** Health care facilities are in low-lying areas, making them vulnerable to direct damage and disruptions to critical infrastructure, accessibility, and supply chains during floods, with major consequences for community health, disaster response activities and the provision of health services.	**Moderate**	Extreme rainfall will cause more frequent and widespread flooding of health facilities. Accessibility for patients and staff may be inhibited and critical infrastructure may be disrupted. Significant consequences for public health and the provision of health services.

Waste management	**Extreme rainfall** Flooding can cause the dumpsite to overflow and leak into soil, coastal areas, and water catchments, as well as impacting drainage systems and causing septic tanks to overflow with significant impacts on water quality and community health.	**Moderate**	Extreme rainfall will cause worsening run-off, overflow, and leakage from waste management systems, causing solid waste and sewage to pollute water catchments and ecosystems. Declining water quality and ecosystem health will increase the risk of disease and impact the productivity of fisheries, affecting community health and wellbeing.

2050 Low emissions scenario

Table 53: Coastal protection and infrastructure 2050 consequences (low emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Coastal defence structures	**Rising sea levels** Wave energy can damage and destroy sea walls, creating debris and exposing communities and infrastructure to inundation and coastal erosion.	**Major**	Sea level rise of 15-28cm and changing wave direction threatens to overtop and damage existing sea walls. In addition to increased exposure of communities and infrastructure to potential rock displacement, hazardous debris, inundation and flooding, significant costs will be required to replace and improve coastal defence structures.
Fisheries infrastructure	**Storm conditions** Large swells can damage fishing infrastructure and equipment through salt spray, wave damage and airborne debris, reducing workforce productivity and safety, and increasing maintenance costs with impacts to the livelihoods, safety, and food security of communities.	**Moderate**	Storm conditions will continue to reduce safe fishing conditions for local fishers. Rising sea levels will result in larger wind-induced swells that affect fishing infrastructure and equipment. Projected increase in annual rainfall may reduce damage from salt spray. Reduced workforce productivity will affect livelihoods and food security, and human safety will be threatened.
Internet and telecommunications	**Extreme rainfall and storms** ICT connectivity in Nauru is disrupted by flooding and clouds which interrupt satellite connections, cause black outs and damage ICT infrastructure, with widespread effects on the	**Moderate**	Possibility of significant increases in annual total rainfall (-1-52%) and a 48 mm/day increase in annual maximum daily rainfall will cause more frequent and widespread disruptions to existing ICT infrastructure.

	provision of essential services, such as education, health care and disaster risk management (including early warning systems), economic development and community wellbeing.		The development of the Nauru economy, essential services and human health will be threatened, especially when the loss of internet and telecommunication services inhibits warnings and communication during extreme weather events. The installation of the EMC will reduce the effect of rain and storms on ICT connectivity, although extreme wave events compounded by rising sea levels may cause water to overlap the artificial wall at the EMC landing site.
Transport and supply	**Coastal inundation from king tides and storm surge** Rising sea levels are disrupting port development, inundating roads, and threatening the airport runway, disrupting critical transport networks and supply chains with widespread effects on community health and economic productivity.	**Major**	By 2060, 625-900m of roads will be below king tide elevation. The airport and runway can l face increasing risk of inundation and flooding during extreme sea level events which are expected beyond 2100 under a high emission scenario. The port will be placed under significant pressure during extreme wave and storm surge events. Major disruptions to all building materials, manufactured foods, and critical emergency relief will threaten the safety and productivity of Nauruans.
Energy security	**Extreme heat events** Heatwaves and hot days can disrupt power supply by causing transformers to overheat, inhibiting critical maintenance, and increasing electricity demand for air conditioners, refrigeration, and fans, with cascading impacts across a wide range of sectors and communities, including disrupting critical services (including health services, RO water supply, ICT connection and disaster response activities) and businesses.	**Major**	An increase in annual hot days (over 32°C) of 44-169 will significantly increase energy demand for cooling purposes, whilst also disrupting critical maintenance and causing transformers to overheat. Without sufficient upgrades and controls, power outages will become more frequent and widespread during hot periods, affecting the provision of essential services, such as health, RO water, disaster response, ICT, commercial and education services, with major consequences for community safety, wellbeing, and productivity.
Buildings and structures	**Coastal inundation from king tides and storm surge** With 40% of total infrastructure replacement value located within 100m of the coast, inundation and flooding can damage and destroy private, government, commercial, education, health, and industrial buildings, with widespread impacts for community health, the economy and essential services.	**Moderate**	By 2050, projections for sea level rise (SLR) are 0.21 (0.15 to 0.28) m for low emissions and 0.25 (0.19 to 0.33) m for high emissions, with minimal additional impacts to infrastructure. Currently 0.7 % of buildings are exposed to coastal inundation, and by 2070 this may increase to 2.3 % i.e. a 0.35 m sea level rise. Service provision will be disrupted.

			Major costs for maintenance, repair, and replacement of exposed buildings.
Health infrastructure	**Extreme rainfall** Health care facilities are in low-lying areas, making them vulnerable to direct damage and disruptions to critical infrastructure, accessibility, and supply chains during floods, with major consequences for community health, disaster response activities and the provision of health services.	**Moderate**	More intense extreme rainfall events (increase of 48 mm/day annual maximum daily rainfall) will cause more severe inundation of health facilities. Critical infrastructure (power and ICT), hospital accessibility and supply of medical goods may be disrupted with widespread impacts for community health, disaster response activities and health service provision.
Waste management	**Extreme rainfall** Flooding can cause the dumpsite to overflow and leak into soil, coastal areas, and water catchments, as well as impacting drainage systems and causing septic tanks to overflow with significant impacts on water quality and community health.	**Moderate**	More intense extreme rainfall events (increase of 48 mm/day annual maximum daily rainfall) will compound increasing waste from population growth and reliance on imported goods to cause worsening pollution of surface and ground water, soil, and marine habitats. Longer-term and widespread impacts to ecosystems and water quality will affect community health and livelihoods.

2050 High emissions scenario

Table 54: Coastal protection and infrastructure 2050 consequences (high emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Coastal defence structures	**Rising sea levels** Wave energy can damage and destroy sea walls, creating debris and exposing communities and infrastructure to inundation and coastal erosion.	**Major**	Sea level rise of 19-33cm will cause overtopping and damage to existing sea walls. Community safety and coastal infrastructure will be threatened by potential rock displacement, hazardous debris, and inundation, with significant government intervention required to replace and improve coastal defence structures.
Fisheries infrastructure	**Storm conditions** Large swells can damage fishing infrastructure and equipment through salt spray, wave damage and airborne debris, reducing	**Moderate**	.

	workforce productivity and safety, and increasing maintenance costs with impacts to the livelihoods, safety, and food security of communities.		Projected decrease in drought and increase in annual rainfall may reduce damage from salt spray. Livelihoods and food security of communities will be affected by reduced productivity.
Internet and telecommunications	**Extreme rainfall and storms** ICT connectivity in Nauru is disrupted by flooding and clouds which interrupt satellite connections, cause black outs and damage ICT infrastructure, with widespread effects on the provision of essential services, such as education, health care and disaster risk management (including early warning systems), economic development and community wellbeing.	**Moderate**	Possibility of significant increases in annual total rainfall and a 54 mm/day increase in annual maximum daily rainfall will cause severe and frequent disruptions to existing ICT infrastructure. Disruptions to disaster response efforts, health care and early warning systems due to a loss of internet and telecommunications services will have major consequences for community safety and wellbeing during disaster events. Commercial activities, economic development and education will also be affected by ICT disruptions. The installation of the EMC will reduce reliance on satellite data and existing fibre cables for internet connectivity, increasing ICT resilience to extreme rainfall and storm events. The EMC may be threatened by storm surges and storm cell driven wave action compounded by rising sea levels which can overtop the artificial wall at the EMC landing site.
Transport and supply	**Coastal inundation from king tides and storm surge** Rising sea levels are disrupting port development, inundating roads, and threatening the airport runway, disrupting critical transport networks and supply chains with widespread effects on community health and economic productivity.	**Major**	By 2060, 900m of roads will be below king tide elevation. The airport is resilient up to a 1.5m SLR with less than 1% area impacted under such scenario. It is likely to have minimal impact in 2050. Port infrastructure will be exposed to more frequent overtopping during storm surge and king tide events. Human health and wellbeing is likely to be impacted if essential services and medical supplies are disrupted due to extreme water events.
Energy security	**Extreme heat events** Heatwaves and hot days can disrupt power supply by causing transformers to overheat, inhibiting critical maintenance, and	**Major**	An increase in annual hot days (over 32°C) of 69-242 days will significantly increase energy demand for thermal control, whilst also

