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# Tuvalu National Adaptation Plan: Climate Impact, Vulnerability & Risk Assessment

## Vulnerability Assessment: Final Report

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# Contents

Executive Summary.....	3
1 Introduction.....	5
1.1 Tuvalu Integrated Vulnerability Assessment.....	5
1.2 Limitations.....	7
1.3 TIVA National Summary.....	8
1.3.1 Summary of Vulnerable Sectors.....	8
1.3.2 Top 5 Vulnerability Subsectors.....	9
1.3.3 Aggregated Summary of Vulnerability Issues.....	12
Food Security (fisheries and agriculture).....	12
Health.....	13
Water.....	13
Coastal Protection.....	14
Disaster Risk Reduction.....	14
1.3.4 Lessons Learned.....	15

# Executive Summary

This report presents the aggregated summary of the Vulnerability Assessment component of the integrated *Climate Impact, Vulnerability and Risk Assessment (CIVRA)* project undertaken for the development of Tuvalu's National Adaptation Plan (NAP). This report should be read in conjunction with the related slide deck titled *CIVRA: Vulnerability Assessment Tuvalu*, also prepared by CSIRO.

The Vulnerability Assessment component of the CIVRA project seeks to identify and summarise climate change vulnerabilities for each NAP priority sector and, combined with the Hazards Assessment component of the project, inform the analysis of integrated risks and associated policy and adaptation action choices for these same sectors. It draws on the comprehensive Tuvalu Integrated Vulnerability Assessment (TIVA) carried out by the Government of Tuvalu's Climate Change Department between 2018 and 2021, across 8 outer-islands and 6 localities in Funafuti. The TIVA adopts the IVA methodology and framework, assessing vulnerability against intersecting combinations of human security sectors and livelihood assets. For the purposes of the Vulnerability Assessment component of the CIVRA, it was determined that these same sectors and assets for the most part aligned well to the related NAP priority sectors, viz: fisheries, agriculture, water, health, coastal protection/infrastructure and disaster risk management.

There are some limitations with the TIVA: it focuses on a series of discrete snapshots of community perceptions of vulnerability; the timing of the TIVA coincided with the implementation of the Tuvalu Coastal Adaptation Project, which in some responses, influenced community perceptions of vulnerability about coastal protection; the TIVA data are granular in scale (island and locality level and disaggregated by men, women and youths); and relevant aspects of exposure, sensitivity and adaptive capacity was implicitly, rather than explicitly, addressed through the TIVA analysis.

## **National Summary**

For the purpose of the CIVRA, the key findings from TIVA were aggregated to generate a high-level national summary. For a more detailed and contextualised understanding of climate change vulnerability, readers should refer to the individual TIVA reports.

### *Summary of Vulnerable Sectors*

Based on the national average, the most climate vulnerable sectors, in order of highest to lowest vulnerability included: ecosystem health, income security, security of place, energy security, water security, food security and community health.

### *Top Vulnerability Sub-sectors*

Using a multi-stage process of issue identification and prioritisation, top 5 priority vulnerability sub-sectors were identified for each island or locality. Nationally, these 'hotspot sub-sectors' have 9% or more of the top 5 vulnerability issues. When combined, almost half (47%) of all top 5 vulnerability issues fall into the four sub-sectors of Ecosystem Health + Natural Resources, Security of Place + Infrastructure and Services, Water Security + Infrastructure and Services, and Food Security + Natural Resources.

### *Aggregated Summary of Vulnerability Issues*

The aggregation of the sub-national-level TIVA data provides a broad national picture of community vulnerability. Key findings and emerging issues included:

- Vulnerability issues vary considerably between locations and groups;
- The most frequently cited vulnerability issues were: inadequate household water tank capacity, declining/retreating shoreline due to coastal erosion, limited to no access to adequately sized and safely located evacuation centre that is safe from storm surge and cyclones, and declining inshore marine food source quantity and yield (fisheries and invertebrates);
- Nearly all of the islands expressed concerns about the need for long-term coastal protection measures that are fit-for-purpose, durable and appropriate for local conditions;
- Majority of the islands identified the need for greater government support to fund adaptation and resilience building initiatives;
- The presence of underlying social, economic and environmental issues that exacerbate community vulnerability to climate hazards and impacts;
- The need for increased community awareness of available government services and funding for climate change adaptation;
- The need for better policy planning and coordination on natural resource management;
- The importance of providing social protection for households on low incomes to address inequity issues; and
- The need for investments in scientific and technical research to assess the appropriateness and feasibility of long-term adaptation strategies.

