

GENDER AND ENVIRONMENT SURVEY 2022 Report

Kingdom of Tonga



Aknowledgements

The Tonga Gender and Environment Survey (2022) was implemented by the Tonga Statistics Department, under the executive leadership of Sione Lolohea. The survey was managed by Lupe Moala Tupou, who oversaw its planning, operations and roll out. Telekaki Latavao, Falemasiva Fonua, Faka'anaua Mafile'o, Fatai Kaufusi and Talaivosa Falepaina supervised enumerators for survey implementation. A total of 37 enumerators and supervisors rolled out the survey on the ground. The data sampling was carried out with the support from Bertrand Buffiere, from the Pacific Community (SPC). The SPC team, including Kim Robertson, Alison Culpin and Winston Fainga'anuku, also supported the server management for data storing during data collection and advised on survey operations. Iranmae Labucal and Kanza Ahmed supported the enumerator training. Anthony Burgard and Sanghyun Jeon, working for UN Women, managed survey scripting and CAPI processes. The UN Women team, under the leadership of Sara Duerto Valero, conceptualized the survey, designed guidance materials, and co-financed the survey with the Tonga Statistics Department and with the support of Australian DFAT. Sara Duerto Valero, Anthony Burgard, Sanghyun Jeon and Lupe Moala Tupou drafted this survey report. Tsz Yu Chang provided fact-checking support. Mary Ann Perkins edited the report and Blossom.it designed the report. The TSD and UN Women teams are grateful to Australian DFAT for their financial support through the Building Back Better project, to all donors contributing to the Women Count programme, as well as to the women and men in Tonga who spared their time to respond to the survey questions.

Table of Contents

Acronyms	4
Introduction	5
Objective and survey scope	5
Geographical scope	6
Reference period	6
Sampling procedure	6
Sampling frame	7
Field operations	8
Data processing	8
General characteristics of the population	9
Findings	10
I. Disasters	10
Impacts on women and men	
Preparedness and coping	
II. Climate Change	20
Impacts on women and men	
Preparedness and coping	
III. Environment-related livelihoods	28
Dependency rates	
Effects on livelihoods	
Inequalities	
Health effects and safety	
IV. Environmental conservation and degradation	38
Land management	
Fishing practices	
Aquaculture	
Forest practices	
Mining	
Household practices	
Inequalities in natural resource management and decision-making	

Acronyms

CAPI	Computer-assisted Personal Interviewing
COVID-19	Coronavirus disease of 2019
GES	Gender and Environment Survey
PHC	Population and Housing Census
PTSD	Post-traumatic stress disorder
SPC	Pacific Community
TSD	Tonga Statistics Department
UN Women	United Nations Entity for Gender Equality and the Empowerment of Women

Introduction

The 2022 Gender and Environment Survey (GES) Tonga is a comprehensive national household survey exploring the multidimensional relationship of women and men with the environment in the Kingdom of Tonga. The survey estimates household and individual level exposure to the immediate consequences of recent disaster events and the prolonged impacts of climate change. It also evaluates the reciprocal influences of both women and men on the environment through their daily economic activities and livelihoods.

The 2022 GES Tonga was implemented by the Tonga Statistics Department (TSD) with support from the United Nations Entity for Gender Equality and the Empowerment of Women (UN Women). The content of the survey was based on guidelines provided by UN Women, including the Model Questionnaire for Measuring the Nexus between Gender and Environment¹, and adapted for the Tongan context in consultation with national stakeholders from the Ministry of Internal Affairs; the Ministry of Meteorology, Energy, Information, Disaster Management, Environment Climate Change and Communications; the Ministry of Fisheries; and the Ministry of Agriculture, Food and Forests; as well as civil society groups, including the Tonga National Centre for Women and Children and the Women and Children Crisis Centre Tonga. Estimates from this survey provide sex-disaggregated data for national and global monitoring frameworks, including the 2030 Agenda for Sustainable Development, the Sendai Framework for disaster risk reduction and the Global Set of Climate Change Statistics and Indicators.

The data collection and analysis took place following one of the largest recent volcanic eruptions in the Tongan archipelago in January 2022, situated just 70 kilometres from Nuku'alofa, the capital city. Plumes from the eruption spread over the 'Eua, Ha'apai, Vava'u and the Niua island groups, and a resulting tsunami crossed the Pacific, affecting the neighbouring countries of American Samoa, Fiji and Vanuatu. The findings reflect on the vulnerability of the Pacific region to frequent disaster events, the long-term impacts of climate change and the individual experiences of women and men who are confronted daily with these impacts.

OBJECTIVE AND SURVEY SCOPE

The main objective of the 2022 GES Tonga is to provide nationally representative and sex-disaggregated statistics across several thematic areas. These areas include household-level data on housing characteristics and individual-level data for women and men respondents. The individual-level data span various themes such as personal attributes, exposure to and experience of disasters and hazards, the impact of climate change, agriculture and land use, and environment-related livelihoods. The 2022 GES Tonga largely adheres to international guidelines, as outlined in the Model Questionnaire for Measuring the Nexus between Gender and Environment, with adaptations specific to Tonga that incorporate modules at the household and individual levels.

1 Model Questionnaire: [Measuring the Nexus between Gender and Environment](#)

MODULE	DESCRIPTION	LEVEL
1	Household roster	Household
2	Housing characteristics	Household
3	Individual characteristics	Individual
4	Disaster exposure, preparedness, and consequences	Individual
5	Exposure to, and preparedness for, climate change-related effects	Individual
6	Agriculture and land use	Individual
7	Environment-related livelihoods	Individual

The complete questionnaire for the 2022 GES Tonga is available from data.unwomen.org.

GEOGRAPHICAL SCOPE

In developing the sample design for the 2022 GES Tonga, one of the primary goals was to achieve a wide geographic representation, including the most remote areas, to better understand the frequency and long-lasting effects of disasters and climate change. Tonga comprises 169 islands, of which 36 are inhabited, spread across nearly 800 kilometres from north to south. Each area may have unique microclimates and risks related to disasters and climate change. Therefore, the sample was designed to represent all six major inhabited regions of the country: Tongatapu (both urban and rural areas), Vava'u, Ha'apai, 'Eua and Niua.

Within each geographic region, the 2022 GES Tonga considered all private household units as eligible and targeted individual-level interviews with adult household members 18 years or older.

REFERENCE PERIOD

Field data collection for the 2022 GES Tonga occurred from 31 October 2022 to 9 January 2023. Most data items have a 12-month reference period from the date of the interview. The questionnaire explicitly notes those data items that deviate from the 12-month reference period, such as those associated with slow-onset processes like climate change. Across the findings presented in this report, the reference period is, in principle, the 12 months prior to the data collection. Where the reference period differs, it will be indicated in each graph explicitly.

SAMPLING PROCEDURE

Sample selection for the 2022 GES Tonga was conducted as part of the three-stage probability sample design from which 2,541 households were chosen. In the first stage, 229 census units were selected from six regional strata proportional to the total number of households: Tongatapu Urban - Nuku'alofa, Tongatapu Rural, Vava'u, Ha'apai, 'Eua and Niua. In the second stage, 12 households were randomly selected from each selected census unit. In the third stage, one adult woman and one adult men (age 18 years or older) were randomly selected from the household roster to respond to the survey. Overall, the survey was administered to 2,136 women and 2,014 men.

SAMPLING FRAME

The survey utilized a sampling frame based on listing 18,847 private households in 803 enumeration areas in the 2021 Population and Housing Census of Tonga (2021 PHC), with no specific geographic areas being excluded. Information in the sampling frame included geographic codes relating to the location of the household and the name of the head of household.

As the sampling frame did not contain information on the individual members of the household, one random adult man and one random adult woman were chosen from the household demographic table gathered during the 2022 GES Tonga survey interview. Before this selection, the list of household members was narrowed down to only include adults (age 18 years and older), grouped by sex. One female respondent was randomly selected from the adult women, and one male respondent was randomly selected from the adult men. In instances where there were no eligible respondents within a specific subgroup, no interviews were conducted. In single-adult households, only one person was selected for an interview, regardless of their sex.