	increasing electricity demand for air conditioners, refrigeration, and fans, with cascading impacts across a wide range of sectors and communities, including disrupting critical services (including health services, RO water supply, ICT connection and disaster response activities) and businesses.		disrupting critical maintenance and overheating energy infrastructure, such as transformers. Intervention will be required to prevent more frequent and widespread power outages during hot periods, which threaten the provision of essential services, such as health, RO water, disaster response, ICT, commercial and education services, with major consequences for the safety, wellbeing, and productivity of vulnerable communities.
Buildings and structures	**Coastal inundation from king tides and storm surge** With 40% of total infrastructure replacement value located within 100m of the coast, inundation and flooding can damage and destroy private, government, commercial, education, health, and industrial buildings, with widespread impacts for community health, the economy and essential services.	**Major**	By 2060, 49 buildings will be below the king tide level. By 2100, 16.7% of buildings are projected to be inundated by a 1-in-5-year coastal inundation event by 2100. Health, safety, and housing of community members will be compromised across the region. Productivity and livelihoods will be disrupted by damage to commercial and industrial buildings.
Health infrastructure	**Extreme rainfall** Health care facilities are in low-lying areas, making them vulnerable to direct damage and disruptions to critical infrastructure, accessibility, and supply chains during floods, with major consequences for community health, disaster response activities and the provision of health services.	**Major**	Increasingly severe extreme rainfall events (increase of 54 mm/day annual maximum daily rainfall) will cause more severe flooding of health facilities. Loss of critical infrastructure (power and ICT), hospital accessibility and pharmaceutical will have severe impacts on public health, disaster response activities and the provision of health services.
Waste management	**Extreme rainfall** Flooding can cause the dumpsite to overflow and leak into soil, coastal areas, and water catchments, as well as impacting drainage systems and causing septic tanks to overflow with significant impacts on water quality and community health.	**Major**	Compounding increasing waste from population growth and reliance on imported goods, increasingly severe extreme rainfall events (increase of 54 mm/day annual maximum daily rainfall) will cause worsening pollution of water catchments, terrestrial and marine ecosystems. Longer-term and widespread impacts to ecosystems and water quality will threaten community health and productivity.

Confidence

Table 55: Coastal protection and infrastructure confidence ratings

Component	Hazard	Confidence score	Comments
Coastal defence structures	**Rising sea levels**	**Medium**	• Detailed inundation assessment of individual walls will increase confidence
Fisheries infrastructure	**Storm conditions**	**Low**	• Despite high confidence in the potential impacts, there are very limited future remote storm-induced swell projections, which significantly reduces confidence
Internet and telecommunications	**Extreme rainfall and storms**	**Medium**	• Despite high confidence in future exposure and high-level consequences, confidence is reduced by the limited detailed information regarding the impacts of hazards on critical ICT infrastructure and how the successful introduction of EMC will reduce current ICT vulnerability
Transport and supply	**Coastal inundation from king tides and storm surge**	**Medium**	• The high confidence in future impacts and consequences is reduced by the limited detailed information regarding the future exposure of the port development and overall risk reduction achieved by Higher Ground Initiative
Energy security	**Extreme heat events**	**Medium**	• High confidence in future impacts and consequences is reduced by uncertainty over how the introduction of solar power will improve resilience of power supply during hot days and heatwaves
Buildings and structures	**Coastal inundation from king tides and storm surge**	**Medium**	• Despite strong evidence for 2060 and 2100 consequences, there are no 1-in-5-year building inundation projections available for 2030 or 2050 • Additionally, high confidence is reduced because development and infrastructure protection projects may reduce future exposure to inundation

Health infrastructure	**Flooding from extreme rainfall events and coastal inundation**	**Medium**	• Although there is high confidence in future consequences, confidence is reduced without specific hospital or health facility flood-risk projections
Waste management	**Extreme rainfall**	**High**	• Strong evidence only marginally reduced by lack of annual maximum daily rainfall (mm/day) projection for 2030

Knowledge Gaps

- Further detailed high resolution wind projections required.

5.7 Biodiversity and environment

Summary of this Sector

Biodiversity has significant cultural, economic, and environmental value in Nauru. Communities rely on ecosystem services such as coastal protection, shade, food resources, income, and traditional medicines. The major drivers that influence biodiversity in Nauru are population growth, climatic conditions, climate change and variability, including natural disasters, unsustainable economic development, and traditional and contemporary values (attitudes and lifestyles).

There are two major components to Nauru's biodiversity:

Figure 15: Buada Lagoon in Nauru (Dave Rissik, Pers. Comms.)

Table 56: Significant sub sectors in the biodiversity and environment sector of Nauru.

Sub sector	Importance
Aquatic and coastal biodiversity	• Nauru's marine biodiversity consists of coral ecosystems and migratory species such as tuna and humpback whales • There are very small numbers of mangroves near the lagoon and no sea grass in the coastal areas of Nauru • Green turtles are reported to nest in Nauru with legislation introduced to protect them
Terrestrial biodiversity	• Nauru has 36 native bird species, including noddy birds which are hunted for domestic consumption and frigate birds that have cultural value • Nauru has experienced significant loss of biodiversity, with no endemic plants and 63 remaining Indigenous plant species. The remaining Indigenous plants, such as the pandanus, are well adapted to climatic conditions and have cultural value

R7: Risks to biodiversity and environment

The below risk statement (**R7**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for biodiversity that have been identified and analysed.

Table 57: R7 risk statement and information

Concise risk statement
Chronic and acute climate hazards will increasingly impact the aquatic, coastal and terrestrial biodiversity of Nauru, which are important for associated sectors such as fisheries, agriculture, freshwater, coastal protection, and the culture of Nauru.
Hazards affecting this domain

- Rising temperatures and extreme heat
- Extreme rainfall
- Drought
- Sea surface temperature, marine heatwaves, and ocean acidification
- Sea level rise, extreme sea level events and coastal inundation

Impacts on this domain

- Habitat damage and loss of key cultural plants and foods
- Continue decline over years of avian species, including species harvested for food (VA pg69)
- Decreased coastal and pelagic marine resources and coastal fish
- Warmer sand temperature can affect gender ratios for turtle hatchlings
- Increased pollution and sediment entering Buada Lagoon, streams, and coastal waters
- Saline ingress into groundwater systems (VA pg. 66)
- Water stress and dieback of plants and animals, even affecting Indigenous plants adapted to dry conditions such as pandanus.
- Reduced coral integrity, decreased coastal invertebrate species, increased algae growth

Vulnerability factors relevant to this domain in Nauru

- Phosphate mining affects coral communities
- Evidence of coral death and low potential for coral recruitment due to distance from other islands
- Overfishing and overhunting compounds problems related to critical habitat loss
- Degraded terrestrial and marine habitats, and species at critical thresholds
- No formally protected areas and limited communication to ensure sustainable hunting
- No planning regulations
- Remnant flora and fauna are in a highly disturbed state, despite high cultural and ecological value.

Consequence to Nauru

- Loss of biodiversity will affect Nauruan culture, food security, water security and the economy
- Loss of ecosystem services for coastal protection, provision of shade, protection from wind and desiccating effects of salt spray

Current and future hazard exposure and impacts

This section discusses the exposure to, impact of, climate hazards on the Biodiversity and Environment in Nauru.

