

COOK ISLANDS CLIMATE CHANGE SURVEY REPORT 2023–2024



Pacific
Community
Communauté
du Pacifique

COOK ISLANDS CLIMATE CHANGE SURVEY REPORT 2023–2024

Report prepared by the
Cook Islands Statistics Office (CISO) and The Pacific Community (SPC)



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CONTENTS

<i>ACRONYMS</i>	<i>VI</i>
<i>FOREWORD</i>	<i>VII</i>
<i>1. INTRODUCTION</i>	<i>1</i>
<i>2. BACKGROUND</i>	<i>2</i>
2.1. Climate Change Impact and Policy Response.....	2
2.2. Importance of Socio-Economic Data	3
2.3. Previous studies and statistics.....	3
<i>3. METHODS</i>	<i>5</i>
3.1. Survey area and Household selection.....	5
3.2. Response rate.....	5
3.3. Weighting	6
3.4. Sampling uncertainty.....	6
<i>4. RESULTS</i>	<i>7</i>
4.1. Understanding of Climate Change.....	7
<i>5. CONCLUSION</i>	<i>13</i>
<i>ANNEX 1: RESULTS TABLES</i>	<i>14</i>

FIGURES AND TABLES

Figure 1. Cook Islands Location (© SPC)	2	Table A. LFS&CC sampling allocation	5
Figure 2. Main source of information about climate change	8	Table B. Response rate and completion rate.....	6
		Table C. Sampling for selected indicators.....	6
		Table D. Natural hazards affecting households in the Cook Islands, 2019–2023	8
		Table E. Economic value of losses caused by natural disasters in the Cook Islands, 2019–2023 .	9
		Table F. Slow-onset events affecting households in the Cook Islands in 2023.....	10
		Table G. Crops Planted by Cook Islands' Households, 2023.....	11

ANNEX TABLES

Table 1. Households definition of climate change, 2023.....	14	Table 10. Distribution of population impacted by natural disasters, 2019–2023.....	16
Table 2. Households' perception of leading causes of climate change, 2023	14	Table 11. Distribution of damages suffered by households due to natural disasters, 2019–2023..	17
Table 3. Number of households concerned about climate change impacts, 2023.....	14	Table 12. Economic value of damages caused by natural disasters, 2019–2023.....	17
Table 4. Households considering their future threatened by climate change impacts, 2023 ...	14	Table 13. Number of households reporting economic damages caused by natural disasters, by value range, 2019–2023	17
Table 5. Feelings generated when hearing about climate change, by household, 2023	15	Table 23. Other impacts on people due to natural disasters, by sex of the household head, 2019–2023	19
Table 6. Households' source of information about climate change, 2023	15	Table 24. Types of slow-onset events impacting households, 2023	19
Table 7. Households' perception of government actions on climate change, 2023	15	Table 25. Slow-onset event impacts on household livelihoods, 2023.....	20
Table 8. Households' perception of government communication on climate change, 2023	16		
Table 9. Distribution of natural disasters that impacted households, 2019–2023	16		

Table 26. <i>Slow-onset event impacts on household food consumption patterns and health, 2023.....</i>	20
Table 27. <i>Slow-onset event impacts on household cultural and community activities, 2023.....</i>	20
Table 28. <i>Displaced people due to slow-onset events, 2023.....</i>	21
Table 29. <i>Crops planted by households, 2023 ..</i>	21
Table 30. <i>Economic losses in crops associated to climate change and natural disasters, 2023.....</i>	21
Table 31. <i>Reasons for crop losses associated with climate change and natural disasters, 2023.....</i>	21
Table 32. <i>Economic losses in agricultural tools and equipment due to climate change and natural disasters, by crop, 2023.....</i>	22
Table 33. <i>Livestock raised by households, 2023</i>	22
Table 34. <i>Value of livestock losses due to climate change and natural disasters, 2023</i>	22
Table 35. <i>Reasons for livestock losses associated with climate change and natural disasters, 2023 .</i>	22
Table 36. <i>Value of losses in livestock tools and equipment due to climate change and natural disasters, 2023.....</i>	23
Table 37. <i>Fish and aquaculture species caught by Households, 2023</i>	23
Table 38. <i>Value of losses in fisheries/aquaculture equipment due to climate change and natural disasters, by species captured, 2023.....</i>	23
Table 39. <i>Changes in fish and aquaculture species availability, by species, 2023.....</i>	23
Table 40. <i>Reasons for fisheries/aquaculture losses associated with climate change and natural disasters, 2023.....</i>	24
Table 41. <i>Retreat adaptation measures adopted by Households, 2019–2023</i>	24
Table 42. <i>Adaptation measures adopted by Households to defend dwellings from flooding, 2019–2023</i>	24
Table 43. <i>Adaptation measures adopted by Households to defend productive activities, 2019–2023</i>	25
Table 44. <i>Adaptation measures adopted by Households to defend freshwater availability, 2019–2023</i>	25
Table 45. <i>Adaptation measures adopted by Households to co-exist with the impacts of climate change, 2019–2023.....</i>	25
Table 46. <i>Adaptation measures adopted by Households for their productive activities co-exist with the impacts of climate change, 2019–2023 ..</i>	26
Table 47. <i>Adaptation measures adopted by Households to co-exist with the impacts of climate change on freshwater, 2019–2023.....</i>	26
Table 48. <i>Households’ opinion about the effectiveness of adaptation measures adopted, 2023</i>	26
Table 49. <i>Type of support Households have received to adapt to climate change, 2023</i>	27
Table 50. <i>Type of organisation providing support to Households for adapting to climate change, 2023</i>	27
Table 51. <i>Households’ opinion about the support received to adapt to climate change, 2023</i>	27
Table 52. <i>Personal challenges preventing Households from implementing adaptation measures, 2023.....</i>	28

ACRONYMS

CCCI	Climate Change Cook Islands
CSDS	Cook Islands Strategy for the Development of Statistics
EAs	Enumeration Areas
FHH	female-headed households
GDP	Gross Domestic Product
HH	household
MHH	male-headed households
NSO	National Statistics Office
PACSTAT	Statistical Innovation and Capacity Building in the Pacific
PICTs	Pacific Island Countries and Territories
SDGs	Sustainable Development Goals
SPC	Pacific Community
UNFCCC	United Nations Framework Convention on Climate Change

FOREWORD

It gives me great pleasure to join with the Statistics for Development Division (SDD) of the Pacific Community (SPC) in the release of the report for the Cook Islands Climate Change Survey (CCS) 2023–2024. The publication of this report represents a further step by the Statistics Office in its attempt to provide a wider range of statistics for use by government and the general public.

This report presents the findings of a comprehensive survey on Climate Change, conducted to better understand public perceptions, awareness, and behaviours related to this critical issue.

I would like to extend my heartfelt thanks to the dedicated field interviewers, whose hard work and commitment ensured the successful completion of the data collection process. Your professionalism and persistence in engaging with respondents were invaluable to the project.

I am also deeply grateful to the household members who generously took the time to participate in this survey. Your insights and perspectives form the core of this report, and your cooperation has been crucial to our understanding of the complex challenges posed by Climate Change.