The aggregated results were also provided for each of the NAP-identified sectors of food security (agriculture and fisheries), health, water, coastal protection (and infrastructure) and disaster risk management.

### *Lessons Learned*

The TIVA process gathered key insights and lessons learned from past adaptation measures. For example, communities mentioned successful and unsuccessful adaptation interventions in household agriculture, coastal protection, water and health.

# 1 Introduction

In 2023 CSIRO was commissioned by SPREP to conduct an integrated physical climate change impact, vulnerability and risk assessment (hereafter referred to as the “CIVRA”) to inform the development of Tuvalu’s National Adaptation Plan (NAP).

The Vulnerability Assessment component of the CIVRA seeks to identify and summarise vulnerabilities for NAP prioritised sectors and, combined with the Hazards Assessment component of the CIVRA, inform the analysis of integrated risks and associated policy and adaptation action choices for these same sectors.

This report details the key findings of the Vulnerability Assessment component of the CIVRA project. This report should be read in conjunction with the related slide deck titled *CIVRA Vulnerability Assessment Tuvalu*, also prepared by CSIRO. The slides contain national and island-level summaries of the Vulnerability Assessment key findings.

## 1.1 Tuvalu Integrated Vulnerability Assessment

In 2018-2021 the Government of Tuvalu completed an integrated vulnerability analysis (IVA) for all nine islands. The initial phase of the IVA was supported by the Global NAP Network via the International Institute for Sustainable Development.

The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt”.<sup>1</sup> Since 2012, the IPCC has framed climate risk as the combination of hazard, vulnerability and exposure.

Drawing on the IVA framework for atoll islands<sup>2</sup>, the Tuvalu IVA (TIVA) is based on a sustainable livelihoods approach that combines the assessment of vulnerability to both climate change and disasters. Vulnerability was identified and assessed across seven human security sectors and five livelihood assets, producing a total of 35 intersecting components (Figure 1). For the purposes of the CIVRA Vulnerability Assessment, these TIVA sectors, assets and associated components broadly align with and otherwise map directly to the six priority NAP sectors, including fisheries, agriculture, health, water, coastal protection/infrastructure and disaster risk management.

Using a participatory rural appraisal approach for the TIVA, an inter-agency team of government and non-government officers from the National Advisory Council Climate Change (NACCC) undertook focus group discussions with men, women and youths in 14 communities (8 islands plus 6 localities in Funafuti).<sup>3</sup>

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<sup>1</sup> IPCC Fifth Assessment Report (2014)

<sup>2</sup> Pacific Community, Secretariat of the Pacific Regional Environment Programme, GIZ (2016). Integrated Vulnerability Assessment Framework for Atoll Islands: A collaborative Approach. Available from: <https://www.sprep.org/attachments/Publications/CC/iva-framework-atolls.pdf>