Average and extreme temperature

- Extreme heat events place pressure on vulnerable terrestrial plant species and can combine with other hazards, such as drought, to cause plant death from heat and water stress.
- Rising temperatures may also impact the sex-determination of sea turtles, potentially causing a gender imbalance that could lead to populations becoming compromised or extinct.
- An increase in annual hot days (over 32°C) of 44-242 days per year and a rise in annual average temperature of 0.9-2°C by 2050 (across low and high emissions scenarios), will cause the loss of species with implications for the food security and cultural heritage of Nauru.

Drought

- Drought can impact terrestrial and freshwater biodiversity by causing the death of Pacific species, such as pandanus and milkfish, that are well adapted to harsh conditions and are important for food security, coastal protection (UNDP 2023). The impact of drought on vegetation is shown in Figure 16 below.

- Prolonged dry spells that occur in a hotter environment with more significant saline intrusion and a higher population (and thus less available freshwater) will place more significant stress on terrestrial and freshwater biodiversity. This will threaten important sources of food, coastal protection, and cultural significance.

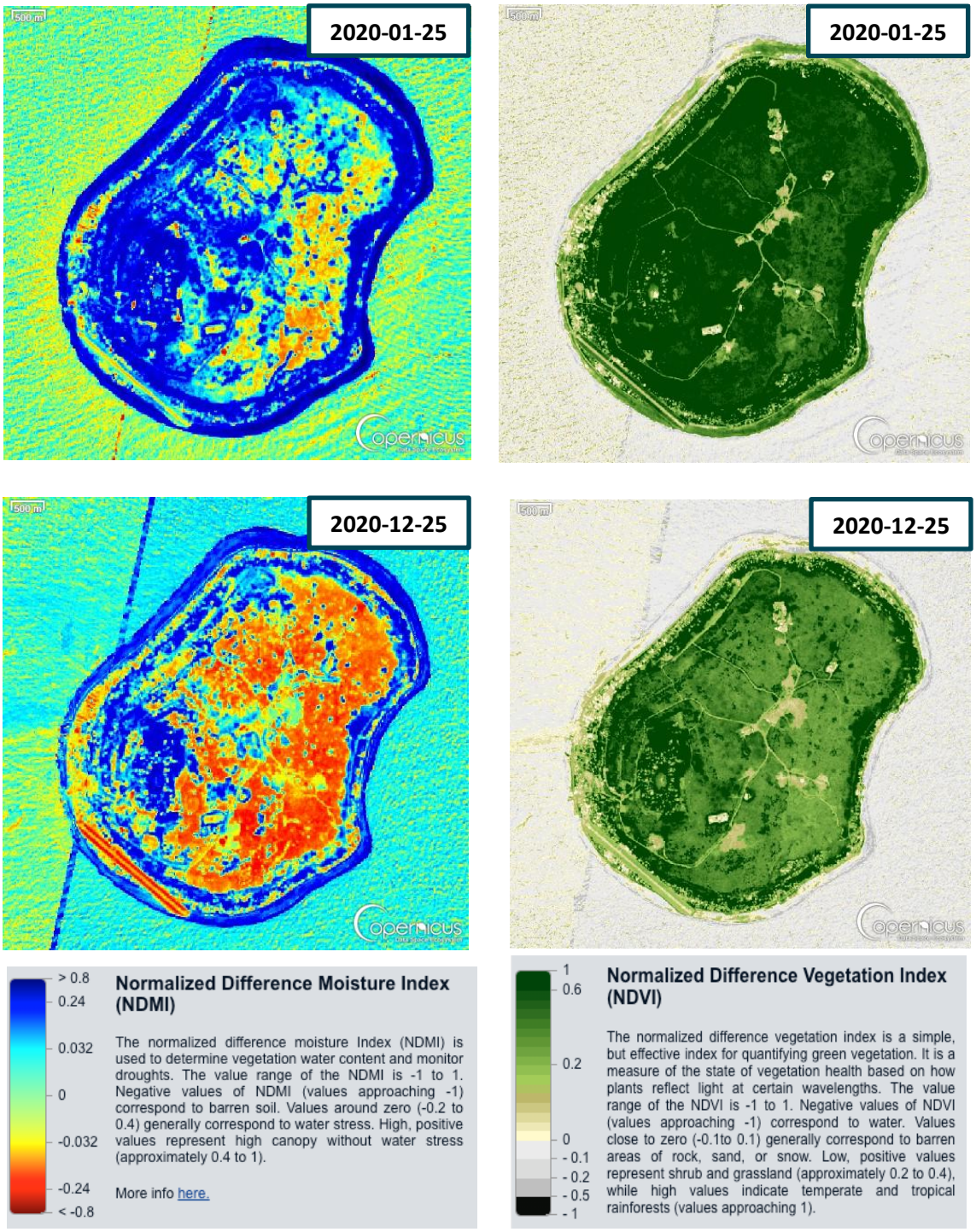


Figure 16: Comparison of the Normalised Difference Vegetation Index and the Normalised Difference Moisture Index across Nauru before and after the 2020 prolonged dry period. Orange and red areas denote water stress. Source: Copernicus Land Monitoring Service.

Sea surface temperature

- Rising sea surface temperatures (**SSTs**) are displacing fish species and damaging reef ecosystems with implications for the food security, livelihoods, and cultural heritage of Nauruans. In 2005, Nauru experienced a 'mysterious' fish kill speculated to be caused by an algal bloom and/or heat shock triggered by prolonged elevated water temperature.

- An increase in SST by up to 2.3°C by 2050 will threaten aquatic biodiversity in Nauru. Coral reef fish biomass is projected to decrease by 20% under a high emissions scenario with widespread impacts on food security, livelihoods, and cultural practices (Bell et al 2013).

Marine heatwaves

- Marine heatwaves are already causing coral bleaching in Nauru, damaging fragile reef ecosystems, and impacting the migration, spawning and viability of fish and other aquatic species such as hawksbill turtles.
- By 2050, it is projected that the number of annual marine heatwave days will increase from 16 to between 105-270 days (across low and high emissions scenarios), resulting in an increase in coral bleaching days per year from 6 to between 92-344 days. Compounded by overfishing, this could lead to the collapse of reef ecosystems and loss of biodiversity, especially given the low coral diversity and low potential for coral recruitment due to the distance from other islands, threatening a critical source of food, income, coastal protection, and cultural significance for Nauruans.

Ocean acidification

- Ocean acidification and aragonite saturation pose a significant global threat to the long-term viability of corals, shellfish, and fish. Ocean acidification compounds the impacts of increasing sea surface temperatures and marine heatwaves, negatively affecting coral growth, making coral more susceptible to coral bleaching, and decreasing chlorophyll concentrations (an indicator of phytoplankton biomass which supports the marine food chain).
- Lower pH may also affect sound attenuation, creating a noisier environment, impact the metabolic demands of fish and stunt growth during the larval stage.
- Habitat loss, changes to physiology and reduction in fish size threatens marine ecosystems and disrupts the provision of key ecosystem services such as food and livelihoods.
- A decrease in aragonite saturation from 3.8 to 3.5-3.2 by 2050 (across low and high emissions scenarios) will reduce coral growth rates, with no current coral reef ecosystems found at aragonite saturation states less than 3. Ocean acidification will continue to compound the impacts of other hazards to threaten fragile coral reefs ecosystems and alter fish physiology with implications for food security and livelihoods.

Sea level rise and coastal inundation

- Sea level rise is impacting aquatic and coastal biodiversity by changing the coral makeup of reef habitats and reducing the physical protection of Nauru provided by coral reefs. The highly sensitive nature of coral reef ecosystems makes parts of these habitats vulnerable to changes in sea level which can limit access to sunlight, causing some coral species to die, and change the structure of reefs.
- Damage to reef habitats is placing pressure on coastal fish species and reducing the ability of reefs to protect Nauru from wave incursion, potentially exposing communities, infrastructure, and turtle nesting sites to wave related damage and inundation.
- Saline intrusion is a growing issue for plants, such as breadfruit, that support agriculture and traditional medicines. This inundation and intrusion will affect fresh water availability and compound the future impacts of drought and extreme heat events.
- Sea level rise is projected to be of 15-33cm by 2050 (across low and high emissions scenarios). Increased wave energy with rising sea levels may damage and destroy already stressed reef habitats, leading to ecosystem collapse that impacts food security and livelihoods and exposing coastal communities to erosion and inundation.

