Nauru Climate Vulnerability Assessment Overview

National Adaptation Plan – Integrated Climate Impacts, Vulnerability and Risk Assessment (CIVRA) Project

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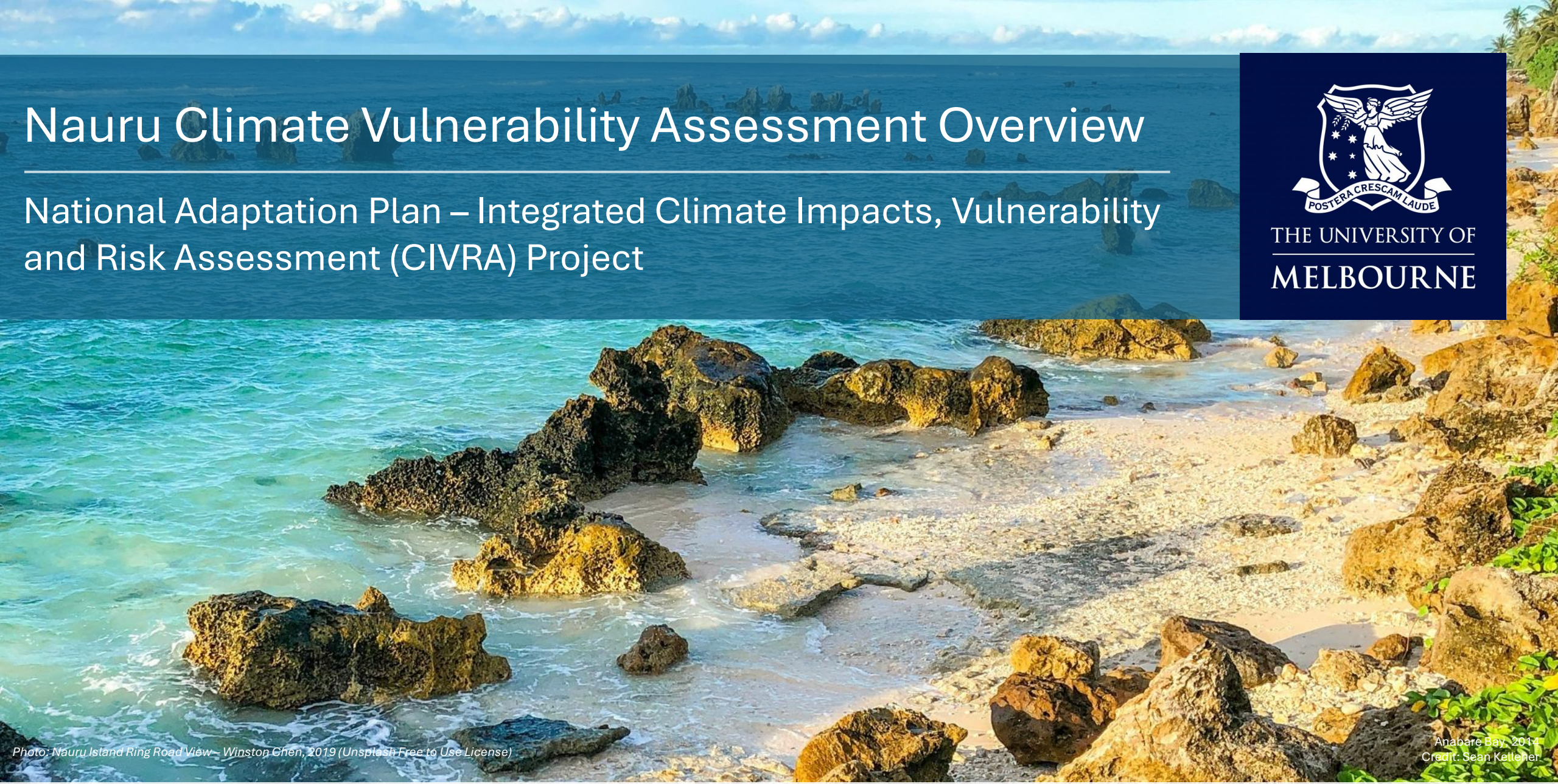

Photo: Nauru Island Ring Road View – Winston Chen, 2019 (Unsplash Free to Use License)

Anabare Bay, 2014
Credit: Sean Kelleher

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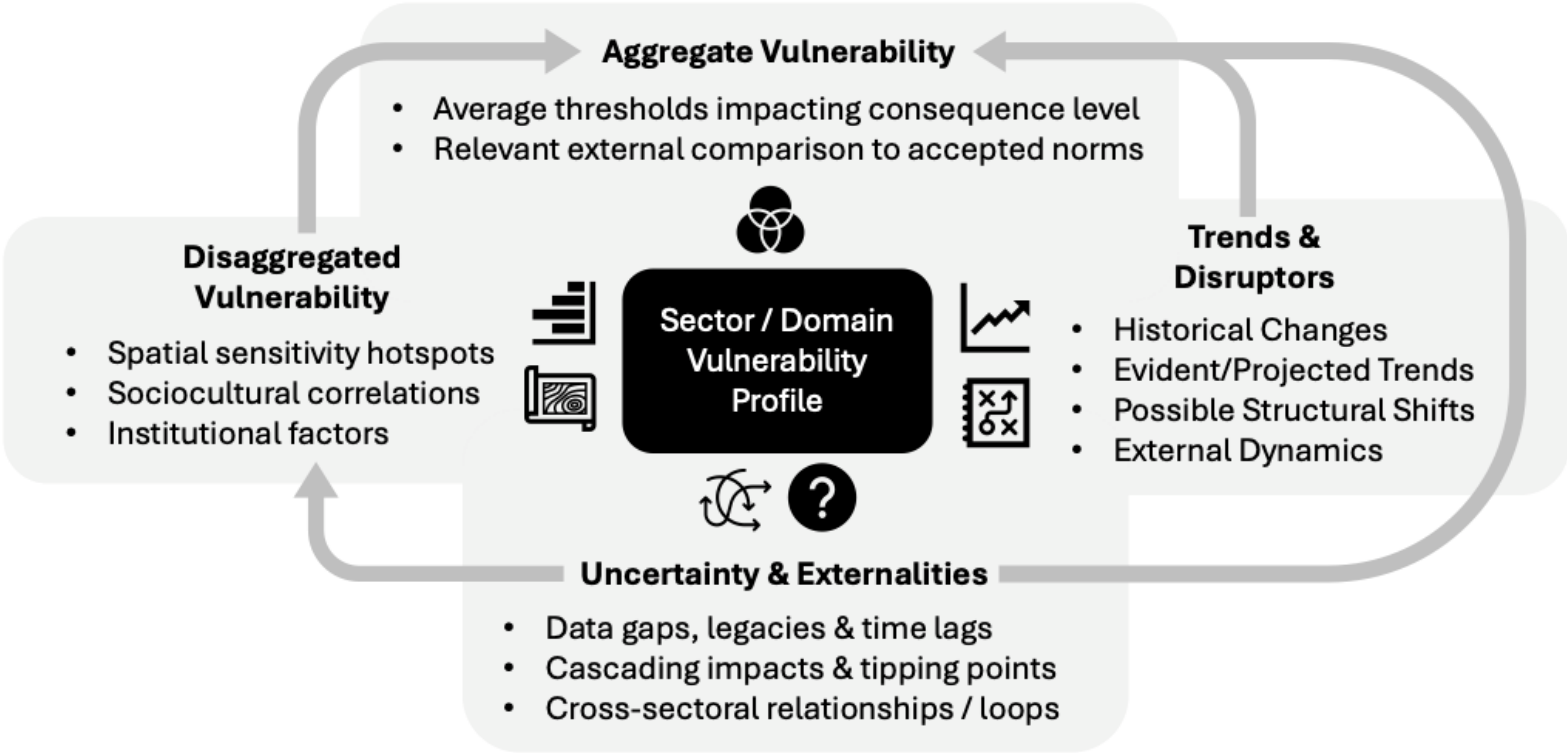
Nauru Climate Vulnerability Assessment Components

- **Aggregate Vulnerability**
  - National scale, key to sectoral and regional comparability & priority setting
- **Disaggregated Vulnerability**
  - Allows for sub-sectoral and spatial prioritization of actions, ensuring equity in adaptation planning
- **Trends & Future Disruptors**
  - Consideration of non-climate trends and potential shifts
- **Uncertainties & Externalities**
  - Point of reference for considering data quality and unknowns (differing by sector), as well as currently planned or underway interventions



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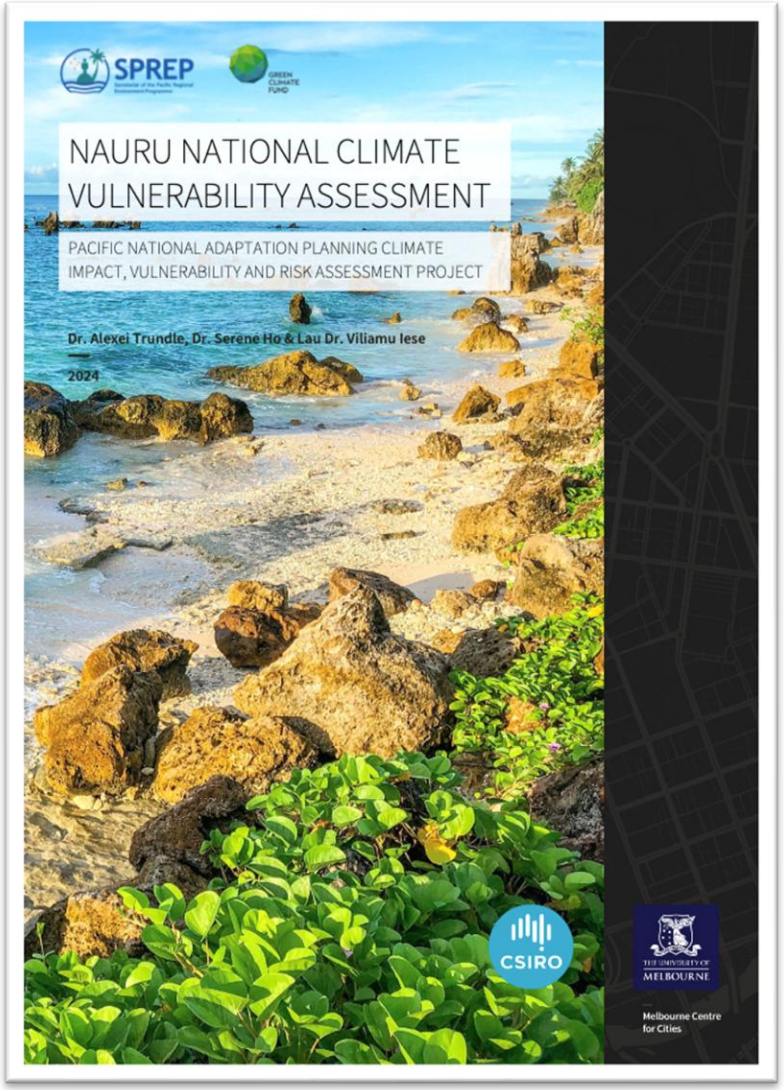
Nauru Climate Vulnerability Assessment – Underlying Report



