Nauru Climate Impact, Vulnerability and Risk Assessment (CIVRA) Synthesis Report

In partnership with:

Nauru Climate Impact, Vulnerability and Risk Assessment (CIVRA) Synthesis Report.

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This Synthesis Report was prepared by Leanne Webb (CSIRO). It draws upon four technical reports:

- **Climate Hazard Assessment (CHA):** CSIRO, Federation University, Climate Comms (2024). Assessment of climate hazards and sectoral impacts for Nauru under current and future conditions. CSIRO, Federation University and Climate Comms, Australia. DOI: https://doi.org/10.25919/wmf3-gg04
- **Climate Vulnerability Assessment (CVA):** Trundle, A., Ho, S. & Lese, V. (2024). Nauru Climate Vulnerability Assessment. University of Melbourne, Australia. DOI:10.26188/27229263
- **Climate Exposure Assessment (CEA):** NGIS (2024). Coastal inundation and sea level rise exposure assessment for Nauru CIVRA. NGIS Australia.
- **Climate Risk Assessment (CRA):** Deloitte (2024). Climate Change Risk Assessment for Nauru. Deloitte, Australia.

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Contents

Key messages

Development of a National Adaptation Plan (NAP) for Nauru requires credible and relevant information about recent and future climate risks. This report summarises climate hazards, vulnerabilities, and risks over recent and future decades, out to 2050, across nine priority sectors: water, health, agriculture, fisheries, disaster management, coastal protection and infrastructure, biodiversity and environment, land management and rehabilitation, human and community development. Key messages for each sector are listed below:

- **Water**: Freshwater storage capacity and functionality is limited in Nauru, and there are limits to the supply of desalinated water (Reverse Osmosis [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.

- **Health**: Health-related climate impacts include direct impacts (e.g. heat stress and injuries from extreme weather events), and indirect impacts on water security / quality (e.g. water borne diseases), food security / quality (e.g. malnutrition and food borne diseases), vector borne diseases, respiratory illness, and diffuse impacts through mental/psycho-social disorders. In future, these impacts are expected to become worse due to projected increases in extreme temperature, extreme rainfall and extreme sea level events.

- **Agriculture**: Floods and droughts have impacted Nauruan agriculture. While annual-average rainfall is projected to increase, along with fewer droughts, an increase in extreme temperature and extreme sea level events will have major implications for agriculture, particularly through drought periods.

- **Fisheries**: In future, increases to sea surface temperatures (SSTs) may affect purse-seine tuna catch due to shifting fisheries' locations. By 2050 in Nauru, the average catch is projected to change depending on the magnitude of regional change to SSTs. Catches may increase by 5.7 % under a medium emissions scenario (RCP4.5), or decline by 21.6 % under a high emissions scenario (RCP8.5), with corresponding changes to national revenue [12] (CHA).

  Critical coastal fishing considerations include overfishing and depletion of near-shore fish stocks (as well as other marine resources), correlating with a population increase, and a lack of implementation and enforcement of traditional or legislative constraints on reef takings. Fish consumption by Nauruans is more than 2.5 times higher than the global average, yet a significant share of consumed fish is imported, having been processed elsewhere.

- **Disaster management**: Floods, droughts, and storm surges, exacerbated by local exposure and vulnerability, have caused natural disasters in Nauru. Increasing temperatures, extreme rainfall and sea levels may increase pressure on disaster management services.

- **Coastal protection and infrastructure**: Increases in sea level will exacerbate exposure of Nauru infrastructure to coastal inundation to a small extent by 2050. By 2050, sea level rise is projected to be 0.15 to 0.28 m for low emissions and 0.19 to 0.33 m for high emissions, so impacts to infrastructure are modest. Currently only 0.7 % of buildings are exposed to coastal inundation, and this may increase to 2.3 % for sea level rise of 0.35 m. Extreme heat can also impact infrastructure and maintenance of such as well. Increasing extreme rainfall will affect some important infrastructure, e.g. the hospital, protection of which needs to be considered.

- **Biodiversity and environment**: Remnant flora and fauna are in a highly disturbed state, despite high cultural and ecological value. Groundwater systems show signs of saline ingress under current conditions and are sensitive to periods of drought. Nearshore reef areas are in a degraded state, with most fish and marine invertebrates undersized. In future, increasing atmospheric temperatures will place pressure on terrestrial species, particularly in times of drought. Similarly, marine heatwaves, ocean acidification and increasing SSTs will adversely affect marine environments.

- **Land Management and rehabilitation**: Degradation of 80 % of land, failure to enforce land remediation, loss of compensatory revenue, and a lack of strategic spatial / urban planning limits land management and rehabilitation in Nauru. 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.

- **Human and community development**: Nauruan cultural traditions stem from twelve tribal groupings or clans. There is limited physical space and natural materials for cultural practices, no national register of sites of cultural significance or heritage, extensive loss of traditional knowledge across generations, and legislated customary land tenure is intertwined with cultural systems. Heat stress affects communities and labour productivity. Flooding due to extreme rainfall, and coastal inundation due to extreme sea level events, may impact cultural sites.

Data, uncertainties, confidence and limitations

The average climate, recent trends, variability and future projections are assessed here. Projections are calculated for 20-year periods centred on 2030 and 2050. The climate is already changing, and ongoing increases in greenhouse gases will lead to further global warming and regional climate change. There are three main sources of uncertainty in regional climate projections:

1. Greenhouse gas emissions and atmospheric concentration pathways, based on assumptions about socio-economic change, technological change, energy and land use.
2. Regional climate responses to a given concentration pathway, based on computer simulations from climate models.
3. Natural climate variability on timescales from days to years.

For each climate variable in the assessment, a confidence rating is provided for projected changes, e.g. temperature and sea level projections have high confidence, rainfall projections have medium confidence, and extreme windspeed projections have low confidence.

Global Climate Models (GCMs) have coarse resolution (100–200 km between data points) and can provide useful climate projections over the coming decades at broad scales, e.g. estimates of global warming. Downscaled modelling (dynamical and/or statistical) can give better representation of regional weather and climate phenomena, especially over complex terrain such as mountains and coastlines. For some climate hazards, separate models are needed to provide relevant information. For example, regional sea level projections require the other models to simulate dynamical ice sheet processes and gravitational changes due to melting of ice sheets and glaciers. Projections for storm surges and ocean waves require hydrodynamic and wave models. All these modelling techniques have limitations; and agreement between multiple models and modelling techniques leads to improved confidence in results.

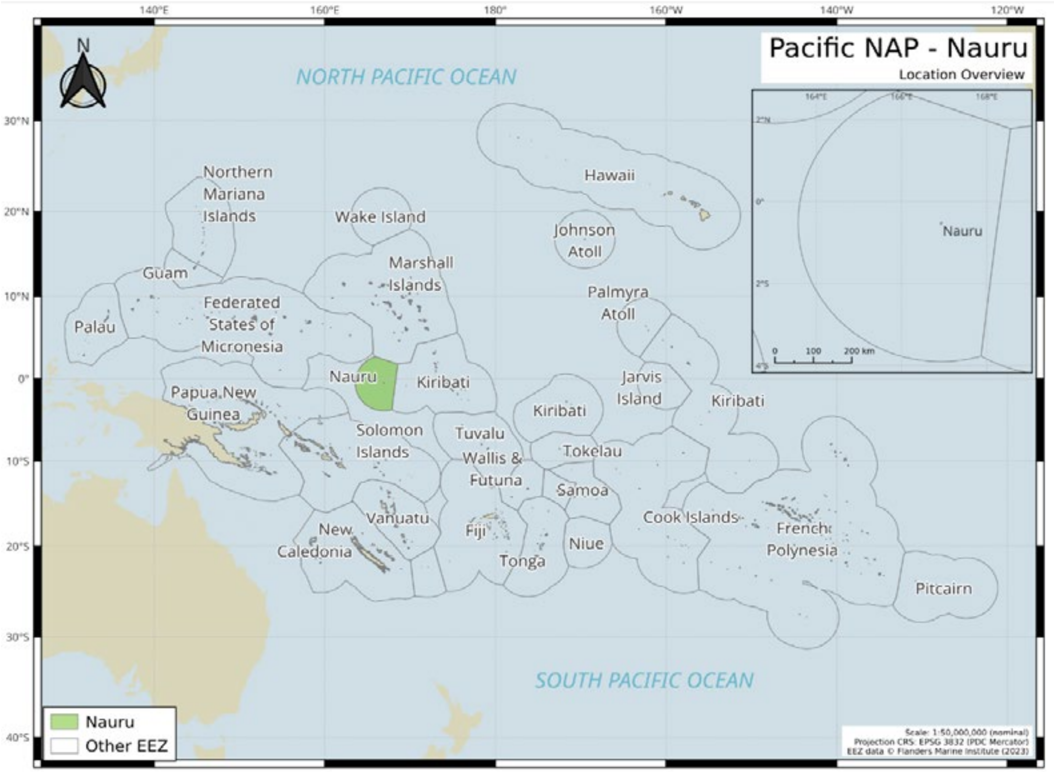
Parts of the climate system can reach a ‘tipping point’ where change is often abrupt and irreversible on long timescales. However, there are deep uncertainties about some of the climate processes that could cause tipping points, e.g. thawing of Northern Hemisphere permafrost, collapse of the overturning ocean circulation in the north Atlantic Ocean, and rapid disintegration of the Greenland and Antarctic ice sheet.

See the main report for more information on data, uncertainties, confidence and limitations.

Country overview

Environment

Nauru is an isolated, uplifted limestone island located 60 km south of the equator (Figure 1, left) [1]. Even though the island is relatively small (21 km^2), Nauru has a large marine area (Exclusive Economic Zone; EEZ) which extends to 309,261 km^2 (Figure 1, inset) [2]. Nauru is divided into 14 administrative districts of varying sizes and populations (Figure 1, right) (CHA).



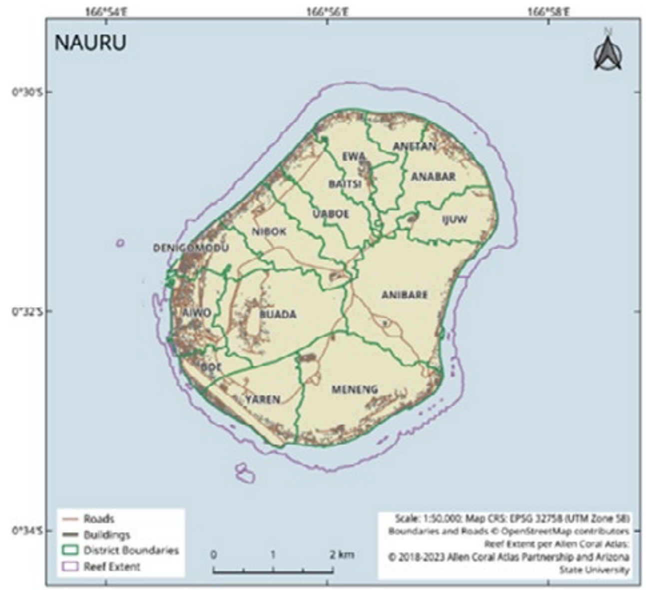


Figure 1 Nauru's Exclusive Economic Zone (EEZ) (green) and the surrounding western tropical Pacific EEZs (grey lines). Inset shows the Nauru EEZ, emphasising the relative size of land and ocean (left). Nauru with district boundaries (green lines), roads and buildings (brown), and reef extent (purple) (right).

On the island, a narrow coastal area known as 'Bottomside' ranges from 100-400 m wide and rises to approximately 10 m above sea level [3]. This area consists of sandy or rocky beaches, followed by a combination of beach ridges or foredunes and low-lying brackish lagoons [3]. The bulk of settlements and infrastructure, including the majority of the road network are situated throughout this area (CVA).

A limestone escarpment rises 30 metres to a central plateau, known as "Topside"; an area of 16km2 that covers roughly 70 % of the island [4]. After extensive phosphate mining, most of Topside is degraded scrubland, interspersed with patches of secondary forest and bare mined sites. Exceptions to this are a series of lagoon and wetland areas in Ewa and Ijuw-Anabar; and Buada Lagoon, a body of water in the southwest surrounded by the only substantive inland settlements. Buada Lagoon, with brackish water covering approximately 5 ha, occupies a depression that extends down to only 5 m above sea level, and is surrounded by a 12 ha marshy expanse (used by the local community for various forms of agriculture) [4] (CVA).

A shallow intertidal fringing reef flat extends between 50-300 m beyond the shoreline around the island. Beyond this reef the Nauru shelf descends rapidly but steadily to nearly a kilometre of depth at an average of 1.5 kilometres from the shore, apart from Anibare Bay to the island's east, where the descent is more rapid [5]. The fringing area plays a critical role in nearshore fishing by Nauruan inhabitants (CVA).

History and Society

Nauru was first inhabited by Micronesians an estimated 3,500 years ago, with the first European contact in 1798 when British merchant captain John Fearn named it Pleasant Island [6]. It was not until the 1830s when regular European contact was recorded [7]. From the 19th century onwards, Nauru increasingly encountered Europeans including whalers, missionaries and German administration (1888 to beginning of World War I) [8]. Phosphate mining started in 1906 through the Pacific Phosphate Company, a British corporation [9]. World War II saw eventual occupation of Nauru by Japanese forces, who exiled two-thirds of the island's population to Chuuk (in the now Federated States of Micronesia), of which only 40 % survived to return home.

Nauru has sustained cultural identities in the face of destruction of many resources and ecosystem assets (e.g. frigate birds) central to associated traditions. There has however been an inequal distribution of wealth from phosphate mining (both internally and externally), resulting in significant systemic differences in infrastructure and socio-physical behaviour (e.g. high electrification, prevalent poverty and food insecurity, and one of the Pacific's highest levels of GDP per capita). There exist high levels of school attendance and literacy, but limited local economic opportunities outside of government and associated services (CVA).

Economy

In the early 1980s, Nauru had the highest GDP per capita in the world, with 95 % of the workforce being public servants, and strong reliance upon phosphate royalties for income. In 2000, commercial mining of phosphate ceased but, while residual phosphate mining continues, government revenue and average household income and living standards had reduced dramatically. This decreased revenue also put pressure on power generation, drinking water and health services. Nauru has a small domestic fisheries industry which provides some revenue, but Nauru remains heavily dependent on revenue from international fishing licences in its Exclusive Economic Zone [12], and fees / visas relating to the Regional Processing Centre (RPC), as well as foreign aid [13, 14]. The national economy (at least in terms of revenue) has improved very significantly since national bankruptcy and sanctions due to tax haven / possible terrorism finance and is now back up to high income status as of 2022 (CHA).