Extreme rainfall

- Extreme rainfall can cause nutrient, waste, and sediment runoff directly into Buada Lagoon, terrestrial ecosystems, coral reefs, and marine habitats, with pollutants harming ecosystems. This is impacting the provision of critical ecosystem services such as freshwater, food, livelihoods, traditional medicine, and coastal protection.
- Projected 48 to 54mm/day increase in annual maximum daily rainfall by 2050 (across low and high emissions scenarios) will cause worsening run off and pollution of Buada Lagoon, terrestrial habitat, coral reefs, and coastal marine ecosystems. This damage to already-stressed ecosystems threaten the food security, culture, and livelihoods of local communities.

Vulnerability

Hazard	Factor relevant for vulnerability
All hazards	• Lack of communication and education means hunters are not aware of appropriate hunting times and procedures, causing overexploitation (including the harvest of more than 300,000 black noddys per year) and biodiversity loss • Most of Nauru's limestone forest trees and woodland has been removed or intermingled with 161 invasive species. The limestone forest tree *Aidia racemose*, known locally as enga, is also close to extinction. • Low potential for coral recruitment due to distance from other islands and reefs • Overfishing has depleted fish stocks in the region and unbalanced the overall fish community structure with a lack of predators, reducing fisheries resilience to climate hazards • Noddy birds are overhunted and forced to nest along the coast because escarpment trees inland have been cleared for development and phosphate mining • No formal terrestrial or marine conservation sites • No bees for pollination, instead relying on wasps, flies, moths, butterflies, and hand pollination • Growing population is increasing competition for land, water and resources • Interconnectivity of transient marine and avian species with wider climatic changes and impacts abroad • No planning regulations • Remnant flora and fauna are in a highly disturbed state, despite high cultural and ecological value
Drought	• Buada Lagoon is rainfall dependent and highly modified due to proximal human settlements and milkfish aquaculture • Uncertainty around the pollution of groundwater by both human sources and saline ingress

Extreme rainfall and average rainfall	• Limited drainage facilities increase exposure to phosphate mining and run-off that affects coral reefs

The below table (Table 58) presents sources of biodiversity vulnerability to hazards in Nauru.

Table 58: Biodiversity and environment vulnerability summary

Complex risks

Biodiversity and environment climate change-related risks can interact with and compound other risks with significant consequences for community health and livelihoods in Nauru. For example:

- **Agriculture and fisheries:** Loss of biodiversity and damage to ecosystems will reduce the productivity of agriculture, aquaculture, and fisheries with consequences for food security, livelihoods, and public health in Nauru.
- **Infrastructure:** Loss of ecosystem services, including coastal protection from reefs, shade provision, erosion control and salt spray protection, will affect coastal communities and infrastructure with implications for human safety and the provision of essential services.

Consequence

Current

Table 59: Biodiversity and environment current-day consequences

Component	Dominant hazard	Risk rating	Comments
Aquatic and coastal biodiversity	**Marine heatwaves and sea surface temperature** Coral bleaching and rising SSTs will compound the impacts of overfishing to damage, deplete and reduce the resilience of aquatic and reef ecosystems with major consequences for the aquatic and coastal biodiversity of Nauru.	**Moderate**	Average of 16 marine heatwave days per year are causing coral bleaching and impacting the spawning and survival of coastal species. The 2005 fish kill is speculated to have been caused by algal bloom and/or heat shock triggered by prolonged elevated water temperature, or an upwelling of de-oxygenated water from depth. Rising sea surface temperatures can also reduce the spawning and recruitment of deepwater species.
Terrestrial biodiversity	**Drought** Terrestrial biodiversity is affected by prolonged drought which places pressure on critical water resources, damaging ecosystems and resulting in the loss of important ecosystem services.	**Moderate**	Drought is already affecting terrestrial biodiversity, with indigenous island-adapted species such as pandanus, breadfruit trees and coconut trees dying and producing produce of a reduced size during the most recent drought. Intervention has been required to import and replace lost plants.

2030 Low and high emissions scenario

Table 60: Biodiversity and environment 2030 consequences (low and high emissions scenarios)

Component	Dominant hazard	Risk rating	Comments
Aquatic and coastal biodiversity	**Marine heatwaves and sea surface temperature** Coral bleaching and rising SSTs will compound the impacts of overfishing to damage, deplete and reduce the resilience of aquatic and reef ecosystems with major consequences for the aquatic and coastal biodiversity of Nauru.	**Major**	Warming seas will affect the suitable foraging and spawning habitat available for oceanic species. Severe pressure will be placed on coastal and aquatic species already threatened by overfishing and pollution with potential for major loss of biodiversity.
Terrestrial biodiversity	**Drought** While **drought** may occur less frequently, plant water use is likely to increase under **more extreme temperature** conditions and higher evaporative demand. Therefore, when drought does occur, terrestrial biodiversity will be more adversely affected resulting in the loss of important ecosystem services.	**Moderate**	Water scarcity will continue to threaten terrestrial biodiversity by placing further pressure on Indigenous species, particularly plant species. This will affect the culture and food security of local communities

2050 Low emissions scenario

Table 61: Biodiversity and environment 2050 consequences (low emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Aquatic and coastal biodiversity	**Marine heatwaves and sea surface temperature** Coral bleaching and rising SSTs will compound the impacts of overfishing to damage, deplete and reduce the resilience of aquatic and reef ecosystems with major consequences for the aquatic and coastal biodiversity of Nauru.	**Major**	In Nauru, 12-18 severe bleaching events/ 20 years (low vs. high warming model) compared to 2 events in 2005. Rising SSTs, 105-140 marine heatwave days per year and 92-236 coral bleaching days per year will cause widespread and significant coral mortality.

			Fish habitats will be extensively damaged, compounded by overfishing and increased pollution, causing significant reductions in fish stocks. Aquatic and coastal biodiversity will be severely threatened with potential for major loss of biodiversity.
Terrestrial biodiversity	**Drought** Terrestrial biodiversity is affected by prolonged drought which places pressure on critical water resources, damaging ecosystems and resulting in the loss of important ecosystem services.	**Major**	Nauru's biodiversity will be more vulnerable to water scarcity occurring in a hotter climate with more significant saline intrusion and a higher human population as water resources are reduced and groundwater becomes more saline, resulting in significant effects on terrestrial biodiversity, particularly plant species. Communities will be affected by the loss of important ecosystem services, such as food, erosion control, shade and medicine will be lost.

2050 High emissions scenario

Table 62: Biodiversity and environment 2050 consequences (high emissions scenario)

Component	Dominant hazard	Risk rating	Comments
Aquatic and coastal biodiversity	**Marine heatwaves and sea surface temperature** Coral bleaching and rising SSTs will compound the impacts of overfishing to damage, deplete and reduce the resilience of aquatic and reef ecosystems with major consequences for the aquatic and coastal biodiversity of Nauru.	**Extreme**	In Nauru, 11-22 severe bleaching events/ 20 years (low vs. high warming model) compared to 2 events in 2005. In Nauru, severe coral bleaching may occur on an annual basis by 2048 under RCP8.5, with significant impact to coral reef ecosystems and aquatic biodiversity. By 2050, increasing SSTs will cause coral reef fish biomass to decrease by 20% under a high emissions scenario. Compounded by overfishing and increasing pollution, 180-270 marine heatwave days and 107-344 coral bleaching

			days per year will cause severe, widespread, and potentially irreversible damage to fragile reef ecosystems. The potential collapse of coral reef ecosystems and altered oceanic habitat may cause mass biodiversity loss.
Terrestrial biodiversity	**Drought** Terrestrial biodiversity is affected by prolonged drought which places pressure on critical water resources, damaging ecosystems and resulting in the loss of important ecosystem services.	**Major**	Terrestrial biodiversity, especially plants, will be more vulnerable and impacted by periods of water scarcity which occur in a hotter climate with rising sea levels and a higher human population as water resources are reduced and groundwater becomes more saline. Communities will suffer from the loss of ecosystem services, such as food, erosion control, shade, and medicine.