Code	2021 National Census Variable Description	Water	Health	Agri-culture	Fisheries	Disaster	Coastal	Bio-diversity	Land	Culture
Housing										
H01	Type of Living Quarters						✓			✓
H02	Wall Materials						✓			
H06	Number of Bedrooms						✓			
H08	Material of Roof		✓				✓			
H32	Appliances						✓			✓
H36	Disasters in Last 10 Years					✓		✓		
H37a	Post-Disaster Action					✓				
H37b	Non-Preparedness Rationale					✓				
Water and Sanitation										
H09	Guttering	✓	✓				✓			
H10	Downpipe/Gutter Condition	✓	✓				✓			
H12	Drinking Water Source	✓								
H13	Cooking Water Source	✓	✓							
H14	Groundwater Use	✓	✓							
H17b	Downpipe Disrepair	✓								
H18a	Water Supply Failure	✓	✓							
H18b	Shared Water Supply									
H19	Drinking Seawater in Drought		✓							
H20	Septic / Sewerage Facilities		✓				✓			✓
H30	Waste Disposal		✓				✓			
Communications and Energy										
H23	Cooking Fuel						✓			
H24	Kitchen Type						✓			✓
H25	Electricity Source						✓			
H33b	Internet Access						✓			
H33a	Mobile phone Access						✓			
Agriculture and Fisheries										
H39	Crop Production		✓	✓				✓		
H41	Fruit Production		✓	✓				✓		
H43	Livestock Production			✓				✓		
H38	Catching Noddy Birds			✓				✓		
H46	Deepsea Fishing				✓			✓		
H47	Involvement in Fishing		✓	✓	✓			✓		
Economy										
P34	Employment and Income									✓
Food Insecurity										
H51a	Insufficient Food		✓	✓						
H51b	Poor Nutrition		✓	✓						
H51g	Hunger		✓							
H51h	Whole Day(s) w/o Food		✓							
Demography										
P01	Ethnicity									✓
P17	Language									✓
Disability										
P12a	Difficulty Seeing									✓
P12b	Difficulty Hearing									✓
P12c	Mobility Difficulties									✓
P12d	Difficulty Remembering									✓
P12e	Self-care Difficulties									✓
P12f	Communication Difficulties									✓

- Comprehensive, 86-page analysis, including details for each sector
- Building on existing secondary analysis and RON documentation
- New re-analysis of more than 100 National Census variables across sectors
- Disaggregates variables from 2021 down to EA levels
- Compares like-for-like data across 2002, 2011 & 2021 census periods where available

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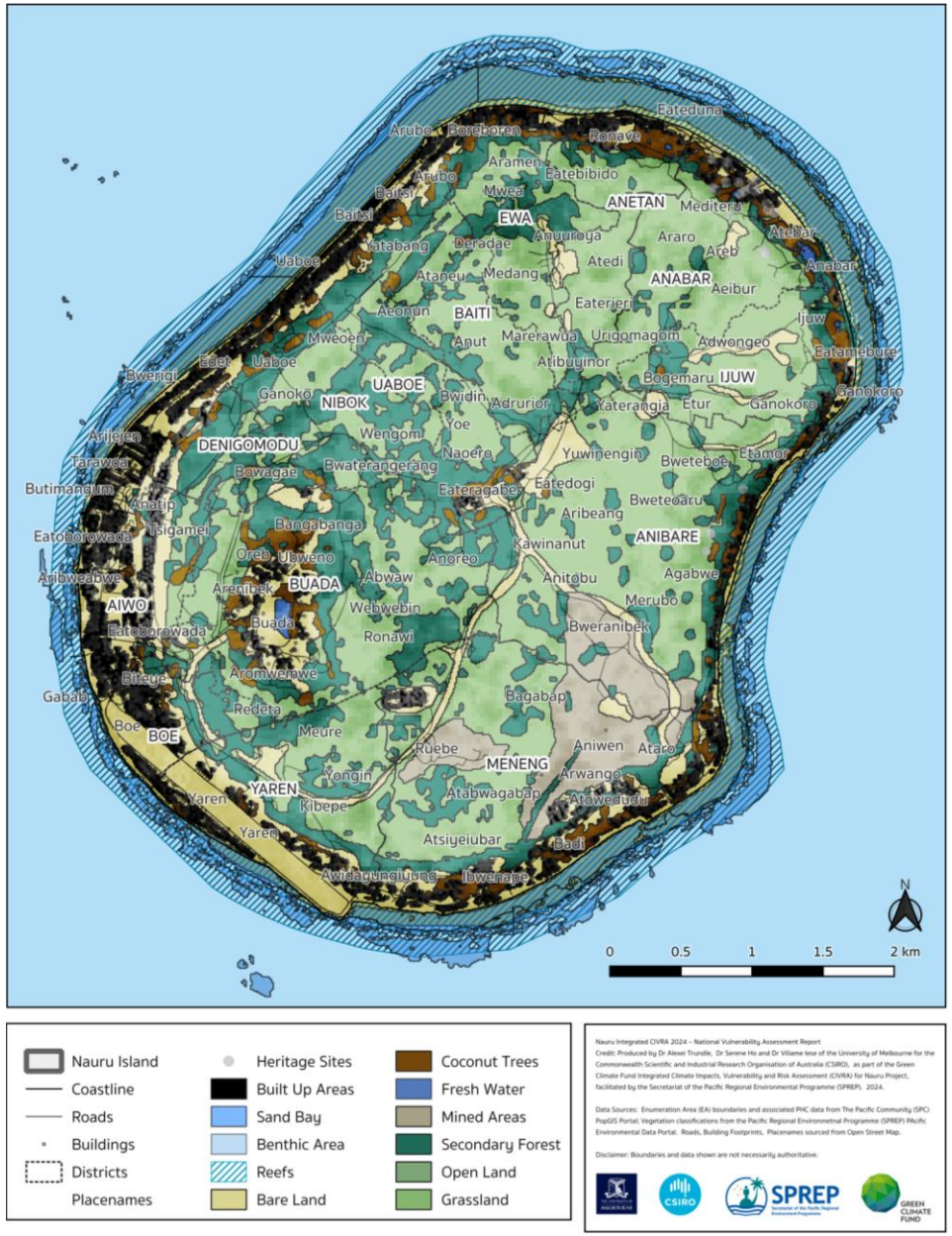
Historical Context

- Baseline of severely degraded natural environment, driven by a century of extractive colonial exploitative processes
- Sustained cultural identities in the face of destruction of many resources and ecosystem assets (e.g. frigate birds) central to associated traditions
- Unique communal land tenure systems complicating large-scale spatial planning and associated development initiatives
- 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)
- High levels of school attendance and literacy, but limited local economic opportunities outside of government and associated services
- Lengthy history of unimplemented land rehabilitation initiatives



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Nauru Climate Vulnerability Overview

- Compared with many other Pacific Island countries, Nauru currently faces fewer and less intense disaster-related hazards, including climate shocks and stresses
- Climate vulnerability is heavily driven by existing sensitivities of human health and water-storage related infrastructure and natural assets, which intersect with high levels of interannual rainfall variability
- Sub-nationally, vulnerability increases due to community variations in livelihoods (incl. ecosystem dependency / subsistence) and very high socio-economic inequality
- Ongoing trends point to extreme risks to currently high levels of community resilience

CIVRA Sector / Domain for National Adaptation Planning	Aggregate Vulnerability	Disaggregated Vulnerability	Trends/Future Disruptions	Uncertainties Externalities
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**

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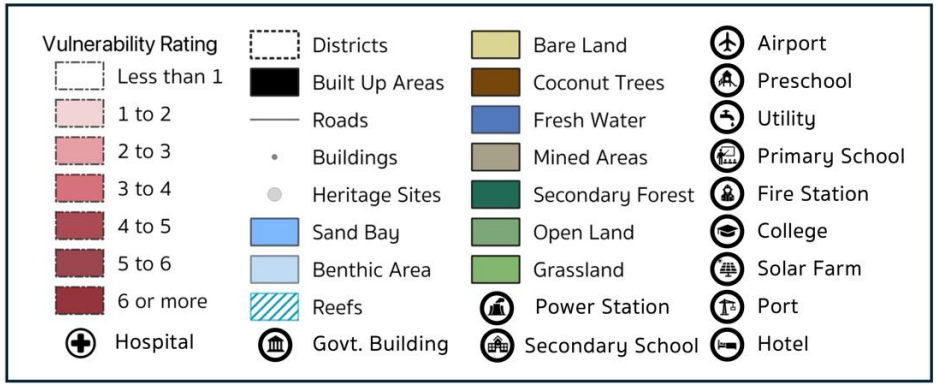
All Sector Vulnerability Hotspots

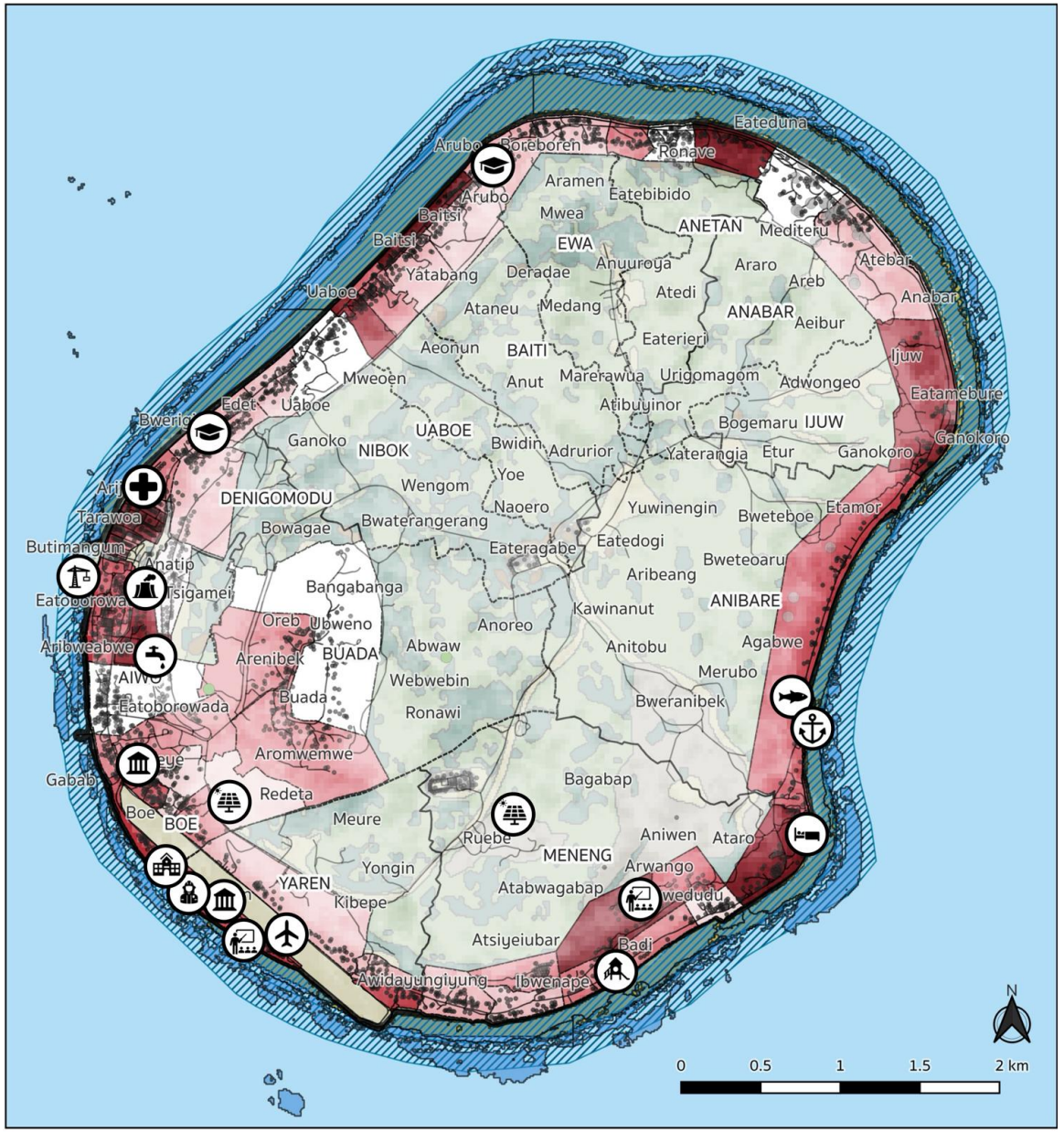
- Sub-national vulnerability disaggregated through analysis of census variables shows spatial ‘hotspots’
- Communities with heightened vulnerability include:
  - Aiwo (EA4) – low adaptive capacity & food security
  - Anetan (EA3) – high climate hazard exposure with households dependent upon ecosystem services for livelihoods (fishing, livestock, noddying, etc.)
  - Location (EA3&4): Disproportionate share of inhabitants with disabilities, lacking tribal identities



Nauru Integrated CIVRA 2024 – National Vulnerability Assessment Report
Credit: Produced by Dr Alexei Trundle, Dr Serene Ho and Dr Viliame Iese of the University of Melbourne for the Commonwealth Scientific and Industrial Research Organisation of Australia (CSIRO), as part of the Green Climate Fund Integrated Climate Impacts, Vulnerability and Risk Assessment (CIVRA) for Nauru Project, facilitated by the Secretariat of the Pacific Regional Environmental Programme (SPREP). 2024.