GEOGRAPHICAL AREAS	2021 PHC LEVEL		2022 GES TONGA		
	NO. OF HOUSEHOLDS	NO. OF ENUMERATION AREAS	SAMPLE SIZE (HOUSEHOLDS)	WOMEN INTERVIEWED	MEN INTERVIEWED
Tongatapu Urban - Nuku'alofa	4,069	181	552	450	432
Tongatapu Rural	9,636	411	624	534	491
Vava'u	2,790	122	528	464	445
Ha'apai	1,157	57	384	320	291
'Eua	931	19	288	236	230
Niuas	264	13	168	132	125
Tonga	18,847	803	2,544	2,136	2,014

To account for different probabilities of selection, sampling weights are calculated for each private household in the sample and for each randomly selected female and male respondent. The 2022 GES Tonga weights are corrected for non-response and calibrated using the number of private households and individuals by region from the 2021 PHC.

FIELD OPERATIONS

All data in the 2022 GES Tonga were collected via the Computer Assisted Personal Interview (CAPI) method, using the World Bank's Survey Solutions software application, by a group of trained enumerators and supervisors. Supervisors were recruited internally by the Tonga Statistics Department with the criteria of having past field data collection experience. The most experienced supervisors were placed in the most remote regions to ensure the quality of responses as the lack of internet and phone connectivity limited field teams' ability to receive real-time feedback. Before the data collection period, all supervisors and enumerators completed a two-week training session covering the concepts, definitions and field procedures.

Survey Solutions was used to design the questionnaire form, and quality assurance was conducted using in-built survey management functionalities. Daily monitoring reports were compiled using R statistical software at the national level and distributed to each field team, providing feedback on the interview status, pending interview appointments and major data inconsistencies for review. Data collection was facilitated by a server hosted by the Pacific Community (SPC) in New Caledonia.

The survey manager, Ms Lupe Moala Tupou of TSD, led quality assurance and oversaw a team of six supervisors and 31 enumerators in the field. Supervisors were distributed across regions proportional to the sample size and were responsible for checking interview completeness, arranging and following up on household interview appointments and validating responses in completed interviews. Data quality checks were conducted in line with the procedures outlined in the [Enumerator's manual](#) for 2022 GES Tonga.

In 2022 GES Tonga, the household response rate was 94.6 percent. From these households, 2,136 adult women and 2,014 adult men were randomly selected for individual interviews, representing 96.9 and 90.8 percent of the respective women and men within the responding households. While extraordinary efforts were taken to track down households who relocated due to disaster events, some households could not be contacted after repeat visits, or dwellings were found to be no longer occupied.

DATA PROCESSING

Data processing for the 2022 GES Tonga was conducted in R and STATA statistical software. These processes included steps for data cleaning, validation, internal and external coherence checks, the computation of sampling weights and the calculation of survey estimates. Where data disaggregation by sex showcased differences between women and men, these were tested for statistical significance. Notes have been included under graphs in which the differences are not statistically significant.

Inconsistencies found during data processing were referred to the survey manager for reconciliation and, in some cases, follow-up with the household. Ultimate editing decisions were made by TSD after consultations with field staff and individual respondents.

General characteristics of the population

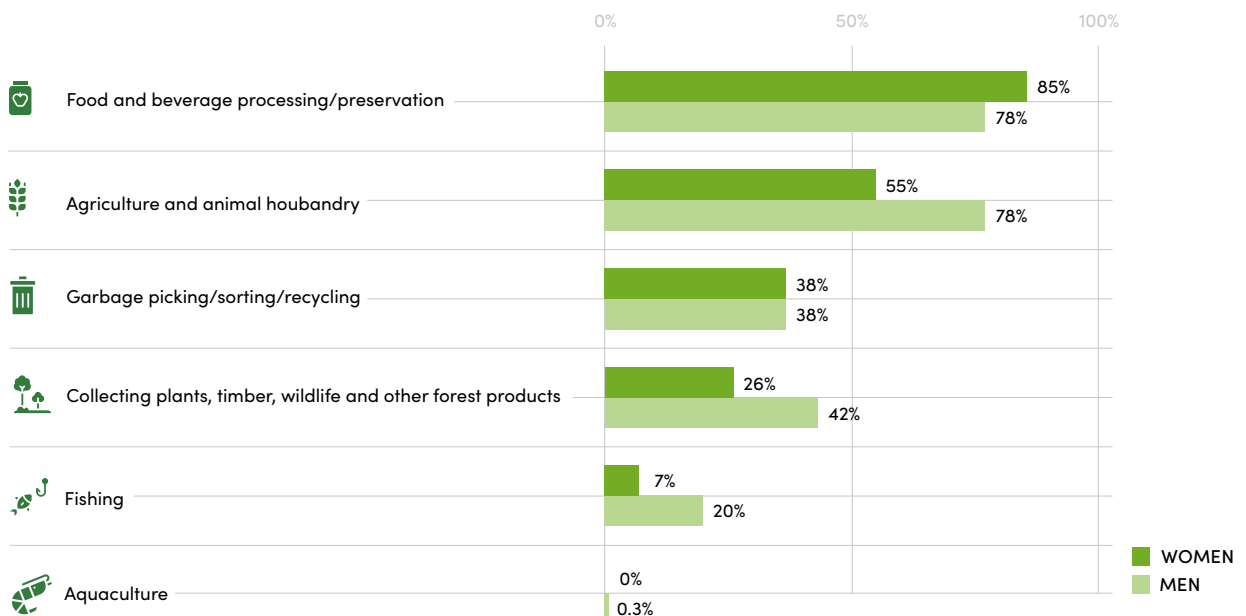
According to the 2021 Population and Housing Census of Tonga, there are 18,847 occupied private households, comprising a total population of 100,179 individuals.



The bulk of the households in Tonga (62 per cent) are made up of two adults and children. An estimated 11 per cent of households are women living alone with children, compared to 2 per cent of households composed of men living alone with children.

A large share of the Tongan population depends on the environment for their livelihoods. Food and beverage processing, preservation, and storage is the most common environment-related livelihood among women. Agriculture and animal husbandry is the most common among men.

Figure 1: Proportion of adult population engaged in environment-related livelihoods, by sex (percentage)



All survey respondents had experienced climate change and at least one disaster. Most individuals had experienced at least four disasters.

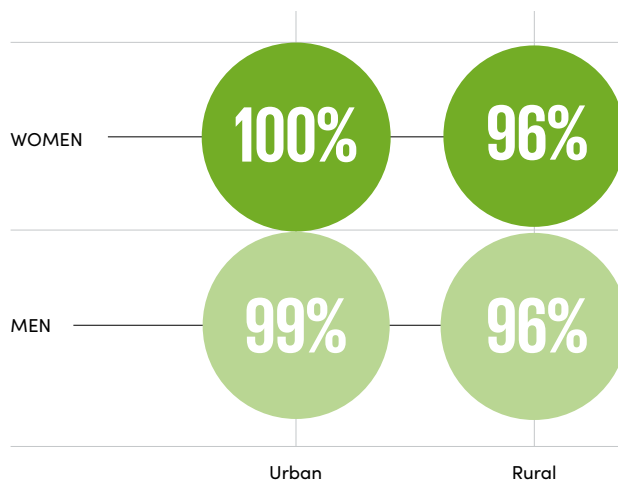
Findings

I. Disaster exposure, preparedness and consequences

ALMOST EVERYONE IN TONGA LIVES IN AREAS WITH HIGH ENVIRONMENTAL RISK.

An estimated 97 per cent of the population in Tonga live in areas with high environmental risk, such as proximity to flood-prone areas and lowlands, active volcanoes, industrial production facilities, and others. This renders people highly vulnerable to disasters and other harmful events. Women in urban areas the most exposed. Women’s coping capacities in the event of a hazard or disaster, in addition, are generally lower, as they are less likely than men to own productive assets, have access to financing, and hold high-income jobs.