Against a baseline of severely degraded natural environment driven by a century of mining, a unique communal land tenure system complicates large-scale spatial planning and associated development initiatives. Nauru has a lengthy history of unimplemented land rehabilitation initiatives (CVA).

Vulnerability and exposure

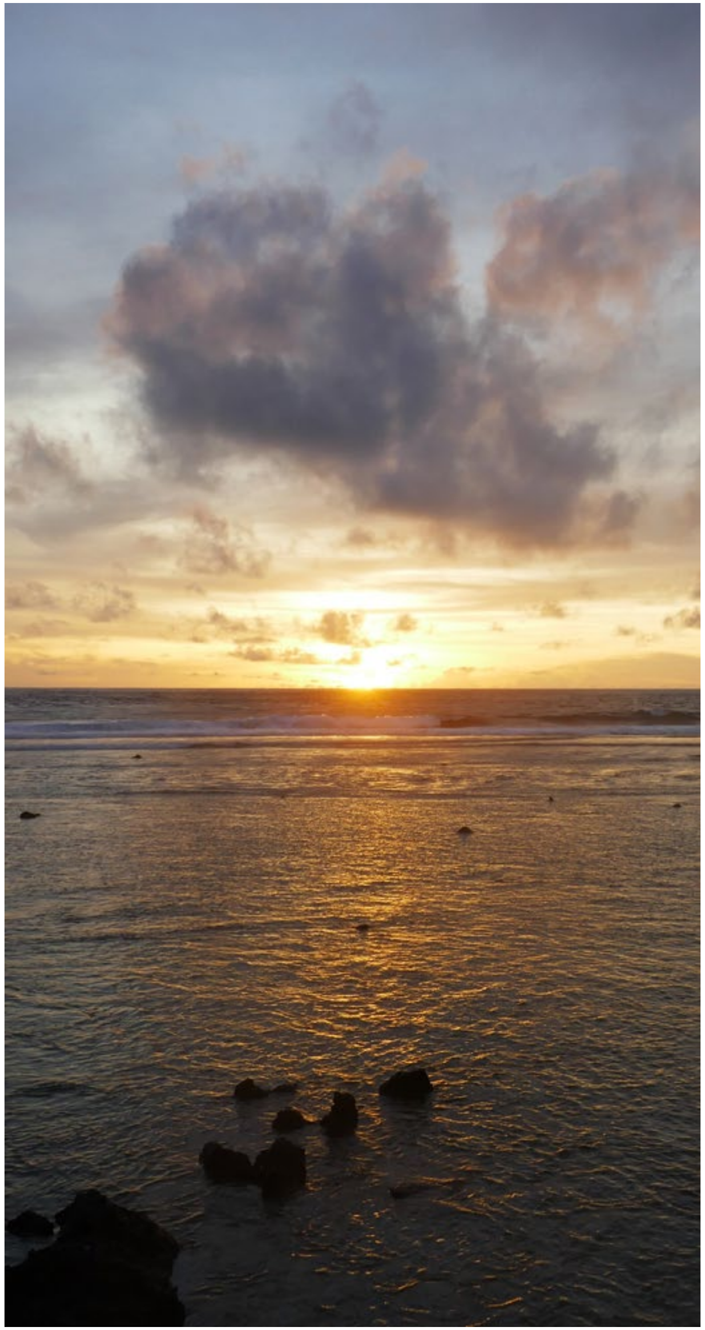
Compared with many other Pacific Islands Countries and Territories, Nauru currently faces fewer and less intense climate-related hazards, e.g. no tropical cyclones. However, national scale vulnerabilities are an outcome of existing infrastructure deficits, as well as the wider complexities of Nauru's economy and legacies of colonial and commercial exploitation of land, the biosphere, and traditional socio-cultural systems (CVA).

At a sub-national level, vulnerability is also exacerbated by wide inequalities relating to economic capacity, land rights (and associated compensation), and levels of skill, education, health and wellbeing. Communities with heightened vulnerability include Aiwo with lower adaptive capacity and food security, Anetan with high exposure to climate hazards, with some households dependent upon ecosystem services for livelihoods (fishing, livestock, noddying, etc.), and Location (part of Denigomodu) with a disproportionate share of inhabitants with disabilities, lacking tribal identities (CVA).

Policies and programs

The Nauru CIVRA draws on many policy documents including below list (and also see the reference sections of the CVA and CHA reports):

- 2021 National Census [1]
- Nauru Water and Sanitation Master plan: 2017 update [15]
- Rapid Biodiversity Assessment of Nauru (SPREP 2014) [16]
- Nauru's 2021 State of the Environment Report [4]
- 2022 Nauru Water and Sanitation Master Plan [17]
- Nauru Climate Risk Profile (WBG, 2021) [18]
- Nauru Demographic and Health Survey 2007 [19]
- Higher Ground Initiative Land Planning and Resiliency Report [20]
- Higher Ground Initiative – Purpose + Need Report [20]
- Higher Ground Initiative Land Tenure and Safeguarding Report [20]
- Nauru 2023-24 Budget (GRN, 2024)
- Nauru National Budget Papers (RON, 2023)
- Fishery and Aquaculture Profile – Nauru (FAO, 2013) [21]
- National Social Protection Strategy 2022-2023 (RoN and UN, 2022)
- Disaster Risk Reduction in Nauru: Status Report (UNDRR, 2022) [13]
- Republic Of Nauru Framework for Climate Change Adaptation and Disaster Risk Reduction (RONAdapt 2015) [14]
- Nauru Integrated Infrastructure Strategic Plan 2024 (GoN, 2024)
- Nauru Coastal Risk Assessment (2023) [22]
- Nauru Sustainable and Resilient Urban Development Plan (ADB, 2024)
- Nauru's Biodiversity Strategy and Action Plan (Onorio & Deiye, 2010)
- National Sustainable Development Strategy 2019-2030 (RON, 2019)
- The National Sustainable Development Strategy (NSDS) [23]
- Nationally Determined Commitment Priority Areas (2019) [24]
- Nauru Climate Change Policy (2023) [25]
- Gender Equality Brief for Nauru [26]
- National Social Protection Strategy 2022-2023 [27]
- Nauru Sustainable Urban Development Phase 1 [28-30]



Climate

Nauru is located in a high rainfall zone in the central tropical Pacific Ocean, where easterly trade winds help to moderate the heat and humidity associated with the warm ocean close to the equator (Figure 2). Extreme weather events such as heatwaves, droughts and floods can cause considerable damage and loss for Nauru. Due to its close proximity to the equator, Nauru experiences no tropical cyclones (CHA).

The four climatic features most relevant to Nauru are the Western Pacific Warm Pool (WPWP), the Western Pacific Monsoon (WPM), the South Pacific Convergence Zone (SPCZ) and Intertropical Convergence Zone (ITCZ). Changes to El Niño Southern Oscillation (ENSO) modulate these features on interannual time scales [31]. El Niño events occur every 3–5 years and typically last 6–24 months, while La Niña events occur every 3–7 years and half of them have lasted 24–36 months. Nauru is in the region where the SPCZ and ITCZ merge [32], however the SPCZ has the more dominant influence on weather and climate [31, 33]. The increased rainfall in the wet season (November to April), increases as the SPCZ intensifies and the ITCZ moves equatorward. The decreased rainfall in the dry season (May to October), decreases as the SPCZ weakens and the ITCZ moves northward [31] (CHA).

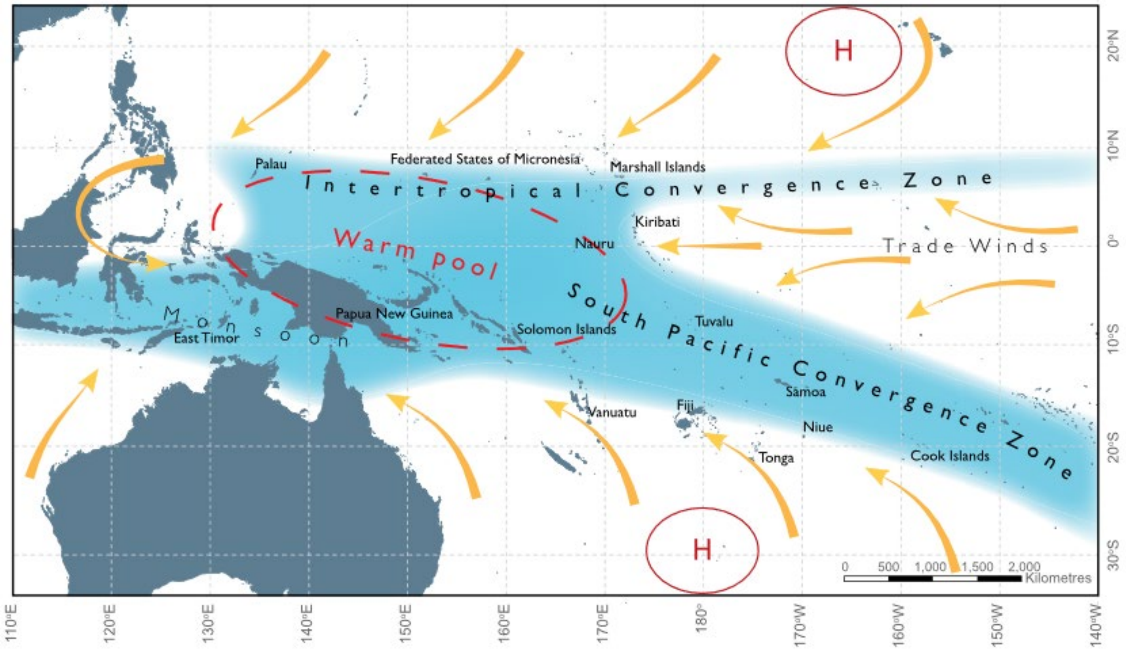


Figure 2 Schematic representation of major climatic features and drivers in the western tropical Pacific. The Intertropical Convergence Zone (ITCZ), South Pacific Convergence Zone (SPCZ) and West Pacific Monsoon are characteristic features where convective activities such as tropical cyclones and thunderstorms are frequently spawned. (Source: [32]).

Average climate

Nauru's average minimum temperature is around 25°C, and the average maximum temperature is around 31°C (Figure 3, left). Annual-average rainfall is around 2100 mm, mostly falling in the wet season from November to April (Figure 3, middle). Annual average sea surface temperature (SST) ranges from 28.9 °C to 29.6 °C from north-east to south-west (Figure 3, right). Nauru is vulnerable to remote typhoon/cyclone-generated winds, large waves, storm surges and swells (typically from the west) (CHA).

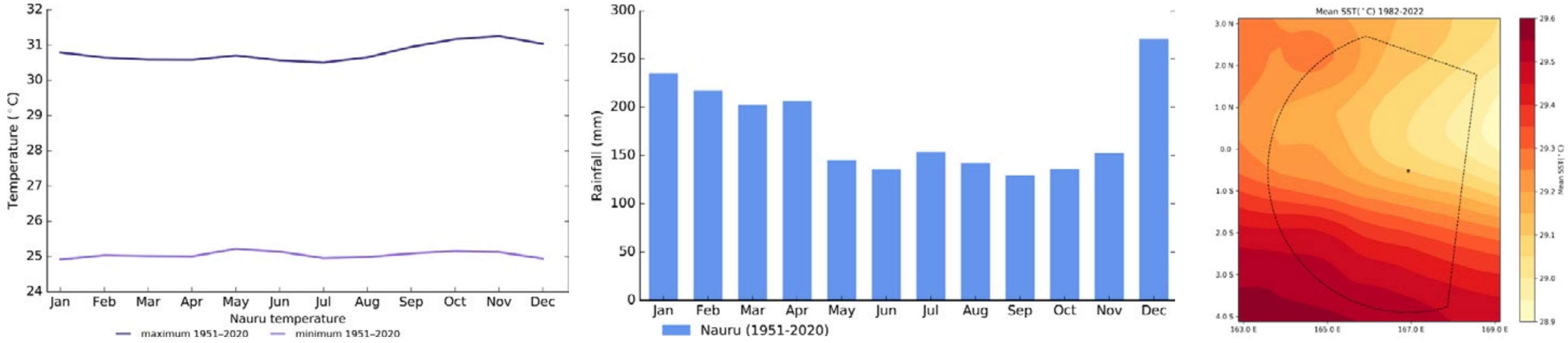


Figure 3 Nauru's monthly-average maximum and minimum air temperature (left) and rainfall (middle) based on data from 1951-2020. Source: McGree et al. (2022). Average sea surface temperature (1982-2022) (right).

Climate variability

Climate variability on daily, monthly and yearly timescales affects the frequency, intensity and duration of heatwaves, droughts, floods, winds, waves, storm surges and ocean swells. Variability in the western tropical Pacific is significantly influenced by ENSO. SST northeast of Nauru is warmer than normal during an El Niño event, cooler than normal during a La Niña event, and close to normal in a neutral year. These SST anomalies affect the position and strength of the SPCZ which is associated with heavy rainfall and cyclone activity. During El Niño events, the SPCZ tends to move north-east, so Nauru gets more rainfall. During La Niña events, the SPCZ tends to move south-west, so Nauru gets less rainfall (CHA).

Climate variable	La Niña	El Niño
Rainfall	Drier	Wetter
Sea surface temperature	Cooler	Warmer
Sea level	Lower	Higher

Climate trends

Increases in greenhouse gas concentrations are causing global climate change. In Nauru, this has contributed to changes in temperature, rainfall, sea level and ocean chemistry. During 1979 to 2021, minimum temperatures increased by 0.17 °C per decade, and maximum temperatures increased by 0.19 °C per decade. There have been fewer cold nights and more hot days; the number of hot days (days with maximum temperatures above the 90th percentile for 1981-2010) has increased by 22 days per decade [34]. While annual maximum 1-day rainfall has been increasing, there has been no significant trend in annual rainfall or drought since 1950 [34] (Figure 4, left) (CHA).