Data Sources: Enumeration Area (EA) boundaries and associated PHC data from The Pacific Community (SPC) PopGIS Portal; Vegetation classifications from the Pacific Regional Environmetnal Programme (SPREP) PAcific Environmental Data Portal. Roads, Building Footprints, Placenames sourced from Open Street Map.

Disclaimer: Boundaries and data shown are not necessarily authoritative.



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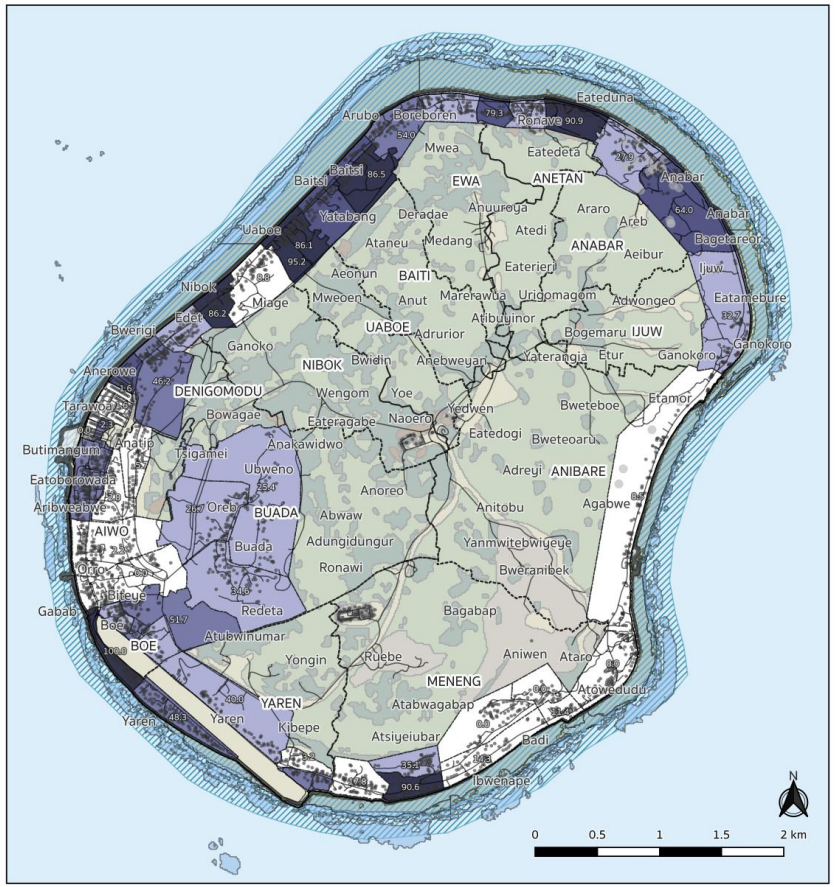
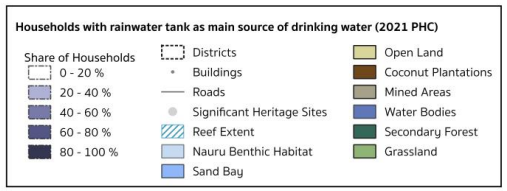
1. Water Resources – Vulnerability Overview

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	Extreme	➢ Water shortages relating to irregular rainfall impacted 2/3 households over the last decade ➢ Collapse of agricultural initiatives, ecosystems in previous droughts ➢ Widespread dependence upon poorly maintained private rainwater collection infrastructure ➢ Limits to desalination plant production, with previous instances of emergency water importation	▪ 2021 National Census: Water scarcity (H18a) ▪ Integrated Water Resource Management Diagnostic Report – Nauru (SOPAC 2007) ▪ Rapid Biodiversity Assessment of Nauru (SPREP 2014)
Disaggregate Vulnerability	Extreme	➢ Households in locales resorting to drinking saline seawater in drought ➢ Poor maintenance of private tanks ➢ Localised contamination issues ➢ Fragile & fragmented ecosystems	▪ 2021 National Census: Drinking seawater in drought periods (H19) ▪ Nauru 2021 State of the Env. Draft Report
Trends & Future Disruption	Moderate	➢ Ongoing risk of the occurrence of drought (although reduced) with ENSO being the key short-term factor in water availability ➢ Various water supply & sanitation initiatives proposed but unfunded	▪ CSIRO *et al.* 2024 Nauru Climate Impacts Report ▪ 2022 Nauru Water & Sanitation Master Plan
Uncertainty & Externalities	High	➢ Unclear risk to freshwater lens in groundwater, with Buada Lagoon potentially exposed to sea level rise ➢ High levels of interannual variability ➢ Changes to ENSO are uncertain, with Nauru experiencing more droughts in La Niña than El Niño	▪ Jacobson & Hill (1987) vs. Alberti et al. (2022) ▪ CSIRO *et al.* 2024 Nauru Climate Impacts Report ▪ Nauru Climate Risk Profile (WBG 2021)

1. Water Resources – Vulnerability Highlights





- Household drinking water
  - **Private rainwater tanks are used by 36.6%** of households as their main source of drinking water
  - **48.6%** depend upon supply from **tanker trucks** and the **desalination plant** for drinking water

- Non-drinking water usage
  - **35,011 mostly private groundwater wells** using pressure pumps or bail buckets are used by ~40 % of the population accessing for washing, showering, cooking and gardening

- Groundwater conditions
  - **Northern freshwater lens 7m thick**, reportedly resilient to saltwater intrusion and drought
  - **Southern freshwater lens is 3.5 m thick** & resilient to saltwater intrusion due to sand base
  - **Central part of Topside is mostly brackish water** at the surface and seawater at 20m

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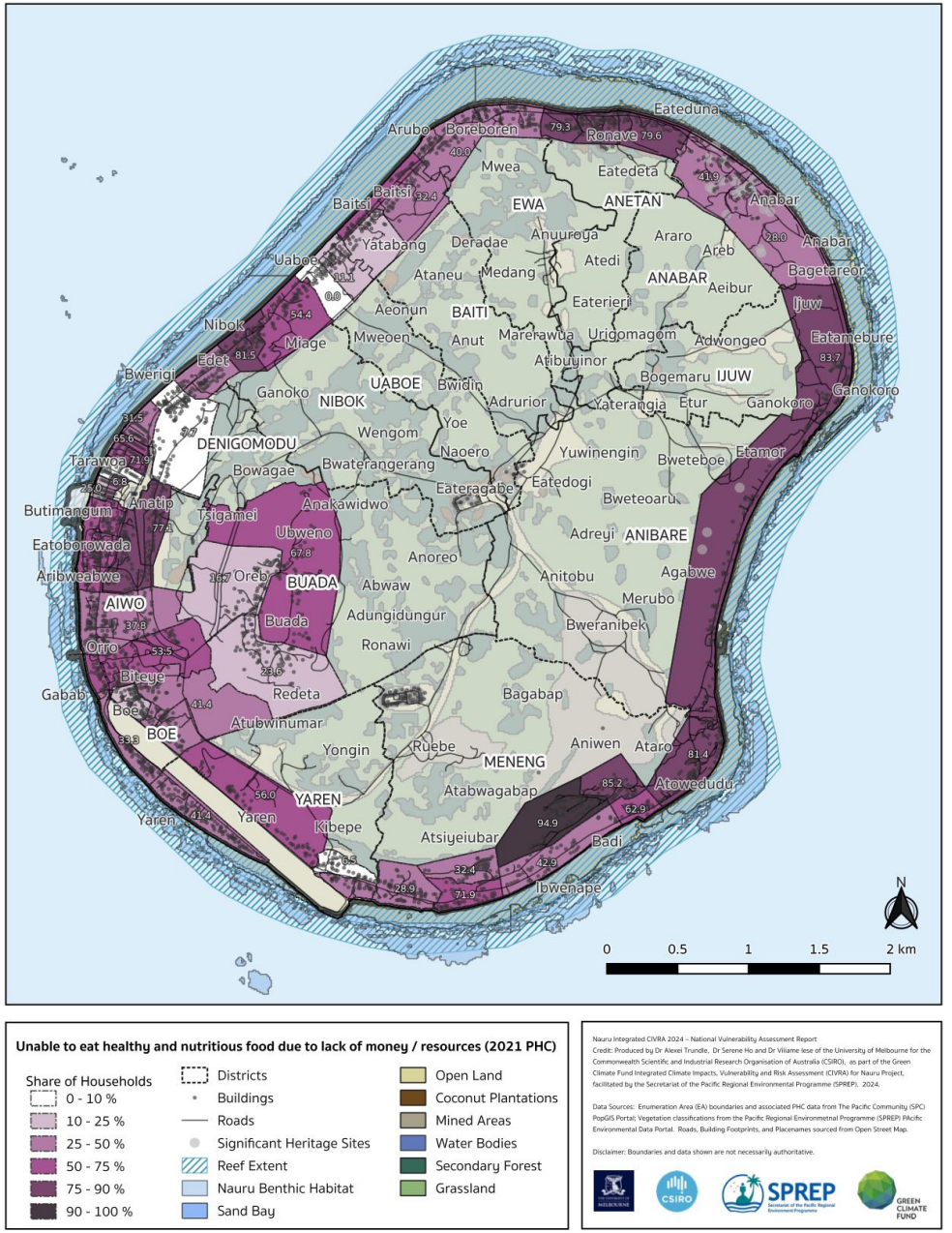
2. Health and Wellbeing – Vulnerability Overview

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	Extreme	➢ Life expectancy at birth is the lowest of any Pacific country, more than 10 years less than the global average ➢ Stunting and anaemia are highly prevalent in Nauruan children ➢ Health services are highly limited ➢ Water scarcity issues for more than 72% of households	▪ WHO Pacific STEPs Survey 2002-2019 (Reeve et al. 2022) ▪ Nauru Demographic & Health Survey 2007 (NBS et al. 2009) ▪ Regional Health Assessment (McIver et al. 2016)
Disaggregate Vulnerability	Extreme	➢ Half of all households were unable to eat healthy or nutritious food in the last year due to unaffordability ➢ High prevalence of NCDs ➢ Frequent E. coli outbreaks cause localised issues for groundwater dependent households	▪ Nauru Demographic & Health Survey 2007 (NBS et al. 2009) ▪ 2021 National Census: Water scarcity (H18a) ▪ Nauru 2021 State of the Env. Draft Report
Trends & Future Disruption	High	➢ Proposed large scale agriculture developments through the Higher Ground Initiative Phase 2 would significantly increase local produce ➢ Potential for scalable behavioural change & education initiatives	▪ HGI Land Planning & Resiliency Report (Baches et al. 2022) ▪ Ampofo & Boateng (2020)
Uncertainties & Externalities	High	➢ Volatile patterns in subsistence production, heavily dependent upon rainfall & water accessibility ➢ External vectors a high transmission risk factor with complex impacts on climate adaptation pathways	▪ Pacific Food Systems Report (O'Meara et al. 2023) ▪ COVID-19 P-SIDS Transmission Report (Filho et a. 2020)