Finally, I wish to express my sincere gratitude to all the people and institutions that made the survey possible, in no particular order of importance: The team at the Cook Islands Statistics Office (CISO) MFEM that adapted and integrated the Natural Disaster and CCS questionnaire; colleagues at SPC–SDD that supported the survey’s sampling design, prepared databases, processed and analysed data and produced this report. Their commitment to addressing Climate Change has been instrumental in bringing this important study to life.

This report aims to contribute to ongoing discussions on Climate Change and support efforts toward finding sustainable solutions.

Meitaki maata

Taggy Tangimetua (Mrs.)

Government Statistician

1. INTRODUCTION

Climate Change is a fundamental global threat; however Pacific Island Countries and Territories (PICTs) are at the frontline of climate vulnerability. In 2022, Pacific Leaders declared a Climate Emergency that “threatens the livelihoods, security and wellbeing of its people and ecosystems”. Increasingly unpredictable natural disasters and slow-onset events pose significant threats to low-lying islands, coastal areas, coral reefs, and delicate marine and terrestrial ecosystems, impacting on freshwater supplies, food security, and people’s daily lives.

The Natural Disaster and Climate Change Survey’s (CCS) primary aim is to foster the production and utilisation of socio-economic data to assess the effects of natural disasters and climate change on PICTs at the Household (HH) level. Launched in 2022, this initiative, led by the Pacific Community’s Statistics for Development Division under the Statistical Innovation and Capacity Building in the Pacific (PACSTAT) project designed to respond to the specific needs of PICTs. These needs were identified by a stocktake of existing data, consultations with countries, and the identification of data gaps for reporting purposes.

The methodology was designed for both a core module of key questions and a more detailed survey (known as the Sourcebook). In addition to capturing the immediate economic impacts, there are questions on social implications including climate change perceptions, implications of slow-onset events, and adaptation strategies. This will enable National Statistics Offices (NSOs) to produce statistics

that can help monitor climate impacts and adaptation strategies, supporting the resilience and well-being of local communities.

The 2023 Cook Islands CCS was conducted alongside the Labour Force Survey and included most of the Sourcebook questionnaire modules. Since this was the first time the survey has been used, it also served as a field test to determine whether the proposed questions in the Sourcebook include accurate variables needed for constructing a comprehensive set of climate change and natural disasters socioeconomic-related indicators suitable to monitor the effects of these phenomena in the Pacific communities.

This volume of the report presents the results of the Natural Disaster and CCS in the Cook Islands, while volume 2 covers the field test findings.



2. BACKGROUND

The Cook Islands is a large ocean state in the central-south Pacific Ocean. Located south of the equator, fifteen islands are spread across nearly two million square kilometres (km²) of the South Pacific Ocean. The country's total land mass is 236.7 km², with an exclusive economic zone of 1.97 million km². The Cook Islands has a population of around 15,000 people, of whom

the majority live on the main island of Rarotonga, a Gross Domestic Product (GDP) per capita of around NZ\$ 25,351, and tourism accounts for an estimated 80% of GDP. However, the nation is highly exposed to tropical cyclones with damaging winds, storm surges, and floods, posing significant challenges.

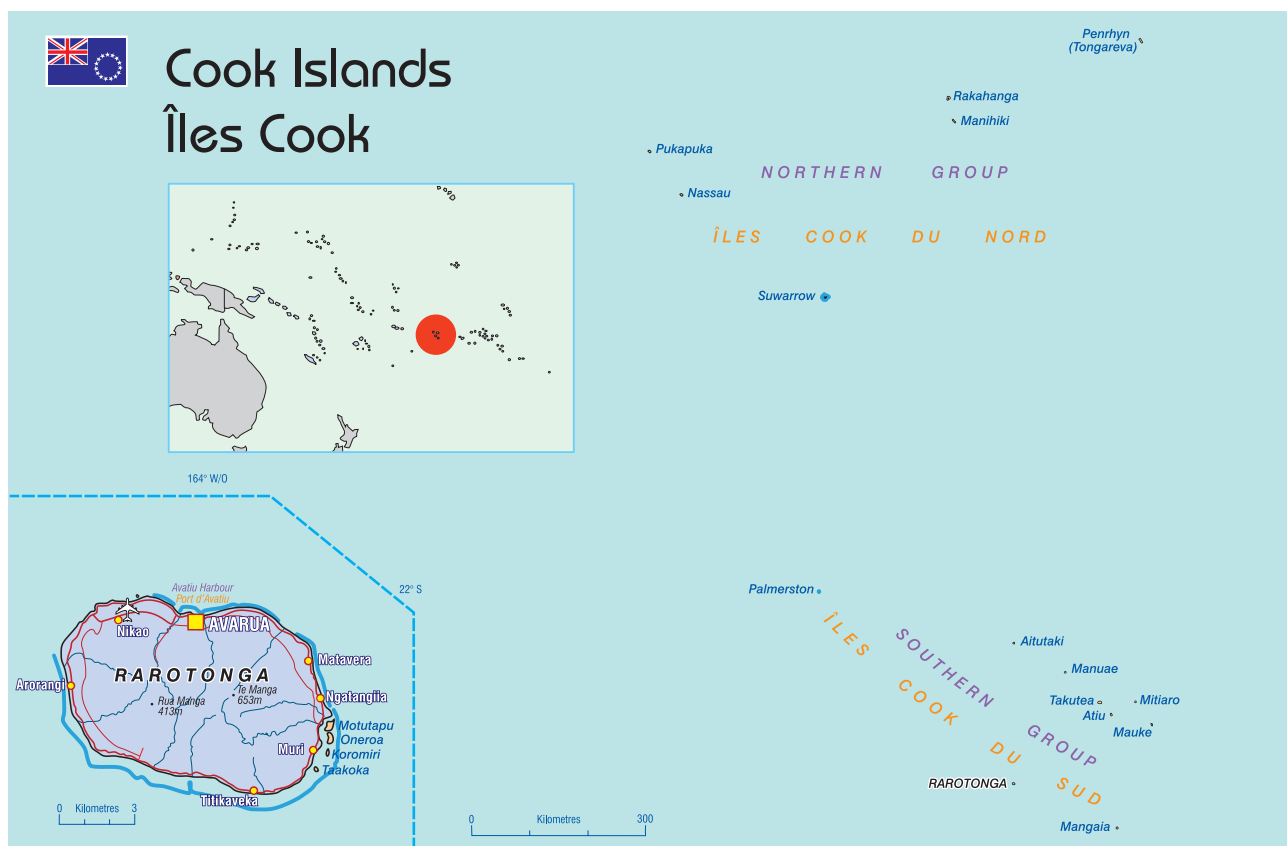


Figure 1. Cook Islands Location (© SPC)

2.1. Climate Change Impact and Policy Response

The Cook Islands faces increasing human, environmental, and economic harms due to climate change, such as rising sea temperatures, air temperature changes, and altered rainfall patterns, affecting agriculture, livelihoods, and

infrastructure, as well as its main economic industry tourism. Coral bleaching and ocean acidification have hindered coral growth, while food and water security are daily challenges due to changing rainfall and saltwater intrusion.

The Cook Islands Third National Communication for the United Nations Framework Convention on Climate Change — UNFCCC 2019 — noted

the increasing human, environmental, and economic harms caused by climate and weather changes, in particular those caused by sea temperatures (recorded to have been rising at 0.12 degrees per decade), air temperature, and rainfall changes, which affect agriculture, livelihoods, and infrastructure.