Sea surface temperatures increased by 0.22 °C per decade since the early 1980's [34] (Figure 4, middle). Observations in the Pacific Islands region indicate that from the 1980s to 2000s, the average duration of MHWs was 5 to 16 days. However, in the 2010s, this increased to 8 to 20+ days [35]. Timeseries of MHW observations have been assessed for Nauru's northern and southern coasts showing an increasing frequency of MHW's during 1981–2023, mostly in the moderate category (Figure 4, bottom right). Oceanic pH measurements since 1988 at Station ALOHA near Hawai'i show that the ocean became 12 % more acidic, due to higher atmospheric concentrations of carbon dioxide being sequestered by the ocean. Sea level has been rising around Nauru at an average rate of 3.5–4.5 mm/year since 1993 (CHA).

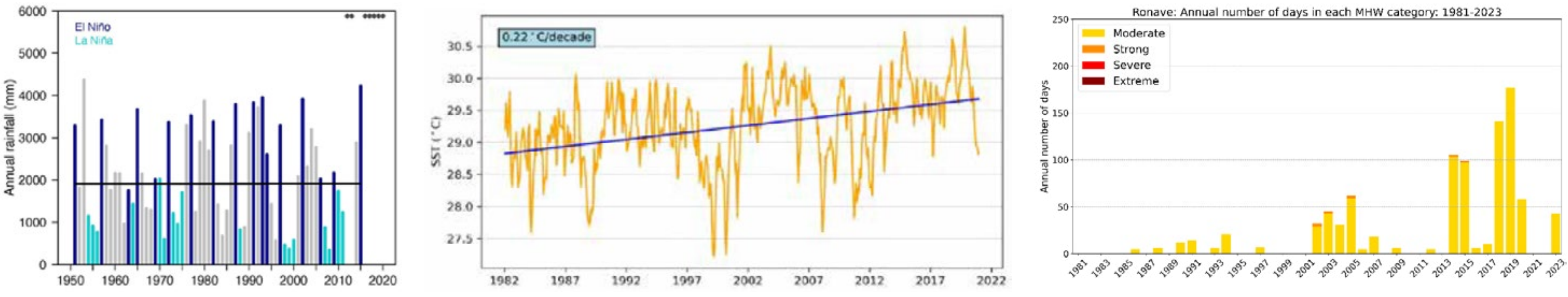


Figure 4 Annual rainfall variability (right) includes El Niño years (dark blue), La Niña years (light blue) and neutral years (grey). Diamonds in the top right indicate years with missing data. (left; Source [36]*) SST from satellite measurements averaged across the Nauru EEZ (1981–2021), with annual averages shown as the orange line. The blue line shows the linear regression trend of 0.22 °C/decade* [36] *(top right; Source:* [37]*). Annual number of MHW days (1981-2023) in each category* [38, 39] *for Ronave (northern Nauru) Data source: NOAA OISST v2-1* [37] *(bottom right).*

Climate projections

Projected changes in climate have been estimated for 2030 and 2050 for Nauru for low and high greenhouse gas emissions pathways based on simulations from climate models. These changes are summarised in Figure 5 with more detail given in Table 1 (CHA).

Figure 5 Climate change projections for Nauru (Photo credits CSIRO, 2024).

Annual-average temperature is projected to increase 0.7 °C by 2030 relative to the average for 1995-2014 (same magnitude for low and high emissions). By 2050, the warming is 1.0 °C for low emissions and 1.5 °C for high emissions. This average warming also translates to more extremely hot days.

Annual-average rainfall is projected to increase 11 % by 2030 relative to the 1995-2014 average. By 2050, the projected increase is 32 % for low emissions and 24 % for high emissions. Drought intensity, frequency and duration are projected to decrease.

Extreme daily rainfall events are projected to become more intense. By 2050, annual maximum daily rainfall may increase by 48 mm/day (43 %) for low emissions and 54 mm/day (52 %) for high emissions. The average return period between extreme rainfall events is projected to become shorter (more frequent). For example, a heavy rainfall event (200 mm/day) that occurred every 80 years (on average) across the 1995-2014 period may occur at an average frequency of every 5.6 years (low emissions) and every 3.5 years under a high emission scenario by 2040-2060.

Storm surges and swell waves from remotely occurring severe weather events (e.g. tropical cyclones) can influence coastal inundation. Tropical cyclones passing nearby (through the 500 km zone) Nauru are projected to become less frequent but more intense in future.

Sea level is projected to rise 0.10 (7 to 14) m by 2030 compared to 1995–2014. 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.

The average number of MHW days is projected to increase from 16 days per year during 1995-2014 to 105-140 days per year by 2050 for low emissions and 180-270 days per year by 2050 for high emissions. There is a large increase in 'Strong' and 'Severe' MHW days, with implications for coral bleaching.

Ocean acidification is projected to continue. By 2050, ocean pH is projected to decline 0.05 units for low emissions and 0.12 units for high emissions. Related to pH, aragonite saturation states may fall below 3 by 2060 under high emissions, a level where coral reefs may not only stop growing but start to get smaller because they dissolve faster than they are built. However, under a low emissions scenario, the aragonite saturation state may start to recover after 2060.

There may be more extreme El Niños and more extreme La Niñas in future, causing greater variability in SST, rainfall and extreme weather events (CHA).

Table 1 Historical climate averages (20-years centred on 2005) are given in the first column. Projected climate change for 20-year periods centred on 2030 and 2050, relative to a 20-year period centred on 2005, are given in the last four columns. Changes are based on simulations from CMIP6 global climate models 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 involving an assessment of the amount of evidence and the degree of agreement between lines of evidence. Drought projections are based on the Standardised Precipitation Index (SPI 3-month) between –1.0 and –1.5 (moderate drought).

Nauru		**Projected change**			
20-years centred on 2005		**2030**	**2050**	**2050**	
		Low/High Emissions*	**Low emissions**	**High emissions**	**Confidence**
	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

Sectoral vulnerability and risk overview

Priority sectors and domains

The forthcoming National Adaptation Plan will be a continuation of the 2015 Republic of Nauru Framework for Climate Change Adaptation and Disaster Risk Reduction (RONAdapt) in the form of a 'RONAdapt 2.0' [14]. The CIVRA team, building on in-country consultations with cross-sectoral stakeholders, refined RONAdapt's sectoral classifications to 9 sectors and domains for the purpose of the integrated climate risk analysis, as shown in Figure 6 below (CVA, CHA, CRA).

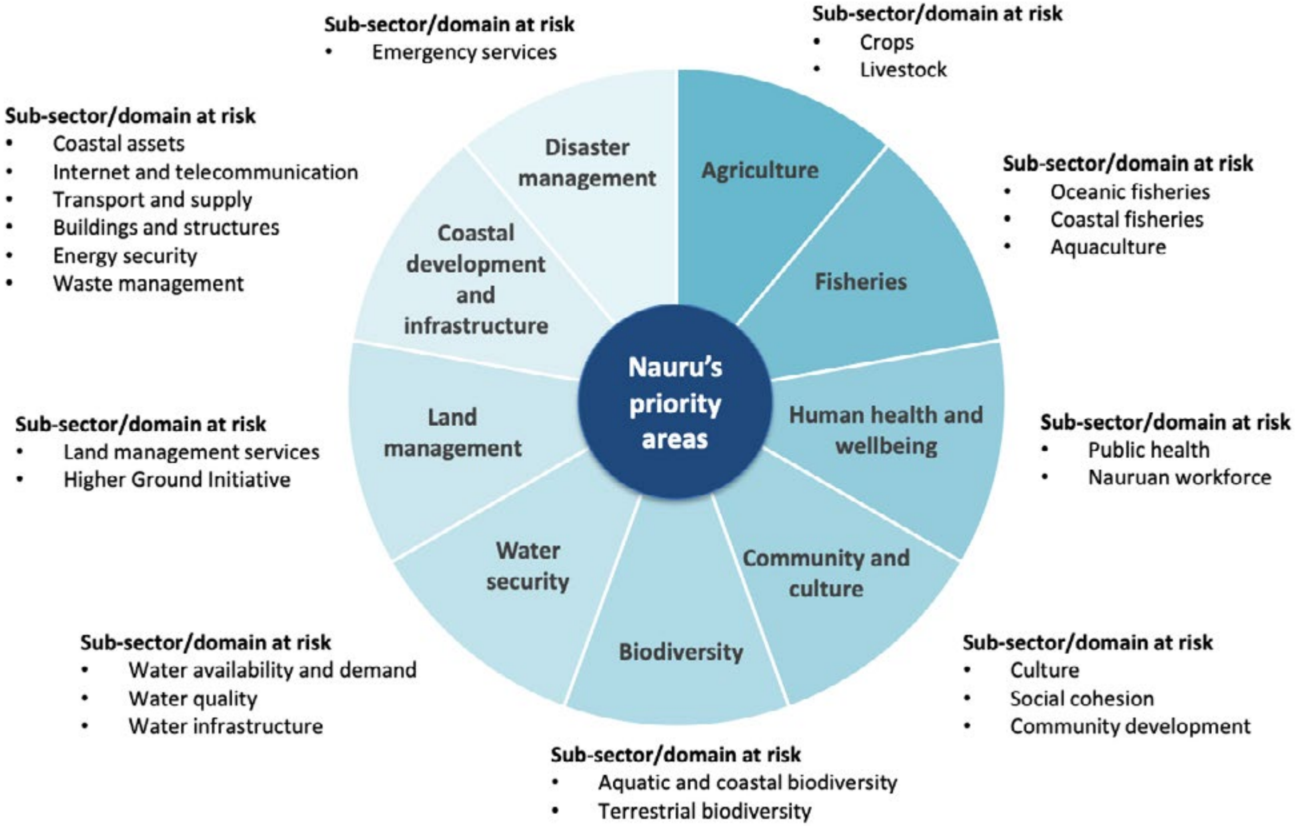


Figure 6 Priority sectors and domains assessed through the CIVRA

Sectoral vulnerability

Compared with many other Pacific Island countries, Nauru currently faces fewer and less intense disaster-related hazards, including climate shocks and stresses. However, consideration of climate vulnerability, particularly in relation to rainfall variability, significantly increases the consequences of existing exposures to climate hazards with implications for future climate change. These heightened aggregate vulnerabilities are an outcome of existing infrastructure deficits, as well as the wider structure of Nauru's economy and legacies of colonial and commercial exploitation of land, the biosphere, and traditional socio-cultural systems. At a sub-national level, disaggregated vulnerability is also exacerbated by wide inequalities relating to economic capacity, land rights (and associated compensation), and levels of skill, education, and health and wellbeing. Observable trends and near-term potential step-shifts, as well as uncertainties and relevant externalities, were considered across each sector (Table 2) (CVA).

Table 2: All Sector / Domain Vulnerability Summary

CIVRA Sector / Domain for National Adaptation Planning	Aggregate Vulnerability[1]	Disaggregated Vulnerability[2]	Trends/ Future Disruptions[3]	Uncertainties, Externalities[4]
Water Resources	● Extreme	● Extreme	● Moderate	● High
Health & Wellbeing	● Extreme	● Extreme	● High	● High
Agriculture	● Moderate	● High	● Low	● Moderate
Fisheries & Marine Resources	● High	● Extreme	● Moderate	● Low
Disaster Management	● Moderate	● High	● Low	● Low
Coastal Protection & Infrastructure	● High	● Extreme	● High	● Low
Biodiversity & Environment	● High	● Extreme	● High	● High
Land Management & Rehabilitation	● Moderate	● High	● Low	● Moderate
Community & Culture	● High	● High	● Extreme	● High

[1] National scale, key to sectoral and regional comparability & priority setting

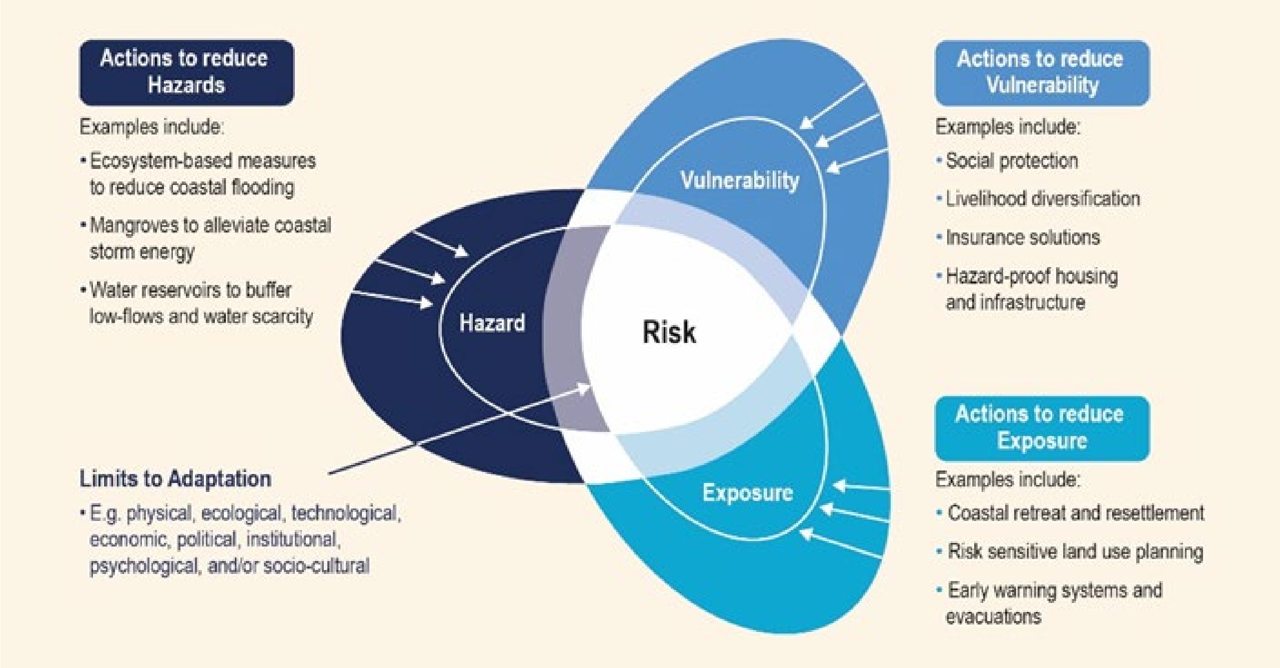
[2] Allows for sub-sectoral and spatial prioritization of actions, ensuring equity in adaptation planning

[3] Consideration of non-climate trends and potential shifts

[4] Point of reference for considering data quality and unknowns (differing by sector), as well as currently planned or underway interventions

Climate Risk

According to the IPCC (2022) [40], climate risk is the combination of climate hazard, exposure and vulnerability. Risk can be reduced by actions that reduce hazard and/or exposure and/or vulnerability (Figure 7; left). Complex risks result from multiple climate hazards occurring concurrently, and from multiple risks interacting, also resulting in risks transmitting through interconnected sectors (Figure 7; right). Understanding these risks is crucial for effective climate adaptation and resilience planning (CRA).