Figure 2: Proportion of population whose dwelling unit or land is located in areas with high environmental-risk, by sex and location (percentage)

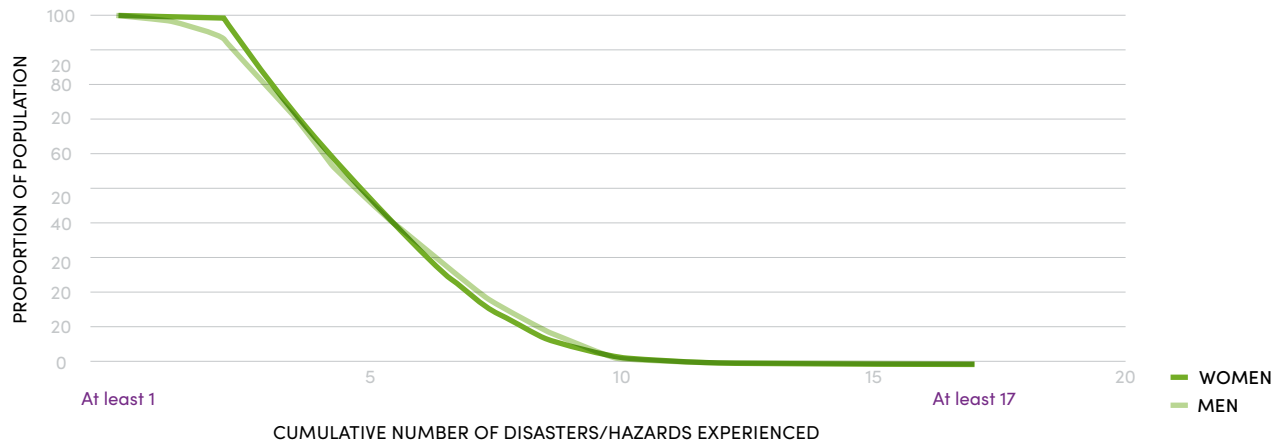


Note: the urban differences between women and men are statistically significant at $\alpha=0.05$. All differences from here onwards are statistically significant unless otherwise indicated.

MOST PEOPLE IN TONGA EXPERIENCED A DISASTER IN THE PAST 12 MONTHS, AND MANY EXPERIENCED MULTIPLE.

At the end of 2022, almost 100 per cent of the population in Tonga had experienced at least one disaster in the past 12 months, and as many as 93 per cent of people had experienced 3 or more disasters or related hazards. The eruption of the Hunga Tonga–Hunga Ha'apai volcano, which brought along ashfall, acid rain, and heavy storms, left many experiencing power cuts, lack of water, and limited access to numerous essential services. Earthquakes, severe thunderstorms and extreme wind episodes were also experienced by large proportions of the population in the 12 months prior to the survey.

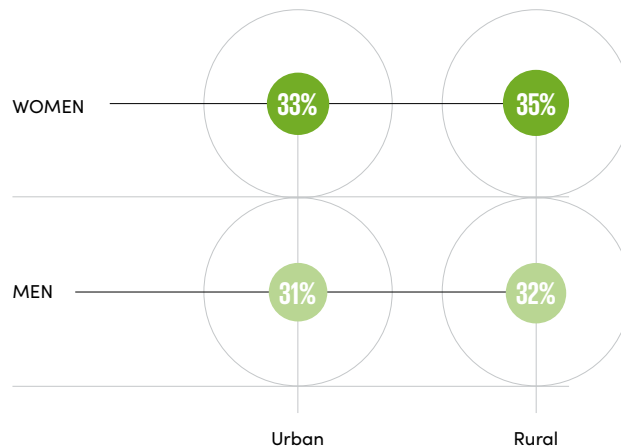
Figure 3: Proportion of the population that experienced at least one or more disasters or related hazards in the past 12 months, by sex (percentage)



Note: the COVID-19 pandemic has been excluded from the list of hazards for the calculation of the disaster statistics presented across this report.

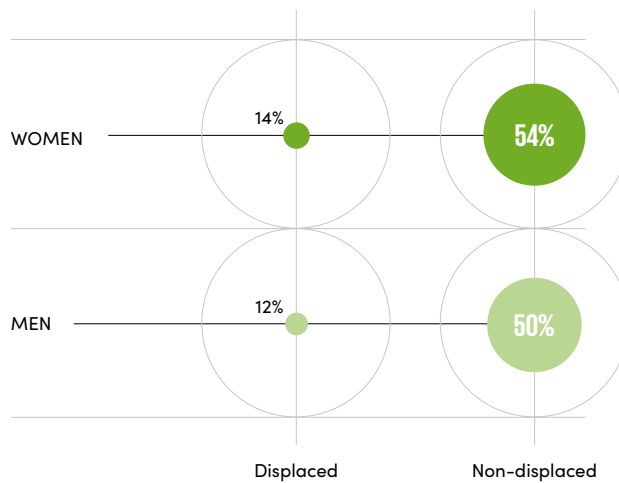
This resulted in more than one third of the population experiencing barriers to access medical care and hygiene products, for instance as a result of road closures, market unavailability, damaged transportation or lack of health services altogether. People in rural areas encountered additional challenges, with as many as 35 per cent of women and 32 per cent of men noting these challenges. These were less severe among those displaced by disasters and other hazardous events, including those that moved to a new location permanently and those experiencing pre-emptive evacuation, as shelters offered basic goods and services. Furthermore, people may have migrated to less-affected areas where there was less strain on healthcare systems.

Figure 4: Proportion of the population exposed to hazards in the past 12 months who encountered barriers to accessing medical care or hygiene products as a result, by sex and location (percentage)



Note: In 2022 GES Tonga, a hazard is defined as any process, phenomenon, or human activity that poses a potential threat to life, health, property, or the environment. Being exposed to a hazard means that an individual has been in a location—such as a city, village, or field—where they have personally witnessed the event.

Figure 5: Proportion of the population exposed to hazards in the past 12 months who encountered barriers to accessing medical care or hygiene products as a result, by sex and displacement status (percentage)



MORE THAN 9 IN 10 WOMEN EXPERIENCED MENTAL HEALTH ISSUES AS A RESULT OF DISASTERS.

When exposed to disasters or other hazards, individuals may experience mental health issues such as stress reactions, grief, depression, post-traumatic stress disorder (PTSD), or anxiety, including related to uncertainties about meeting basic needs for food, water, or medical care. In Tonga, as many as 92 per cent of women and 85 per cent of men exposed to disasters and related hazards experienced such feelings. The disproportionate impacts of hazards on women may be due to their heightened vulnerability, which renders them ill-equipped to cope with the effects on their livelihoods; as well as the heavier burden on women to care for those who are ill or injured as a result of disasters. The 2022 disasters in Tonga caused multiple injuries and illnesses. For instance, an estimated 0.2 per cent of people experiencing acid rain sustained injuries as a result, while 0.8 per cent of women and 0.7 per cent of men contracted illness. Other events, such as the 2022 tsunami and floods, also left numerous injuries.

Figure 6: Proportion of the population exposed to hazards in the past 12 months whose mental health was affected as a result, by sex (percentage)



DISASTERS CAUSED SEVERE DAMAGE TO PEOPLE'S LIVELIHOODS, WITH WOMEN AND MEN AFFECTED DIFFERENTLY.

As many as 46 per cent of women and 59 per cent of men reported that the crops they grow were damaged or destroyed, and more than 5 per cent of those raising livestock saw their animals contracting serious illness or dying as a result of disasters. Since many people in Tonga rely largely on environment-related activities as a source of income, the 2022 disasters had devastating effects for people's livelihoods. Men were more likely to see their crops and livestock affected overall, as they typically run larger agricultural operations compared to women (figure 7). Women, however, were more likely to note that their personal income had decreased as a result of disasters or exposure to hazards. This is largely because their incomes are substantially reliant on environmental resources: for 9 of every 10 women whose crops were damaged or destroyed, agriculture was their main source of income, compared to 8 for every 10 men (figure 8). In addition, women generally own fewer productive assets than men and are therefore more likely to encounter barriers to access loans and other forms of credit, which reduces their coping capacities to deal with these disasters.