The government has responded with the Cook Islands Climate Change Policy 2018–2028, aiming to strengthen financial systems for climate-resilient strategies and established the Climate Change Cook Islands office (CCCI) as the national government official body to provide oversight for implementing the Climate Change Country Programme and coordinate all sectors and levels of government to include climate actions.

2.2. Importance of Socio-Economic Data

The Cook Islands Strategy for the Development of Statistics (CSDS 2015–2025) mandates the NSO to oversee the National Statistical System and produce indices to support sustainable development. The CSDS aligns with the 2016–2020 National Development Strategy, which focuses on the Sustainable Development Goals (SDGs) of the United Nations (2030 agenda). Emphasizing the need for comprehensive statistical information across social, economic, and environmental sectors, the CSDS provides insights to shape and inform policies and strategies. It highlights the importance of producing climate change-related data to assess the country's vulnerability and guide adaptation measures.

The CSDS outlines five components, including the “Sustainable Natural Resources and

Environment Sector,” which aims to produce indices for assessing sustainable development. These indices aim to reflect the country's vulnerability, guide informed policies and strategies, strengthen national data systems, and enhances analytical capabilities for decision-making. This includes sustainable management, protection, and conservation of marine and coastal ecosystems and enhancing the resilience of vulnerable populations to climate-related events and other shocks. The strategy emphasizes a holistic approach to support sustainable livelihoods, disaster preparedness, and climate resilience.

To address data gaps and needs, the CSDS proposes several strategies to strengthen statistical capacity. Notably, it suggests establishing a “*core national set of indicators and associated timeliness, range, and accuracy guidelines for the environment, energy, agriculture, fisheries, livestock and biosecurity, meteorology, and land use*”. Agencies with established data systems, such as the Ministry of Marine Resources and the Meteorological Service (Ministry of Transport MOT), are tasked with leading this effort. Other agencies such as the Cook Islands Seabed Minerals Authority, Renewable Energy Development Division (OPM REDD), CCCI, and the Ministry of Agriculture will also contribute.

2.3. Previous studies and statistics

The Cook Islands has taken a proactive approach to climate change adaptation activities and is seen as a leader in the Pacific context. This has encouraged the assessment of climate change vulnerability and communities' resilience capacity, which is, in fact, a country's continuing



priority. Several studies and surveys have been conducted by the Cook Islands Government to understand the socio-economic effects of climate change, these include:

- **Cook Islands National Communications (2007, 2012, 2019):** for the United Nations Framework Convention on Climate Change (UNFCCC)
- **Vulnerability and Adaptation Assessments (1998–2015):** For nearly all of the Pa Enea islands and selected Rarotonga Communities. These studies employed systematic literature review, community meetings, and surveys along with community awareness campaigns, HH and geospatial mapping. These studies also identified community strengths and potential adaptation activities, with food and water security priorities emerging from the surveys and consultations.
- **Cook Islands Climate Change Bibliography:** A collection of research documents on climate change impacts including those produced through Intergovernmental Panel on Climate Change, CSIRO and Asian Development Bank since the early 2000s that serve as key baselines for future work.
- **World Bank Cook Islands Risk Profile (2021):** This is part of the assessments produced by the World Bank Group's Climate. The country profile screening

tool draws up-to-date and relevant information from the World Bank Group's Climate Change Knowledge Portal. The profile gives a country overview and more detailed information on climatology, key trends, climate future, climate change impacts, communities, policies, and programs.

The Cook Islands NSO+ has produced official statistics that have relevance to the topic of climate change and its impact on communities, including:

- **Census of Population and Dwellings (2021):** Offers demographic, social, and economic data, though it did not include specific environmental variables.
- **Household Income Expenditure Survey (HIES 2015–2016):** Collected data relevant for climate change exposure and vulnerability analysis.
- **Labour Force Survey (2019, 2024):** Captures economic activity and labour force characteristics, essential for designing response policies.
- **Cook Islands Gender Profile:** Implemented in 2012 by the National Statistics Office and the SPC's Human Development Programme, it was the first comprehensive study to systematically collect, compile, process, and analyse gender-differentiated data.

3. METHODS

3.1. Survey area and Household selection

The survey sample was a two-stage stratified design. In the first stage, a stratified sample of enumeration areas (EAs) from the most recent population census (2021) was drawn with a probability proportional to the number of occupied dwellings recorded in the census. In the second stage, a fixed number of sample HHs was selected with equal probability within each sample enumeration area. The sample selection at both stages of the sampling design was done randomly.

Within each selected EAs on Rarotonga and Aitutaki, the HH listing was updated prior to HH selection. In outer islands, HH listing were not updated and random selection was done directly using the 2021 census framework. A geographical stratification was implemented to report at the Urban (Rarotonga) and Rural (outer islands) levels, as well as National level. Nine HHs were randomly selected within each EA to finally select 37 EAs in urban and 28 in rural. The sampling process results in a total of 585 HHs randomly selected (333 in urban and 252 in rural).

Table A. *Climate Change and Labour Force Survey sampling allocation*

Strata	Island	Census 2021 and HH listing (2023)		Sample Allocation	
		Number of EAs	Number of HHs	Number of EAs	Number of HHs
Urban	Rarotonga	88	3,481	37	333
	Aitutaki	18	558	13	117
	Atiu	6	113	2	18
	Mangaia	6	157	4	36
	Manihiki	3	67	1	9
	Mauke	3	89	3	27
	Mitiaro	2	55	1	9
Rural	Nassau	1	17	0	0
	Palmerston	1	7	0	0
	Penrhyn	3	56	2	18
	Pukapuka	3	85	2	18
	Rakahanga	1	22	0	0
	Suvarrow	1	0	0	0

No replacement procedure was in place in Rarotonga and Aitutaki, and all selected HHs were interviewed. In the rest of the islands, within each selected EA, 14 HHs were selected: 9 for an interview and 5 as a replacement (in case of non-response, such as refusal or absence, etc.).

3.2. Response rate

The Cook Islands NSO and SPC reported a response rate of 88%. If the replacement procedure for the outer islands is considered, then the completion rate will reach 91%.

Table B. *Response rate and completion rate*

Strata	Sample design			Field work completion	
	Number of clusters	Cluster size	Number of HHs	Number of HHs	Response rate
Urban	37	9	333	294	88.3%
Rural	28	9	252	237	94.0%
National	65	-	585	531	90.8%

In urban Cook Islands, the response rate equals the completion rate because no replacement procedure exists. In outer islands, the replacement procedure allows the completion of the targeted sample (except in Mauke, where 1 HH was missing).

3.3. Weighting

The first set of weights provided by the sampling design after field work completion was calculated using the inverse of the probability of selection of the completed HHs.

This set of weights was adjusted using a calibration process that increases precision of estimates, account for unit non response, and force estimates to be consistent with external data. In the case of the Cook Islands climate change and labour force survey, variables from

the 2021 census (projected in 2023) were used to adjust the weights. Within each strata, the first set of weights was adjusted using age and sex structure of the population, as well as education level of the HH head.

3.4. Sampling uncertainty

As the survey was completed by a sample, not the full population, there is a degree of statistical uncertainty about all the estimates in this report. The exact amount varies according to what is being estimated, its own distribution, and its relationship to variables used in the sample design.