There are three categories of complex risks:

- **Aggregating risk:** Aggregation occurs when risks occur simultaneously.
- **Compounding risk:** Risks that arise from the unilateral and/or bilateral interaction of hazards, which can be characterised by a 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.

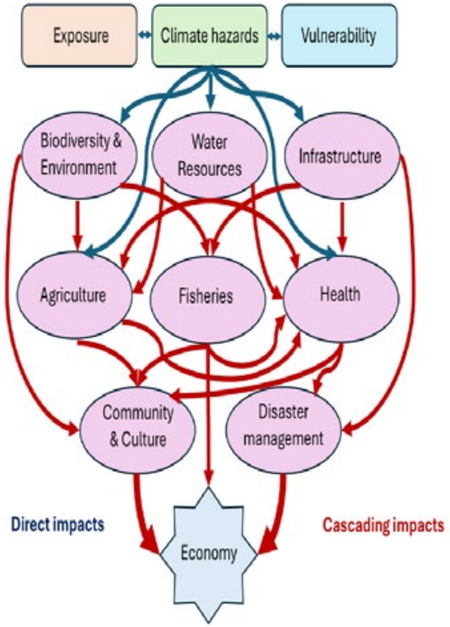


Figure 7 Risk is derived from the combination of hazard, exposure and vulnerability. Source: [40] (top panel). Risk transmission from climate hazards, exposure and vulnerability, and interconnections between the nine sectors assessed for Nauru. Note this is an indicative high-level diagram and does not capture all possible connections (Adapted from [41]) (bottom panel).

Water

Key message

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.

Nauru's three main water supply sources

(Data here primarily drawn from the 2023 census [1]).

Rainwater harvesting

Rainfall harvested in water-tanks provides a critical water resource for communities, agriculture, businesses, livelihoods, food security, sanitation and drinking water; 36.5 % of the community use rain catchment for drinking water supply. The overwhelming majority (96.3 %) of households in Nauru had some form of water storage. Most (75.9 %) rainwater tanks can hold between 3,000 and 10,000 litres of water. However, only 61.5 % of households had downpipes connected to a water storage tank, and only 56.4 % of households had downpipes that were working.

Desalinated sea water (RO)

For potable water supply, Nauru supplements rainfall with desalinated sea water, locally termed 'RO, or reverse osmosis'. There is one main diesel-powered RO facility located near the port and a smaller facility at the Meneng Hotel. Water is transported by truck from the desalination plant to household water-tanks. Currently (2024) there are six 'official' delivery trucks, and six private-contractor delivery trucks. Almost half of the community (48.6 %) is heavily reliant on RO to meet a range of water demands including washing, firefighting and, during drought periods, agriculture / kitchen gardens.

Groundwater

Shallower groundwater is recharged from direct rainfall. However much of the shallow groundwater is at least slightly brackish, with salinity increasing with depth. The low-lying (5m) Buada Lagoon is understood to be partially separated from the island's groundwater lens, though is still slightly brackish. Most households (56 %) did not use groundwater. Those that did use it mostly for washing (27.5 %) and personal bathing (25.7 %), followed by gardening and other outside uses (17.4 %). Very few households (1.6 %) used it for cooking and drinking.

Climate vulnerability assessment

Extreme Aggregate vulnerability	Extreme Disaggregated vulnerability*	Moderate Trends & future disruption*	High Uncertainty & externalities*

Water resources – and the periodic lack thereof – is the domain that presents extreme levels of climate vulnerability for Nauru under present conditions (Table 2). With limited surface water in the form of brackish lagoon systems, an increasingly saline freshwater lens, and the regular historical occurrence of droughts, the impacts on agriculture, ecosystems, households, and the economy have been widespread over the last 100 years. Water scarcity issues are reported for more than 72 % of households. There is a dependence upon poorly maintained private rainwater collection infrastructure and limits to desalination plant production and delivery systems, resulting in previous instances of emergency water importation, and a collapse of agricultural initiatives and ecosystems in previous droughts. Exposure to water scarcity is not evenly distributed across the island.

(*see more detail on 'disaggregated vulnerability mapping' and comments on 'trends & future disruption' and 'uncertainty & externalities' in the CVA report).

Climate hazard assessment

Current impacts	Current hazard ratings (Rating scale below the table)	*	Climate hazard ratings 2030 Low/High*	Climate hazard ratings 2050 Low	Climate hazard ratings 2050 High
Extreme heat increases water demand	Extreme temperature	↑			
Drought increases demand for desalinated water, pressure on delivery trucks and demand for groundwater resources.	Drought	↓			
Floods can damage water supply/drainage infrastructure, and increased pollution/sediment can reduce water quality.	Extreme rainfall	↑	No data		
	Extreme sea level	↑			
Coastal inundation can damage water infrastructure and contaminate the freshwater lens	Extreme sea level	↑			
Wet years reduce demand for desalinated water, but there's limited ability to capture water in household water tanks	Rainfall	↑			

* Little difference between low and high emissions at 2030. Arrows indicate projected direction of change.

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

Climate risk assessment

Sub-sector/ sub-domain	Hazard	Baseline: Current	Future magnitude of consequence score: 2030 Low / high	2050 Low emissions	2050 High emissions
Water availability and demand	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.	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

Key message

Health-related climate impacts include direct impacts (e.g. heat stress and injuries from extreme weather events), and indirect impacts on water security / quality (e.g. water borne diseases), food security / quality (e.g. malnutrition and food borne diseases), vector borne diseases, respiratory illness, eye, ear and skin disorders and diffuse impacts through mental/psycho-social disorders [42]. In future, these impacts are expected to become worse due to projected increases in extreme temperature, extreme rainfall and extreme sea level events.

Nauru has some of the poorest health indicators for non-communicable diseases (NCDs) in the Pacific Islands, with significant impacts on life expectancy [1]. While the Republic of Nauru Hospital and Naoero Public Health Centre provide free health care and dental treatment, people with serious illnesses and injuries need to be evacuated to Australia for treatment.

Much of the poor health stems from poor nutrition. The continued focus on processed foods, as well as those with high sugar and fat, has become heavily ingrained as local fresh food production has declined. The high cost of imported food products, limited capacity for fresh food production and a constrained economic situation results in lack of fresh and healthy food consumption; over 50 % of households report not having access to healthy and nutritious fresh food because of a lack of money or other resources [1].

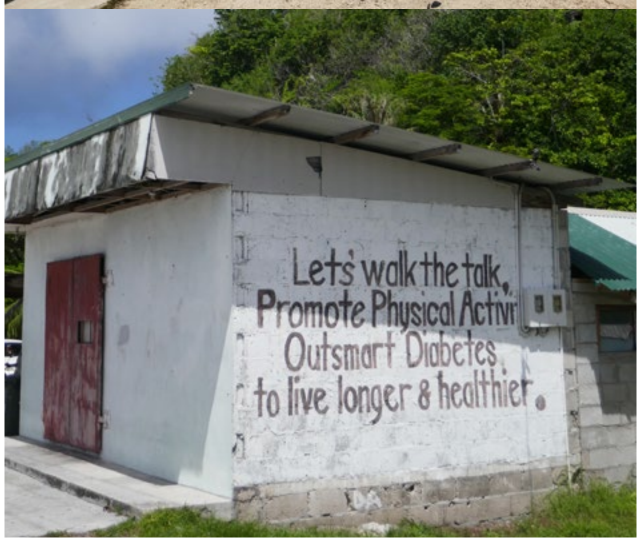
Nauru has the Pacific region's highest mortality rate from cardiovascular disease, associated with Nauru having one of the world's highest rates of type 2 diabetes – nearly one-in-three adults – and 71.7 % of Nauruan adults being classified as obese [43, 44]. Nutrition is a central element of the country's 2014–2020 NCD action plan, which includes initiatives to address obesity, diabetes, and a junk-food epidemic [45].

While no mental health policy or Act currently exists, a draft mental health policy has been developed. Nauru is a member of the WHO Pacific Islands Mental Health Network and has recently launched a Mental Health Toll-Free Help Line. Facilities on the island consist of one mental health outpatient facility, and two psychiatric beds in the general hospital [46].

Communicable diseases also present risks, although the lack of exposure to tourism has been argued to have some benefits in terms of disease transmissibility, such as in the case of the COVID-19 pandemic [47]. Despite this, Nauru was one of the first Pacific Island Countries to record the zika virus, whilst a dengue outbreak in 2017 saw 901 cases reported in three months, infecting one-tenth of the total population [48].

Phosphate mining dust is an issue where it is blown onto surfaces such as houses' rooves subsequently entering the water supply. Further data and information around this issue is required regarding the extent of impact on the Nauruan community's health.

Heat stress is an emerging issue. Anecdotal reports of the cooling afternoon sea breeze not occurring means that residents will need to run air-conditioners or other cooling devices more often and for longer.



Climate vulnerability assessment

Extreme Aggregate vulnerability	Extreme Disaggregated vulnerability*	High Uncertainty & externalities*	High Uncertainty & externalities*
By several global standards Nauru's general health indicators are poor, correlating to an extremely high level of aggregate vulnerability to climate impacts (Table 2). By even a subset of high-level measures, such as life expectancy, disease prevalence, information on dietary intake, and levels of mental health, Nauru faces particularly acute health and wellbeing pressures. Life expectancy at birth is the lowest of any Pacific country, and more than 10 years less than the global average, with a high prevalence of NCDs. The continued focus on processed foods, as well as those with high sugar and fat, has become heavily ingrained as local food production has declined. Stunting and anaemia are prevalent in Nauruan children. Water scarcity issues are reported for more than 72 % of households, while E-coli outbreaks are common due to poor quality of groundwater and septic systems. Health services are highly limited.			

(*see more detail on 'disaggregated vulnerability mapping' and comments on 'trends & future disruption' and 'uncertainty & externalities' in the CVA report).

Climate hazard assessment

Current impacts	Current hazard ratings (Rating scale below the table)	*	Climate hazard ratings 2030	Climate hazard ratings 2050	
			Low/High*	Low	High
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 rainfall	↑			
Exposure of health infrastructure to inundation, affecting health services					

* Little difference between low and high emissions at 2030. Arrows indicate projected direction of change.

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

Climate risk assessment

Sub-sector/ sub-domain	Hazard	Baseline	Future magnitude of consequence score		
		Current	2030 Low / high	2050 Low emissions	2050 High emissions
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

Key message

Floods and droughts have impacted Nauruan agriculture. While annual-average rainfall is projected to increase, along with fewer droughts, an increase in extreme temperature and extreme sea level events will have major implications for agriculture, particularly through drought periods.

Historically, agricultural outputs were a substantive component of Nauru's economy, however currently, by most international measures, local agriculture production is low, both in terms of local consumption and in terms of economic productivity by way of sales or exports. Past high levels of mining income and ready access to imported goods has resulted in limited technical skills and local knowledge of food production in Nauru [49]. A limited variety of fruit trees and vegetables are cultivated. In 2021, only 5.2 % of households reported growing food crops, 4.9 % growing fruits, and 7.9 % raising livestock [1].

The overwhelming majority (94 %) of households who were involved in agricultural activities did so for their own consumption. In Boe, Buada, Denigmodu and Meneng, there were only six households who sold part of their production, and none that produced exclusively for selling their crops [1]. Nauruans therefore remain heavily dependent on expensive imports for up to 90 % of food, and are consequently exposed to food insecurity, price fluctuations in the global market, and interruptions in global supply chains such as during the COVID-19 pandemic [13, 14].

Factors limiting reintroduction of agricultural production include water availability and quality, combined with soil fertility and land constraints [23, 50]. Nauru has limited water storage and the soils have limited moisture retention capacity. Soil carbon has been depleted by disturbances including mining, road building and housing construction [51]. In addition, there is only about 4 km^2 of arable land on Nauru, the average plot size available for agriculture is less than 100 square metres, and much of the arable land is occupied by residential dwellings [1]. The difficulties surrounding land ownership often restricts the yield any single farmer can produce due to the limited size of allotments available for agriculture [51].

Before European arrival, coconut and pandanus palms were cultivated providing a staple source of food, also being used in cultural ceremonies [52]. In the mid-19th century breadfruit (de me), bananas, and paw paw (babaias) were also introduced by Europeans [52]. Currently, the growth of 'wild food species', such as mango, is confined to the Buada district which has rich black soils [49]. Initiatives to encourage additional food gardens exist with a range of small-scale trial agriculture projects, including vegetable and breadfruit farms (Meneñ farm), piggeries, seedling distribution, kitchen gardens and public education [14].

To make way for mining, under the *Lands Act 1976 [53]*, the landowners were (and still are) compensated for the removal of coconut palm, pandanus, breadfruit, banana, pawpaw, mango, lime, tomano (*Calophyllum inophyllum*) and almond (Pers Comm: Inception visit 2024).

Agricultural pests found in Nauru include the Coconut Hispine Beetle (*Brontispa longissima*) which is controlled by a biological agent [51]. Yellow crazy ants *Anoplolepis gracilipes* are also a pest in Nauru (Pers Comm, July 2024).

Through the Higher Ground Initiative, the regeneration of areas of Topside that were previously agriculturally productive is planned, creating a sustainable and nutritious local food supply. This initiative is viewed nationally as a key pathway for sustainably developing Nauruan agriculture.