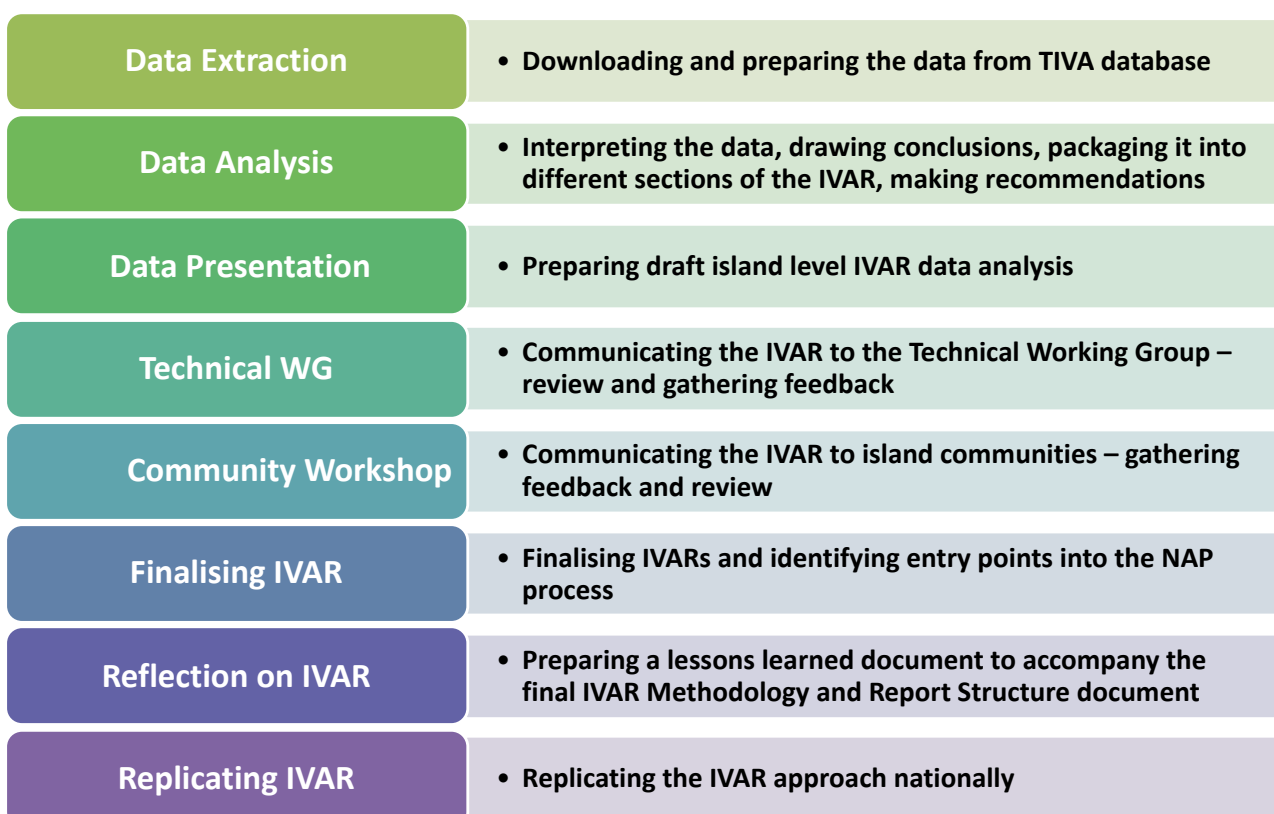
<sup>3</sup> IVA for Funafuti was undertaken across 6 localities: Amatuku (Maritime Training Institute), Senala/Alapi, Fakaifou/ Nanumasa, Vaiaku, Lofeagai/Teone and Kavatoetoe

The data were collected and stored on the online TIVA database using the Fulcrum platform. The database provides data sorting, analysis and visualisation capabilities. The preliminary results from the community consultations were presented to the IVA Technical Working Group for expert review, then the results were presented back at a community workshop for final validation. The findings were documented and synthesised into a final IVA report (IVAR) for each respective island/locality (Figure 2).

Figure 1. The IVA Framework: Human Security Sectors and Livelihood Assets

IVA FRAMEWORK	ASSETS					
SECTORS	NATURAL RESOURCES (n)	INFRASTRUCTURE & SERVICES (i)	FINANCE (f)	HUMAN RESOURCES (h)	INSTITUTIONS & GOVERNANCE (g)	TOTAL (by Sector)
ECOSYSTEM (E)	E(n)	E(i)	E(f)	E(h)	E(g)	
WATER SECURITY (W)	W(n)	W(i)	W(f)	W(h)	W(g)	
SECURITY OF PLACE (P)	P(n)	P(i)	P(f)	P(h)	P(g)	
ENERGY SECURITY (N)	N(n)	N(i)	N(f)	N(h)	N(g)	
INCOME SECURITY (I)	I(n)	I(i)	I(f)	I(h)	I(g)	
COMMUNITY HEALTH (H)	H(n)	H(i)	H(f)	H(h)	H(g)	
FOOD SECURITY (F)	F(n)	F(i)	F(f)	F(h)	F(g)	
<b>TOTAL (by Asset)</b>						<b>(IVA)</b>