For indicative purposes **Table C** highlights the standard error, 95% confidence interval and design effect for selected indicators.

Table C. *Sampling for selected indicators*

Percentage of HHs	Estimate	Standard error	95% confidence interval		Design effect
Impacted by natural disaster	47%	0.029	41%	57%	2.03
Affected by slow-onset events	58%	0.031	52%	64%	2.34
Concerned about climate change impact	72%	0.025	67%	77%	1.85

These confidence intervals only reflect uncertainty from the sampling and weighting process, and do not consider other

measurement issues (such as respondent difficulties in remembering events or estimating values).



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4. RESULTS

4.1. *Understanding of Climate Change*

The survey indicates that about 79% of respondents understood climate change as a change in seasons, with more female-headed households (FHH) respondents holding this perception (82%). Sea temperature rise and sea level rise were also definitions provided by Cook Islanders to climate change, with 56% and 53% of responses provided, respectively.

Respondents were asked what they believed was a major cause of climate change and had the option of multiple responses. The most common response was the use of fossil fuels (70%) followed by deforestation (36%). However, 36% of HHs interviewed attached climate change causes to Earth's natural processes.

As a whole, 72% of respondents declared being concerned about climate change impacts, with 69% of HHs perceiving their future welfare as strongly and somewhat threatened by climate change. Major feelings generated due to climate change are anxiety (38%), sadness (32%), fear (29%) and helplessness (25%). These feelings were found stronger in FHHs; for example, 44% of FHHs declared feeling anxiety, contrasting with 34% of male-headed households (MHH). Only 16% of HHs stated that climate change did not generate any feelings.

Sources of information about climate change varied. Most respondents (57%) said they had received information on climate change from the Internet and social media, and the second most common information source was television (14%).

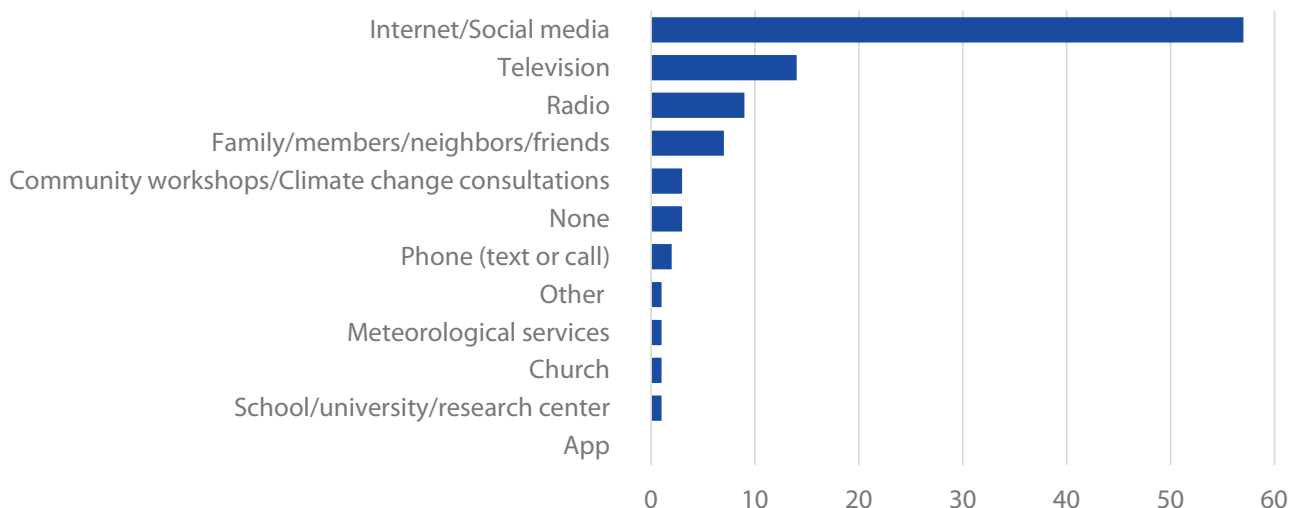


Figure 2. Main source of information about climate change

Respondents reported different perceptions of their government's actions to counter the impacts of climate change: 43% declared government actions were not enough to address the impacts on people and localities, followed by 38% being not aware of their government's actions and 19% reporting their government actions were good and sufficient to address the impacts on people and localities.

Nearly half of respondents (47%) were of the view that their government did not communicate enough about climate change strategies. In contrast, 19% believed that

government's communication generated positive incentives to act in response to climate change. A further 17% were unaware of government communication strategies, and 16% said their government did not incentivise them to act in response to climate change.

Impact of Natural Hazards

Between 2019 and 2023, 2,243 HHs in the Cook Islands were affected by natural disasters. This represents 47% of the total HHs registered in the country. Of this total, 71% were located in urban areas (Rarotonga) and 29% in rural areas (outside of Rarotonga).

Table D. Natural disaster affecting households in the Cook Islands, 2019–2023

Natural disaster	HHs Total (%)	HHs in urban area (%)	HHs in rural area (%)
Flood caused by heavy rain	14	17	8
Flood caused by king tides/sea surge	4	3	8
Drought	5	24	28
Storm/strong winds	26	22	36
Landslide	1	2	0
Extreme Temperature	11	11	10
Wildfire	1	0	3
Tropical Cyclone	14	14	15
Tsunami	1	1	3
Other	0	0	1

These natural disasters mainly affected HHs' dwellings (33%), agricultural area (18%), access to basic services (10%) and family members health (5%).

In the survey, respondents who indicated that their HHs were affected by a natural disaster

were asked to estimate the monetary value of the impact they experienced. These questions aimed to quantify the economic consequences of such events on HHs. The results of these estimations are displayed in **Table E**.

Table E. Economic value of losses caused by natural disasters in the Cook Islands, 2019–2023

Asset type	Total economic impact (NZ\$)	Average economic impact (NZ\$)
Dwelling	1,797,000	2,460
Agriculture	669,000	1,650
Farm Assets	90,000	1,430
Fisheries Assets	57,000	1,430
Animals	167,000	1,440
Vehicles	88,000	1,720
Other Productive Assets	27,000	1,020
Total	2,894,000	2,020

According to HH estimates, losses due to natural disasters in the reference period totalled NZ\$ 2.9 million, with an average loss value per HH that reported any damage of NZ\$ 2,020.

However, it is essential to recognize that estimating financial impacts can be inherently challenging, as individuals may struggle with accurately assessing the full extent of damages or associated costs. Consequently, the values reported should be viewed with caution, as they may not reflect precise financial realities.

243 people were affected by natural disasters in 2019–2023, with 17 deaths, 17 missing, and 36 injured and 173 sick. Natural disasters also caused the loss of 17 permanent jobs. 98 people experienced work interruptions, with 152 workdays lost. 131 children interrupted school days due to natural disasters, recording 416 lost school days.

It was reported that HHs did not suffer serious disruptions in the supply of basic services. The basic services interrupted were water (7%), communication (7%) and electricity (5%). For water service, a total interruption of 929 days with an average per HH of 4.1 days without service supply was reported in the survey. Communication services (Internet, mobile telephone, etc.) were interrupted for 521 days, for an average of 2.3 days per HH without access to this service.