Climate vulnerability assessment

Moderate Aggregate vulnerability	High Disaggregated vulnerability*	Low Trends & future disruption*	Moderate Uncertainty & externalities*

By most international measures, local dependence agriculture production is low, both in terms of local consumption, and of economic productivity by way of sales or exports, correlating to a moderate level of aggregate vulnerability to climate impacts (Table 2). At present there is only about 4 km^2 of arable land in Nauru, with much of this occupied by residential dwellings. There is limited agricultural land in the Topside region as a result of the encroachment of phosphate mining through the second half of the 20th century, with landowners compensated for the removal of agricultural plants, including coconut palms and pandanus. Some localities in Nauru are missing meals and experiencing malnutrition worsened by a lack of fresh food production, while some localised livestock production for subsistence and cultural practices are at risk from extreme heat events.

(*see more detail on 'disaggregated vulnerability mapping' and comments on 'trends & future disruption' and 'uncertainty & externalities' in the CVA report).

Climate hazard assessment

Current impacts	Current hazard ratings (Rating scale below the table)	*	Climate hazard ratings		
			2030	2050	
			Low/High*	Low	High
Exposure of agriculture in low lying areas to coastal inundation and saltwater intrusion into soil	Extreme sea level	↑			
Livestock (pigs and chickens) are affected by 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		

* Little difference between low and high emissions at 2030. Arrows indicate projected direction of change.

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

Climate risk assessment

Sub-sector/ sub-domain	Hazard	Baseline	Future magnitude of consequence score		
		Current	2030 Low / high	2050 Low emissions	2050 High emissions
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	Moderate	Major	Major
	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
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

Key message

In future, increases to Sea surface temperatures (SSTs) may affect purse-seine tuna catch due to shifting fisheries' locations. By 2050 in Nauru, the average catch is projected to change depending on the magnitude of regional change to SSTs. Catches may increase by 5.7 % under a medium emissions scenario (RCP4.5), or decline by 21.6 % under a high emissions scenario (RCP8.5), with corresponding changes to national revenue [12] (CHA).

Critical coastal fishing considerations include overfishing and depletion of near-shore fish stocks (as well as other marine resources), correlating with a population increase, and a lack of implementation and enforcement of traditional or legislative constraints on reef takings. Fish consumption by Nauruans is more than 2.5 times higher than the global average, yet a significant share of consumed fish is imported, having been processed elsewhere.

Oceanic fishing

Oceanic purse-seine fisheries activities do not generate any direct benefits or co-benefits for communities, in the form of livelihoods or food security. Nauru does not directly operate commercial fishing vessels or process any fish on site. Most vessels fishing in Nauru's EEZ belong to foreign nations, and do not visit Nauru as they cannot dock at Nauru's existing port (in 2024) (this port is currently being upgraded). Commercial operators (around 200) take advantage of Nauru's tuna fish stocks by purchasing 'fishing days', with these licence fees contributing significantly to the economy [12]. Nauru's economy has been termed 'tuna-dependent' with access fees equivalent to up to ~31 % of government revenue [12]. Longline and pole-and-line fishing also occurs, making relatively minor contributions to the economy compared with purse-seine fishing [12].

The four main species that underpin these oceanic fisheries are skipjack tuna, yellowfin tuna, bigeye tuna and South Pacific albacore tuna [54]. Each species of tuna has a limited range of ocean temperature within which it occurs [54]. Skipjack tuna, for example, are most abundant in water temperatures around 20 to 29 °C. With global warming, locations of suitable foraging and spawning habitat may change, altering the availability of tuna species within Nauru's EEZ [54].

Coastal fishing and aquaculture

Nauru is surrounded by reef flats which are just above the level of the lowest tides, extending about 100–300 m wide from the shoreline to the reef crest where waves break, and the reef slope begins. The reef flat is almost completely devoid of corals, with dominant organisms being algae and some introduced species (e.g. sea cucumbers). The narrow reef surrounding the island supports a wide range of finfish (snappers, surgeonfish, parrot fish, groupers, mullet, trevally, scads etc.) and invertebrates (cephalopods, gastropods, bivalves, crustaceans, echinoderms etc.).

Coastal resources are harvested using a variety of methods. Nauru's artisanal fleet comprises small (less than 6 m) powered skiffs or canoes operated by local fishers. Finfish are typically captured by handlines (including the local 'Christmas tree' rigs), cast nets, seine nets or by spearfishing (either by freediving or using scuba) [55]. Invertebrate resources are typically gathered from the shallows or using snorkel or scuba. Lobsters are usually speared using scuba [56]. Most of the catch from fishing further offshore using canoes and skiffs is landed at a few artificial channels cut through the fringing reef.

Of the 29.6 % of households that were involved in some form of fishing in 2021, the majority (72.3 %) fish for home consumption. Over 30 % of households collect fish from reefs (18.4 % collect by hand, 11.3 % using rods, line or spear) [1]. Other critical coastal fishing considerations at the national scale include overfishing and depletion of near-shore fish stocks (as well as other marine resources), which correlates with a steady overall human population increase over the last 3-4 decades, and a lack of implementation and enforcement of traditional or legislative constraints on reef takings. Fish consumption by Nauruans has been estimated to be 52.3 kg per person per year [21], more than 2.5 times higher than the global average [21]. However, a significant share of consumed fish is imported (canned), having been processed elsewhere in Asia and other Pacific Island Nations.

Climate vulnerability assessment

High Aggregate vulnerability	Extreme Disaggregated vulnerability*	Moderate Trends & future disruption*	Low Uncertainty & externalities*

Fisheries and marine resources are a critical sector for Nauru at multiple scales. Fisheries revenue underwrites many government services making up a considerable proportion of GDP, whilst local fishing for household subsistence (and, to a lesser extent, income) is significant in some areas (Table 2). Fishing contributes to a key source of dietary protein - fish consumption ~52.3 kg/person/year - with a minor household income stream relative to comparable Pacific-SIDS. Local fishers can be exposed to high temperatures and wind-driven waves. In addition to a low-quality of existing nearshore coral ecosystems and species diversity, overfishing and limited protected areas have depleted fish stocks, reducing fisheries resilience to climate hazards. Limited drainage facilities also can increase exposure to phosphate mining and other run-off that may affect coral reefs. (* CVA has more detail on 'disaggregated vulnerability' and comments on 'trends & future disruption' and 'uncertainty & externalities').

Climate hazard assessment

Current impacts	*	Current hazard ratings	Climate hazard ratings 2030 Low/High*	2050 Low	2050 High
Fish catch may increase or decline depending on rate of SST warming and the phase of ENSO, affecting national revenue.	↑	SST	No data		
Marine heatwaves can affect inshore fisheries productivity and marine biodiversity	↑	SST / MHW			
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. Fishers' working conditions are hampered by high temperatures.	↑	Extreme temperature			
Heavy rainfall and flooding increase pollution and sediments that degrade coastal water quality	↑	Extreme rainfall	No data		

* Little difference between low and high emissions at 2030. Arrows indicate projected direction of change.

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

Climate risk assessment

Sub-sector/ sub-domain	Hazard	Baseline Current	Future magnitude of consequence score 2030 Low / high	2050 Low	2050 High
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	No data	Minor	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

Key message

Floods, droughts, and storm surges, exacerbated by local exposure and vulnerability, have caused natural disasters in Nauru. Increasing temperatures, extreme rainfall and sea levels may increase pressure on disaster management services.

Disaster response in Nauru is managed by the Department of National Emergency Services (NES), which includes the relevant emergency agencies and incorporates the Nauru Disaster Risk Management Office (NDRMO). The NES also includes rescue and fire services, ambulance services, lifeguard services, and meteorological services. Nauru owns a total of four fire trucks – two for aviation, one for domestic purposes, and one additional tanker. The fire trucks use desalinated RO water, due to the salinity of groundwater affecting the trucks' machinery.

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. In addition to extreme rainfall and drought, remote cyclones and sub-tropical storms can cause storm surges and coastal inundation in Nauru [57]. Tsunamis originating in the Solomons, New Hebrides and Kuril trenches [58] are also identified in the Strategic Roadmap for Emergency Management [57].

For Nauru, components of the early warning system in 2024 were assessed as shown in Figure 8. Hazards Knowledge, Hydrological Monitoring Systems, and information about 'Exposure, Vulnerabilities, Capacities and Risks' were identified as gaps [59].

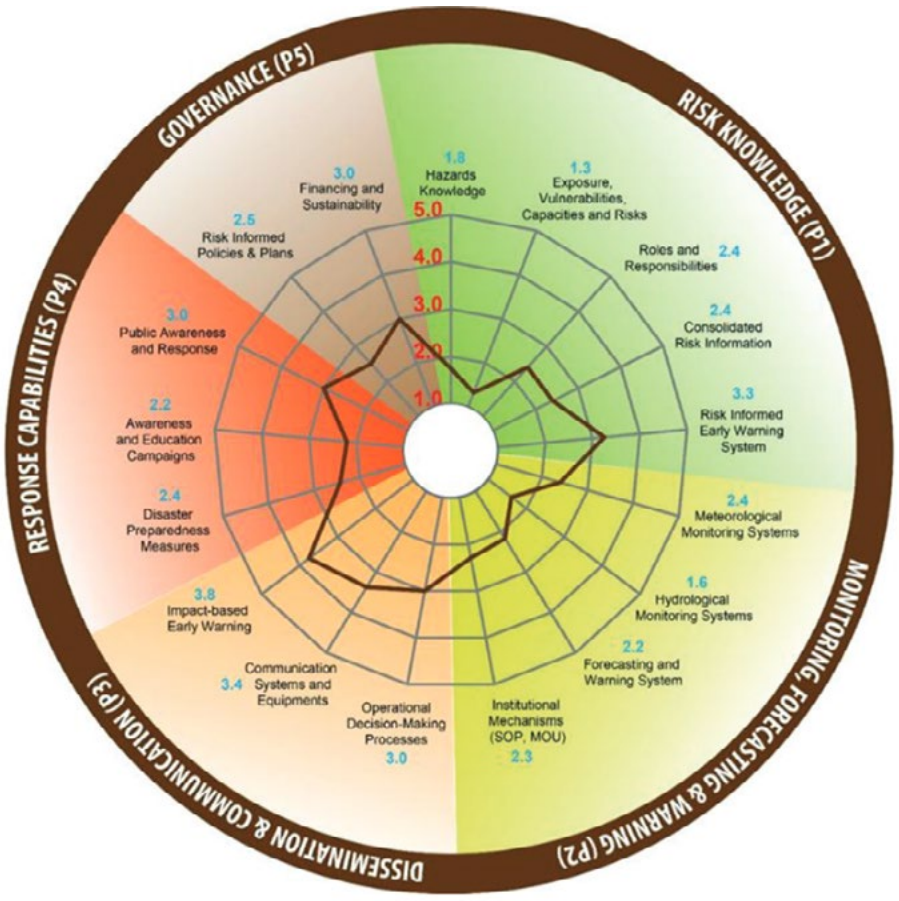


Figure 8 Assessment of the multi-hazard early warning systems in Nauru. (Source: [59]).

Climate vulnerability assessment

Moderate Aggregate vulnerability	High Disaggregated vulnerability*	Low Trends & future disruption*	Low Uncertainty & externalities*
Climate impacts are the primary source of disaster exposure, particularly drought, which has widespread impacts on water availability and quality across the island. Adaptive capacity in relation to most disasters is low, with many households lacking resources or knowledge to deal with disasters. National impacts from disasters are low in terms of economic and other damage relative to overall revenue. While heat stress exposure is not measured in national statistics, day/night extremes are likely to impact some households since 21.8% of households do not have air-conditioning (A/C) and 13.5% of households do not have A/C or a ceiling fan. For relative sectoral vulnerability ratings see Table 2. (* more detail on 'disaggregated vulnerability mapping' and comments on 'trends & future disruption' and 'uncertainty & externalities' in the CVA report).			

Climate hazard assessment

Current impacts	Current hazard ratings	*	Climate hazard ratings		
			2030	2050	
			Low/High*	Low	High
Lack of property protection from extreme sea level and extreme rainfall elevates disaster risk	Extreme sea level	↑			
	Extreme rainfall	↑	No data		
Extreme heat can cause power outages, leading to cascading and compounding impacts across multiple sectors (e.g. health), which increases demand for emergency services.	Extreme temperature	↑			
Extreme heat increases the risk of fire. As there can be competing uses for water suitable for use on fire trucks (e.g. RO water), fire-fighting capacity may be limited.		↑			
Exposure to coastal inundation in low lying areas affects essential infrastructure and associated services	Extreme sea level	↑			
Severe droughts can cause disasters, requiring overseas aid. Competing water demand from fire trucks.	Drought	↓			
Flood damage to roads, airport, water, energy and telecommunication facilities can disrupt emergency services	Extreme rainfall	↑	No data		

* Little difference between low and high emissions at 2030. Arrows indicate projected direction of change.

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

Climate risk assessment

Hazard	Baseline	Future magnitude of consequence score		
	Current	2030 Low / high	2050 Low	2050 High
Worsening **coastal 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
(including Exposure Mapping CEA)

Key message

Increases in sea level will exacerbate exposure of Nauru's infrastructure to coastal inundation to a small extent by 2050. By 2050, sea level rise is projected to be 0.15 to 0.28 m for low emissions and 0.19 to 0.33 m for high emissions, so impacts to infrastructure are modest. Currently only 0.7 % of buildings are exposed to coastal inundation, and this may increase to 2.3 % for sea level rise of 0.35 m [60]. Extreme heat can also impact infrastructure and maintenance of infrastructure as well. Increasing extreme rainfall will affect some important infrastructure, e.g. the hospital, protection of which needs to be considered.

The coastal protection and infrastructure sector incorporates a wide range of built environment assets across Nauru, with a particular focus on commercial and public infrastructure of national importance, utilities, assets and buildings. Subsectors assessed in this CIVRA report are listed below:

Coastal assets and flood defences: Infrastructure currently located within 100 m of the coast accounts for 34 % of the total asset number and 40 % of the total infrastructure replacement value [61]. To mitigate risks to these from inundation, concrete structures and large boulders sourced from broken-down pinnacles are acting as seawalls in some areas [62]. See Exposure mapping report (CEA) and Figure 9.

Fisheries infrastructure: Two boat ramps provide access to the open water. Alongside the Anibare fish-market (currently not operational), a community boat harbour has a protective sea wall, and the locals also use the compound for swimming, while the other harbour is just a ramp to the open water.