Confidence

Table 63: Biodiversity and environment confidence ratings

Component	Hazard	Confidence score	Comments
Aquatic and coastal biodiversity	**Marine heatwaves and sea surface temperature**	**Medium**	• Although there is high confidence in future impacts and consequences, confidence is reduced because there are no specific projections for loss of coral reefs and aquatic habitats • Lack of spatial uniformity in future coral bleaching also reduces confidence
Terrestrial biodiversity	**Drought**	**Medium**	• Moderate confidence due to some uncertainty in the net impact of projected changes in drought, anthropogenic pressures and increases in sea level

Knowledge Gaps

- No quantitative projections for changes to terrestrial and marine habitats in different emissions scenarios.

5.8 Land management and rehabilitation

Summary of this Sector

Nauru has been extensively degraded by past and current mining activities, with slow rehabilitation processes. The island is affected by unexploded ordnances from World War II and limestone pinnacles which are highly expensive to flatten. Land rehabilitation is crucial to supporting agriculture development, conservation, water catchment, residential development, and commerce and industry development. Land rehabilitation and management is inhibited by inadequate environmental legislation and land use planning due to weak policies, limited capacity, traditional tenure systems and outdated laws. Existing land and environmental legislation do not provide the framework to enable the actions needed to reduce vulnerability with no update to laws related to lands and survey since the 1970s.

There are current land management and rehabilitation strategies that demonstrate a commitment to integrated land use planning, such as the Higher Ground Initiative, which aims to increase the availability of land resources for agriculture and housing, improve waste management to reduce land degradation and contamination risks, and increase biodiversity, energy, and water resilience. These efforts are inhibited by outdated land laws, the lack of a building code, the strength of customary land tenure systems and a lack of spatial and cadastral data for evidence-based decision making. There are around 5,000 lots of land in Nauru and there is a lack of clear processes to access this due to the fragmented institutional environment regarding land governance. This is a key issue when larger pieces of land need to be assembled for protection/restoration/infrastructure.

There are two major subsectors in the Nauru land management and rehabilitation sector:

Table 64: Key features of different sub sectors within the land management and rehabilitation sector of Nauru.

Sub sector	Key features
Land use	• Land is owned by 12 different clans/groups and land-use needs to be negotiated and appropriately compensated • There is limited comprehensive and up-to-date data on land use and ownership, with current land use mapping presented in Figure 18 • Due to the strength of customary land tenure systems, there is no provision for compulsory acquisition of land by the state for public purposes (although the government can override the minority) which will be needed if new infrastructure around housing and energy is to be met • Most of the land (over 90%) is owned on a customary basis • Limestone boulders is used in construction and as armour rock for low lying islands, providing export and income generation opportunities for land holders • Unexploded ordnances are an ongoing challenge
Higher Ground Initiative	• Rehabilitate Topside for agriculture, settlement, service provision and biodiversity • Base for new water, energy, and sewage systems • No mention of Protected Areas

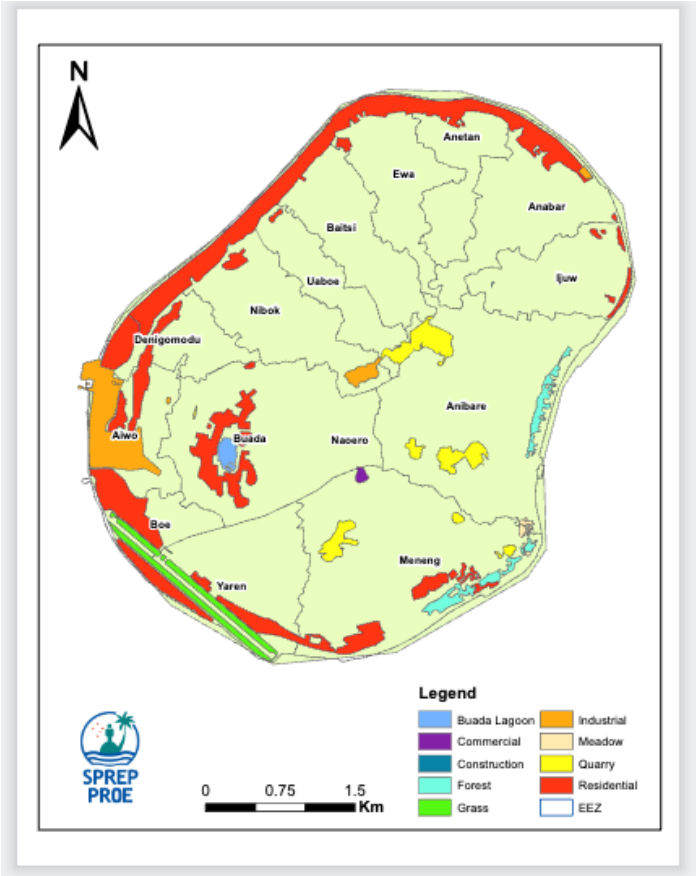


Figure 17 Land use map of Nauru by SPREP

R8: Risks to land management and rehabilitation

The below risk statement (**R8**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for land management and rehabilitation that have been identified and analysed.

Table 65: R8 risk statement and information

Concise risk statement
Chronic and acute climate hazards will increasingly impact the land management and rehabilitation strategies currently in place, which are important for the sustainability of Nauruan land, livelihoods and culture.
Hazards affecting this domain
• Extreme temperature • Extreme rainfall • Drought • Wind • Sea level rise and coastal inundation
Impacts on this domain
• Disruptions and delays to the Higher Ground Initiative • Reduced labour productivity • Flood damage to land rehabilitation sites; changes in flood risk also have implications for land management (for example, flood zones)

- Reduced access to water for construction
- Dieback of vegetation with effects on biodiversity and cultural plants
- Increased demand for land management services to clear fallen trees and debris
- Disruption and damage to land management infrastructure and supply chains due to inundation and erosion
- Exposure of unexploded ordnances
- Further contamination of Buada Lagoon, land, ocean, and groundwater lens from waste contamination

Vulnerability factors relevant to this domain in Nauru

- Weak and limited integrated planning, including no building code and a fragmented institutional environment regarding land governance
- Significant cost to flatten pinnacles (on top of rehabilitation and topsoil addition costs)
- Land use planning delays and complexity of tribe-based land rights and ownership system; the current approaches to land ownership and leasing both present risks to development
- Potential value of limestone for export can increase hesitancy to sell land
- Laws related to lands and survey haven't been updated since the 1970s
- Reliance on international funding for rehabilitation
- Limited comprehensive and up-to-date data on land use and ownership and gaps in spatial and cadastral data which impede evidence-based decision-making
- Inequality of land ownership between tribes, families, migrants
- Fragmentation of allotment subdivision and 'shareholder' land ownership inheritance
- No mention of Protected Areas in the HGI

Consequence to Nauru

- Increased competition between sectors for viable land
- Inability to perform land management actions needed to reduce vulnerability
- Significant cost of rehabilitation and development
- Competition for diminishing available land may cause unrest, threatening community bonds and impact culture as people move from their traditional homes

Current and future hazard exposure and impacts

Extreme temperature

- Heatwaves and hot days will cause disruptions and delays to the Higher Ground Initiative and land management processes by reducing labour productivity and placing pressure on energy and water infrastructure.
- An increase in annual hot days (over 32°C) of 44-242 days per year by 2050 (across low and high emissions scenarios) will increasingly disrupt and delay land management and rehabilitation activities by reducing productivity and placing more severe pressure on limited water and energy resources with implications for public health, cultural practices, and development.

Drought

- Drought can reduce access to water for construction, disrupting the Higher Ground initiative. Land management is also affected by the dieback of vegetation during prolonged dry periods.
- Droughts occurring in a hotter climate with a higher population will cause worsening disruptions and delays to land management activities, including the Higher Ground Initiative, by placing pressure on vegetation and increasing competition for limited water resources. This will threaten economic and human development, cultural practices, and human safety.