6% of HHs reported family members as displaced due to natural disasters, with a national total of 422 people displaced in the last five years. Of the 75 HHs reporting displacement, all moved to another locality of the same island. No HHs reported permanent displacement.

Impact of slow-onset events on households

Slow-onset events evolve gradually from incremental changes occurring over many years

or from an increased frequency or intensity of recurring events. In contrast a rapid onset event is a single, discrete event that occurs in a matter of days or even hours.

The slow-onset events examined in this analysis are those most commonly observed to affect respondent's livelihoods in the PICTs, including sea level rise, increase in temperature and coastal erosion. Whilst it is well established that these slow-onset events are increasing in frequency and intensity due to climate-change, they are complex and multifaceted in nature and it is possible that other activities could

be contributing (e.g., human activity causing pollution resulting in smaller fish).

This section assesses the impact of these slow-onset events on Cook Islanders, highlighting the cumulative and escalating effects such as loss and damage to assets and livelihoods as well as adverse impacts on individuals and groups.

2,782 HHs in the Cook Islands were affected by slow-onset events in the past year. This represents 58% of the total HHs recorded in the country.

Table F. Slow-onset events affecting households in the Cook Islands in 2023

Slow-onset event	HHs affected (number)	HHs affected (%)
Irregular rains	2,146	77
Sea level rise	1,241	45
Coastal erosion	666	24
Less availability of freshwater	1,154	42
Increase in temperature	1,474	53
Lesser amount of fish	630	23
Smaller fishes	286	10
Coral bleaching	318	12
Increase of invasive species	219	8
Saltwater intrusion	182	6
Other	9	0

The main slow-onset events reported were irregular rains (77%), followed by an increase in temperature (53%) and sea level rise (45%). Most respondents stated that slow-onset events were not affecting their livelihoods (61%), health and food consumption parameters (64%) and social and cultural activities (81%). Some respondents reported lower crop yields (15%), changes in the planting/harvesting periods of crops/agricultural products (13%) and lower availability of natural resources such as wood, firewood, and construction materials (10%). Others

reported lower availability of freshwater (23%) and increased consumption of processed food products (9%).

Impacts of natural disasters and slow-onset events on crops, livestock, fisheries, aquaculture and forestry

This section aims to capture in more detail the impacts of natural disasters and climate change related slow-onset event on agriculture and fisheries activities.

Agriculture

In the Cook Islands, the majority of respondents earn most of their income from employment with 2% reporting that their main income comes from farming and fishing. However, many HHs (1,298 HHs) also practice farming for self-consumption and occasional sale. In the past year 56% HHs planted taro, followed by vegetables (40%) and bananas (38%) as the most planted crops by HHs.

An average home garden total area of 17 ha was reported. Respondents estimated crop losses due to natural disasters and slow-onset events worth NZ\$ 31,000. Reported losses of agricultural equipment were estimated at NZ\$ 43,000, with no losses reported for infrastructure. 11% of HHs reported that there were crop losses was due to the lack of rain.

Table G. Crops Planted by Cook Islands' Households, 2023

Crop	HHs affected (number)	HHs affected (%)
Taro	724	56
Maniota (Cassava)	385	30
Bananas	488	38
Pawpaw	235	18
Vegetables	518	40
Lemons	97	8
Pineapple	75	6
Other	88	7

Livestock

In 2023, 1,179 respondents in the Cook Islands reported having livestock, with 92% raising pigs, 18% goats, and 10% poultry. These HHs reported animal losses due to the onset of disease (32%), high temperatures (23%) and lack of rainfall (16%). These losses amounted to a total of NZ\$ 65,000, with NZ\$ 37,000 in machinery and equipment and NZ\$ 31,000 in infrastructure.

Aquaculture and Fisheries

In 2023, 775 respondents engaged in aquaculture or fisheries in the Cook Islands. Most (52%) caught fish from coral reefs, followed by fish from the ocean (25%) and harvesting of paua or other shellfish (18%). Regarding changes in fisheries, 52% of respondents reported fish

capture was about the same, 41% less than usual, and 6% more than usual. Changes in fish caught were attributed to it being too hot (70%), too cold (25%) and large waves/seas/swell (24%). Economic losses for fisheries equipment totalled NZ\$ 13,000.

Forestry

Only 130 (3%) HHs in the Cook Islands collect forest products. Forest products commonly collected are coconuts (65%), wild pigs (38%), and wild chickens (13%).

Adaptation Measures

Retreat adaptation measures

In the Cook Islands, 3% of HH respondents stated that they had implemented retreat adaptation measures in the past 5 years (such as relocating

the house to another area/locality/island with or without a managed retreat approach).

Defensive adaptation measures

24% of respondents in the Cook Islands had implemented action to protect their homes from flooding. Of these, 12% had improved their drainage systems, 9% house infrastructure, and 6% used roofs capable of coping with high intensity rainfall events.

12% of respondents reported that they implement measures to protect their productive activities. 5% had installed irrigation systems and 4% had strengthened/upgraded land infrastructure used for agriculture.

To ensure water supply, 38% had installed water tanks and capture and distribution facilities and 20% had put filtering systems in the water supply to the house.

Co-existing measures

12% of respondents implemented actions to co-exist with climate change and natural disasters such as attending training programs. 10% implemented actions specifically for their productive activities such as adjusting their harvesting or fishing dates or growing crops undercover.

Institutional support for adaptation

13% of the respondents declared having received support for implementing adaptation strategies in the past five years.

Almost a third (33%) did not know the type of support received, with a further 18% stating they had received support for community strengthening and organisation, and 11% received support to improve HH dwellings and infrastructure.

25% of HHs did not know which institution had supported implementing adaptation strategies. In comparison, 20% acknowledged that the government has provided support, and 10% had received help from the local community or civil society organisations.

65% of HHs thought the support provided had been good and enough for adapting to climate change, while 29% did not think this. Few respondents had engaged with climate change groups or committees for addressing climate change issues, and 69% of HH heads did not declare having personal challenges limiting their action on natural disaster prevention and climate change adaptation.



5. CONCLUSION

The 2023 Cook Islands Climate Change Natural Disaster and CCS marks the first time this survey has been conducted. It offers a comprehensive overview of the current climate change related challenges, aiming to inform decision makers in the country.

Survey respondents showed a good understanding of climate change, its causes and its impacts on their livelihoods, families and communities.

Being able to quantify how HHs are adapting to climate threats, as well as documenting the losses they experienced can inform policy makers to direct support where it's needed. The survey also establishes baseline data, that can be used to monitor and track changes in future survey iterations.

The experience from this first implementation will be used to refine and improve the design of the survey, with additional details to be published in Volume 2 of this report.