Internet and telecoms: Telecommunications and internet facilities are focussed around the Bottomside and are therefore potentially vulnerable to coastal inundation. Digicel telecom owns and operates nine telecommunication towers; the highest located on Command Reach, Nauru's highest point.

Transport and supply chains: Currently there are 72.5 km of **roads** in Nauru [63], and the longest section circumnavigates the island, while a few gravel roads access the Topside area from different points around the island. There is no road that goes across the island. The **sea port**, located on the western shore of Nauru, is under development with major works initially being undertaken to enable Nauru's main shipping vessel, the 'Micronesian Pride', to dock and unload onshore. Nauru's **airport** is located on the southwest corner of the island, with some land reclaimed at the southern edge to accommodate the runway [22]. The perimeter road runs either side of the runway, with the inland road being closed when planes are taking off and landing.

Energy: Nauru Utilities Corporation provides both power and water to the community. They are located next to each other and adjacent to the port. From June 2022 to July 2023, Nauru Utilities indicated that the maximum of power demand was 5-6 MW each month [64].

Buildings and Structures: There are approximately 2500 separate buildings in Nauru with the largest concentrations being in the Districts of Aiwo (414 buildings) and Denigomodu (229 buildings) on the West Coast and Meneng (360 Buildings) on the Southeast Coast (CEA).

Health Infrastructure: Republic of Nauru Hospital (RoNH) is located in Yaren and provides basic medical care. Using the EMC cable, RoNH is implementing Picture Archiving and Communication System (PACS), and this new technology will increase the hospital's reliance on internet access and electricity connectivity.

Waste management: Waste is collected from households, Government facilities, and businesses then transported to the Nauru Dump Site (located on the Topside) for disposal.

Exposure mapping:

CEA

	Decade (likely) of projected SLR occurrence [66].	
SLR Increment (m)	Low emissions RCP2.6	High emissions RCP8.5
0.5m	2130	2070
1m	Beyond 2300	2110
1.5m	Beyond 2300	2150
2m	Beyond 2300	2190

Most of Nauru's population and critical infrastructure, including the airport and hospital, are concentrated along the coastal plain (50-300 metres wide), known as "Bottomside" [65] [1, 22] (see left). Within this coastal plain, the ground elevation is highest (7-8 m Nauru Island Datum) around the west/northwest fringe (including the districts of Aiwo, Denigomodu, Nibok, Uaboe and Baiti, and the north-western end of the airport runway) and is hence the least exposed to sea level rise [63]. Conversely, the land around lagoons and backshore depressions have the lowest elevation (2-4 m NID) and are the most exposed, particularly around lagoons on the southern, eastern and northern shorelines (i.e., Meneng, Anibare, Ijuw and Yaren) [63].

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 [60].

The 0.5 m column in the table below is showing percentage change in building numbers exposed to sea level rise at around 2070 for high emissions (RCP8.5). The 2.0 m impacts will not occur until around 2190 for high emissions (RCP8.5)

Area	Number Buildings	Buildings Impacted (Percentage)			
		0.5m	1m	1.5m	2m
Nauru (all)	2471	3%	7%	17%	26%
Aiwo	414	0%	0%	0%	1%
Anabar	149	9%	18%	50%	66%
Anetan	130	3%	8%	17%	32%
Anibare	104	6%	16%	47%	72%
Baiti	111	0%	0%	0%	1%
Boe	151	0%	1%	5%	20%
Buada	185	0%	0%	0%	0%
Denigomodu	229	0%	0%	0%	0%
Ewa	123	7%	12%	19%	27%
Ijuw	52	6%	12%	31%	50%
Meneng	360	11%	26%	44%	58%
Nibok	164	0%	0%	1%	1%
Uaboe	68	0%	0%	1%	6%
Yaren	186	2%	4%	33%	65%

Figure 9 Overview of Nauru Critical Infrastructure (top left). Likely timing of SLR for different SLR increments under low and high emissions scenarios (bottom left). Percentage of buildings inundated under different increments of SLR (bottom right). For additional sectorally specific coastal inundation statistics, see the CIVRA CEA report.

Coastal protection and infrastructure
(including Exposure Mapping CEA)

Climate vulnerability assessment

High Aggregate vulnerability	Extreme Disaggregated vulnerability*	High Trends & future disruption*	Low Uncertainty & externalities*

The vulnerability of infrastructure is significantly higher than that of coastal protection, with the patchwork nature of coastal defences generally offset by relatively moderate hazard impacts (e.g. low-level inundation in most parts, though Anetan and Anibar are more exposed). Dwelling materials are overall reasonably constructed, with minimal improvised/makeshift buildings; however, some are in disrepair (e.g. 1/3 of household guttering). Housing shortage across Nauru is creating overcrowding issues and poor building quality in some areas. The main ring road and curb assets are assessed as being in generally 'fair' condition, with footpaths along sealed roads. The new seaport (under construction in 2024) and single container vessel are critical for Nauru's import dependent economy (including food supply). Energy remains dependent on centralised diesel generators and household gas supply systems. There is limited access to refrigeration, with 1/3 of households lacking freezers. For vulnerability comparison with other sectors see Table 2.

(*see more detail on 'disaggregated vulnerability mapping' and comments on 'trends & future disruption' and 'uncertainty & externalities' in the CVA report).

Climate hazard assessment

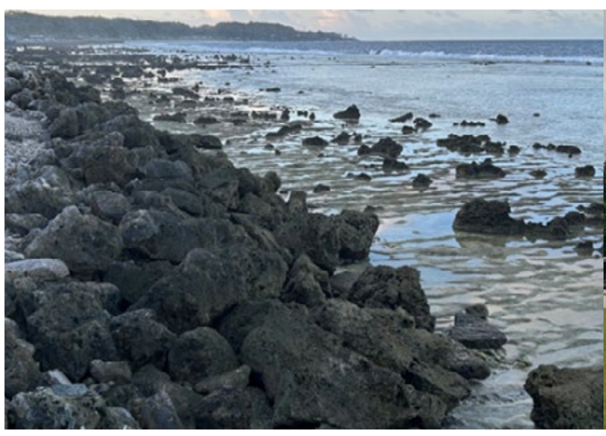
Current impacts	Current hazard ratings	*	Climate hazard ratings		
			2030	2050	
			Low/High*	Low	High
Some roads are exposed to coastal inundation/erosion, flooding and heat-related deterioration. Labour productivity is reduced with extreme heat. Flooding may cause increased runoff / pollution, increasing pressure on wastewater infrastructure	Extreme sea level	↑			
	Extreme rainfall	↑	No data		
	Extreme temperature	↑			
Telecommunication, buildings, coastal protection and electricity assets are subject to surface flooding, coastal inundation, and saline intrusion of groundwater.	Extreme rainfall	↑	No data		
	Extreme sea level	↑			
Increased energy demand and outage risk on hot days, with cascading impacts for telecoms, transport and health infrastructure	Extreme temperature	↑			
Salt spray is transported by wind, reduced during wet years and increased during drought years. This may affect electricity transmission wires	Drought	↓			
	Wind speed				
	Rainfall	↑			

* Little difference between low and high emissions at 2030. Arrows indicate projected direction of change.

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

Climate risk assessment

Sub-sector/ sub-domain	Hazard	Baseline	Future magnitude of consequence score		
		Current	2030 Low / high	2050 Low	2050 High
Coastal assets and flood defences	Wave energy can damage and destroy sea walls, creating debris and exposing some communities and infrastructure to **extreme sea level** related coastal inundation and erosion.	Moderate	Moderate	Moderate	Major
Internet and telecommunications	ICT connectivity in Nauru is disrupted by **flooding** which interrupts satellite connections and damages 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	**Extreme sea levels** from high tides and storm surges can inundate roads, disrupting transport and supply chains	Moderate	Moderate	Major	Major
Energy	**Extreme heat** 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, 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

Key message

Remnant flora and fauna are in a highly disturbed state, despite high cultural and ecological value. Groundwater systems show signs of saline ingress under current conditions and are sensitive to periods of drought. Nearshore reef areas are in a degraded state, with most fish and marine invertebrates undersized. In future, increasing atmospheric temperatures will place pressure on terrestrial species, particularly in times of drought. Similarly, marine heatwaves, ocean acidification and increasing SSTs will adversely affect marine environments.

Nauru's onshore **fauna** does not comprise any native terrestrial mammals, with domesticated dogs and cats, livestock species (pigs and chickens), and Polynesian rats being the prevailing species, all of which are introduced. Nauru does, however, have endemic insects, including moths and dragonflies, and reptiles (four species of gecko, three skinks, and a blind snake). The sensitivity of these species to climate impacts such as increasing temperatures and surface water availability has not been analysed as part of this assessment and has not been documented elsewhere. Nauru's bird diversity comprises 36 species, with seven resident species, including the endemic Nauru reed warbler *Acrocephalus rehsei* [4]. The Micronesian Pidgeon *(Ducula oceanica)* also resides on Topside, along with Black and Brown Noddy's *(Anous minutus* and *Anous stolidus)*. Lesser *(Fregata ariel)* and Greater *(Fregata ariel)* Frigate birds are also indigenous to the island, with both these and Noddy bird species hunted for sport and food, also being of cultural significance (as reflected in the presence of the Frigate bird on the Nauruan coat of arms).

Similarly to its fauna, Nauru's **flora** is dominated by introduced species, with a total of 573 species and cultivars identified in the Draft 2021 State of the Environment Report, of which only 63 are indigenous [4]. Of the island's four endemic plants, it is believed that one has already become extinct. The limestone forest tree Aidia racemose, known locally as enga, is also close to extinction, whilst several forest trees on the Topside such as Cordia subcordata (eongo) and Erythrina variegate (eora) exist only in small patches of remnant forest that have survived decades of phosphate mining. A detailed vegetation map of Nauru was most recently developed in 2008, building on a 2007 survey (see [50]).

A reef survey facilitated by SPC in 2015 identified that most **marine invertebrates** were in low abundance and undersized, with giant clams having been believed to be locally extinct as recently as 2005, before three were identified in the SPC study [55]. Sea cucumber species – a potential export industry – were also undersized, with the most prevalent including surf redfish (Actinopyga mauritiana), lollyfish (Holothuria atra), and flowerfish (Pearsonothuria graeffei) [55]. Coral communities on the 7.4 square kilometres of reef slope are sparse, particularly adjacent to population centres. Reef flats are primarily covered in turf algae, with 58 algal species identified. Beyond the reef flats subtidal coral cover is of much higher quality, with 51 hard coral species recorded, including several rare and threatened species [4]. Coral species diversity within the reef is, however, generally low, with phosphate mining, coral bleaching, and human disturbance and pollution all potentially contributing to the lack of reef quality.

An earlier 2005 survey identified **fish** that were predominantly from the Acanthuridae (surgeonfish) and Balistidae (triggerfish) families, which accounted for 34 of the 129 species [4, 55]. Surgeonfish are herbivorous and thrive in the algae-dominated areas of the reef, while triggerfish were found more in seaward reef areas (being a species that feeds more on detritus and crustaceans, benefiting from the vigour of wave action). Small-size schooling species of mullets, snappers and goatfishes were also identified as being commonly found behind the breaker zone. Other commercially targeted species were viewed as being primarily undersized, including groupers, snappers and emperors, with species generally caught by spearing such as parrotfish also lower in density and size than expected.

Climate vulnerability assessment

High Aggregate vulnerability	Extreme Disaggregated vulnerability*	High Trends & future disruption*	HIgh Uncertainty & externalities*
An overview of the vulnerability of Nauru's current environment and associated biodiversity attributes is primarily a function of the degraded state of much of Topside resulting from nearly a century of phosphate mining. However, the steady increase in total population since World War II, coupled with inadequate environmental controls, ranging from sanitation to overfishing of the nearshore reef areas, has led to a wider range of impacts to marine and terrestrial flora and fauna. Remnant flora and fauna are in a highly disturbed state, despite high cultural and ecological value. Groundwater systems show signs of saline ingress under current conditions and are highly sensitive to periods of drought. Nearshore reef areas are in a degraded state, with most fish and marine invertebrates undersized, suggesting overfishing. For vulnerability comparison across sectors see Table 2. (* more detail on 'disaggregated vulnerability mapping' and comments on 'trends & future disruption' and 'uncertainty & externalities' in the CVA report).			

Climate hazard assessment

Current impacts	Current hazard ratings	*	Climate hazard ratings		
			2030	2050	
			Low/High*	Low	High
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 due to marine heatwaves and ocean acidification	MHW and ocean acidification	↑			

* Little difference between low and high emissions at 2030. Arrows indicate projected direction of change.

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

Climate risk assessment

Sub-sector	Hazard	Baseline	Future magnitude of consequence score		
		Current	2030 Low / high	2050 Low	2050 High
Aquatic and coastal biodiversity	**Marine heatwaves and sea surface temperature** cause coral bleaching (exacerbated by **ocean acidification**), compound the impacts of overfishing to damage 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

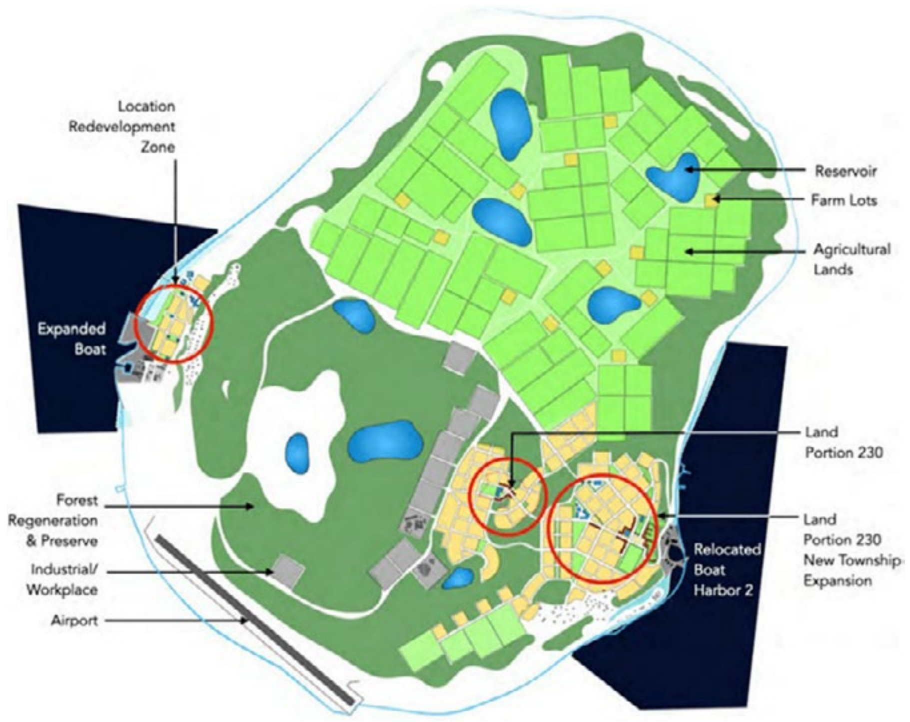
Key message	
	Degradation of 80 % of land, failure to enforce land remediation, loss of compensatory revenue, and a lack of strategic spatial / urban planning limits land management and rehabilitation. In future, increasing temperatures and extreme rainfall may make any land rehabilitation more difficult. Projected increases to average rainfall, along with fewer droughts, may improve options for any terrestrial biodiversity improvements and agricultural pursuits.