2. Health and Wellbeing – Highlights

- Malnourishment / Food Scarcity
  - Significant share of households nationally – **49% of households unable to eat healthy or nutritious food** over a 12-month period due to a lack of financial or other resources
    - Highest rates in Anetan (76-80% of HHs), Ijuw (84%), Anibare (83%), similar shares at the EA level elsewhere
  - 1/4 Nauruan children were found to be stunted and half of all children aged 6-59 months were anaemic in 2007
  - Imported food dependence nationally
  - **90% of Nauru's food imported**, with highly-processed foods prevalent due to lower cost and longer preservation periods
  - **40% of Nauruans have Type 2 diabetes**
- Water contamination
  - E. coli outbreaks are frequent due to degraded and variable quality of both groundwater extraction and septic systems

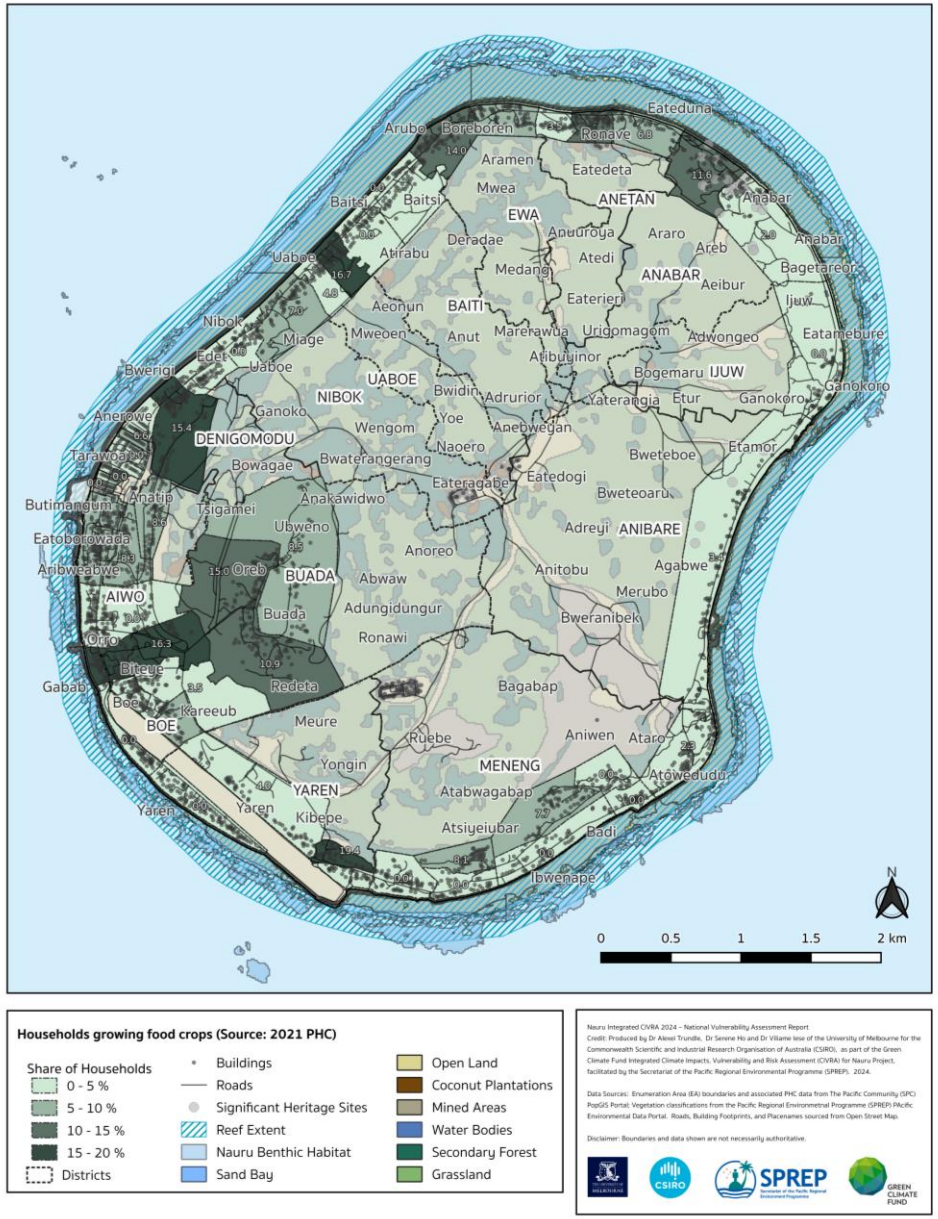


3. Agriculture – Vulnerability Overview

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	Moderate	➢ Relatively low levels of dependence on local produce for consumption ➢ Historical evidence of multiple commercial agricultural enterprises failing due to existing rain variability ➢ Negligible income from agricultural produce as a share of GDP	▪ 2021 National Census: Households growing crops (H39), fruit (H41), and producing livestock (H43) ▪ Nauru 2023-24 Budget (GRN, 2024)
Disaggregate Vulnerability	High	➢ Localities missing meals and experiencing malnutrition worsened by a lack of fresh food production ➢ Localised livestock production for subsistence & cultural practices at risk from extreme heat events	▪ 2021 National Census: Household Food Insecurity (H51) ▪ CSIRO *et al.* (2024) Nauru Climate Impacts Report
Trends & Future Disruption	Low	➢ Previous declines in crop production have resulted in low current day exposure ➢ High rainfall variability an existing feature of climate	▪ Pacific Food Systems Report (O'Meara et al. 2023) ▪ Nauru Climate Risk Profile (WBG 2021)
Uncertainty & Externalities	Moderate	➢ Changes to rainfall patterns are likely to be within existing variability ➢ Future upscaling of local production is proposed but likely to require extremely substantive investment in rehabilitation and water storage	▪ CSIRO *et al.* 2024 Nauru Climate Impacts Report ▪ HGI Land Planning & Resiliency Report (Baches et al. 2022)

3. Agriculture – Crop Production Highlights

- Nauru has one of the Pacific's lowest subsidence food production levels
  - Historically **phosphate mining diverted labour and investment** in agriculture (including commercial coconut plantations); land degradation prevents more recent uptake
  - Increased income increased **dependence on imported food goods** with significant health-related impacts (e.g. NCDs)
- Food crops
  - **<10% of households** maintain some form of **vegetable 'home gardens',** including cabbage (2.4%), chili (3%), cucumber (1.6%), cherry tomatoes (1.6%) & pumpkin (1.5%)
  - **A similarly small number grow fruit**, including pawpaw (2.3%), breadfruit (1.8%), banana (2.9%), coconut (1.5%) & lime (2.7%)
  - Significant spatial variations household crop production relate to levels of **access to suitable land & fresh water**, with some biodiversity impacts, such as destruction of mangroves



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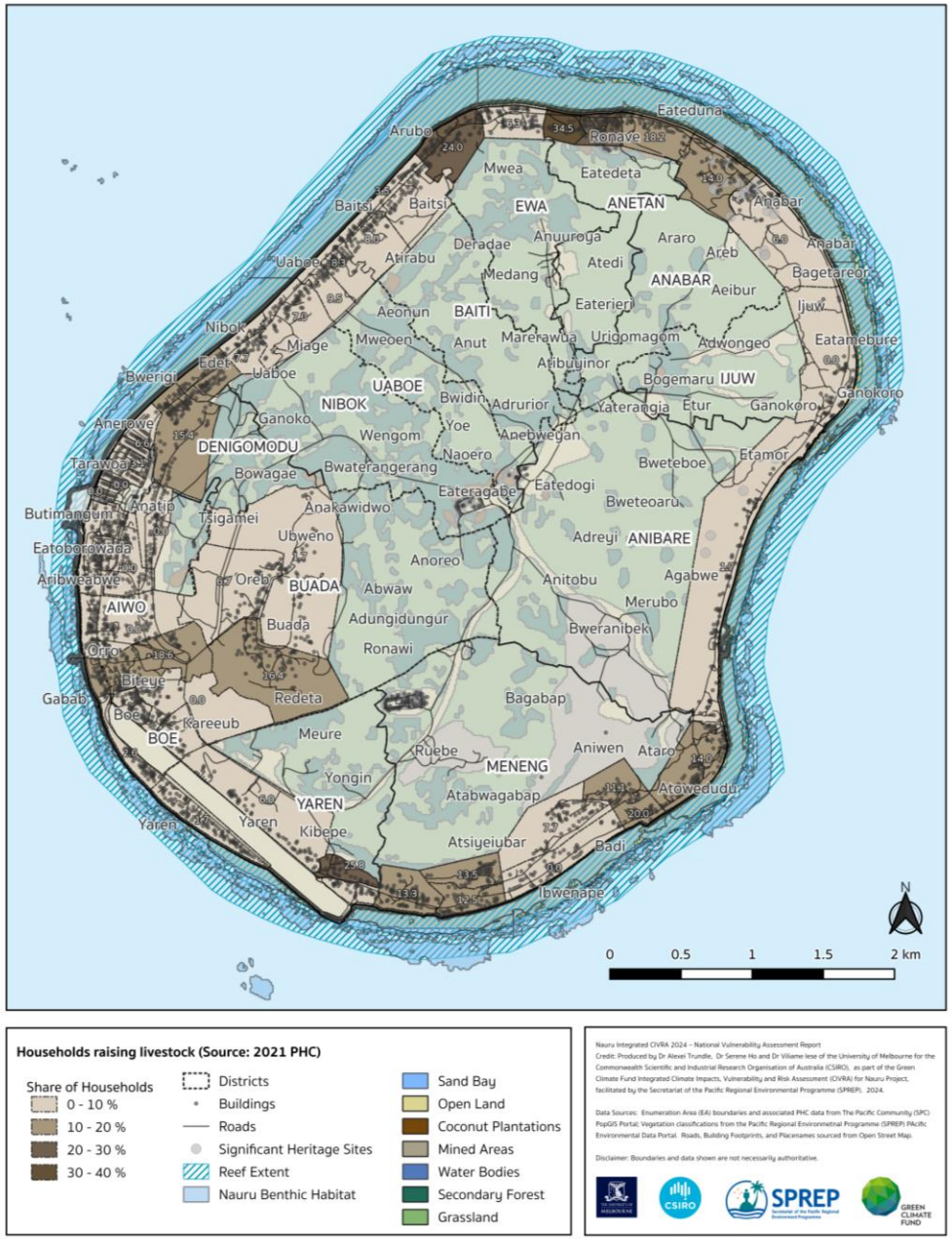
3. Agriculture – Livestock & Hunting

- Livestock
  - **No major livestock farming**; at the household level primarily **pigs** (6.7% of households) and **chickens** (2.3%)
    - Pigs of cultural and nutritional significance, with piggeries clustered spatially (e.g. >1/4 households in Anetan district), however distribution presents a secondary waste / pollution / disease hazard
- Hunting
  - 9.5% of households hunt **noddy birds** using a traditional 'netting' technique, considered **a key cultural practice**
  - The Micronesian pidgeon (tope) is hunted but is a less scarce, with limits to hunting following the rollout of firearms restrictions & destruction of habitat for phosphate
- Aquaculture
  - Longstanding practice to **harvest *ibiya*** (milkfish), however 1960s introduction of tilapia reduced output & production