ANNEX 1: RESULTS TABLES

Table 1. Households definition of climate change, 2023

Definition of climate change	MHH	FHH	Total HH	MHH (%)	FHH (%)	Total HH (%)
Temperature rise	1,280	794	2,075	44	43	43
Sea temperature rise	1,662	1,024	2,687	57	55	56
Extreme events frequency	1,201	704	1,906	41	38	40
Extreme events intensity	936	641	1,577	32	34	33
Sea level rise	1,519	1,006	2,526	52	54	53
Season change	2,256	1,525	3,782	77	82	79
Glaciers melting	635	414	1,047	22	22	22
Polar ice melting	541	418	960	19	22	20
Don't know	203	124	327	7	7	7
Other	60	9	70	2	1	2

Table 2. Households' perception of leading causes of climate change, 2023

Leading causes of climate change	MHH	FHH	Total HH	MHH (%)	FHH (%)	Total HH (%)
Fossil fuels use	2,007	1,358	3,365	69	73	70
Deforestation	1,009	712	1,721	35	38	36
Cattle raising	267	233	500	9	13	10
Natural causes	1,007	718	1,725	35	39	36
Unknown	368	150	518	13	8	11
Other	260	199	459	9	11	10

Table 3. Number of households concerned about climate change impacts, 2023

Number of HH concerned about climate change impacts	MHH	FHH	Total HH	MHH (%)	FHH (%)	Total HH (%)
Yes	2,099	1,361	3,460	72	73	72
No	686	394	1,080	24	21	23
I don't know	134	110	244	5	6	5

Table 4. Households considering their future threatened by climate change impacts, 2023

Threat level	MHH	FHH	Total HH	MHH (%)	FHH (%)	Total HH (%)
Yes, strongly	848	645	1,492	29	35	31
Yes, somewhat	1,137	664	1,800	39	36	38
No, not very much	664	321	985	23	17	21
No, not at all	200	161	362	7	9	8
I do not know	69	75	145	2	4	3

Table 5. Feelings generated when hearing about climate change, by household, 2023

Feeling	MHH	FHH	Total HH	MHH (%)	FHH (%)	Total HH (%)
Fear	770	634	1,403	26	34	29
Helplessness	655	522	1,177	22	28	25
Sadness	975	552	1,527	33	30	32
Guilt	153	142	295	5	8	6
Anger	287	219	505	10	12	11
Anxiety	997	822	1,820	34	44	38
Indifference	485	258	742	17	14	16
Impotence	0	13	13	0	1	0
Distrust	26	41	68	1	2	1
Willing to help	443	218	661	15	12	14
Other	114	17	131	4	1	3

Table 6. Households' source of information about climate change, 2023

Source of Information	Total HH	Total HH (%)
Internet/social media	2,733	57
Television	667	14
Radio	447	9
Family members/Neighbours/Friends	335	7
Community workshops/Climate change consultations	165	3
None	121	3
Phone (text or call)	102	2
Other	67	1
Meteorological services	59	1
Church	50	1
School/university/research center	24	1
App	14	0

Table 7. Households' perception of government actions on climate change, 2023

HH's perception	Total HH	Total HH (%)
Good and sufficient to address the impacts on people and localities	895	19
Not enough to address the impacts on people and localities	2,054	43
I am not aware of any actions by our government	1,835	38

Table 8. Households' perception of government communication on climate change, 2023

HH's perception	Total HH	Total HH (%)
Government communication generates positive incentives to act in response to climate change	907	19
Government communication does not incentivise people to act in response to climate change	780	16
My government does not communicate enough about climate change	2,242	47
I do not know	820	17
Other	35	1

Table 9. Distribution of natural disasters that impacted households, 2019–2023

Natural Disaster	HH					
	Urban	Rural	Total	Urban (%)	Rural (%)	Total (%)
Flood caused by heavy rain	599	99	697	17	8	15
Flood caused by king tides/sea surge	93	95	189	3	8	4
Drought	862	342	1,205	24	28	25
Storm/strong winds	804	435	1,239	23	36	26
Landslide	57	2	59	2	-	1
Extreme Temperature	407	122	529	11	10	11
Wildfire	-	38	38	-	3	1
Tropical Cyclone	508	187	695	14	15	15
Tsunami	30	31	62	1	3	1
Other	-	8	8	-	1	-

Table 10. Distribution of population impacted by natural disasters, 2019–2023

Natural Disaster	Population					
	Urban	Rural	Total	Urban (%)	Rural (%)	Total (%)
Flood caused by heavy rain	2,002	381	2,383	18	9	16
Flood caused by king tides/sea surge	179	352	532	2	9	4
Drought	2,583	1,370	3,952	24	33	26
Storm/strong winds	2,370	1,555	3,926	22	38	26
Landslide	236	2	237	2	-	2
Extreme Temperature	1,079	611	1,689	10	15	11
Wildfire	-	222	222	-	5	2
Tropical Cyclone	1,614	744	2,358	15	18	16
Tsunami	101	145	246	1	4	2
Other	-	16	16	-	-	-

Table 11. Distribution of damages suffered by households due to natural disasters, 2019–2023

Damage	Total HH	Total HH (%)
Dwelling/House	729	33
Agricultural area	406	18
Farm assets	63	3
Fisheries assets	44	2
Farm animals	116	5
Vehicle including motorcycles and scooters	51	2
Other productive assets	26	1
Health	118	5
Members resulting in death	17	1
Members going missing	17	1
Members resulting in injury	36	2
Access to transportation infrastructure or to other islands	101	5
Access to work facilities	82	4
Access to school	83	4
Access to basic services (water, electricity, internet)	232	10
Forest area or trees, water bodies	54	2
Other	-	-

Table 12. Economic value of damages caused by natural disasters, 2019–2023

Asset type	Total economic impact (thousand NZ\$)	Average damage cost allocated per affected HH by category (NZ\$)
Dwelling	1,797	2,460
Agriculture	669	1,650
Farm assets	90	1,430
Fisheries assets	57	1,430
Animals	167	1,440
Vehicles	88	1,720
Other productive assets	27	1,020
Total	2,894	2,020

Table 13. Number of households reporting economic damages caused by natural disasters, by value range, 2019–2023

Asset type	HH per value range (NZ\$)					
	\$1–\$1,999	\$2,000–\$3,999	\$4,000–\$5,999	\$6,000–\$7,999	\$8,000–\$9,999	\$10,000 or more
Dwelling	465	149	47	7	3	57
Agriculture	320	47	36	-	3	-
Farm assets	50	13	-	-	-	-
Fisheries assets	38	6	-	-	-	-
Animals	96	14	6	-	-	-
Vehicles	32	18	-	-	-	-
Other productive assets	27	-	-	-	-	-

Table 14. *Impact of natural disasters on people, 2019–2023*

Impact on people	People #
Sick	173
Injured	36

Table 15. *Impact of natural disasters on workdays, 2019–2023*

Workdays impacts	Days
Workdays disrupted	98
Workdays lost	152

Table 16. *Impact of natural disasters on schooldays, 2019–2023*

Schooldays impacts	Days
Children not attending school	131
Schooldays lost	416

Table 17. *Households without access to basic services due to natural disasters, 2019–2023*

Basic services	Total HH	Total HH (%)
Electricity	102	5
Water	160	7
Sanitation	50	2
Transport	53	2
Communication	148	7
Waste collection	7	-
Health	17	1
Local administration	-	-
Markets	20	1
None	-	-
Other	-	-

Table 18. *Number of days of basic services disruption due to natural disasters, 2019–2023*

Basic services	Days	Days/HH
Electricity	240	1
Water	929	4
Sanitation	262	1
Transport	91	-
Communication	520	2
Waste collection	43	-
Health	34	-
Local administration	-	-
Markets	34	-
None	-	-
Other	-	-