Figure 2. The IVA analysis and reporting process





## 1.2 Limitations

TIVA has a number of limitations. First, TIVA is a series of single (not continuous) snapshots in time of community perceptions of vulnerability. TIVA does not specify the timing horizon of such perceptions, hence to some extent there is an assumption inherent in the findings that the current state of vulnerability will continue into the future. Therefore it does not explicitly consider future climate uncertainties nor does it consider potential changes in physical, social and economic conditions.

Second, TIVA was conducted before and during the implementation of the Tuvalu Coastal Adaptation Project (TCAP) and some community perceptions of vulnerability, particularly in relation to coastal protection, were inevitably focused on what was or was not being actioned through the TCAP at the time of community consultation.

Third, TIVA presents qualitative and quantitative results that are highly nuanced. With the disaggregated data collection based on geographical location (island community or locality) and social group (men, women, youths and, for some localities, it was mixed), the results are specific to the local context and situations. For the Vulnerability Assessment component of the CIVRA, where possible the qualitative results were aggregated to generate broad, high-level national statements on vulnerability. These statements need to be considered as a line of evidence informing the integrated risk assessment for the NAP in the context they are highly generalised, with potential to be taken out of context if not applied within the stated limitations. Where possible, the TIVA results should be assessed and interpreted at the scale in which the data were originally collected (island/locality). Refer to Section 1.3 for more details.

Lastly, relevant aspects of exposure, sensitivity and adaptive capacity, including what financial, technical and technological resources the government and communities have to address the identified vulnerabilities, were implicitly rather than explicitly addressed through the TIVA analysis. This was due primarily to limitations of available data, resourcing and timelines for the CIVRA project. In practice exposure and sensitivity to climate change where appropriate was implicitly included in the TIVA and by association the CIVRA Vulnerability Assessment for ecosystems, communities, infrastructure (e.g. transport, energy, water, telecommunication) and buildings (e.g. hospitals, schools).

The Vulnerability Assessment for the CIVRA also examined the Island Strategic Plans (ISPs) to identify what specific adaptation strategies have been prioritised already by each island. However, these plans were developed in 2021 and the progress and status of these strategies are unknown. To obtain a more holistic understanding of vulnerability including adaptive capacity, it is recommended that further consultation with the Island Kaupules is undertaken. This would provide up-to-date information on the efficiency and effectiveness of adaptation strategies being implemented at the island level and what gaps exist in community's capacity to adapt to and cope with actual and expected changes in climate; particularly as might be in scope for the NAP. Monitoring and evaluation is critical for assessing such adaptation outcomes and to determine whether specific adaptation strategies can be improved and their potential for scale up and replication through the NAP.



## 1.3 TIVA National Summary

For the Vulnerability Assessment component of the CIVRA, the qualitative and quantitative data from the TIVA served as the primary source of information. While the TIVA provides rich and diverse snapshots of vulnerability at the sub-national levels, the key findings were aggregated to generate a high-level national summary for the purpose of informing the integrated risk assessment and by association, the NAP development. It is recommended that the following summary be used as a broad overview of vulnerabilities, however for a more granular and contextualised understanding of vulnerability, one should refer to the individual TIVA reports.

Nationally, a total of 38 focus group discussions were conducted across 14 locations (8 outer islands and 6 localities in Funafuti) for the TIVA. The key findings presented in this Section have been used in the CIVRA project as a key line of evidence to inform the hazard ratings contained in the final report of the CIVRA Hazard Assessment component. Similarly, the findings have been incorporated into the overall Risk Assessment component of the CIVRA (refer to document titled *Integrated CIVRA for Tuvalu Summary Report*).

### 1.3.1 Summary of Vulnerable Sectors

The participants of the TIVA focus group discussions were asked to identify the most vulnerable sectors (out of a possible combination of 35 subsectors) by using a nominal scale (1=more vulnerable to 5= less vulnerable). The results were averaged to provide overall national scores for each sector. These national scores were then used to compare against the scores for each island/hamlet.