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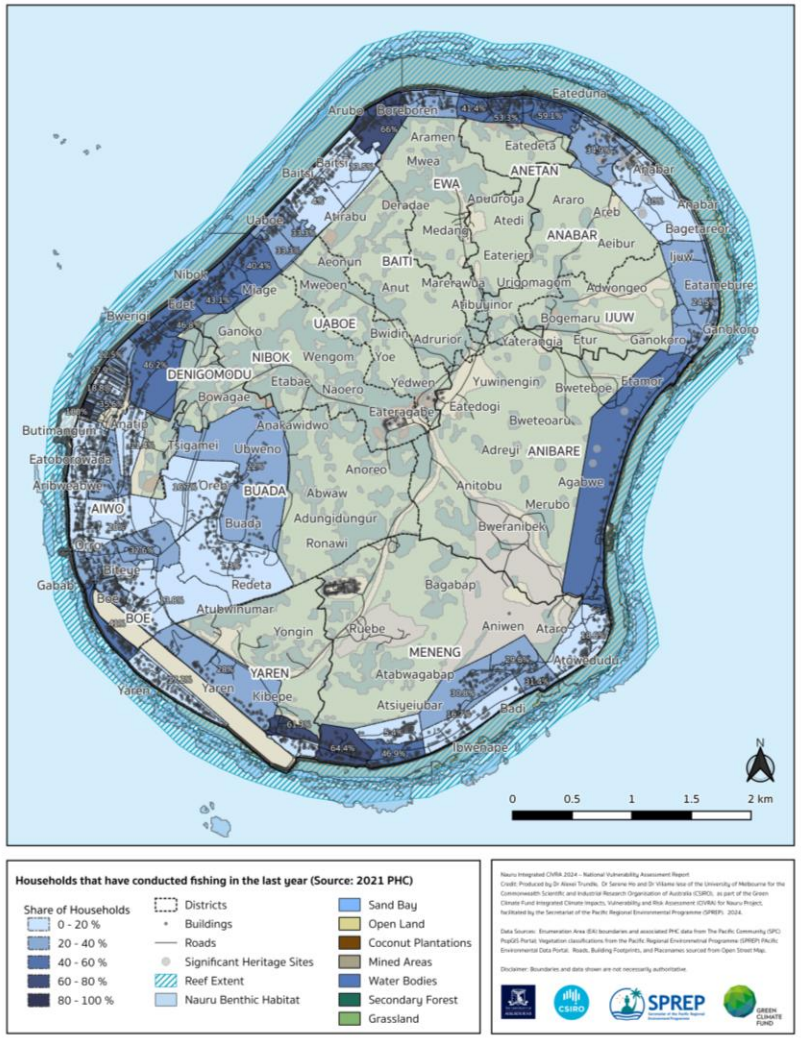
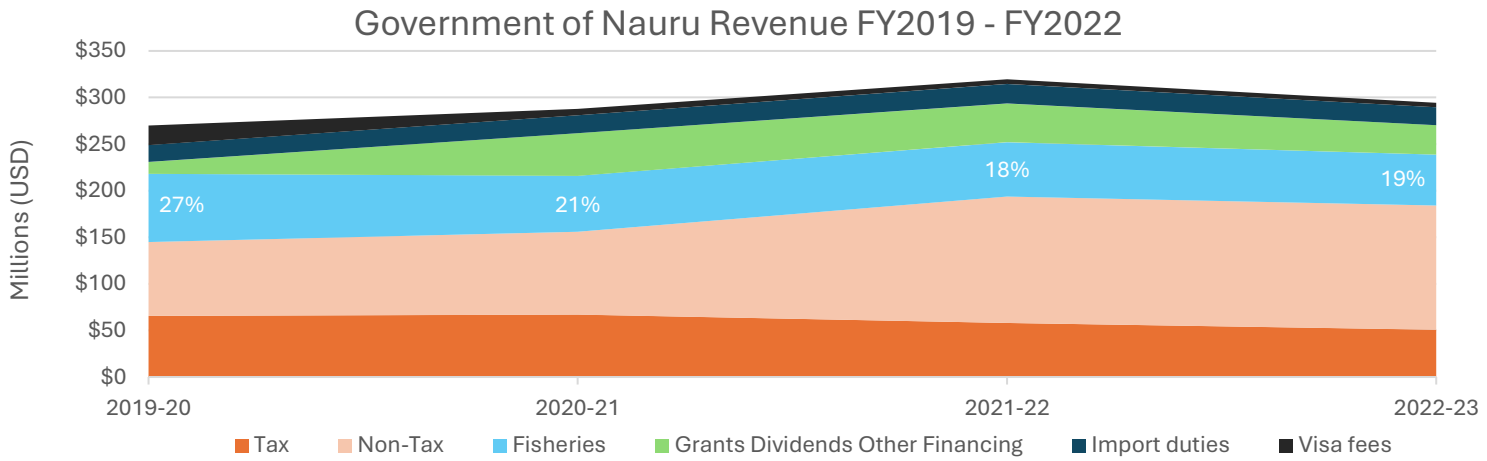
4. Fisheries and Marine Resources – Vulnerability Overview

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	High	➢ Licenses ~20% of national revenue ➢ Key source of dietary protein - fish consumption ~52.3 kg/person/year ➢ Minor household income stream relative to comparable P-SIDS ➢ Low-quality of existing nearshore coral ecosystems & species diversity	▪ Nauru National Budget Papers (RON 2023) ▪ Fishery & Aquaculture Profile – Nauru (FAO 2013) ▪ SPC Reef Invertebrate Survey (Harris et al. 2016) ▪ Tuna Indicators (FFA 2023)
Disaggregate Vulnerability	Extreme	➢ Key sections of the community are heavily reliant on a range of different subsistence fishing modes, from deep sea fishing to reef fishing by foot ➢ Localities with 100% rates of fishing and fish selling for income ➢ Nutritional deficits related to ~70% of households economically vulnerable ➢ Failure of previous efforts to establish local deep sea fishing business	▪ 2021 National Census – Households involved in Fishing (H46,47) ▪ 2021 National Census – Households exhibiting food insecurity (H51a, H51b) ▪ National Social Protection Strategy 2022-2023 (GoN) ▪ Bell et al. (2021)
Trends & Future Disruption	Moderate	➢ Recent trend data suggests stable income from fisheries licensing ➢ Overfishing of tuna stock is a risk but is monitored regional through FFA ➢ Possible increase in local fish consumption risks overfishing due to a lack of local controls ➢ Probable shift in tuna catch outside of Nauru's EEZ over time	▪ Nauru National Budget Papers (RON 2023) ▪ Rethinking fisheries policy in the Pacific (Pretes & Petersen, 2004) ▪ Yeeting et al. (2018) ▪ CSIRO *et al.* (2024) Nauru Climate Impacts Report
Uncertainties & Externalities	Low	➢ Recent trend data suggests stable income from fisheries licensing ➢ FFA negotiations on revenue may be fraught as climate change shifts tuna fishing areas relative to EEZs ➢ Capacity to monitor / police illegal fishing is dependent upon ODA ➢ Shelf reef ecosystem quality currently limits resources, with potential for positive interventions	▪ Nauru National Budget Papers (RON 2023) ▪ Yeeting et al. (2018) ▪ Status of Coral Reefs in the South West Pacific (Lovell et al., 2004) ▪ SPC Reef Invertebrate Survey (Harris et al. 2016)

4. Fisheries and Marine Resources – Vulnerability Highlights





Source: Government of Nauru Budget Papers

Note: 2019-20 & 2021-22 Preliminary Actual Revenue, 2020-21 & 2022-23 Projected Actual Revenue

- Fishery licensing **~ 20%** of Nauru's revenue, **(>tax** & **ODA)**
- Fisheries income **peaked at US$73m** in FY19/20 however this is highly **dependent upon ENSO** and regional fisheries **income negotiations**
- Of the 29.6% of households involved in fishing in 2021, **72.3% did so for subsistence only**, with only 5.2% doing so for income
- Household fishing practices are split between motorized boats (33%), shore based (31%), with fishing primarily conducted by hand/reel
- **Small-scale inland aquaculture** of milkfish ('ibiya')

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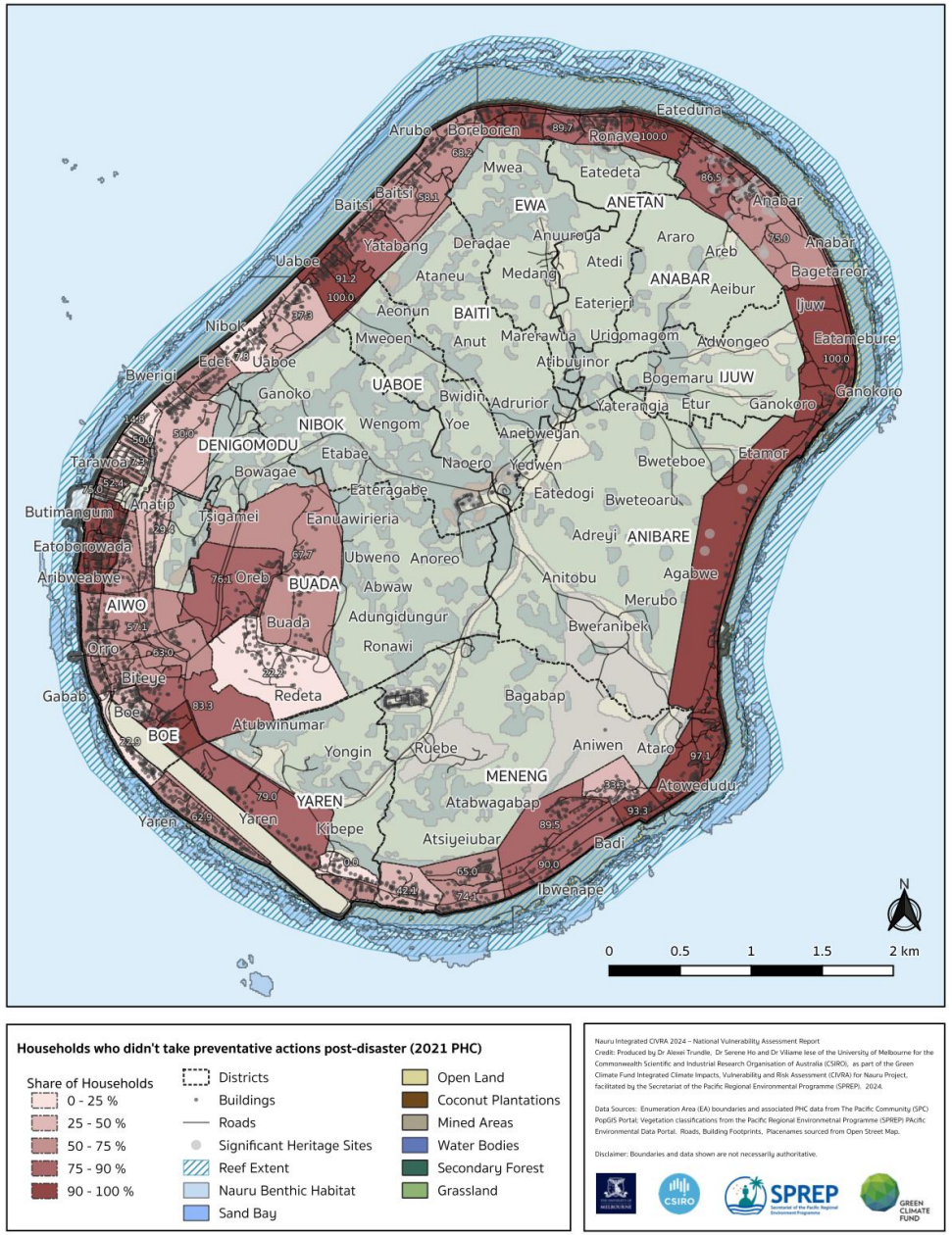
5. Disaster Management – Vulnerability Overview