Land management in Nauru has undergone deep transformation over the last one-and-a-half centuries, as a function of inter-tribal warfare, colonisation, world wars, forced relocation, and the physical and economic disruptions stemming from phosphate mining. A detailed description of this is documented in the CVA.

The longstanding failure to rehabilitate mined areas, coupled with the poor outcomes of revenue from the mining process, demonstrates ongoing difficulty in managing the country's limited land resources, with significant implications for any planned retreat as part of national adaptation strategies. Whilst the prevalence of customary land ownership across Nauru, coupled with its legislative recognition, is undoubtedly a positive aspect of the island's land management processes, it is less clear that these systems have been adequately supported or harmonised at the institutional level. The ongoing weakness of land use planning, and lack of regulatory controls such as building codes, has instead been primarily beneficial to mining industries, but less so to residents in terms of quality of life and the condition, sustainability, and quality of their built and natural environments.

The most substantive ongoing land remediation effort is the Higher Ground Initiative (HGI), a whole-of-government initiative led by the Department of Climate Change and National Resilience, the NRC, and the Ministry of Finance and Sustainable Development. HGI is led by a ministerial 'troika' constituting the leadership of these three portfolios, accompanied by a wider high level leadership committee [20]. The initial scope of work is focused on Land Portion 230, a 10-hectare plot of government owned land on Topside within the Meneng District [20]. Documents describe the aim of expanding this initial 'pilot' township to extend towards Meneng's existing coastal housing area; the LP230 Expansion Plan, with the total expanded area having the capacity to accommodate the entirety of Nauru's current population [20].

A second component of HGI develops an 'infill' master plan for upgrading of the Location housing complex on the island's west coast; considered a priority due to the poor quality of the medium density housing in this area, as well as the site's proximity to the national port. The longer-term Island



Source: Department of Climate Change and National Resilience. Higher Ground initiative. 2024 Available from: https://www.climatechangenauru.nr/higher-ground-initiative.

Wide Master Planning component of HGI variously sets out agricultural areas, water reservoirs, forest regeneration and conservation zones, and commercial and industrial settings across Topside. Although more detailed than the 1994 Master Land Use Plan, these wider concepts remain high level and require consultation and agreement with customary landowners, legislative arrangements, and a yet-to-be-determined, but substantive, quantity of finance if this vision is to be implemented.

Climate vulnerability assessment

Moderate Aggregate vulnerability	High Disaggregated vulnerability*	Low Trends & future disruption*	Moderate Uncertainty & externalities*

Vulnerabilities to climate hazards and adaptive management include exclusive Nauruan ownership of land, with 90 percent customary tenure (<10 percent state owned) enshrined in legislation. Currently, the degradation of 80 percent of land; failure to enforce land remediation; and loss of compensatory revenue compounds the ownership issue. There is a lack of traditional or state systems for formal environmental control as well as a lack of current/enforced strategic spatial planning and urban planning for built up areas.

For relative sectoral vulnerability comparisons see Table 2. (* more detail on 'disaggregated vulnerability mapping' and comments on 'trends & future disruption' and 'uncertainty & externalities' in the CVA report).

Climate hazard assessment

Sector	Current impacts	Current hazard ratings	*	Climate hazard ratings		
				2030	2050	
				Low/High*	Low	High
Land rehabilitation and land management	Some rehabilitation areas are exposed to coastal inundation and erosion	Extreme sea level	↑			
	Workers and communities are vulnerable to heat stress	Extreme temperature	↑			
	Rehabilitation sites may be susceptible to flood damage	Extreme rainfall	↑	No data		
	Lack of access to water for building construction	Drought	↓			

* Little difference between low and high emissions at 2030. Arrows indicate projected direction of change.

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

Climate risk assessment

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

Community and culture

Key message

Nauruan cultural traditions stem from twelve tribal groupings or clans. There is limited physical space and natural materials for cultural practices, no national register of sites of cultural significance or heritage, extensive loss of traditional knowledge across generations, and legislated customary land tenure is intertwined with cultural systems. Heat stress affects communities and labour productivity. Flooding due to extreme rainfall, and coastal inundation due to extreme sea level events, may impact cultural sites.

Socio-cultural vulnerability in many ways cuts across all the other eight sectors, with cultural practices intertwined with land management, disaster management, and agricultural practices, to name a few. However, key features of community practice, infrastructure, and attributes, as well as those of more explicit cultural significance, warrant explicit consideration. For example, Nauruan land rights should be viewed as a manifestation of the intertwinement of land rights, Nauruan community, and cultural longevity, not as a self-serving interest due to the residual phosphate royalties. As such, they should serve as a critical consideration for any future climate adaptation planning that requires changes to land management

Nauruan cultural traditions stem from twelve tribal groupings or clans, each named totemically, with each having an origin in Nauruan mythology [7]; these are represented in the 12-pointed star in the nation's flag. Contemporary descendants trace their familial origins matrilineally to a 'foundress' of each tribe. Chiefs of these tribes have been recorded as being either men or women, variously elected or appointed at different stages of the 20th century

As with many Pacific Island Countries, the church plays a significant role in community and cultural fabric in Nauru. Most Nauruan inhabitants (98.2 %) identified with a particular religious denomination in 2021 [1]. The Nauruan Congregational Church is the largest denomination in Nauru, a protestant congregationalist denomination with seven congregations across Nauru, counting 34.3 % of Nauru's population within its membership. This is closely followed by the Roman Catholic faith, which is observed by just over one-third of Nauruans [1].

At present, there is no national register of sites of national significance, although the National Heritage Act 2017 provides for such a register, as well as the framework for establishing a National Heritage Office [4]. Potential sites of significance include the Ara Pond, the Damamak Rock, and Nibok, which have significance in traditional lore (with the latter being the site where Nauruans are believed to have first come ashore) [4]. Other potential heritage sites include the various World War remnants, including batteries, tunnels, and fortifications. Much war paraphernalia and other relics are displayed in the Nauru museum and cultural centre with the developing tourism sector offering tours of World War 2 relics including guns, cannons and bunkers.

Other aspects of community and cultural practice include 'traditional work', which are considered in the census to include fishing, diving, noddying, gardening / agriculture, arts and craft [67]. These practices, however, remain dependent upon access to natural materials, particularly for wood carvings, which have been depleted due to phosphate mining. Knowledge of traditional medicines has been similarly impacted as elders who retain the knowledge pass on [4]. The continued fluency and regular use of Nauruan language by more than 94 % of the population is a key cultural strength.

Climate vulnerability assessment

HIgh Aggregate vulnerability	High Disaggregated vulnerability*	Extreme Trends & future disruption*	High Uncertainty & externalities*

Vulnerabilities relating to community and culture include limited physical space and natural materials for conduct of cultural practices ('traditional work'), no national register of sites of cultural significance or heritage, extensive loss of traditional knowledge across generations and legislated customary land tenure intertwined with cultural systems.

There exists very high levels of identification with Nauru's 12 tribal groups and Nauruan linguistic fluency, along with a complex relationship between cultural fabric, land and royalties. Nauru has limited migration (net inward). Tertiary education levels are very low across adult population and there remains a high dependence upon public service roles for employment. For vulnerability comparison across sectors see Table 2. (* more detail on 'disaggregated vulnerability mapping' and comments on 'trends & future disruption' and 'uncertainty & externalities' in the CVA report).

Climate hazard assessment

Current impacts	Current hazard ratings	*	Climate hazard ratings		
			2030	2050	
			Low/High*	Low	High
Heat stress on community and reduced labour productivity in hot conditions	Extreme temperature	↑			
Rehabilitation sites may be susceptible to flood damage	Extreme rainfall	↑	No data		
Population, agriculture and gardens are vulnerable to dry conditions and cost of desalinated water.	Drought	↓			
Disruption for people at school or university.	Extreme rainfall	↑	No data		
Community disruption, especially at spring and king tides.	Extreme sea level	↑			
Stress and dieback for cultural plants (pandanus) during drought	Drought	↑			

Climate risk assessment

Hazard	Baseline	Future magnitude of consequence score		
	Current	2030 Low / high	2050 Low	2050 High
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

Knowledge gaps and research priorities

Knowledge gaps have been identified that will inform research priorities to enhance the knowledge base for future risk assessments:

Water

- Assess how Buada Lagoon, and other groundwater sources around the coastal plain, are linked to sea level variability and how they will respond to sea-level rise.
- Assess potential flooding of the airport due to the compounding effects of wave over-washing, coastal defence design, the capacity of the airport drainage system and infiltration rates, particularly that coinciding with heavy rainfall and high groundwater levels.
- Rigorous understanding of existing physical structures – ranging from rainwater tanks to the freshwater lenses under Nauru's lagoon systems
- Reduce uncertainty in projections of annual-average rainfall, droughts and floods.
- Better hydrological monitoring systems for disaster risk management.

Health

- Better information about the effect of phosphate dust on population health.
- Consider recording heat stress (along with presence/ absence of associated household cooling access) in hospital admissions data.
- There is limited information available about how mental health related issues are likely to unfold under future climate in Nauru.

Agriculture

- Better information about insect/pollinator capacity to assist with agricultural production. Although several programs are currently in place to encourage local food production, including provision of seed stock through local nurseries, a better understanding of salinity tolerance, climatic thresholds and innovative growing techniques that minimise water loss (and maximise nutrients balance) would be beneficial.
- Consider plant and animal species genetic variability with regard to tolerating extreme heat.

Fisheries

- Assess impacts on coastal fishery ecosystems using clearly defined reference points to better understand current health and future sustainability.
- Better climate model interpretation of the 'cold tongue' issue to improve confidence in fisheries modelling.

Coastal Protection and Infrastructure

- Need to gather evidence of heat related damage to infrastructure, and design standards for managing heat stress.
- A national housing strategy – drawing on low-cost, climate adaptive building designs, is needed to improve the baseline resilience of Nauru's inhabitant population.
- Reduced uncertainty about potential climate tipping points, particularly around Antarctic ice-sheet stability and extreme sea level rise.

Biodiversity and environment

- Assess impacts on coastal fishery ecosystems using clearly defined reference points to better understand current health and future sustainability.

Land management and rehabilitation

- Land tenure in Nauru is extremely complex, though not included within this analysis. However, land rights are central to both the ongoing revenue from royalties, and the long-standing accumulation of wealth. The inter-relationship with both capital accumulation, as well as the ability to 'veto' large scale adaptation actions, must be clearly understood if Nauru's more substantive adaptation projects are to be successful.

Community and culture

- Use of Western, capital-centric measures may underestimate the social connectivity and traditional knowledge systems, whereby endogenous forms of climate resilience, when better understood, are critical if localised, community level responses to climate change are to be developed.
- A detailed gender-based adaptation assessment component would be beneficial within the National Adaptation Plan (NAP) development process, beyond representation in consultations for development of the NAP.
- 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.
- 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.

Climate information

- Dynamical and statistical downscaling of CMIP6 climate models over the western tropical Pacific to improve spatial detail in projections, especially for extreme weather events.
- Better information about historical links between climate hazards, exposure, vulnerability and impacts, e.g. for heat-related impacts on health and electricity demand. This would inform 'damage functions' that can be used in risk assessments and associated 'loss and damage' negotiations.
- Enhance the technical capacity of policy-makers, adaptation planners and associated sectoral decision-makers to ensure the available scientific data and information is well understood, routinely accessed and effectively applied.
- Enhanced monitoring of climate variability and change for all climate variables including wind. Sub daily (e.g. hourly) data is useful for monitoring extremes.
- Additional monitoring of large waves. This is being achieved by Tuvalu and Kiribati with the CREWS wave buoys (details available at https://gem.spc.int/projects/climate-risk-early-warning-systems-crews-inundation-forecast-system-for-tuvalu-kiribati).
- Co-design and co-develop products and services to support the uptake of climate change information in policy development, planning, capacity development and decision-making.

References

1. SPC and Government of the Republic of Nauru, *Nauru 2021 population and housing census - Analytical report*. 2023 SPC: Noumea, New Caledonia; Available from: https://sdd.spc.int/news/2023/08/23/nauru-2021-population-and-housing-census-analytical-report

2. Straza, T., *State of Environment and Conservation in the Pacific Islands: 2020 Regional Report.* 2020. Secretariat of the Pacific Regional Environment Programme: Apia, Samoa; Available from: https://pacific-data.sprep.org/system/files/SOE-conservation-pacific-regional-report.pdf.

3. Alberti, L., I. La Licata, and M. Cantone, Saltwater intrusion and freshwater storage in sand sediments along the coastline: hydrogeological investigations and groundwater modeling of Nauru Island. *Water Research,* 2017. 9(10): p. 788.

4. SPREP, *Nauru's 2021 Draft State of the Environment Report.* 2021 Secretariat of the Pacific Regional Environmental Programme.

5. Krüger, J. and A. Sharma, *High-Resolution Bathymetric Survey of Nauru.* 2008. Available from: http://www.sopac.org.

6. Connell, J., Nauru: The first failed Pacific State? . *Round Table,* 2006. 95(383): p. 47–63 DOI: https://doi.org/10.1080/00358530500379205.

7. Viviani, N., *Nauru: Phosphate and Political Progress.* 1970. ANU Press.

8. Storr, A.C., *Nauru: International Status, Imperial Form, and the Histories of International Law*. 2017, University of Melbourne.