Sea level rise and coastal inundation

- Extreme sea level events can interrupt land management activities by damaging infrastructure, disrupting supply chains, and causing dieback of vegetation.
- Coastal erosion also exposes unexploded ordnances, threatening public safety.
- Sea level rise of 15-33cm by 2050 (across low and high emissions scenarios) will increase the demand for land management activities, including the Higher Ground Initiative, whilst also disrupting and delaying land management initiatives by damaging infrastructure (by 2050 this implication is likely to me minimal), increasing competition between sectors for viable land and exposing unexploded ordnances. Disruptions to land management activities will increase the risks to public health and affect culture and community development.

Wind and Storms

- Storms have, and will continue to, drive demand for land management services to clear fallen trees and debris which can create hazards, damage critical infrastructure, and disrupt transport and supply.

Extreme rainfall

- Extreme rainfall can cause flood damage to land rehabilitation sites and affect land management planning (for example, flood zones and contamination of terrestrial and freshwater habitats). Disruptions and delays to the Higher Ground Initiative can occur during extreme rainfall events as a result of reduced labour productivity, disruptions to supply chains and flood damage to land management equipment and infrastructure.
- Increasingly severe extreme rainfall events (increase of 48-54 mm/day annual maximum daily rainfall by 2050 across low and high emissions scenarios) will cause flooding and inundation that will affect public safety, culture, and development in Nauru through widespread impacts on land management, including interruptions to the Higher Ground Initiative, damage, and disruption to supply chains and infrastructure, reduction in viable land and further contamination of Buada Lagoon, land, ocean and groundwater lens from waste contamination.

Vulnerability

The below table (Table 66) presents sources of land management vulnerability to hazards in Nauru.

Table 66: Land management and rehabilitation vulnerability summary

Hazard	Factor relevant for vulnerability
All hazards	• Weak and limited integrated planning, including no building code and fragmented institutional environment regarding land governance • Topside's degraded state remains a key limitation on adaptation pathways, such as retreat of housing, development of renewables and agriculture • Significant cost to flatten pinnacles (on top of rehabilitation and topsoil addition costs) • Limited land rehabilitation capacity • Land use planning delays and complexity of tribe-based land rights and ownership system, current approaches to land ownership and leasing both present risks to development • Laws related to lands and survey haven't been updated since the 1970s • Reliance on international funding for rehabilitation

	• Limited comprehensive and up-to-date data on land use and ownership and gaps in spatial and cadastral data which impede evidence-based decision-making • No mention of Protected Areas in the HGI • Growing population is increasing competition for land, water, and resources • Potential value of limestone for export and income generation can increase hesitancy to sell land

Sub-sector	*Hazard*	Baseline	Future magnitude of consequence score		
		Current	2030 Low / high	2050 Low	2050 High
Land rehabilitation	In future, **increasing temperatures** and **extreme rainfall** may make any land rehabilitation more difficult. Projected increases to average rainfall, along with fewer droughts, may improve options for any terrestrial biodiversity improvements and agricultural pursuits.	Moderate	Moderate	Major	Major
	Projected increases to **average rainfall**, along with **fewer droughts**, may improve options for any terrestrial biodiversity improvements and agricultural pursuits. When **droughts** occur, they will be experienced along with more extreme temperature conditions	Moderate	Moderate	Moderate	Major

Complex risks

- **Water resources:** Drought and extreme heat can reduce water availability and increase water demand, limiting the water available for construction and land rehabilitation activities.
- **Social cohesion:** Disruptions to the Higher Ground Initiative and diminishing available land may cause unrest and increase competition for limited land resources, as well as threatening community bonds and culture as people move from their traditional homes.

Knowledge Gaps

- No consequence scoring of dominant hazards was undertaken for land management due to the lack of information regarding land management impacts and vulnerabilities related to climate and climate hazards.

5.9 Community and culture

Summary of this Sector

To become more resilient to climate change, Nauru has strategies for building the capacity of individuals and the community through cultural preservation initiatives, support for women's and youth affairs, support for family and community services and promoting community participation.

There are three major subsectors in the Nauru community and culture sector:

Table 67: Key features and relevant sub sectors within the community and culture sector of Nauru.

Sub sector	Key features
Culture	• Cultural practices • Cultural sites
Social cohesion	• Human capacity • Social inclusion/capital/ networks • Gender equality
Community development	• Food initiatives and co-ops • Education • Critical services support • Cultural initiatives • Empowerment of vulnerable populations

R9: Risks to community and culture

The below risk statement (**R9**) has been developed through consultation during the Nauru NAP Project-Mission (2024). It discusses the risks that climate change presents for community and culture that have been identified and analysed.

Table 68: R9 risk statement and information

Concise risk statement
Chronic and acute climate hazards will increasingly impact cultural practices and sites, social cohesion, and community development, which are important for the resilience of Nauru's communities.
Hazards affecting this domain
• Extreme heat • Extreme rainfall • Drought • Sea level rise and coastal inundation
Impacts on this domain
• Water, land, and food insecurity can lead to community unrest • Inundation-driven migration threatens community bonds and culture

- Lower human capacity due to more destructive or frequent severe weather events
- Poverty due to a shift in funding and budget concerns due to damage from severe weather events
- Disruption of people at school and work due to impact of hazards including power outages and water shortages
- Disruption of essential services required for community development
- Success of kitchen gardens compromised by climate hazards
- Stress and die back of cultural plants (pandanus)
- Damage and destruction of cultural sites

Vulnerability factors relevant to this domain in Nauru

- Historical exploitation, degradation of the Topside and previous occupations of island has resulted in disadvantage, reliance on aid, and loss of culture
- High rate of NCDs and poverty, low rate of secondary and tertiary education
- Tribe-based land rights and ownership requires deeper exploration of customary land management and adaptation practices
- No register of sites of cultural significance
- Very low tertiary education levels
- Growing population
- Increasing income inequality
- Declining fishing and agricultural practices
- Loss of intergenerational transmission of cultural knowledge around hunting practices
- Lack of structural resilience
- Uncertain effectiveness of Nauruan housing for thermal safety

Consequence to Nauru

- Weaker social capital, networks and increase in gendered inequality
- Continued loss of cultural practices and significant sites
- Disruptions to human development

Current and future hazard exposure and impacts

Extreme temperature

- Heatwaves and hot days can drive water insecurity that can lead to community unrest and the failure of community initiatives such as kitchen gardens. Community development is also affected by reduced workforce productivity and potential power outages during heatwaves.
- An increase in annual hot days (over 32°C) of 44-242 days per year by 2050 (across low and high emissions scenarios) will increase competition for scarce water resources, increase the risk of power outages and lower human capacity during hot days, with implications for public safety, human development, and productivity.

Drought

- Drought and prolonged dry periods can cause water and food insecurity that can lead to community unrest. Both community initiatives (such as kitchen gardens) and culturally significant species (such as pandanus and milkfish) are affected.
- Droughts occurring in a hotter climate with a higher population will place pressure on water resources, terrestrial and freshwater ecosystems, and community initiatives, as well as increasing the risk of fires that damage cultural sites, with more severe impacts on community development, social cohesion, and cultural practices in Nauru.

Sea level rise and coastal inundation

- Extreme sea level events disrupt education and commercial activities, whilst also causing direct damage to culturally significant sites and ecosystems and causing people to move to higher ground. The high cost of sea

level rise adaptation actions can impede community development initiatives through shifts in funding and budget due to concerns over damage from coastal inundation and erosion. The possibility of inundation-driven migration away from particularly exposed areas threatens community bonds and culture.

- Sea level rise of 15-33cm by 2050 (across low and high emissions scenarios) will affect community development by cause worsening inundation and erosion that lowers human capacity, drives people to move away from the coast, generates significant recovery costs, and disrupts economic activities and the provision of essential services. Cultural practices may also be threatened due to the loss of land and damage to terrestrial and marine ecosystems. Disruptions to the Higher Ground Initiative and diminishing available land may also cause unrest and increase competition for limited land resources, as well as threatening community bonds and culture as people move from their traditional homes.