Figure 7: Proportion of the population exposed to hazards in the past 12 months whose livelihoods were damaged or destroyed, by sex and whether this was main source of income (percentage)

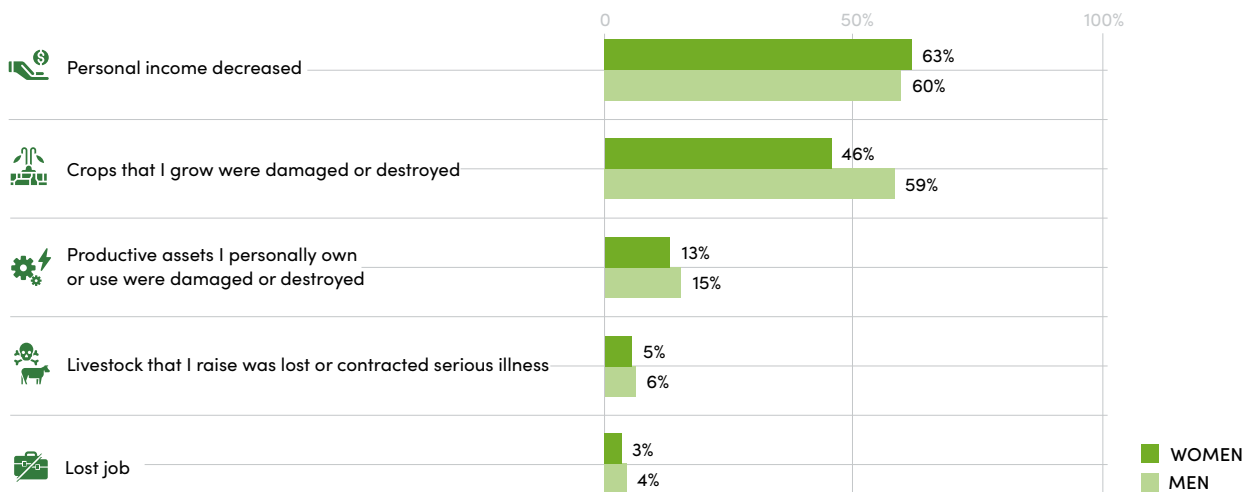
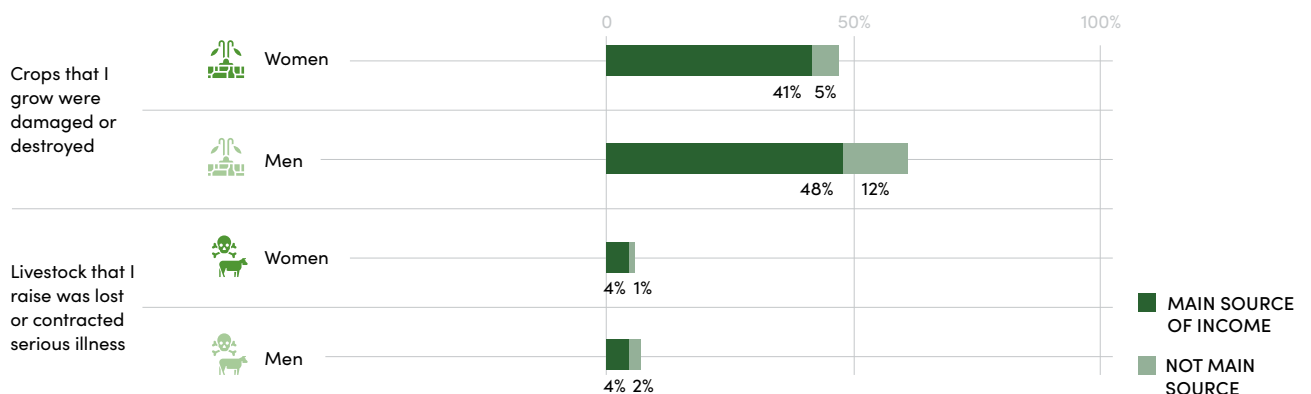


Figure 8: Proportion of the population exposed to hazards in the past 12 months whose crops and livestock were damaged or destroyed, by sex and whether or not these were their main sources of income (percentage)

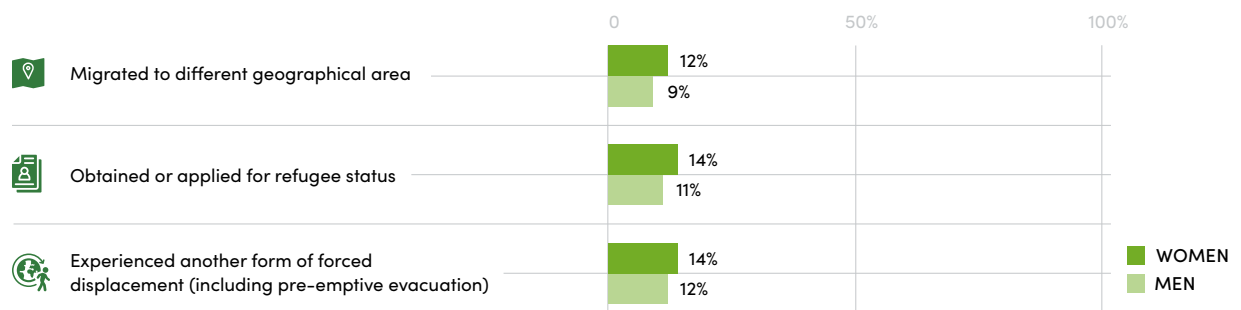


The multiple disasters that affected the country in 2022 left 4 per cent of people unemployed, and many more had to switch jobs as a result. Mobility restrictions, road closures, health-related hazards associated with outdoor exposure to acid rain, and heavy domestic and care work burdens exacerbated by disasters, such as the need to clean volcanic ashes or to care for those injured or sick, may all have worsened job and income losses. Many people also had to reduce their total working hours to tend to household chores and other responsibilities. The 2022 hydrometeorological and seismic events that took place in Tonga compounded the effects of the COVID-19 pandemic, which brought about general economic downturn and further contributed to job loss. An estimated 5 per cent of people lost jobs due to the compound effect of the COVID-19 pandemic, disasters and other hazards.

MULTIPLE DISASTERS IN TONGA IN 2022 PROMPTED MORE WOMEN THAN MEN TO MIGRATE.

The volcanic eruption, along with the flooding, toxic ashfall and tsunami that hit Tonga in 2022 caused widespread destruction. As many as 12 per cent of people saw damage in their dwellings and roughly 1 per cent reported their homes were destroyed. This, may have compounded the loss of livelihoods, prompting many to migrate. Although displacement was temporary (e.g. pre-emptive evacuation) for 14 per cent of women and 12 per cent of men in Tonga, many relocated permanently, either within or outside the country. Women were, overall, likelier than men to find themselves in displacement settings. Relocating may carry important economic and safety consequences for many, especially for single parents that flee or migrate with children, most of which were women.

Figure 9: Proportion of the population exposed to hazards in the past 12 months who experienced temporary or permanent displacement as a result, by sex and type (percentage)



DISASTERS WORSENERD UNPAID CARE AND DOMESTIC WORK BURDENS IN TONGA.

Unpaid domestic and care work burdens multiplied in Tonga as a result of the 2022 disasters and related hazards. With school closures and disaster-related injuries, many parents and care takers had no choice but to reduce their paid work hours or limit their own care, education and leisure time to care for those in need. As water sources were compromised and supply chains disrupted, food and water availability became scarcer, prompting many to spend more time procuring these items as well, or processing them for safe consumption. These increased burdens were

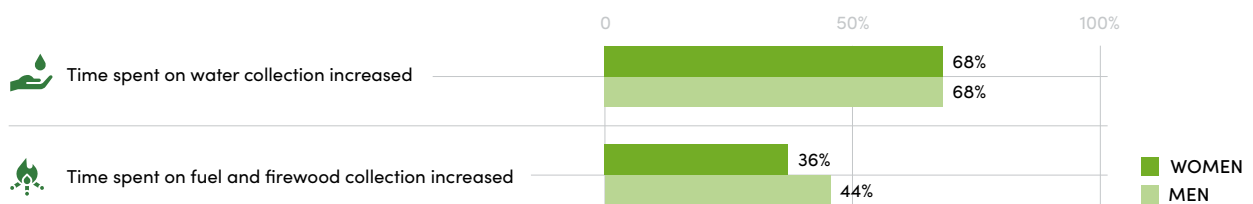
disproportionately shouldered by women. An estimated 77 per cent of women reported their unpaid care work burdens had worsened as a result of disasters, despite the fact that they were already doing the bulk of these chores before the disaster took place. In addition 80 per cent of women and 81 per cent of men noted increases in domestic work chores, ranging from cooking and cleaning (typically performed by women) to making household repairs or fixing animal shelters (more often performed by men).

Figure 10: Proportion of the population exposed to hazards in the past 12 months whose time spent on unpaid care and domestic work increased as a result, by sex and type (percentage)



As many as 56 per cent of women and 55 per cent of men who experienced disasters saw their water sources compromised, and 27 per cent of people noted that shortages affected their household's water use. This prompted many to have to go and fetch clean water. Water collection may carry health and safety concerns, both associated with carrying weights and walking long distances alone. In some instances, the water from some sources requires treatment before consumption, which is an additional time burden. The multiple overlapping crises in Tonga also affected the availability and use of clean fuels. An estimated 15 per cent of women and 16 per cent of men had to switch to unclean fuel sources for lighting, heating or cooking for more than two weeks. This may have been due to supply chain issues, or to changes in energy prices and cost of living, rendering clean fuels unaffordable for many. Using cheaper fuels, such as charcoal, wood and kerosene, worsens indoor air quality and puts those in charge of cooking and spending more time at home, such as women and children, at heightened risk of respiratory and cardiovascular disease. Although the increased water collection burdens were reportedly shared equally between women and men, more men reported that their time allocated to fuel collection had increased as a result of disasters or related hazards.