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	Moderate	➢ Current day climate impacts are the primary source of disaster exposure, particularly drought, which has widespread impacts across the island ➢ Adaptive capacity in relation to most disasters is low, with many households lacking resources or knowledge to deal with disasters ➢ Overall national impacts from disasters are low in terms of economic and other damage relative to overall revenue	▪ 2021 National Census: Household experience of disasters H36) ▪ 2021 National Census: Household level post-disaster actions H37a) ▪ DRR in Nauru Status Report (UNDRR, 2022) ▪ RONAdapt (RON 2015) ▪ Nauru Climate Risk Country Profile
Disaggregate Vulnerability	High	➢ High frequency of food shortages with localities resorting to drinking unsafe water during drought ➢ Multiple communities where 100% of households have not taken preventative action post-disaster ➢ High localised levels of self-perceived lack of adaptive capacity	▪ 2021 National Census: Household experience of disasters H36) ▪ 2021 National Census: Household level post-disaster actions H37a) ▪ DRR in Nauru Status Report (UNDRR, 2022)
Trends & Future Disruption	Low	➢ Changes to existing disaster exposure over the short to medium term are largely within existing levels of variability, with gradual incremental change driven by sea level rise relative to disaster response timeframes / planning ➢ Stable underlying household adaptive capacity levels ➢ Resilience of existing sociocultural connections & fabric (e.g. language)	▪ CSIRO *et al*. (2024) Nauru Climate Impacts Report ▪ DRR in Nauru Status Report (UNDRR, 2022) ▪ Nauru Climate Risk Country Profile (World Bank 2021) ▪ 2021 National Census: Household post-disaster action (H37a)
Uncertainty & Externalities	Low	➢ Well-structured and stable institutional environment for DRM ➢ Planned retreat inland further limits exposure to coastal hazards	▪ DRR in Nauru Status Report (UNDRR, 2022) ▪ HGI Reports (Baches et al. 2022)

5. Disaster Management – Highlights

- Existing infrastructure disrepair at the household level is a significant vulnerability, compounding exposure to more minor / frequent events (e.g. flooding)
  - 15% of households have **guttering in need of repair**
  - 91.3% of households have sheet metal roofing,
- **Food supply chains remain at risk of disruption in the event of a disaster**, with 11% of households going without food for a day or more during the period of COVID-19 restrictions (2020-2021), according to 2021 Population and Housing Census responses
- Heat stress exposure is not measured in national statistics, however **day/night extremes are likely to be impacted HHs**
  - 21.8% of households do not have air-conditioning
  - 13.5% of households do not have A/C or a ceiling fan
- Limited exposure to high intensity climate shock events (e.g. tropical cyclones, wildfires) **may reduce overall preparedness**



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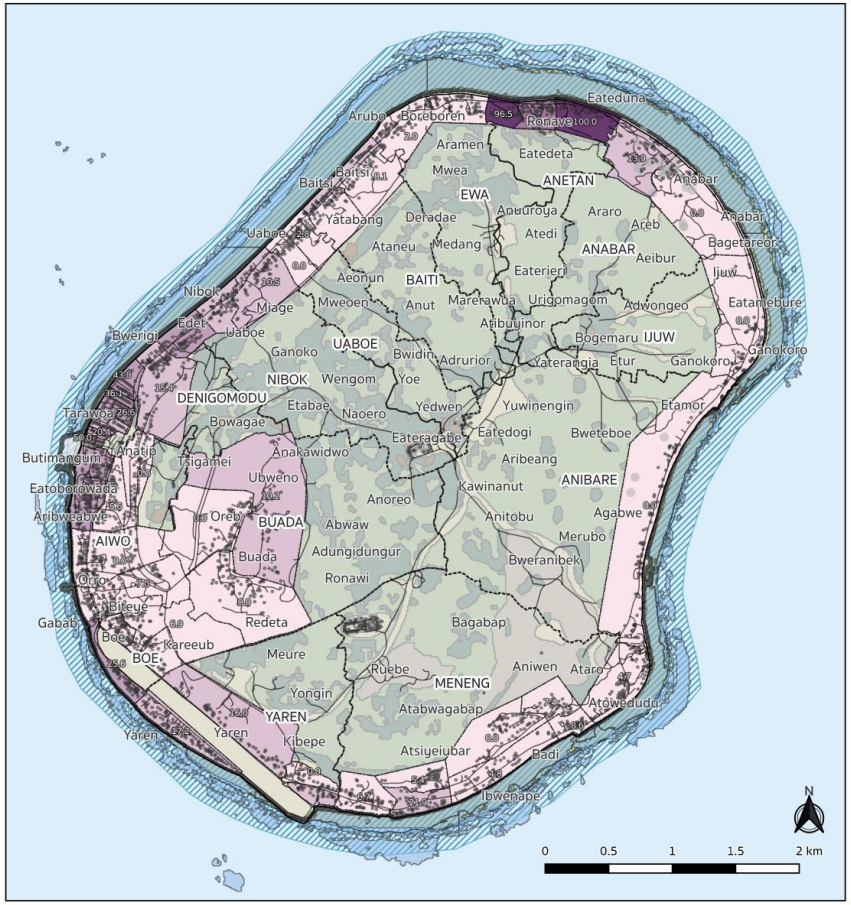
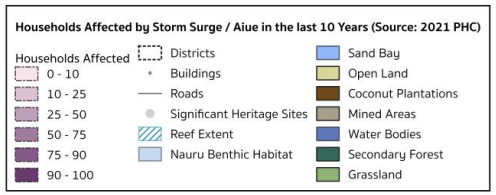
6. Coastal Protection and Infrastructure – Vulnerability Summary

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	High	➢ Dwelling materials overall reasonably constructed, with minimal improvised/makeshift buildings; however, in disrepair (e.g. 1/3 of household guttering) ➢ Main ring road & curb assessed as being in generally 'fair' condition, with footpaths along sealed roads ➢ Seaport & single container vessel critical for import dependent economy (including food supply) ➢ Energy remains dependent on centralised diesel generators and household gas supply systems ➢ Limited access to refrigeration, with 1/3 households lacking freezers	▪ 2021 National Census: Household guttering & downpipe condition (H09 & H10) ▪ Nauru Integrated Infrastructure Strategic Plan 2024 ▪ CSIRO *et al.* (2024) Nauru Climate Impacts Report ▪ 2021 National Census: HHs with refrigeration & freezers (H32)
Disaggregate Vulnerability	Extreme	➢ High levels of current inundation exposure in Anetan and Anibar (up to 100 percent in some localities) ➢ External household cooking areas prevalent (>40%) in some localities ➢ Areas with 2/3 of households lacking freezers, ¼ lacking fridges ➢ Housing shortage across Nauru creating overcrowding issues & poor building quality in areas	▪ 2021 National Census: Household experience of disasters (H36), refrigeration access (H32) & kitchens (H24) ▪ Higher Ground Initiative – Purpose + Need Report ▪ CSIRO *et al.* (2024) Nauru Climate Impacts Report
Trends & Future Disruption	High	➢ Increasing exposure to inundation and related climate impacts ➢ Increasing extreme heat exposure ➢ Current upgrading of Seaport Facilities, RoN Hospital, water supply network, septic treatment & solid waste management ➢ Planned inland relocation of several services and upgrading of national infrastructure through HGI and Future NSRUDP Phases	▪ Nauru Coastal Risk Assessment (2023) ▪ Nauru SRUDP Resettlement Plan (ADB 2024) ▪ Nauru Integrated Infrastructure Strategic Plan 2024 ▪ Higher Ground Initiative – Purpose + Need Report
Uncertainty & Externalities	Low	➢ Households without access to cooling (fans, A/C) unknown, with implications for heat exposure ➢ Land tenure complexities limit options for retreat & resettlement ➢ Possible impacts of private sea walls on adjacent shoreline areas	▪ 2021 National Census (SPC & GRN 2023) ▪ HGI Land Tenure & Safeguarding Report (Baches et al. 2022) ▪ Nauru Coastal Risk Assessment (2024)

6. Coastal Protection and Infrastructure – Vulnerability Highlights





- Key assets
  - **National Hospital Redesign & Expansion** included drainage redesign to address flood risk and other climate considerations
  - **Port Facility Redesign** included a climate risk assessment, focused on storm surges, increased wave height and SLR
  - **Airport runway** and **Ring Road** both play critical roles in connectivity & require resurfacing in the short-medium term
- Utilities
  - **12.6% of households are using desalinated seawater** when water is scarce, but a large spatial variation in usage (from 82% of Households in Location EA6, to none in Atetan & Baitsi Districts
  - Despite nearly universal access to grid electricity, only 10.1% of households use it for cooking; **88.5% use gas** (butane & propane)
  - **Electricity Grid & Generator Upgrading** will be needed as part of NUC renewables roadmap; current reliability issues have resulted in business and commercial operators shifting ‘off grid’ (e.g. RONPHOS, RPC) due to regular supply failures (pre-ADB upgrades)

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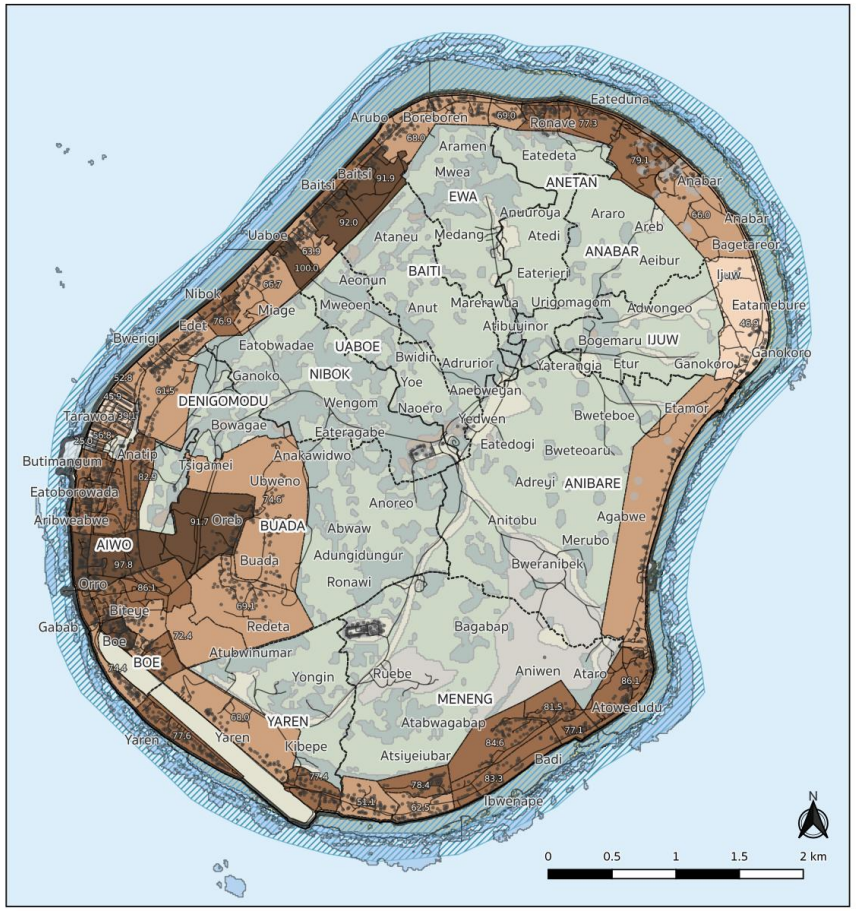
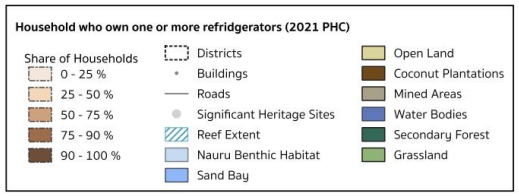
6. Coastal Protection and Infrastructure – Vulnerability Highlights