Extreme rainfall

- Extreme rainfall can drive community unrest because of water and food insecurity caused by contamination, inundation and disruptions to infrastructure and supply chains. Cultural sites, the provision of essential services, including education, and commercial activities can also be damaged or disrupted by flooding and inundation.
- Increasingly severe extreme rainfall events (increase of 48-54 mm/day annual maximum daily rainfall by 2050 across low and high emissions scenarios) will cause worsening flooding and inundation, resulting in more severe damage and disruptions to community development, cultural sites, and social cohesion.

Vulnerability

The below table (Table 69) presents sources of community and culture vulnerability to hazards in Nauru.

Table 69: Community and culture vulnerability summaries

Hazard	Factor relevant for vulnerability
All hazards	• Topside's degraded state inhibits human development and has caused the loss of cultural practices and traditions, such as hunting and agriculture, and increased reliance on imported goods • High rate of NCDs and poverty, low rate of secondary and tertiary education • Tribe-based land rights and ownership requires deeper exploration of customary land management and adaptation practices • Historical exploitation and previous occupations of island has resulted in disadvantage, reliance on aid, and loss of culture

Complex risks

- **Agriculture/Fisheries/Biodiversity:** Hazards which impact food production, commercial activities and biodiversity will have flow on impacts for community development and cultural practices.
- **Water resources:** Extreme rain and drought can affect water availability and infrastructure, which can drive unrest and affect social cohesion.
- **Coastal protection and infrastructure:** Infrastructure disruptions will affect workplaces and residential buildings with flow on consequences for social cohesion as people experience workforce and home duties disruption.
- As coastal protection is challenged and land erosion occurs, people will be forced to move further away from the coast, placing pressure on municipal services, and increasing density living. Additionally, cultural landmarks and places of significance may be damaged or destroyed. This has flow on consequences to social cohesion.

- **Human health and wellbeing:** If fractures within social cohesion occur, mental health issues will rise, placing the health sector under strain.

Knowledge Gaps

- No consequence scoring of dominant hazards was undertaken for community and culture due to the lack of information regarding human and community development impacts and vulnerabilities related to climate and climate hazards.
- More information is needed on known and emerging areas of conflict within the community caused by/ worsened by climate and the impacts/consequences. For example, inequality, civil unrest, violence, theft, community, and workforce participation.

Appendices

Appendix 1

Magnitude of consequence rating criteria

Negligible (1)	Minor (2)	Moderate (3)	Major (4)	Extreme (5)
Very minor consequences which can be handled through business-as-usual processes; or some minor region-specific impacts requiring no specialised management or intervention.	Some minor consequences across the island that could be addressed through local or regional management and adaptation processes. Consequences are short-term, not permanent, and entirely reversible	Significant consequences across the island that may require intervention by the Nauru Government. Consequences are moderate, but reversible with appropriate interventions.	Major consequences across the island requiring intervention by the Nauru Government. Consequences are long-term but reversible with significant intervention. May be of interest to Nauru's international partners.	Extreme consequences across the island that requires urgent intervention by the Nauru Government. Consequences are permanent and irreversible. Consequences may completely compromise the system. May be of interest to Nauru's international partners.

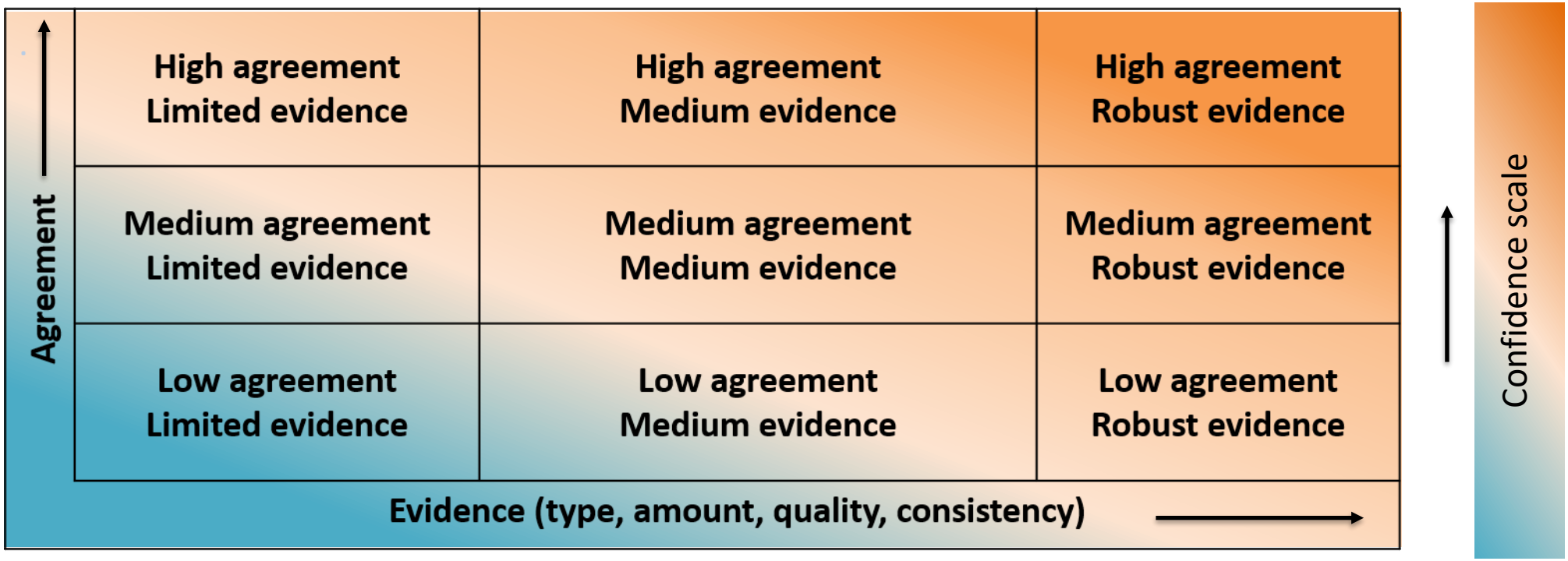
Guidance of the application of the proposed magnitude of consequence scoring criteria

Negligible (1)	Minor (2)	Moderate (3)	Major (4)	Extreme (5)
• *Insignificant infrastructure disruption to utility services (i.e., water, electricity, and telecommunication) and road infrastructure.* • *No discernible changes to health and wellbeing, including housing.* • *Negligible damage to commercial, health and residential buildings not requiring repair or relocation.* • *Negligible or no disruptions to education, employment and/or community services.* • *Negligible impact on natural land and coastal areas.* • *Indistinguishable impacts to ecosystems and/or on quality and availability of water resources.*	• *Isolated and short-term infrastructure service disruption to utility services (i.e., water, electricity, and telecommunication) and road infrastructure.* • *Limited to no impact on health and wellbeing outcomes.* • *Some minor restoration work required to commercial, health and residential buildings.* • *Minor disruptions to education, employment and/or community services.* • *Short-term and minor impacts to a small minority of land and coastal areas.* • *Temporary localised or minor effects on ecosystems and/or species and quality and*	• *Many short-term infrastructure service disruptions; disruption recoverable by maintenance and minor repair.* • *Moderate lasting impacts on health, safety and wellbeing, social welfare, and housing of community members.* • *Damage recoverable by maintenance and minor repair to commercial, health and residential buildings. Some buildings require immediate relocation and assessment.* • *Moderate disruption to education, employment and/or community services.* • *Regional/medium term reduction in the*	• *Widespread short-to-medium term disruptions to utility services (i.e., water, electricity, and telecommunication) and road infrastructure.* • *Prolonged disruption to health, safety and wellbeing, social welfare, and housing of community members.* • *Extensive infrastructure damage requiring major repair to commercial, health and residential buildings. Considerable number of buildings need to be immediately relocated.* • *Prolonged disruption to education, employment, and community services; widespread and moderate impacts on social cohesion.*	• *Widespread, long-term service disruption; significant permanent damage and/or complete loss to utility services (i.e., water, electricity, and telecommunication) and road infrastructure.* • *Health, safety and wellbeing, social welfare and housing of community members is significantly compromised across the region.* • *Severe and often irreparable infrastructure damage to commercial, health and residential buildings. Substantial number of buildings need to be immediately relocated.* • *Widespread, long-term disruption to education, employment, and community services.*