Figure 11: Proportion of the population exposed to hazards in the past 12 months whose time spent on water and fuel collection increased, by sex (percentage)



INFRASTRUCTURE DAMAGE IN HOUSING, ROADS AND THE ELECTRICAL GRID MAY HAVE REDUCED THE SAFETY OF MANY WOMEN.

The 2022 disasters had caused widespread damage on housing and infrastructure. As many as 12 per cent of people saw their dwellings damaged as a result, and more than half of the population (55 per cent) saw their drinking water source compromised. In addition 15 per cent of the population had to switch to unclean fuels for more than two weeks. Worse yet, as a result of disasters, 4 per cent of women and 5 per cent of men had to start sharing sanitation facilities with other households, while 1 per cent of women and 2 per cent of men had to switch to unimproved forms of sanitation, including public latrines and open defecation. The use of shared sanitation facilities, other poorly illuminated facilities, or facilities without locks puts people, especially women, at a heightened risk of assault. These safety concerns may have been compounded by disaster-related power cuts. Shortly after the eruption of the Hunga Tonga-Hunga Ha'apai volcano, extended power outages took place, which have occurred repeatedly since, even up to one year later, as volcano ash corrodes electrical cables. The lack of electricity and public lighting have compounded economic instability and other stressors, and may have worsened crime and safety across the country. An estimated 5 per cent of women and 6 per cent of men reported that crime had increased as a direct result of disasters, while 2 per cent knew someone that had been a victim of violence since.

Figure 12: Proportion of the population exposed to hazards in the past 12 months who saw their dwellings damaged or destroyed, by sex and level of damage (percentage)

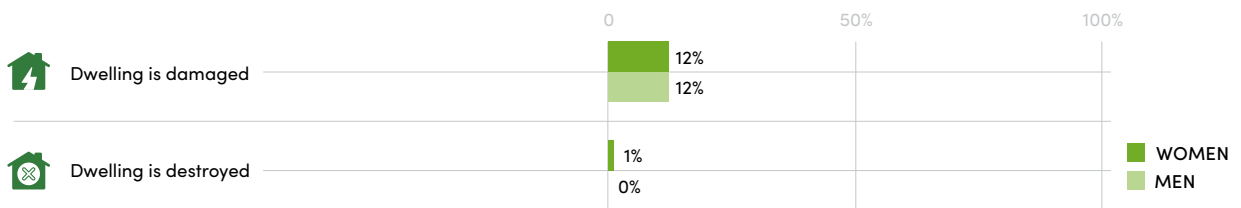
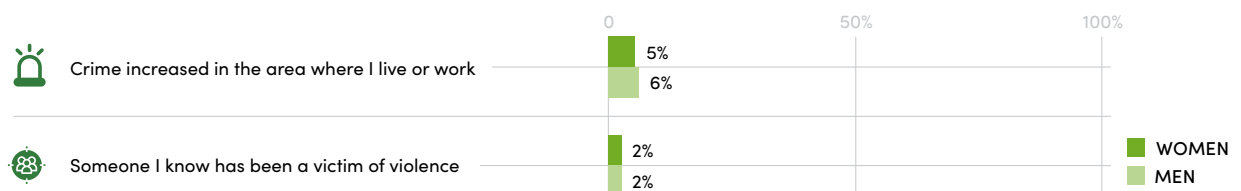


Figure 13: Proportion of the population exposed to hazards in the past 12 months who reported that crime or violence have worsened as a result, by sex and type of event (crime/violence) (percentage)



Infrastructure and road damage also affected access to public transportation, especially in rural areas, where more than 20 per cent of people noted having lost access to public transportation as a result of disasters and related hazards. Women, both in urban and in rural areas, were slightly likelier than men to lose access, which limits their mobility further, as they are less likely than men to own private vehicles, and the lack of transportation may further expose women to safety concerns. Losing access to public transportation in a situation in which public service interruptions may be widespread in the most affected areas, puts ill and injured people, elders and pregnant women at a disproportionate risk.

Figure 14: Proportion of the population exposed to hazards in the past 12 months who lost access to public transportation as a result, by sex and location (percentage)



WHEN PEOPLE RECEIVED EARLY WARNING OF HAZARDS, THIS PROVIDED VITAL PREPAREDNESS INFORMATION.

Roughly 83 per cent of women and 84 per cent of men received early warning information about extreme wind episodes, which helped them prepare for the upcoming events. In turn, the volcanic eruption and related acid rain, were among the least known forecasted hazards, with only 7 and 6 per cent of people, respectively, having advance information, mainly from the radio. People in rural areas have been less likely to receive early warning information, and this may have hampered preparedness. Differentials also exist on the likelihood of utilizing different information sources for early warning, with men more likely than women to rely on the radio and women more likely than men to use the internet or social media. The differentials between early warning sources are, in part, driven by different availability of household items. For instance, as many as 20 per cent of rural households did not have a working Internet connection prior to disasters taking place, which prevented them from using the Internet or social media to learn about the hazards.

Figure 15: Proportion of population exposed to hazards in the past 12 months who were able to access early warning information, by sex, location, and type of disaster (percentage)

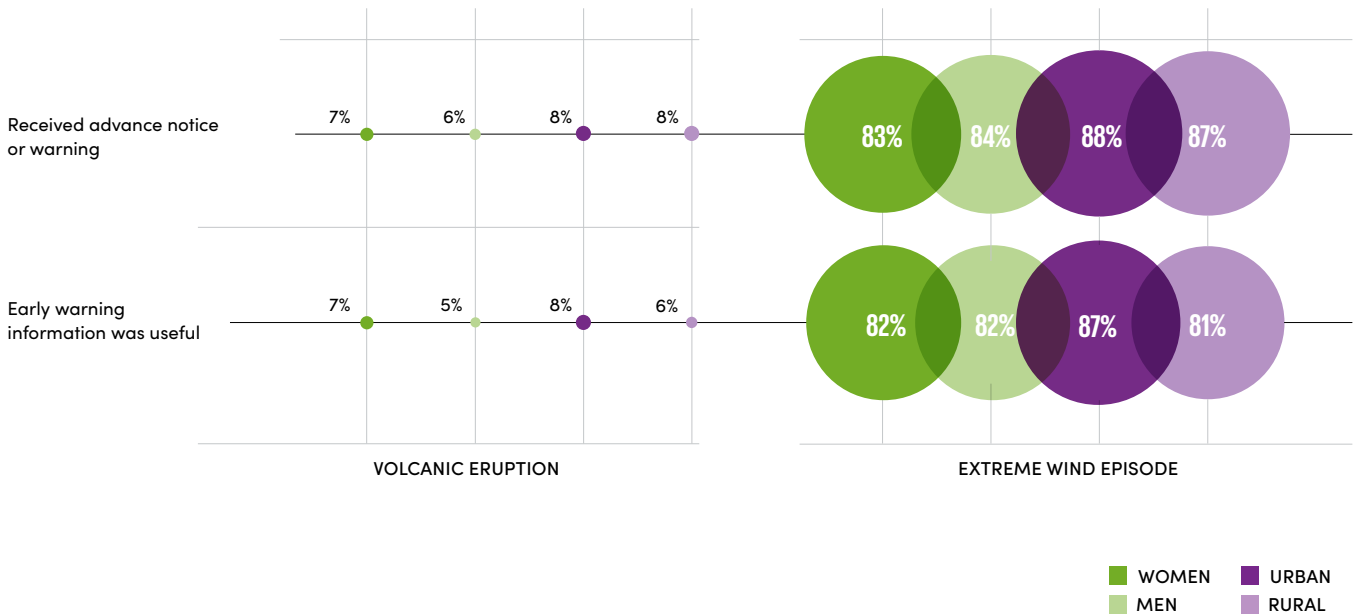
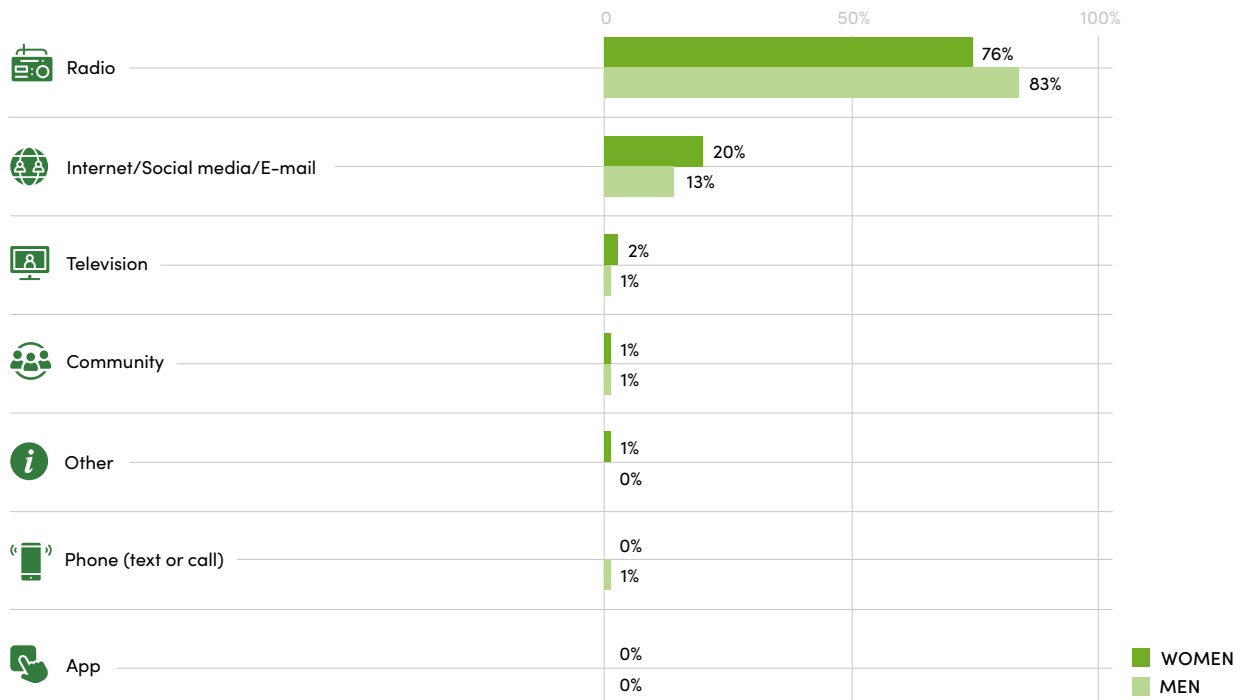