- Households
  - **64.2% of households** reported that their household's **main water supply dried up sometimes**; **8.4% frequently**
  - 21.2% of households have storage of more than 10,000L
  - Almost a third of households have no guttering; 1.1% asbestos
    - Of those with guttering, **35% needs repair or replacement**
  - **44% of households use underground water**: 38.9% clothes washing, 19% kitchen washing, 36.3% bathing, 24.6% gardening
  - **53% of all households have septic piped flush toilets**, 20.4% flush to a pit latrine, and only 15.4% connected to piped sewerage
  - **29.7% of households share toilet facilities** with another household
  - Solid waste collection is fairly prevalent across Nauru, however some areas continue to burn rubbish (e.g. 16.3% in Ijuw district)
  - **19.7% of households had at least one bicycle**, while 69.3% had one or more motorbike, and only 41.5% of households owned a car

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6. Coastal Protection and Infrastructure – Vulnerability Highlights

- Seawalls
  - Comprehensive assessment of sea wall conditions conducted for the Department of Infrastructure Development in 2023 by Jeremy Benn Pacific (JBP)
  - **Mixture of private, public assets in varying condition and states of degradation**
  - Total value of seawalls and riprap assets held by the government (public sector) in the Nauru Asset Register Summary have a gross replacement cost of $40.6 million, with annual maintenance cost needs estimated at $717,000 (PRIF 2023)
  - Significant issues exist where drainage interfaces with seawalls are not being effectively managed or maintained, leading to local erosion and seawall damage
  - Significant uncertainty noted by SPC around impacts of seawalls, particularly private assets in residential locations, on un-walled coastal strips, needing further investigation

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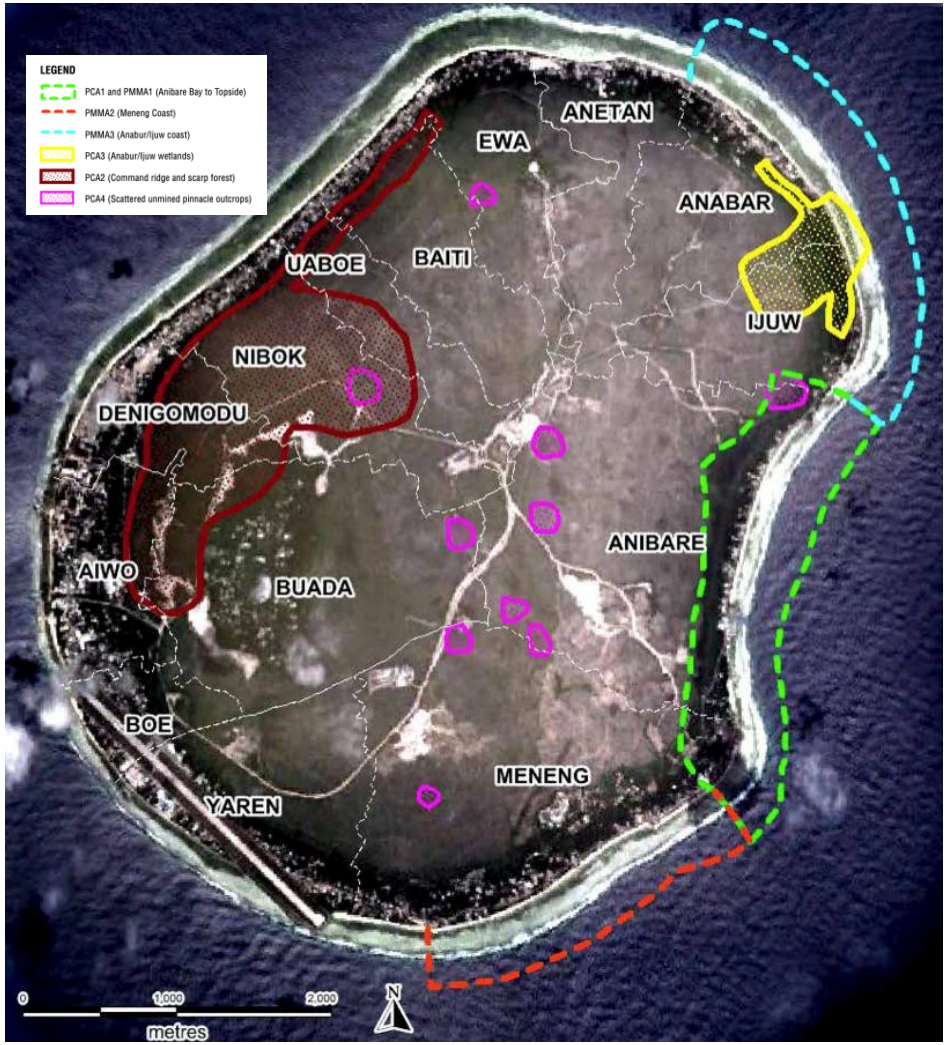
7. Biodiversity and the Environment – Vulnerability Overview

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	High	➢ 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	▪ Nauru's Biodiversity Strategy & Action Plan (Onorio & Deiye, 2010) ▪ Nauru's 2021 State of the Environment Report (SPREP, 2021b) ▪ Fishery & Aquaculture Profile: Nauru (FAO 2013) ▪ SPC Reef Invertebrate Survey (Harris et al. 2016)
Disaggregate Vulnerability	Extreme	➢ Some marine species likely at critical thresholds (giant clam, sea turtles) and lacking protection ➢ Several tree species are close to local extinction (e.g. *Aidia racemosa),* with cascading ecosystem service impacts (e.g. *Bruguiera gymnorrhiza*, which purifies nearby lagoon water)	▪ Nauru's 2021 State of the Environment Report (SPREP, 2021b) ▪ Rapid Biodiversity Assessment of Nauru (SPREP 2014) ▪ Fishery & Aquaculture Profile: Nauru (FAO 2013)
Trends & Future Disruption	High	➢ Ongoing issues with sanitation are likely to continue to pollute groundwater systems ➢ Evidence of recent coral deaths, correlating with populated areas, suggesting degradation since 2014 ➢ Reduced levels of fishing may decrease pressure on nearshore marine ecosystems	▪ CSIRO *et al.* Nauru Climate Impacts Report ▪ Rapid Biodiversity Assessment of Nauru (SPREP 2014) ▪ 2022 Nauru Water & Sanitation Master Plan ▪ 2021 National Census – Households involved in Fishing (H46,47)
Uncertainties & Externalities	High	➢ Permeability of groundwater lenses to saline ingress is uncertain, critical for sea level rise impacts ➢ Proposed biodiversity conservation areas	▪ Jacobson & Hill (1987) vs. Alberti et al. (2022) ▪ Nauru Climate Risk Profile (WBG 2021)

7. Biodiversity and the Environment – Vulnerability Highlights



RON Priority Sites for Conservation (BIORAP 2013)

- Flora
  - Some **remnants of littoral forest**, including the last remaining stands of *Pisonia grandis*, a key rookery tree
  - Most of Nauru's limestone forest and woodland has been removed or **intermingled with invasive species**
- Fauna
  - Endemic / native birds: **Reed Warbler** (Acrocephalus rehsei), **Brown/Black Noddy** (Anous stolidus/minutus)
  - Endemic reptiles (skinks)
  - **Up to 161 invasive species** (cats, rodents, Mozambique tilapia in inland waterways, 18 invasive ant species)
- Conservation Hotspots
  - **Buada Lagoon** – rainfall dependent, priority national conservation site (NBSAP), but highly modified due to proximal human settlements & fish breeding (milkfish)
  - **Ewa Wetlands** – 20ha in the north, currently 'dried' state
  - **Ijuw-Anabar Wetlands** – 46ha in the north-east (yellow), anachialine, with mangrove scrubs, high biodiversity value
  - **No formal terrestrial or marine conservation sites**

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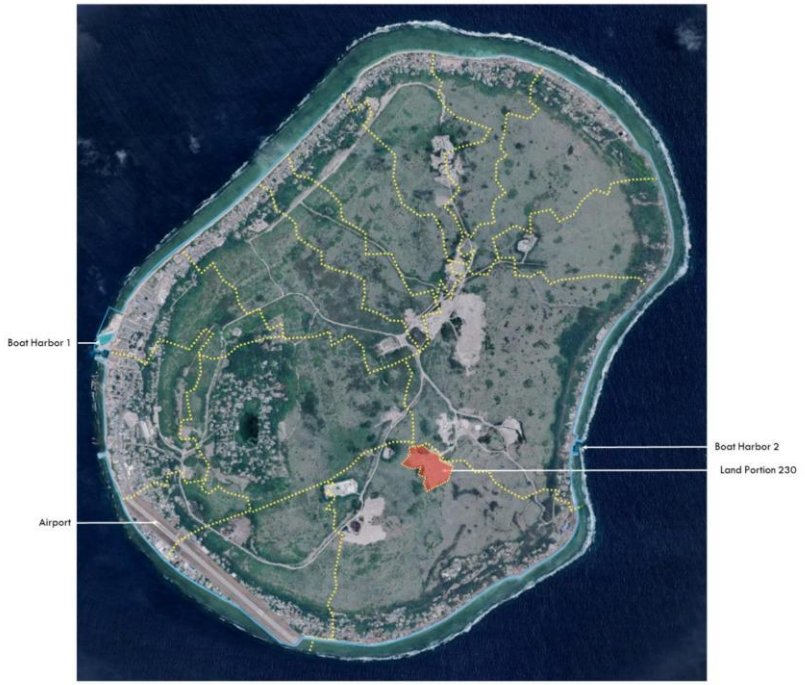
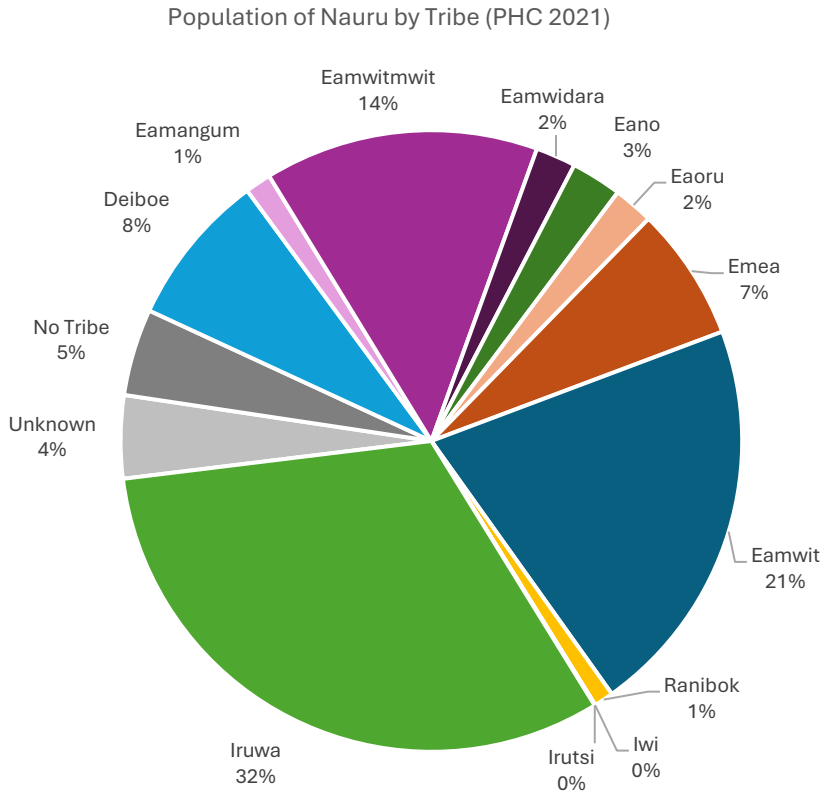
8. Land Management & Rehabilitation – Vulnerability Overview