Negligible (1)	Minor (2)	Moderate (3)	Major (4)	Extreme (5)
• *Inconsequential impacts to fisheries and/or agriculture.*	*availability of water resources.* • *Short-term, isolated reductions in the productivity and profitability of agriculture and fisheries*	*integrity/stability of most of coastal areas.* • *Sustained localised or shorter-term regional effects on ecosystems and/or the quality and availability of water resources.* • *Medium-term reductions in the productivity and profitability of fisheries and/or agriculture sector.*	• *Major/longer-term reduction in the integrity/stability of most of coastal areas.* • *Longer-term and widespread impacts to ecosystems and/or water quality and availability.* • *Widespread, significant, and prolonged impacts to fisheries and/or agriculture sector requiring significant structural adjustment.*	• *Severe and widespread instability in coastal areas.* • *Widespread and long-term impacts that have compromised ecosystems and/or the quality and availability of water resources.* • *Failure of the fisheries and/or agriculture sectors.*

Confidence scoring (Confidence) criteria

The criteria for confidence in the risk score is taken by the degree of agreement amongst the evidence and the type, amount, quality, and consistency of the evidence. In the depiction below, confidence increases towards the top-right corner as suggested by the shading turning orange. Generally, evidence is most robust when there are multiple, consistent independent lines of high-quality evidence.



Source: *IPCC Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties. 2010. https://www.ipcc.ch/site/assets/uploads/2017/08/AR5_Uncertainty_Guidance_Note.pdf*

Appendix 2

Summary of results

Based on an assessment of climate hazards, exposure, vulnerability, and related impacts currently experienced in Nauru, each hazard has been assigned a rating (Table A2.1). Currently, sea level and droughts are given a 'very high' rating, while the other climate hazards have a medium or high rating. These may, or may not, change under projected climate conditions. For example, the projected increase in sea level by 2050 is likely to raise the rating from very high to extreme for low emissions and very extreme for high emissions. The impact ratings will also increase for extreme temperatures, marine heatwaves, and floods, given projected increases in SST and extreme rainfall. Wind speed will not change due to lack of high confidence wind speed projections. There is significant variation across Moderate, Severe and Extreme drought projections (see Chapter 7 of the Hazards Report), with the compounding influence of growing population, hotter mean climate and sea level rise affecting the severity of future drought impacts.

Table A2.1: Climate hazard assessment for Nauru, based on current and future climate hazards (Table 3) for 2030 (when low and high emissions are similar) and 2050 for low and high emissions scenarios, noting current vulnerability and exposure. Colours are aligned to the consequence rating scale below. SST is sea surface temperature and MHW is marine heatwave.

Low	Medium	High	Very high	Extreme	Very Extreme	Unclear / no data

Sector	Current vulnerability and exposure	Current hazard ratings	Climate hazard ratings		
			2030	2050	
			Low/High	Low	High
Water resources	Water demand increases under extreme heat conditions	Extreme temperature			
	Saltwater contamination of freshwater lens increases demand for desalination. Water infrastructure can be damaged by coastal inundation.	Extreme sea level			
	Pressure on water delivery truck network and groundwater resources. Greater demand for desalination.	Drought*			
	Floods can damage to water supply/drainage infrastructure, and increased pollution/sediment can reduce water quality.	Extreme rainfall	No data		
		Extreme sea level			
	Limited ability to capture water in household water tanks	Rainfall			
Health and wellbeing	Heat stress and associated health and mental-health issues due to inadequate cooling in buildings, exposure of outdoor workers and heat-related power outages	Extreme temperature			
	Food safety and medical supply issues where refrigeration is limited				

	Flood-related water-borne disease and sanitation issues due to limited water treatment and sewage treatment plants. Flood damage to hospital and disruption to health services.	Extreme rainfall	No data		
	High exposure of communities to inundation, loss, and damage in low lying coastal areas, affecting mental health	Extreme sea level			
	Exposure of health infrastructure to inundation, affecting health services				
Agriculture	Exposure of agriculture in low lying areas to coastal inundation and saltwater intrusion into soil	Extreme sea level			
	Livestock are vulnerable to heat stress. Reduced labour productivity when hot	Extreme temperature			
	Limited water for crops and livestock during droughts	Drought*			
	Crops are exposed to floods. Reduced farm access during floods.	Extreme rainfall	No data		
Fisheries and marine resources	Fish catch may increase/ or decline depending on rate of SST warming/ emission scenario. National revenue is strongly dependent on offshore fish catches and licences	SST	unclear		
	Household consumption is strongly dependent on inshore fisheries productivity and marine biodiversity	SST			
	Maritime safety and fishing activity for coastal fishers can be affected by high winds / waves	Wind speed			
	Fish being processed may spoil in the heat without refrigeration, affecting potential sale value and suitability for consumption. Working conditions affected by high temperatures.	Extreme temperature			
	Pollution and sediments degrade coastal water quality	Extreme rainfall	No data		
Disaster management and emergency response	Lack of property protection from extreme sea level and extreme rainfall elevates disaster risk	Extreme sea level			
		Extreme rainfall	No data		
	Black-outs can cause cascading and compounding impacts across multiple sectors which increase demand for emergency services	Extreme temperature			
	Increased risk of fire – resulting in the requirement for increased firefighting capacity. As there is limited water storage on Nauru, fire-fighting capacity is also limited.				
	Exposure to coastal inundation in low lying areas affects essential infrastructure	Extreme sea level			
	Flood damage to roads, airport, water, energy, and telecommunication facilities can disrupt emergency services	Extreme rainfall	No data		
Infrastructure and coastal		Extreme sea level			
		Extreme rainfall	No data		

protection (including transport energy, waste management, telecommunication)	Roads and airport runway are exposed to coastal inundation/erosion, flooding, and heat-related deterioration. Flooding may cause increased runoff / pollution to the sea	Extreme temperature			
	Telecommunication, building and coastal protection assets subject to surface flooding, coastal inundation, and groundwater intrusion	Extreme rainfall	No data		
		Extreme sea level			
	Electricity assets subject to surface flooding, coastal inundation, and groundwater intrusion	Extreme sea level			
		Extreme rainfall	No data		
	Increased energy demand and black-out risk on hot days	Extreme temperature			
	Salt spray may affect transmission wires	Drought*			
		Wind speed			
Biodiversity and environment	Heat stress for some animals and plants. Sea turtle gender affected by sand temperature.	Extreme temperature			
	Declining health of coastal marine habitat such as coral reefs and lagoons	MHW and ocean acidification			
Land rehabilitation and land management	Rehabilitation areas are exposed to coastal inundation and erosion	Extreme sea level			
	Heat stress for workers	Extreme temperature			
	Rehabilitation sites may be susceptible to flood damage	Extreme rainfall	No data		
	Lack of access to water for building construction	Drought*			
Community and culture	Reduced labour productivity in hot conditions	Extreme temperature			
	Rehabilitation sites may be susceptible to flood damage	Extreme rainfall	No data		
	Population and gardens are vulnerable to dry conditions	Drought*			
	Heat stress for community and workers	Extreme temperature			
	Disruption for people at school or university.	Extreme rainfall	No data		
	Success of kitchen gardens affected by water availability and cost of desalinated water.	Drought*			
	Community disruption, especially at spring and king tides.	Extreme sea level			

*Projections for drought intensity, frequency and duration vary for Moderate, Severe and Extreme droughts as well as across different time periods and emissions scenarios. Please see Chapter 7 of CSIRO (2024) *Assessment of Climate Hazards and Associated Sectoral Impacts for Nauru Under Current and Future Conditions* for further information and detailed drought projections.

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