Figure 16: Proportion of the population exposed to hazards in the past 12 months who accessed sources of early warning information for extreme wind episodes, by sex and source (percentage)

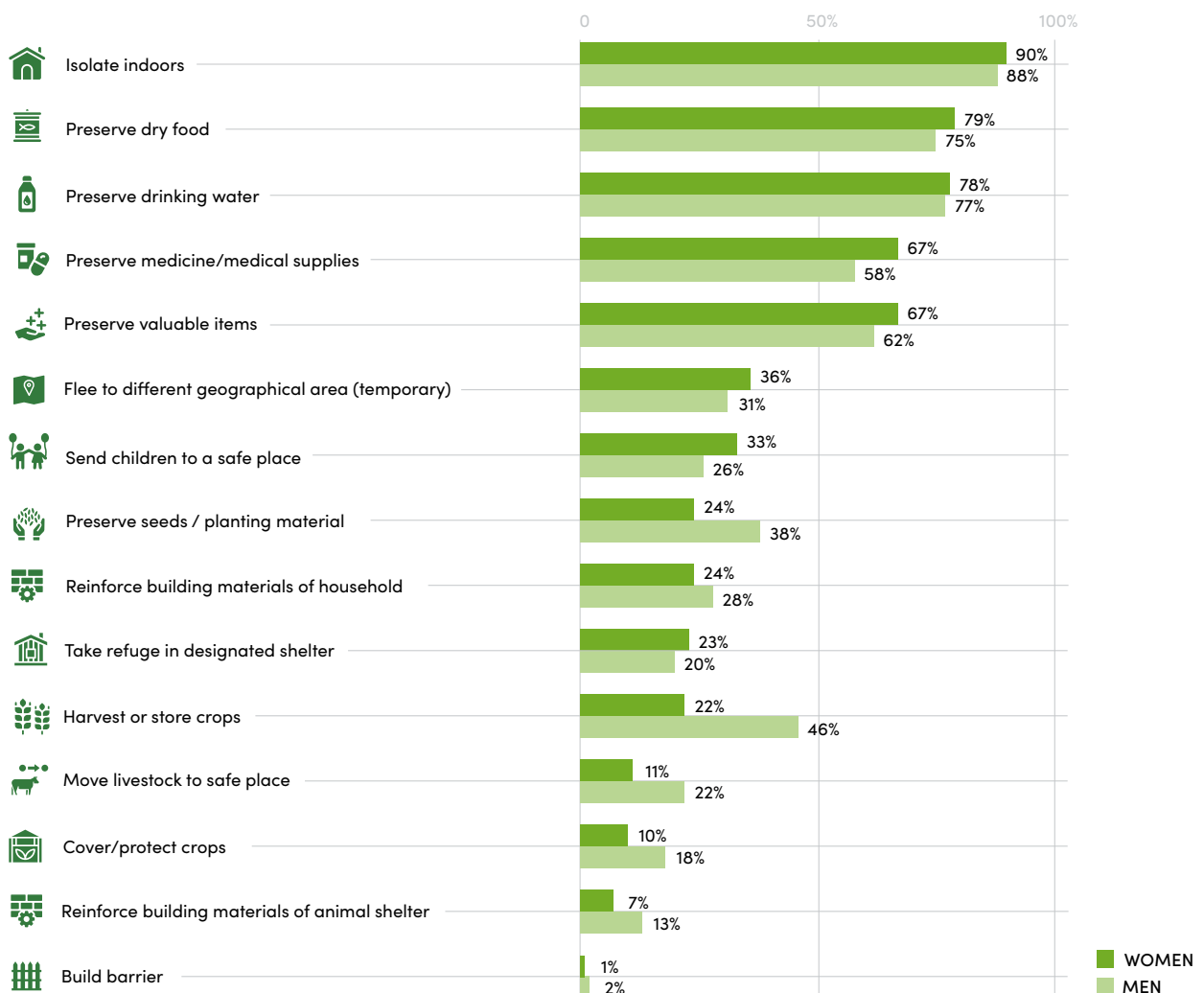


Note: the differences between women and men utilizing phones are not statistically significant at $\alpha=0.05$.

WOMEN AND MEN PLAYED VITAL BUT DIFFERENTIATED ROLES IN PREPARING FOR HAZARDOUS EVENTS.

Social norms often dictate the types of activities that women and men may engage with. For instance, women were often the ones in charge of preserving water, food, medicine and valuable items in preparation for hazardous events. This aligns with their disproportionate engagement in unpaid household chores such as cooking, cleaning and water treatment overall. They also were more likely than men to take the children to a safer place, or move elsewhere themselves (e.g. take refuge in a designated shelter or flee to a different area). Men, on the other hand, were disproportionately in charge of reinforcing their homes and animal shelters, as well as of covering crops, saving seeds, moving animals to a safer place and other agriculture related activities, given that they engage in agriculture more often than women in Tonga.

Figure 17: Proportion of population exposed to hazards in the past 12 months who put precautionary measures in place for disaster preparedness, by sex and type of measure (percentage)



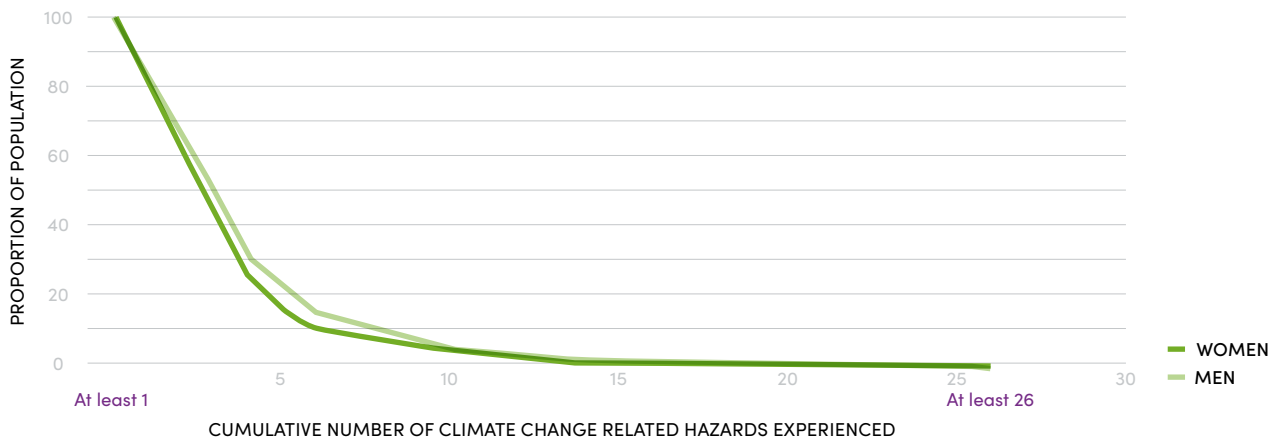
Note: The graph shows average percentages for all disasters and disaster-related hazards, with the exception of the COVID-19 pandemic.