Based on the national average, the most vulnerable sectors, in order of highest to lowest vulnerability included:

- Ecosystem health (average score of 1.6)
- Income security (average score of 1.9)
- Security of place (average score of 2.0)
- Energy security (average score of 2.0)
- Water security (average score of 2.2)
- Food security (average score of 2.3)
- Community health (average score of 2.4).

The national average scores for the sectors are shown in Table 1 below.

Table 1. National average IVA vulnerability scores

Sector	Sub-sector					Total (avg.)
	Natural resources	Infrastructure & services	Finance	Human resources	Institutions & governance	
Ecosystem health	1.4	1.5	1.7	1.7	1.7	1.6
Water security	2.0	2.3	1.9	2.4	2.4	2.2
Security of place	1.4	1.6	2.0	2.7	2.4	2.0
Energy security	2.2	1.9	1.9	2.1	1.9	2.0
Income security	1.8	1.8	1.9	1.9	2.1	1.9
Community health	2.0	2.3	3.2	1.8	2.5	2.4
Food security	2.1	2.2	2.1	2.6	2.5	2.3
<b>Total (Avg.)</b>	<b>1.8</b>	<b>1.9</b>	<b>2.1</b>	<b>2.2</b>	<b>2.2</b>	<b>2.1</b>

← more vulnerable than comparison area      less vulnerable than comparison area →



Source: TIVA reports, 2021

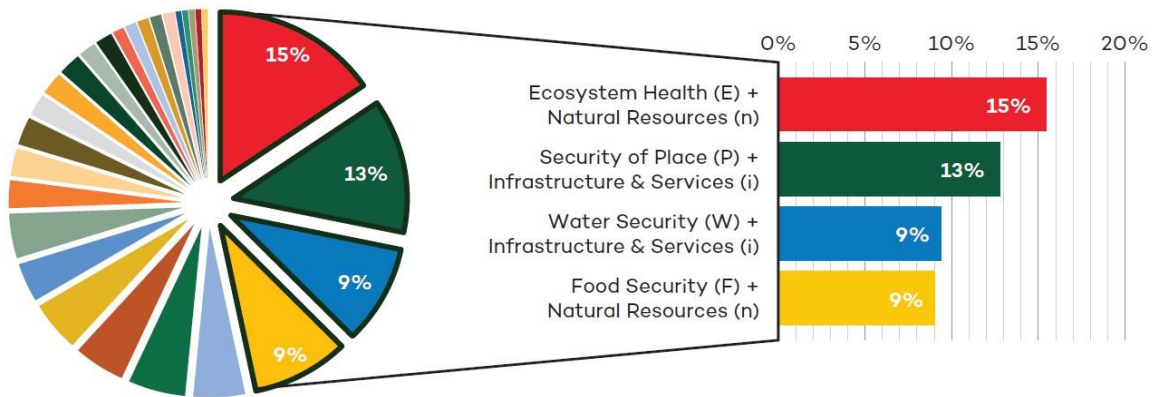
### 1.3.2 Top 5 Vulnerability Sub-sectors

As part of the IVA survey, participants in the focus groups were asked to prioritise the overall top 5 vulnerability sub-sectors in their location (island or Funafuti locality). This follows a multi-stage process of identifying and prioritising issues at a sub-sector level.

The analysis of top 5 vulnerability issues by sub-sector indicates where both *related* and *frequently reported* issues occur in each sub-sector (TIVAR, 2021). In effect, these are considered as *clusters* of top 5 priority issues, otherwise referred to as ‘*hotspot sub-sectors*’. Nationally, hotspot sub-sectors have 9% or more of the top 5 vulnerability issues. When combined, almost half (47%) of all top 5 vulnerability issues fall into the four hotspot sub-sectors (Figure 3):

- Ecosystem Health + Natural Resources (En), accounting for 15% of all top 5 issues;
- Security of Place + Infrastructure and Services (Pi) at 13%;
- Water Security + Infrastructure and Services (Wi) at 9%; and
- Food Security + Natural Resources (Fn) at 9%.