Table 19. *Displaced people due to natural disasters, 2019–2023*

Displaced people	People
People displaced	423
People displaced per HH	6

Table 20. *Duration of displacement due to natural disasters, 2019–2023*

Duration	Total HH
A few days	63
A few weeks	-
Several months	12
Permanently	-

Table 21. *Location of displacement due to natural disasters, 2019–2023*

Location	Total HH
To another locality of the same island	75
To another island in the same country	-
Abroad (AU or NZ)	-
Abroad (Other)	-

Table 22. Facility hosting displaced people due to natural disasters, 2019–2023

Location	Total HH	Total HH (%)
Government shelter	16	22
Friends' home	17	23
Family or relatives' home	60	79
Buy/rent a new place	-	-

Table 23. Other impacts on people due to natural disasters, by sex of the household head, 2019–2023

Other impacts	Total HH (%)	MHH (%)	FHH (%)
Loss in non-farm income (e.g., reduction in sales)	6	10	12
Time spent on water collection increased	13	16	11
Time spent on firewood collection increased	2	1	2
Time spent on childcare increased	6	7	9
Time spent on caring for adult family members increased	2	2	1
Time spent on any domestic work activities increased	18	19	20
Found difficulties accessing personal hygiene products	1	-	1
Domestic violence increased	-	1	-
School dropout increased	1	-	1
Other	-	-	1

Table 24. Types of slow-onset events impacting households, 2023

Slow-onset event	Total HH	Total HH (%)
Irregular rains	2,146	77
Sea level rise	1,241	45
Coastal erosion	666	24
Less availability of fresh water	1,154	42
Increase in temperature	1,474	53
Lesser amount of fish	630	23
Smaller fishes	286	10
Coral bleaching	318	12
Increase of invasive species	219	8
Saltwater intrusion	182	7
Other	9	-

Table 25. *Slow-onset event impacts on household livelihoods, 2023*

Impact	Total HH	Total HH (%)
Reduced crop/livestock/fisheries yields	414	15
Increased crop/livestock/fisheries yields	110	4
Changes in crop planting and harvesting seasonality	373	13
Decreased soil fertility due to salination and soil erosion	70	3
Less availability and diversity of seeds and planting material	54	2
Past areas for crops becoming too warm	86	3
Reduced fish stock	279	10
Reduced availability of housing materials, bushmeat, water, firewood, etc.	268	10
Loss of employment	11	-
Reduced non-farm business income	29	1
No impact	1,702	61
Other	-	-

Table 26. *Slow-onset event impacts on household food consumption patterns and health, 2023*

Impact	Total HH	Total HH (%)
Reducing food availability	168	6
Reducing food diversity	129	5
Increasing the dependence on processed foods	256	9
Increasing prevalence of diseases like dengue, yellow fever, etc.	64	2
Increasing prevalence cardiovascular diseases, diabetes, etc.	25	1
Increasing stress, anxiety	141	5
Reducing water availability and quality	645	23
No impact	1,769	64
Other	-	-

Table 27. *Slow-onset event impacts on household cultural and community activities, 2023*

Impact	Total HH	Total HH (%)
Recovering and applying ancient knowledge	222	8
Less willingness to attend community events	73	3
Promote the creation of disaster-related or climate change committees or groups	67	2
Fewer possibilities to participate in social/cultural/leisure/religious and sports activities	96	4
Increased participation in spiritual activities, prayer services, etc.	206	7
Disappearance of sites considered a heritage of the community	39	1
Increasing conflicts between community members	45	2
Increasing crime in the community	33	1
None	2,254	81
Other	2	-

Table 28. *Displaced people due to slow-onset events, 2023*

Displaced people	People
People displaced	151
People displaced per HH	4

Table 29. *Crops planted by households, 2023*

Crop	Total HH	Total HH (%)
Taro	724	56
Maniota	386	30
Bananas	488	38
Pawpaw	235	18
Vegs	517	40
Lemons	97	7
Pineapple	75	6
Other	88	7

Table 30. *Economic losses in crops associated to climate change and natural disasters, 2023*

Crop	Planted area (m ²)	Harvested area (m ²)	Losses value (NZ\$)
Taro	92,644	44,960	7,300
Maniota	23,074	11,940	2,140
Bananas	10,493	7,901	2,690
Pawpaw	3,609	1,049	50
Vegetables (tomatoes, cucumbers, cabbages, etc.)	29,951	23,603	8,880
Lemons	77	64	-
Pineapple	1,054	194	-
Other	9,502	3,508	10,000

Table 31. *Reasons for crop losses associated with climate change and natural disasters, 2023*

Harvest losses reason	Total HH	Total HH (%)
Too little or no rain (drought)	143	11
Flooding from too much rain	12	1
Strong winds/Storm/Cyclone	15	1
Flooding from sea (king tides/storm surge)	-	-
Landslide	-	-
Temperature too hot	16	1
Temperature too cold	-	-
Wildfire	-	-
Pest/disease	13	1
Other	222	17

Table 32. Economic losses in agricultural tools and equipment due to climate change and natural disasters, by crop, 2023

Crops	Losses (NZ\$)	Losses/HH (NZ\$)	Total HH
Taro	-	-	724
Maniota	30,620	80	386
Bananas	6,120	13	488
Pawpaw	-	-	235
Vegetables (tomatoes, cucumbers, cabbages, etc.)	6,120	12	517
Lemons	-	-	97
Pineapple	-	-	75
Other	-	-	88
Total	42,870	33	1,298

Table 33. Livestock raised by households, 2023

Livestock	Total HH	Total HH (%)
Pigs	1,086	92
Poultry/Chickens	112	10
Goats	211	18
Cows	31	3
Other	29	3

Table 34. Value of livestock losses due to climate change and natural disasters, 2023

Livestock	Value (NZ\$)
Pigs	56,750
Poultry/Chickens	2,760
Goats	6,020
Cows	-
Other	-

Table 35. Reasons for livestock losses associated with climate change and natural disasters, 2023

Livestock losses reason	Total HH	Total HH (%)
Too little rain/drought	22	16
Flooding from too much rain	6	5
Strong winds/Storm/Cyclone	-	-
Flooding from the sea (king tides/storm surge)	-	-
Landslide	-	-
Temperature too hot	31	23
Temperature too cold	-	-
Wildfire	-	-
Pest/Disease	42	32
Other	24	18

Table 36. Value of losses in livestock tools and equipment due to climate change and natural disasters, 2023

Livestock	Losses (NZ\$)	Losses/HH (NZ\$)	Total HH
Pigs	30,6220	28	1,086
Poultry/Chickens	-	-	112
Goats	6,120	29	211
Cows	-	-	31

Table 37. Fish and aquaculture species caught by Households, 2023

Species	Total HH	Total HH (%)
Fish (reef)	609	52
Fish (ocean/pelagic)	294	25
Tupa (crabs), koura (crayfish/lobster/shrimp) or other crustaceans	174	15
Paua or other shellfish	212	18
Remu	15	1
Other	-	-

Table 38. Value of losses in fisheries/aquaculture equipment due to climate change and natural disasters, by species captured, 2023