II. Exposure and coping strategies to deal with the effects of climate change

CLIMATE CHANGE AFFECTED EVERYONE IN TONGA, MOST NOTICEABLY THROUGH SUSTAINED CHANGES IN TEMPERATURES, PRECIPITATION, AND SEA LEVEL RISE.

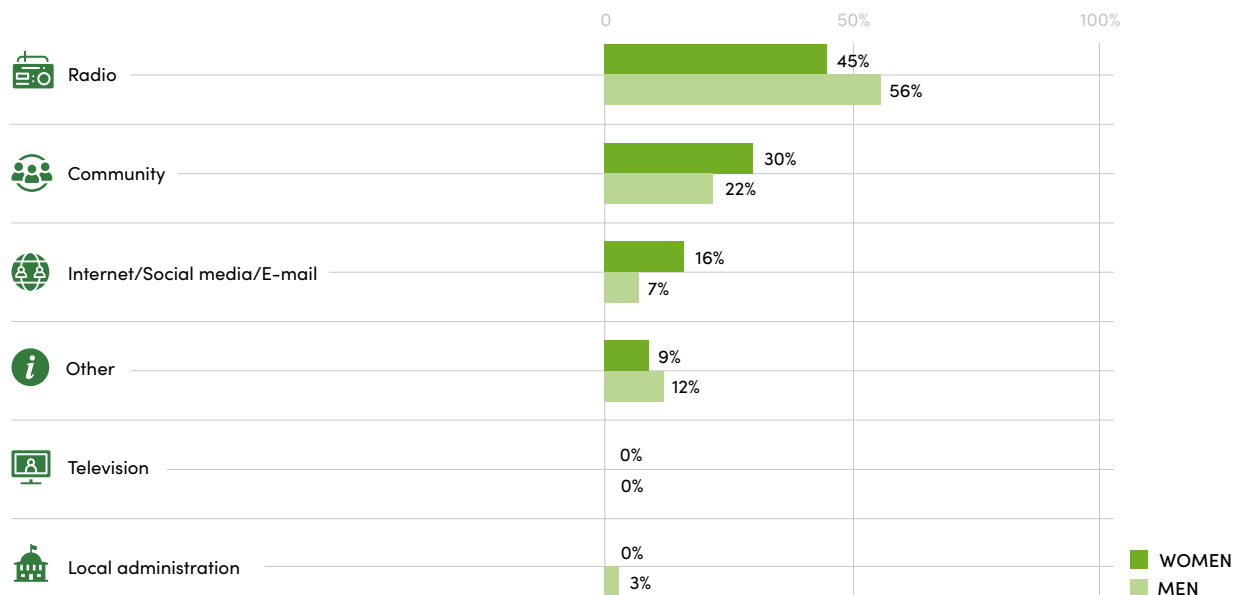
The effects of climate change permeate every island of the Tongan archipelago. All survey respondents had noticed effects of climate change in their daily lives. Besides an increased frequency of disasters, other slow-onset hazards are also increasingly noticeable. For instance, 86 per cent of people had witnessed the direct effects of sustained changes in temperatures, 48 per cent witnessed changes in precipitation, and 16 per cent saw the effects of sea level rise. The specific impacts were widespread, ranging from worsening health, lowering income, lengthening the time people spend at work, or increasing domestic and care work burdens, among others. Because climate change refers to slow onset effects, the reference period for all climate change related questions was the respondent's lifetime.

Figure 18: Proportion of the population that experienced one or more climate change related hazards in their lifetime, by sex (percentage)



Putting in place mitigation and adaptation measures is important to cope with the effects of climate change. However, not everyone had access to accurate, useful and timely climate-related information. While information on some climate hazards, such as changes in increased temperature and overall increased precipitation, reached many, only 77 per cent of women and 69 per cent of men heard about the effects of increasing or decreasing temperatures. The most common source of information about all these issues was, by far, the radio; with between 40 and 80 per cent of people receiving the information through this source, depending on the climate hazard. Across hazards, women were overall more likely than men to get information on the Internet or from friends, while men were more likely than women to listen to the radio.

Figure 19: Proportion of the population with access to information on the effects of increased ocean temperature, by sex and source (percentage)

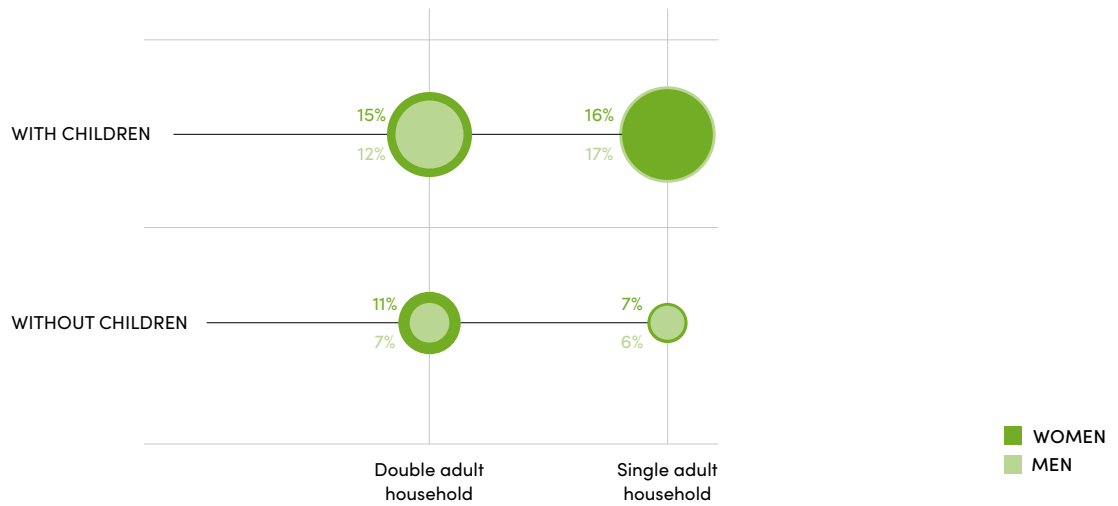


Note: Only early warning sources for increased ocean temperature are pictured. The distribution of sources was similar across all climate hazards. Sources such as mobile apps, CSOs and children's school were not used by anyone and have been excluded from the figure.

WOMEN ARE MORE LIKELY TO SACRIFICE THEIR NUTRITION TO COPE WITH CLIMATE CHANGE.

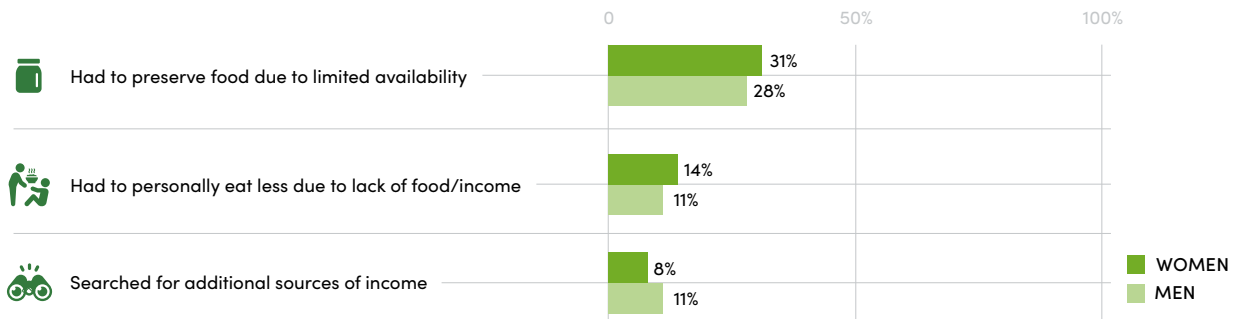
As a result of hazards related to climate change, 14 per cent of women and 11 per cent of men ate less as they lacked food or income to buy food. This coping strategy raises substantial health concerns, as people typically reduce food intake as an extreme measure, only after first attempting to cope by selecting more affordable foods but with lower quality and nutritional value. Single adults with children were the most likely to eat less in favor of offering the limited food supplies to their children. In Tonga, where many people benefit from communal settings and religious institutions for food intake, those who had to eat less were likely struggling substantially. Other coping strategies adopted by many included preserving food due to limited availability and searching for additional sources of income. While women were overall likelier to sacrifice their nutrition to cope with climate change, men were likelier to search for additional sources of income.