9. Tate, M., Nauru, Phosphate, and the Nauruans*. *Australian Journal of Politics & History, ,* 1968. 14(2): p. 177-192 DOI: https://doi.org/10.1111/j.1467-8497.1968.tb00703.x.

10. Pollock, N.J., Nauru Phosphate History and the Resource Curse Narrative. *Journal de la Société des Océanistes,* 2014. 138(139): p. 107-120

11. Viviani, N., *Nauru: Phosphate and political progress*. 1970: Australian National University Press.

12. Bell, J.D., I. Senina, T. Adams, O. Aumont, B. Calmettes, S. Clark, M. Dessert, M. Gehlen, T. Gorgues, and J. Hampton, Pathways to sustaining tuna-dependent Pacific Island economies during climate change. *Nature sustainability,* 2021. 4(10): p. 900-910.

13. UNDRR, *Disaster Risk Reduction in the Republic of Nauru: Status Report 2022*. 2022 United Nations Office for Disaster Risk Reduction, Sub-Regional Office for the Pacific; Available from: https://www.undrr.org/media/85130/download.

14. Republic of Nauru. *Nauru Framework for Climate Change Adaptation and Disaster Risk Reduction (RONAdapt).* 2015 Available from: https://policy.asiapacificenergy.org/sites/default/files/Nauru%20Framework%20for%20Climate%20Change%20Adaptation%20and%20Disaster%20Risk%20Reduction%20%28EN%29.pdf.

15. Non-Revenue Water (NRW), *Nauru Water and Sanitation Master plan: 2017 update*. 2017 Government of Nauru. Non-Revenue Water (NRW) Specialists Pty Ltd and NRW Macallan (Fiji) Ltd. 2017. ; Available from: https://nauru-data.sprep.org/system/files/Nauru%20Master%20Plan%20Final%20Report-%2021.02.17%20%281%29.pdf.

16. McKenna, S., D. Butler, and A. Wheatley, *Rapid biodiversity assessment of Republic of Nauru. SPREP. Apia, Samoa.* 2015.

17. Government of Nauru, *Nauru Water and Sanitation Master Plan 2015*. 2016; Available from: http://ccprojects.gsd.spc.int/wp-content/uploads/2016/06/8.-Nauru-Master-Plan-Final.pdf.

18. World Bank, *Climate Risk Country Profile: Nauru (2021): The World Bank Group*. 2021. The World Bank Group: Washington, USA.; Available from: https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15819-WB_Nauru%20Country%20Profile-WEB.pdf.

19. Nauru Bureau of Statistics (NBS), Secretariat of the Pacific Community (SPC), and Macro International Inc (MII). *Republic of Nauru Demographic and Health Survey 2007.* 2009. Secretariat of the Pacific Community; Available from: https://nauru-data.sprep.org/resource/republic-nauru-demographic-and-health-survey-2007.

20. Baches, M., D. Baches, G. Walters, A. Lerner, and S. Chen, *Higher Ground Initiative: Land Planning + Resiliency. Tenure + Social Safeguarding. Housing + Architecture.* 2022.

21. FAO, *Fishery and Aquaculture Country Profiles, Nauru 2017*. 2024 Fisheries and Aquaculture Division: Rome; Available from: https://www.fao.org/fishery/en/facp/nru?lang=en.

22. Wandres, M., J. Giblin, A. Espejo, T. Sovea, R. Simpson, N. Jackson, A.C. Pickering, and H. Damlamian, *Nauru coastal risk assessment*. 2023 Pacific Community (SPC): Suva, Fiji.

23. Nauru Government, *National Sustainable Development Strategy 2019-2030: Revised 2019*. 2019; Available from: https://policy.asiapacificenergy.org/sites/default/files/National%20Sustainable%20Development%20Strategy%20%28NSDS%29%202019-2030%20%28Revised%202019%29_0.pdf.

24. Republic of Nauru, *First Nationally Determined Contribution Under the United Nations Convention on Climate Change.* . 2019; Available from: https://unfccc.int/reports?f%5B0%5D=corporate_author%3A138.

25. Republic of Nauru, *Climate Change Policy – Second Draft*. 2023; Available from: https://nauru-data.sprep.org/system/files/Nauru%20Climate%20Change%20Policy%20%28Final%29.pdf.

26. UN Women, *Gender Equality Brief for Nauru*. 2022; Available from: https://asiapacific.unwomen.org/sites/default/files/2022-12/UN_WOMEN_NAURU.pdf

27. Government of Nauru, *National Social Protection Strategy 2022-2032*. 2022; Available from: https://naurufinance.info/wp-content/uploads/2022/11/Nauru-Social-Protection-Strategy-published-version_Final.pdf.

28. Beca Tonkin and Taylor, *Nauru Sustainable Urban Development Phase 1: Water Supply System Subproject Master Plan, Prepared for Government of Nauru*. 2023 Beca, Tonkin and Taylor,.

29. Beca Tonkin and Taylor, *Nauru Sustainable Urban Development Phase 1: Sanitation System Subproject Master Plan, Prepared for Government of Nauru*. 2023 Beca, Tonkin and Taylor,.

30. Beca Tonkin and Taylor, *Nauru Sustainable Urban Development Phase 1: Solid Waste Management Subproject Master Plan, Prepared for Government of Nauru*. 2023 Beca, Tonkin and Taylor,.

31. Brown, J.N., J.R. Brown, C. Langlais, R. Colman, J.S. Risbey, B.F. Murphy, A. Moise, A.S. Gupta, I. Smith, and L. Wilson, Exploring qualitative regional climate projections: a case study for Nauru. *Climate Research,* 2013. 58(2): p. 165-182.

32. Chand, S., S. Power, K. Walsh, and Coauthors, Climate processes and drivers in the Pacific and global warming: a review for informing Pacific planning agencies. *Climatic Change,* 2023. 176(5) DOI: 10.1007/s10584-022-03467-z.

33. Brown, J.R., M. Lengaigne, B.R. Lintner, M.J. Widlansky, K.v.d. Wiel, C. Dutheil, B.K. Linsley, A.J. Matthews, and J. Renwick, South Pacific Convergence Zone dynamics, variability and impacts in a changing climate. *Nat. Rev. Earth Environ.,* 2020. 1: p. 530–543 DOI: 10.1038/s43017-020-0078-2.

34. McGree, S., G. Smith, E. Chandler, N. Herold, Z. Begg, Y. Kuleshov, P. Malsale, and M. Rittman, *Climate Change in the Pacific 2022: historical and recent variability, extremes and change*. 2022 SPC: Suva, Fiji.

35. Marra, J.J., G. Gooley, M.-V.V. Johnson, V.W. Keener, M.K. Kruk, S. McGree, J.T. Potemra, and O. Warrick, *Pacific Islands Climate Change Monitor: 2021*. 2022 The Pacific Islands-Regional Climate Centre (PI-RCC) Network Report to the Pacific Islands Climate Service (PICS) Panel and Pacific Meteorological Council (PMC); Available from: https://www.pacificmet.net/pacific-climate-change-monitor-report.

36. McGree, S., G. Smith, E. Chandler, N. Herold, Z. Begg, Y. Kuleshov, P. Malsale, and M. Ritman, *Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change.* 2022. Climate and Oceans Support Program in the Pacific. Pacific Community: Suva, Fiji.; Available from: https://library.sprep.org/content/climate-change-pacific-2022-historical-and-recent-variability-extremes-and-change

37. Huang, B., C. Liu, V. Banzon, E. Freeman, G. Graham, B. Hankins, T. Smith, and H. Zhang, *NOAA 0.25-degree daily optimum interpolation sea surface temperature (OISST), version 2.1*. 2020; Available from: https://psl.noaa.gov/data/gridded/data.noaa.oisst.v2.html

38. Hobday, A.J., L.V. Alexander, S.E. Perkins, D.A. Smale, S.C. Straub, E.C. Oliver, J.A. Benthuysen, M.T. Burrows, M.G. Donat, and M. Feng, A hierarchical approach to defining marine heatwaves. *Progress in Oceanography,* 2016. 141: p. 227-238.

39. Hobday, A.J., E.C. Oliver, A.S. Gupta, J.A. Benthuysen, M.T. Burrows, M.G. Donat, N.J. Holbrook, P.J. Moore, M.S. Thomsen, and T. Wernberg, Categorizing and naming marine heatwaves. *Oceanography,* 2018. 31(2): p. 162-173.

40. IPCC, *Summary for Policymakers. IPCC Sixth Assessment Report from Working Group 2 on Impacts, Adaptation and Vulnerability.* 2022. Available from: https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf.

41. European Environment Agency, *European Climate Risk Assessment. (EEA Report; No. 01/2024).* 2024. Publications Office of the European Union: Luxembourg; Available from: https://www.sei.org/publications/european-climate-risk-assessment/

42. McIver, L., R. Kim, A. Woodward, S. Hales, J. Spickett, D. Katscherian, M. Hashizume, Y. Honda, H. Kim, and S. Iddings, Health impacts of climate change in Pacific Island countries: a regional assessment of vulnerabilities and adaptation priorities. *Environmental health perspectives,* 2016. 124(11): p. 1707-1714.

43. Ampofo, A.G. and E.B. Boateng, Beyond 2020: Modelling obesity and diabetes prevalence. *Diabetes Research and Clinical Practice,* 2020: p. 167 DOI: https://doi.org/10.1016/j.diabres.2020.108362.

44. Wardhani, B., The Legacy of Colonialism and Ecological Genocide on Indigenous People of Nauru. *Andalas Journal of International Studies,* 2023. 12(1): p. 13-26.

45. Maclellan, N., Nauru. *The contemporary Pacific JSTOR,* 2020. 32(1): p. 213-225.

46. Government of Nauru, *RoN Hospital*. 2024 Government of Nauru: Nauru; Available from: http://naurugov.nr/government/departments/department-of-health-and-medicinal-service.aspx

47. Leal Filho, W., J.M. Lütz, D.N. Sattler, and P.D. Nunn, Coronavirus: COVID-19 transmission in pacific small island developing states. *International Journal of Environmental Research Public Health,* 2020. 17(15): p. 5409.

48. Government of the Republic of Nauru, *Nauru Voluntary National Review on the implementation of the 2030 Agenda.* . 2019; Available from: https://www.theprif.org/sites/theprif.org/files/2020-08/Nauru%20VNR%202019.pdf

49. FAO, *Country Reports: The State of Nauru's Biodiversity for Food and Agriculture.* 2019. Available from: https://openknowledge.fao.org/server/api/core/bitstreams/6692d0ca-5baf-4cf5-bc11-c161bede17c5/content.

50. Thaman, R.R., F.R. Fosberg, H. Manner, and D. Hassall, The flora of Nauru. *Atoll Research Bulletin,* 1994.

51. FAO, TCP/NAU/3301: An assessment for Increased Agricultural Production Project Development for the Republic of Nauru. 2012.

52. Hambruch, P., *Nauru* Ch in *Results of the South Sea Expedition-Ethnography: B Micronesia. Vol 1.* , G. Thilenius, Editor. 1914, https://www.tandfonline.com/doi/full/10.1080/00223340701692007

53. Republic of Nauru, *Lands Act 1976.* . 2011.

54. Bell, J.D., J.E. Johnson, and A.J. Hobday, *Vulnerability of tropical Pacific fisheries and aquaculture to climate change*. 2011, Noumea, New Caledonia.: Secretariat of the Pacific Community (SPC).

55. Harris, D., G. Gioura, N. Helagi, and B. Moore. Survey of reef invertebrate resources in the Republic of Nauru: May 2015. 2016: SPC.

56. Dalzell, P. and A. Debao, *Coastal fisheries production on Nauru. Inshore Fisheries Research Project country assignment report.* . 1994 SPC, : Noumea, New Caledonia.

57. PIEMA & SPC, *Nauru Strategic Roadmap For Emergency Management 2021-2023*. 2023: Nauru; Available from: https://spc.int/resource-centre/publications/nauru-strategic-roadmap-for-emergency-management-2021-2023.

58. SOPAC, *SOPAC Member Countries National Capacity Assessments: Tsunami Warning and Mitigation Systems: Nauru Tsunami Capacity Assessment Report.* . 2013; Available from: http://www.bom.gov.au/tsunami/assessments/pdf/Nauru_Results_Outline.pdf.

59. Dashora, L.K., S. Basnayake, G.C. Ganepola, and S. Jayasinghe, Readiness stocktaking of multi-hazard early warning systems in Pacific small Island developing states. *Asia-Pacific Sustainable Development Journal,* 2024. 31(1): p. 47-75.

60. Bosserelle, C. and S. Williams, *Coastal flooding from sea-level rise in Nauru: Stage 2 - wave inundation mapping, Prepared for the Nauru Higher Ground Project*. 2023 Prepared for: New Zealand Ministry of Foreign Affairs and Trade The Government of the Republic of Nauru, and Calibre Group Limited: Christchurch, NZ.

61. Kumar, L. and S. Taylor, Exposure of coastal built assets in the South Pacific to climate risks. *Nature Climate Change,* 2015. 5(11): p. 992-996.

62. JBA Pacific Scientists and Engineers, *Nauru Seawall and Road Drainage Condition Assessment: Final Report Appendices*. 2023 Department of Infrastructure, Government of Nauru: Qld, Australia.

63. Allis, M., S. Williams, and S. Wadwha, *Coastal flooding from sea-level rise in Nauru: Stage 1 - static inundation mapping, Prepared for the Nauru Higher Ground Project*. 2020: Prepared for: New Zealand Ministry of Foreign Affairs and Trade The Government of the Republic of Nauru, and Calibre Group Limited.

64. Nauru Utilities Corporation. 2024; Available from: https://www.nuc.com.nr/.

65. Andrew, N.L., P. Bright, L. de la Rua, S.J. Teoh, and M. Vickers, Coastal proximity of populations in 22 Pacific Island Countries and Territories. *PLoS One,* 2019. 14(9): p. e0223249.

66. IPCC, *The ocean and cryosphere in a changing climate*. 2019; Available from: https://www.ipcc.ch/srocc/chapter/summary-for-policymakers/.

67. SPC and NBS, *Nauru census main report and demographic profile of the Republic of Nauru.* 2006 Secretariat of the Pacific Community & Nauru Bureau of Statistics.

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