Species	Losses (NZ\$)	Losses/HH (NZ\$)
Fish (reef)	13,360	45.4
Fish (ocean/pelagic)	-	-
Tupa (crabs), koura (crayfish/lobster/shrimp) or other crustaceans	-	-
Paua or other shellfish	-	-
Remu	-	-
Other	-	-

Table 39. Changes in fish and aquaculture species availability, by species, 2023

Species	More than usual	Less than usual	About the same	More than usual (%)	Less than usual (%)	About the same (%)
Fish (reef)	46	237	311	4	18	24
Fish (ocean/pelagic)	27	155	114	2	12	9
Tupa (crabs), koura (crayfish/lobster/shrimp) or other crustaceans	-	38	136	-	3	10
Paua or other shellfish	2	100	110	-	8	8
Remu	-	4	12	-	-	1

Table 40. *Reasons for fisheries/aquaculture losses associated with climate change and natural disasters, 2023*

Fisheries/Aquaculture losses reason	Total HH	Total HH (%)
Flood from too much rain	17	3
Flood from king tides/storm surge	10	2
Strong winds/Storm/Cyclone	64	12
Low sea level (very low tides)	94	18
Large waves/seas/swell	126	24
Temperature too hot	372	70
Temperature too cold	133	25
Coral bleaching	65	12
Other	39	7

Table 41. *Retreat adaptation measures adopted by Households, 2019–2023*

Adaptation measures	Total HH	Total HH (%)
We relocated our house to another area/locality in the same island without a managed retreat approach	97	2
We relocated our house to another island in the same country without a managed retreat approach	8	-
Our house was relocated to another area/locality in the same island under a managed retreat approach	15	-
I do not know	98	2
None of the above	4,542	95
Other	24	1

Table 42. *Adaptation measures adopted by Households to defend dwellings from flooding, 2019–2023*

Adaptation measures	Total HH	Total HH (%)
Construct embankments/levees around the house	163	3
Improve drainage system	590	12
Improve gardens to safety redirect water	172	4
Use roofs capable of coping with the high intensity rainfall events using impact and moisture resistant materials	297	6
Reinforce house structure	414	9
Maximize use of water-resistant materials	106	2
Raise floor heights	65	1
I do not know	70	2
None of the above	3,557	74
Other	33	1

Table 43. *Adaptation measures adopted by Households to defend productive activities, 2019–2023*

Adaptation measures	Total HH	Total HH (%)
Reforest in areas likely to flood	99	2
Enrich the soil with organic matter	130	3
Improve irrigation system and did local dams	236	5
Substitute crops with drought and salt resistant cultivars	35	1
Incorporate agro-forestry, shade and inter-cropping	31	1
Prepare vegetal material in nurseries	122	3
Strengthen/upgrade land infrastructure used for agriculture	191	4
Select animals and/or species that are more resistant to heat and disease	31	1
Reinforce touristic assets (lodges, restaurants, hotels, beach facilities)	31	1
I do not know	131	3
None of the above	4,090	86
Other	21	-

Table 44. *Adaptation measures adopted by Households to defend freshwater availability, 2019–2023*

Adaptation measures	Total HH	Total HH (%)
Install water tanks/capture and distribution facilities	1,808	38
Install filtering systems in the water supply to the house	973	20
I do not know	65	1
None of the above	2,629	55
Other	10	-

Table 45. *Adaptation measures adopted by Households to co-exist with the impacts of climate change, 2019–2023*

Adaptation measures	Total HH	Total HH (%)
Family member participated in education and public awareness campaigns	579	2
Family members trained and enrolled in volunteer/comunitarian emergency and relief teams/groups	375	3
Family members enhanced labor and professional skills	86	5
Family members remained attentive of warning systems	937	1
My family had disaster management plan and evacuation plan	433	1
Family members had their vaccination schedule up to date	344	3
Children attended risk reduction programs at school	89	4
Family members participated in disaster simulation exercises	247	1
My family changed food consumption habits	107	1
I do not know	126	3
None of the above	2911	86
Other	2	-

Table 46. *Adaptation measures adopted by Households for their productive activities co-exist with the impacts of climate change, 2019–2023*

Adaptation measures	Total HH	Total HH (%)
Farm on higher ground to avoid flood-prone areas	151	3
Adopt vertical farms	13	-
Grow crops undercover	81	2
Diversity cropping species	18	-
Adjust planting and harvest or fishing dates	255	5
Regulate the use of agritoxics that exterminate pollinizers	12	-
Participate in financial and technical assistance programmes	77	2
Constitute women's groups to plant HH gardens, recover women's ancestral knowledge, etc.	22	1
Sought paid jobs in the other sectors less exposed to climate change	24	1
Introduce aquaculture projects	25	1
I do not know	174	4
None of the above	4,105	86
Other	16	-

Table 47. *Adaptation measures adopted by Households to co-exist with the impacts of climate change on freshwater, 2019–2023*

Adaptation measures	Total HH	Total HH (%)
Install water filtering systems	1,065	22
Install tanks to supplement the HH reticulated water supply system	1,201	25
Support community projects or programs to improve supply of water during droughts	494	10
I do not know	52	1
None of the above	2,806	59
Other	7	-

Table 48. *Households' opinion about the effectiveness of adaptation measures adopted, 2023*

Opinion	Total HH	Total HH (%)
Yes, adaptation measures strongly reduced the impact of climate change	637	13
Yes, adaptation measures somewhat reduced the impact of climate change	1,702	36
No, adaptation measures not very much reduced the impacts of climate change	1,187	25
No, adaptation measures did not at all reduce the impact of climate change	686	14
I do not know	572	12

Table 49. *Type of support Households have received to adapt to climate change, 2023*

Type of support	Total HH	Total HH (%)
Subsidies, loans, grants, insurance, etc.	63	10
Programs and projects aimed at women, children and elderly	20	3
Technical assistance/support to adapt economic/income activities	6	1
Support to improve food security	36	6
Support to improve the HH dwellings and infrastructure	68	11
Support from the community strengthening and organisation	115	18
None	231	37
I do not know	208	33
Other	16	2

Table 50. *Type of organisation providing support to Households for adapting to climate change, 2023*

Organisation	Total HH	Total HH (%)
Government	126	20
NGO (Non Government Organisations)	8	1
Private sector	27	4
International organizations	0	-
Local community/civil society organization	65	10
Faith-based groups	0	-
I don't know	156	25
Other	5	1

Table 51. *Households' opinion about the support received to adapt to climate change, 2023*

Opinion	Total HH	Total HH (%)
Was good and sufficient for adapting to climate change	128	65
Was not enough for adapting to climate change	55	29
I do not know	11	6

Table 52. *Personal challenges preventing Households from implementing adaptation measures, 2023*

Opinion	Total HH	Total HH (%)
Lack of physical skills (running, swimming, etc.)	343	7
Lack or low education level	317	7
Lack or difficulty in access and control of clean water, firewood, land, productive assets, bank account, financing, etc.	175	4
Lack of other abilities (build or fix infrastructure, internet use, technologies use, etc.	251	5
High dependency on forest products, water, or other natural resources compromised because of natural disasters and climate change	59	1
Little influence on decision-making during and after natural disaster events	355	7
Lack of time for find a job or participate in adaptation programmes	422	9
Long distance of my dwelling to main road	29	1
Long distance of my dwelling to town	52	1
None of the above	3,311	69
Other	30	1

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