Figure 3. Top 5 vulnerability subsectors at the national level



While vulnerability issues associated with each sub-sector differ between groups and locations, common issues identified and prioritised nationally are listed in Table 2 in order of frequency of responses across all groups combined (high to low percentage of responses).



**Table 2. Hot-spot sub-sectors and vulnerability issues by frequency of total responses (issues with frequency rates of <5% are not included)**

Sector	Vulnerability Issue	Total frequency of responses (%)
Ecosystem Health + Natural Resources (En)	En.5 Declining/retreating shoreline due to coastal erosion	63
	En.12 Presence of land-based species (e.g. crazy yellow ants, African snails, etc)	26
	En.6 Decline in shoreline vegetation health and cover	18
	En.13 Marine pollution from rubbish, wastewater and shipping vessels	16
	En.4 Decline in coral and reef health	16
	En.24 Low resilience of shoreline and forest (mangrove/trees and plants) to experienced impacts of rising sea levels	13
	En.14 land pollution from rubbish and wastewater	8
	En.20 Low resilience of shoreline and forest (mangrove/trees and plants) to past impacts of dry spells and drought	8
	En.3 Decline in health of offshore fisheries (in terms of abundance/size and diversity)	5
	En.23 Low resilience of fisheries and coral to experienced impacts of rising sea levels	5
En.2 Decline in health of inshore fisheries (in terms of abundance/size and diversity)	5	
Security of Place + Infrastructure and Services (Pi)	Pi.34 Limited to no access to adequately sized and safely located evacuation centre that is safe from storm surge and cyclones	47
	Pi.8 Access to store purchased raw materials for building construction	16
	Pi.21 Limited to no access to mobile and internet services from the island	16
	Pi.5 Lack of housing to accommodate existing and new households	13
	Pi.3 House occupancy rate (number of people per house/room size)	13
	Pi.6 Lack of land for housing due to lack of customary land or government leasable land/housing	8
	Pi.4 Housing ventilation and sanitation	8
	Pi.32 Low resilience of hospitals to past cyclones/storm surge and extreme inundation events	8
	Pi.28 Low resilience of houses to past cyclones/storm surge and extreme events	8
	Pi.19 Limited to no access to reliable and adequate ferry service	8
	Pi.20 Low resilience/functioning of roads following extreme weather (storms/inundation events)	8
	Pi. 35 Limited to no access to post-disaster building reconstruction services (shipment and freight)	8
	Pi.33 Low resilience to telecommunications to past extreme weather events (storms/heat/inundation)	5
Pi.1 Access to houses with adequate protection from rain and cyclone (e.g. condition of roofing/walls)	5	
Water Security + Infrastructure and Services (Wi)	Wi.1 Inadequate household water tank capacity	82
	Wi.3 Inadequate communal water tank capacity	16
	Wi.21 Household water supply system cannot cover for dry spells and droughts	16
	Wi.19 Inadequate access to government water supply extension services	16
	Wi.9 Limited to no access to water treatment/filter equipment	13
	Wi.18 Inadequate or no water supply back up options	11
	Wi.20 Inadequate access to community education and training on water management and efficiency	11
	Wi.2 Inadequate household water tank capacity due to high household size and demand	8
	Wi.5 Leaking or faulty household water tanks	5
Wi.17 Limited access to citywide water distribution system	5	
Food Security + Natural Resources (Fn)	Fn.1. Declining inshore marine food source quantity yield (fisheries and invertebrates)	24
	Fn.10 Declining or poor soil quality for farming (fertility/salinity)	21
	Fn.15 Invasive species affecting crops (e.g. crazy ants/African snails)	18
	Fn.4 Declining offshore fisheries food source quality (size/diversity)	16
	Fn.3 Declining offshore fisheries food source quantity	16
	Fn.7 Invasive species affecting marine food sources	13
	Fn.12 Declining or limited crop diversity (e.g. pulaka, taro, breadfruit, coconut, vegetables, fruit trees)	13
	Fn.8 Limited to no access to land for farming	13
	Fn.19 Low resilience of land-based food (crops and tree fruits) sources to past drought impacts	11
	Fn.21 Low resilience of land-based food (crops and tree fruits) sources to past storm surge and inundation impacts	8
	Fn.2 Declining inshore marine food source species size and diversity (fish and invertebrates)	8
	Fn.9 Limited to no access to land for farming due to lack of customary or legal access to land	5
	Fn.13 Recurrent crop failure	5
	Fn.22 Low resilience of land-based food (crops and tree fruits) sources to sea level rise and salt water intrusion	5
	Fn.20 Low resilience of land-based food (crops and tree fruits) sources to past cyclone impacts	5
Fn.16 Low resilience of marine food sources to past drought impacts	5	
Fn.5 Declining marine food habitat (reef/lagoon) health	5	