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	Moderate	➢ Exclusive Nauruan ownership of land, with 90 percent customary tenure (<10 percent state owned) enshrined in legislation ➢ Degradation of 80 percent of land; failure to enforce land remediation; and loss of compensatory revenue ➢ Lack of traditional or state systems for environmental control (e.g. EIAs) ➢ Lack of current/enforced strategic spatial planning and urban planning for built up areas	▪ Customary land and development in the Pacific (AusAID, 2008) ▪ National Sustainable Development Strategy '19-2030 (RON, 2019) ▪ National Env. Mgmt. Strategy (Thaman & Hassall, 1996) ▪ OHCHR Nauru Review Joint Submission (NIANGO, 2011)
Disaggregate Vulnerability	High	➢ Significant inequality in land ownership between tribes, families, migrant populations & refugees ➢ Large spatial differentiation in both land degradation & compensation ➢ Inequality in access to remnant water resources & agricultural areas ➢ Undermining of traditionally matrilineal land systems by colonial powers and associated governance ➢ Localised land management issues (e.g. landfill, school sanitation)	▪ 2021 National Census – Persons who don't identify with a tribe (incl. unknown) (P17) ▪ Land Ownership & Control in Nauru (Macsporran, 1995) ▪ Nauru: Phosphate and Political Progress (Viviani, 1970) ▪ 2022 Nauru Water & Sanitation Master Plan
Trends & Future Disruption	Low	➢ Shift from eldest daughter majority inheritance to equal siblings' rights ➢ Continued intergenerational disbursal / dilution of collective ownership complicating 'buy back' ➢ Potential for further fluctuations in remnant phosphate value shifting rehabilitation feasibility ➢ Home ownership steady as a percentage of households and increasing in net numbers	▪ Gender Equality Brief for Nauru (UN Women, 2022) ▪ Land Ownership & Control in Nauru (Macsporran, 1995) ▪ Nauru's 2021 State of the Environment Report (SPREP, 2021b) ▪ 2002, 2011 & 2021 National Census Data
Uncertainty & Externalities	Moderate	➢ Water (wells), reef, and other natural elements (e.g. trees) were part of customary tenure but lack literary analysis, but are critical components of climate vulnerability ➢ Rehabilitation proposals such as the Higher Ground Initiative Master Plan require renegotiation of, and potentially constitutional amendment to, customary tenure systems to be implemented ➢ Households with insecure tenure (squatting) not published in 2021	▪ Land Ownership & Control in Nauru (Macsporran, 1995) ▪ CSIRO *et al.* 2024 Nauru Climate Impacts Report ▪ 2022 Nauru Water & Sanitation Master Plan ▪ HGI Land Tenure & Safeguarding Report (Baches et al. 2022) ▪ 2021 National Census (SPC & RON, 2023)

8. Land Management and Rehabilitation – Vulnerability Highlights

- **Topside's degraded state** remains a key limitation on adaptation pathways, particularly retreat of housing, development of renewables (providing energy resilience), and agriculture (food security & economic resilience)
- **Tribe-based land rights and ownership** is central to land management and requires deeper exploration of customary land management and adaptation practices
- The **Higher Ground Initiative**, whilst not associated with current vulnerability, is a key rehabilitation process going forward, and should be tied to existing community structures and levels of vulnerability





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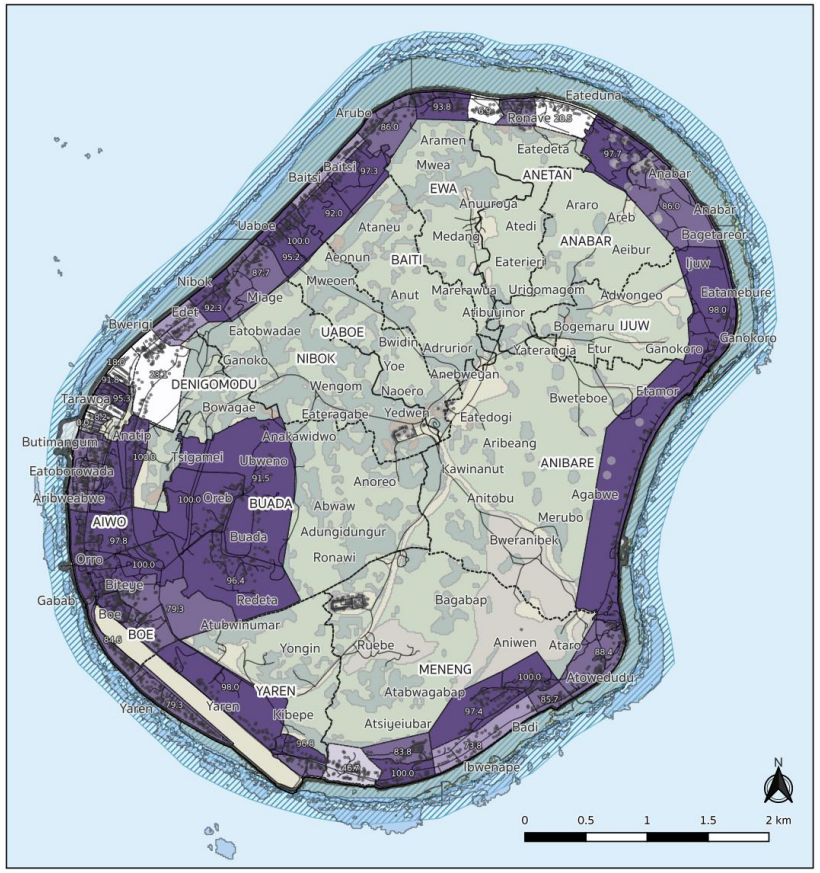
9. Community and Culture – Vulnerability Overview

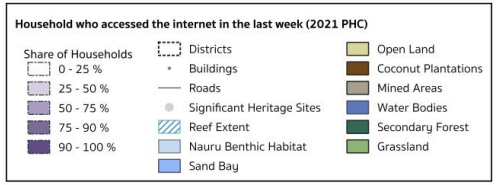
CVA Component	Rating	Description / Rationale	Key Evidence / Data
Aggregate Vulnerability	High	➢ Limited physical space and natural materials for conduct of cultural practices ('traditional work) ➢ No national register of sites of cultural significance or heritage ➢ Extensive loss of traditional knowledge across generations ➢ Legislated customary land tenure intertwined with cultural systems ➢ Very high levels of identification with Nauru's 12 tribal groups & linguistic fluency in Nauruan ➢ Complex relationship between cultural fabric, land & royalties ➢ Limited migration (net inward) ➢ Tertiary education levels are very low across adult population ➢ High dependence upon public service roles for employment	▪ Higher Ground Initiative – Purpose + Need Report ▪ Nauru Coastal Risk Assessment (SPC 2023) ▪ Nauru's 2021 State of the Environment Report (SPREP, 2021b) ▪ 2021 National Census – Tribal Identity (P17) ▪ OHCHR Nauru Review Joint Submission (NIANGO, 2011) ▪ Nauru Integrated Infrastructure Strategic Plan 2024 ▪ Nauru Demographic & Health Survey 2007 (NBS et al. 2009)
Disaggregate Vulnerability	High	➢ Women significantly under-represented in paid employment ➢ Areas with high levels of dependence on communal infrastructure (e.g. toilets) ➢ ¼ of the population below BNPL ➢ Gini (inequality) coefficient up to 0.52 in 2014, from 0.34 in 2012 ➢ Localities with high numbers of persons with differing disabilities ➢ Parts of the island where large numbers of inhabitants lack tribal connection, incl. Nauruan citizens ➢ Traditional foods & ecosystem service use are endangered by limited source stock (fish, trees)	▪ 2021 National Census – Employment status by gender (P34) ▪ 2021 National Census – Household toilet facilities (H20) ▪ National Social Protection Strategy 2022-2023 (GoN 2022) ▪ 2021 National Census – Persons who don't identify with a tribe (incl. unknown) (P17) ▪ Pacific Food Systems Report (O'Meara et al. 2023)

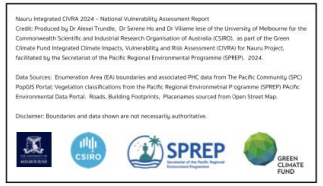
9. Community and Culture – Vulnerability Overview continued

CVA Component	Rating	Description / Rationale	Key Evidence / Data
Trends & Future Disruption	Extreme	➢ Increasing number of single (or no) bedroom households ➢ Reduction in number of persons born overseas other than in PICTs ➢ High levels of religious participation but with increasing fragmentation ➢ Rapid emergence of internet access likely to disrupt community and cultural practices, but also enable linkages to diaspora & new economic opportunities ➢ Potential for increased outmigration through seasonal worker migration and other associated medium-term migration programs ➢ Complex inter-relationship with proposed relocation / planned retreat initiatives and customary land governance	▪ 2021 National Census – # of Bedrooms (H06) ▪ 2002, 2011 & 2021 Census comparison of place of birth (P01) ▪ 2002, 2011 & 2021 Census comparison of religious affiliation ▪ 2021 National Census – Households with internet access (H33b) ▪ Nauru's 2021 State of the Environment Report (SPREP, 2021b) ▪ Petrou & Connell (2023) ▪ HGI Land Tenure & Safeguarding Report (Baches et al. 2022)
Uncertainty & Externalities	High	➢ Wider impacts of technological change, internet access & remote work may profoundly change community structures, migration patterns & cultural practices ➢ Government revenue (supporting key community services) is highly dependent upon three at-risk sources: refugee-related visas and ODA, purse-seine fishery licensing, and limited phosphate reserves ➢ Some positive prospects for revitalisation of traditional practices and livelihoods through the Higher Ground Initiative & enactment of biodiversity conservation measures	▪ Kant et al. (2018) ▪ Nauru Coastal Risk Assessment (SPC 2023) ▪ Context Assessment – Nauru (IMF, 2020) ▪ OHCHR Nauru Review Joint Submission (NIANGO, 2011) ▪ HGI Land Tenure & Safeguarding Report (Baches et al. 2022) ▪ Nauru's Biodiversity Strategy & Action Plan (Onorio & Deiye, 2010)

9. Community and Culture – Vulnerability Highlights







- Community diversity & structure
  - **91.2% of Nauru's population identify with one of twelve tribes**, with tribal identity inherited matrilineally at birth
  - Customary land tenure is enshrined within the constitution, with land access rights held by family clans on a hereditary basis
- Social / Community Resilience
  - **22.7%** of households reported being able to **use relatives' or neighbours' water sources** in periods of water scarcity / drought
  - International remittances make up a small share of household income relative to many other Pacific Islands Countries & Territories
- Adaptive Capacity
  - 98.4% of houserholds reported having access to cell/mobile phones
  - **1 in 5 households reported not having accessed the internet** in the week prior to the 2021 census, with significant spatial variation

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Nauru Climate Vulnerability Assessment Overview

National Adaptation Plan – Integrated Climate Impacts, Vulnerability & Risk Assessment (CIVRA) Project

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