Source: TIVA dashboard

### 1.3.3 Aggregated Summary of Vulnerability Issues

The aggregation of the sub-national-level TIVA data provides a broad national picture of vulnerability, including:

- Vulnerability issues vary considerably between islands, localities and groups (men, women and youths).
- The most frequently cited vulnerability issues were: inadequate household water tank capacity, declining/retreating shoreline due to coastal erosion, limited to no access to adequately sized and safely located evacuation centre that is safe from storm surge and cyclones, and declining inshore marine food source quantity and yield (fisheries and invertebrates).
- Nearly all of the islands expressed concerns about the need for long-term coastal protection measures that are fit-for-purpose, durable and appropriate for local conditions.
- Majority of the islands identified the need for greater financial support from the national government to fund adaptation and resilience building initiatives.
- Underlying social, economic and environmental issues, such as lack of basic income and housing, and inadequate waste management services, emerged as ongoing challenges for some islands. If these issues are not addressed, they may exacerbate the community's vulnerability to climate hazards and impacts.

Emerging themes from the focus group discussions were:

- The need for greater community awareness of available government services and funding opportunities for climate change adaptation.
- The need for better policy planning and coordination to manage environmental resources to address issues such as overfishing, pollution and sand extraction.
- The importance of providing social protection for households on low incomes to address inequity issues.
- The need for investments in scientific and technical research to assess the appropriateness and feasibility of long-term adaptation strategies.

Key findings under each of the six NAP-identified sectors (which differ somewhat from the four hotspot sub-sectors in Table 2, but otherwise broadly align with/map to these sub-sectors ) are summarised as follows:

#### **Food Security (fisheries and agriculture)**

- Declining or poor soil quality for farming was identified as a key vulnerability issue by men in Nanumea, Nanumaga and Nukulaelae, and for all groups in Niulakita.

- The presence of yellow crazy ants (*Anoplolepis gracilipes*) and their implications on agriculture was identified as a key vulnerability issue by women in Nanumea and Nanumaga, and by youth in Nui.
- Limited ability to pay for fisheries or marine-based food production expenses was identified as a key vulnerability issue in nearly all of the islands.
- Other cited issues: declining or limited crop diversity (Niutao, Nui), limited land for commercial agriculture (Funafuti, Nukufetau), low drought resilience of marine food sources (Nukulaelae), low resilience of land-based food to storm surge and inundation (Vaitupu) and cyclone-damaged fisheries infrastructure (Nanumea).
- Compared to the national average, Niutao and Nui communities assigned a lower vulnerability score (more vulnerable) for food security. On the other hand, Nukulaelae and Niulakita scored higher for food security (less vulnerable) in comparison to the other islands.

## Health

- Vector-borne disease was the most commonly identified health security issue for all islands. Women were more likely than men to identify vector-borne disease as a vulnerability issue.
- Other most commonly identified health security issues included: declining ability to pay for transportation from the island to Funafuti main hospital when required; limited or no means for paying for adequate and safe sanitation facilities; low community health resilience to past droughts; community members affected by diabetes; limited or no capacity to respond effectively to issues of domestic violence; and low resilience of health facilities to disasters (cyclone, storms, inundation and droughts).
- Compared to the other islands, the community of Nanumaga assigned a lower vulnerability score (more vulnerable) for health security. Nukufetau and Niulakita communities considered health security as being the least vulnerable issue.

## Water

- Inadequate household water tank capacity and insufficient rainfall were widespread issues for all islands.
- Most islands and groups identified the limited ability to pay for the operations/maintenance and upgrade of the household water system as a vulnerability issue for water security.
- Other most commonly identified issues included: limited to no community members with skills to monitor water quality; rainfall not sufficient to meet community water security needs; and limited to no certified or experienced plumbers or water engineers in the community.
- Nationally, the southern island of Niulakita scored the lowest for water security (most vulnerable) due to the poor quality of ground water, lack of communal and household



water tanks, and limited funding available for households to purchase water harvesting and storage systems. On the contrary, the neighbouring island of Nukulaelae scored the highest (least vulnerable) for water security.

### **Coastal Protection (and infrastructure)**

- Declining/retreating shoreline due to coastal erosion was identified as a top vulnerability issue for the majority of the islands and for most men, women and youths (except for Niulakita, which did not identify this as a key issue, possibly due to Niulakita being the most elevated island in Tuvalu).
- Coastal erosion encroaching housing and settlement was a frequently identified vulnerability issue for many islands as well as all localities in Funafuti.
- Other identified issues included limited or no access to coastal protection: i) finance (Niutao and Vaitupu); ii) infrastructure (Nukulaelae); and iii) government and NGO support (Vaitupu). Unsustainable rate of internal migration, in particular increasing movements of people from the outer islands to live in Funafuti, was a vulnerability issue identified by the Funafuti community and localities.
- In the TIVA coastal protection issues fall under the sector categories of 'Ecosystem Health' and 'Security of Place' (for the latter category, refer to the next section on DRM). Nationally the islands of Nanumea and Nanumaga scored the lowest (most vulnerable) to ecosystem health with coastal erosion and access to coastal stabilisation infrastructure and support being major vulnerability issues for these two northern islands. Niulakita scored the highest (least vulnerable) for ecosystem health.

### **Disaster Risk Management**

- Disaster risk management (DRM) falls under the TIVA sector category of 'Security of Place'. A common issue identified in the TIVA in relation to DRM was coastal erosion encroaching on housing and settlement (as mentioned in the coastal protection section above).
- Other most commonly identified DRM issues included: limited or no access to adequately sized and safely located evacuation centres that are safe from storm surge and cyclones (in particular Vaitupu, Nui, Nukufetau); unsustainable rate of migration out of the island to live in Funafuti or other islands in Tuvalu; limited or no certified carpenters on the island; limited or no ability to pay for safe and adequate housing; and limited or no ability to pay for post-disaster housing reconstruction.
- Access to houses with adequate protection from rain and cyclones was identified as a key vulnerability issue by men in Nui and Niutao, by women in Nanumaga and by women and youths in Nukufetau.
- Niulakita and Niutao scored the lowest (most vulnerable) for 'Security of Place'. Nukufetau scored the highest (least vulnerable).



In addition, energy security was considered to be the most vulnerable sector for Niulakita and least vulnerable for Vaitupu, while income security was considered as the most vulnerable sector for localities in Funafuti and least vulnerable for Nukulaelae.

#### 1.3.4 Lessons Learned

The TIVA focus group discussions also provided key insights and lessons learned from past adaptation measures. This information should be considered in the adaptation options development and appraisal stages of the NAP development.

- **Agriculture:** Raised planting tubs provided to households as part of a national project by Live and Learn (funded by Australia) in 2019-20 were well received by the community to address land scarcity and saline groundwater intrusion issues.
- **Coastal protection:** The gabion basket seawalls constructed in the 1980s remain somewhat intact in many islands. Previous attempts in the 1980s and 1990s to protect the island's foreshore, including the installation of gabion baskets and concrete blocks, as well as planting of vegetation along the shoreline have been unsuccessful. The Nanumaga community expressed concerns regarding the proposed seawall design (geotextile bags) and location (behind the church) of the TCAP project, stating that the design and location will not be effective in protecting critical infrastructure and properties from climate hazards and impacts.
- **Water and health:** When PVC water tanks were introduced to the island by the NAPA I project in 2011-13, there was an outbreak of mosquitoes in Nanumea as the overflow outlets were not covered with mesh.



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