Figure 20: Proportion of the population who decreased food intake as a result of climate change, by sex and household composition (percentage)



Note: the sex differences in single adult households are not statistically significant at $\alpha=0.05$.

Figure 21: Proportion of the population who experienced (income and/or food) shortages as a result of climate change, by sex and type (percentage)

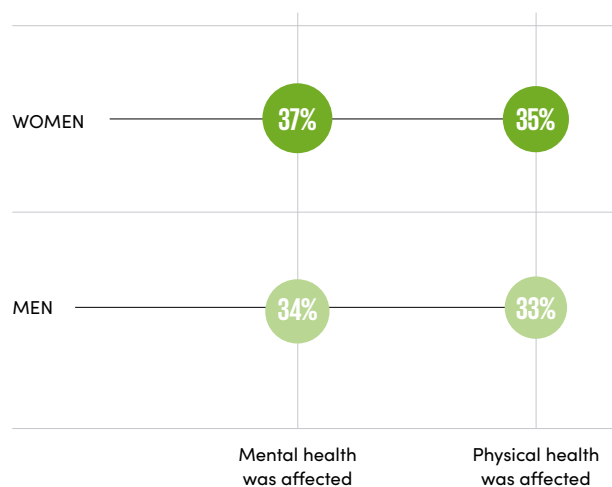


CLIMATE CHANGE WORSENERD THE HEALTH OF MORE THAN ONE IN THREE PEOPLE, ADDING TO WOMEN’S UNPAID CARE WORK BURDENS.

The effects of the changing climate on people’s livelihoods, especially agriculture, fisheries or other environment-related livelihoods, may lead to economic instability and food insecurity, and related stressors may impact migration, safety and security. This has direct effects on people’s physical and psychological health. As many as 37 per cent of women and 34 per cent of men reported that stress and anxiety associated with climate change affected their mental health. In addition, almost as many women and men highlighted that climate related phenomena affected their physical health. From respiratory disease driven by the increased frequency of wildfires to gastroenterological

ailments driven by the spread of pathogens, and heat-related cardiovascular issues, there can be numerous effects of climate change on people's physical health. In Tonga, sustained changes in temperatures and air pollution, haze and smoke were the climate phenomena most commonly associated with worsening health.

Figure 22: Proportion of population who attributed health ailments to the effects of climate change, by sex and type (percentage)



When family members are sick, women are typically in charge of caring for them. According to previous data, in 66 per cent of Tongan households women are in charge of feeding, cleaning, and providing physical and medical care for children, while in 43 per cent of households they provide such care for elders and other adults.² To cope with the increased healthcare burdens brought about by climate change, an estimated 62 per cent of women and 56 per cent of men now spend more time caring for family members. As women were already doing the lion's share of these chores, the distribution of additional tasks shows that climate change is worsening inequalities in this regard. These burdens come on top of the increases in unpaid care work brought about by disasters (presented in figure 10 above), which have been computed separately.

Existing data indicates that women also carry the heaviest domestic work burdens, as they were in charge of cooking in 74 per cent of households prior to hazardous events, cleaning in 75 per cent and shopping for the family in 62 per cent.³ As a result of climate change, however, men are also seeing substantial impacts in the time they spend on domestic work, particularly making household repairs to reinforce household structures against the effects of climate change, such as protecting against salinization or heatproofing. For instance, an estimated 4 per cent of men had to repair or make changes to their house to cope with the most common effects of climate change, compared to 3 per cent of women.⁴ All in all, 54 per cent of women and 52 per cent of men have seen their domestic workloads increase. As women were already doing more of it to begin with, climate change is contributing to further exacerbate the unequal distribution of domestic tasks.

² UN Women 2022, Two Years On. Available from: <https://data.unwomen.org/sites/default/files/documents/Publications/Asia%20Pacific/AP-RegionalReport-2yearson-COVID-compressed.pdf>

³ UN Women 2022, Two Years On. Available from: <https://data.unwomen.org/sites/default/files/documents/Publications/Asia%20Pacific/AP-RegionalReport-2yearson-COVID-compressed.pdf>

⁴ Refers to the top five most noticed effects of climate change.

Figure 23: Proportion of the population whose time spent on care work (caring for children, older people, sick, people with disabilities) and domestic work, increased as a result of climate change, by sex (percentage)

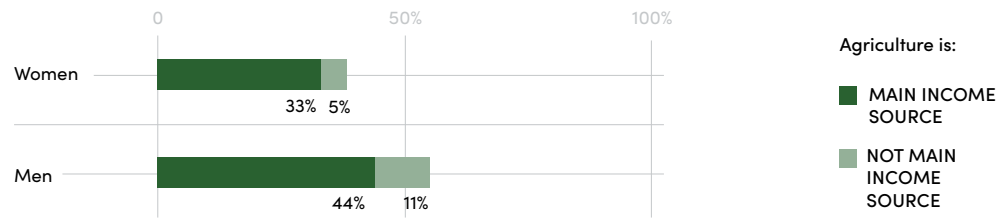


FROM SWITCHING JOBS TO REDUCING AGRICULTURAL YIELDS, PEOPLE’S LIVELIHOODS HAVE BEEN SEVERELY AFFECTED BY CLIMATE CHANGE.

Changes in the availability of natural resources, climate-related supply chain disruptions, biodiversity loss and changes in meteorological conditions may all have contributed to people switching jobs, particularly those engaged in tourism, agriculture, fisheries or other environment-related activities. As a result of climate change, an estimated 2 per cent of men and 1 per cent of women switched jobs, and 1 per cent lost their job. Men are more likely than women to hold a job in Tonga, but women are disproportionately engaged in the informal sector, including subsistence farming and fishing. As a result, both women and men experienced job changes and job losses.

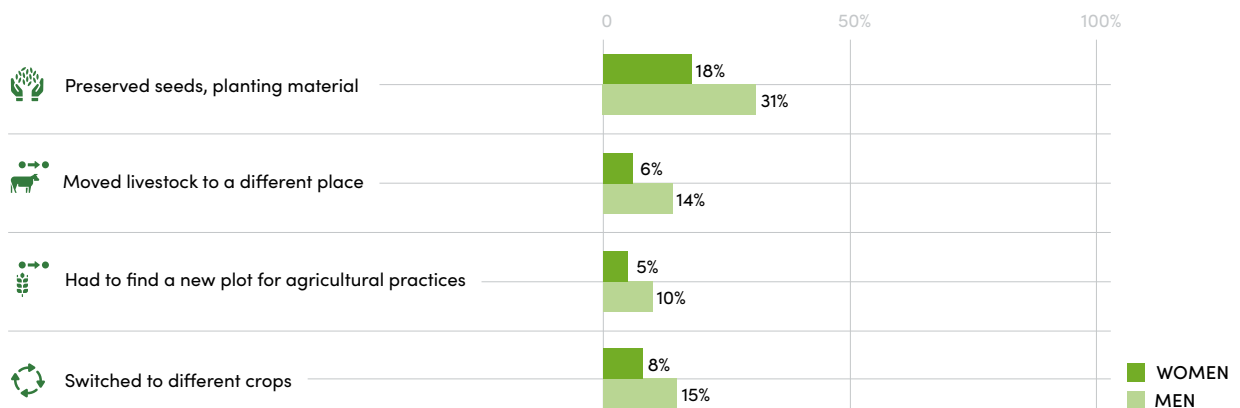
People growing crops or raising livestock saw some of the biggest climate change impacts. As many as 39 per cent of women and 54 per cent of men engaging in these activities (either for pay or profit, or for other reasons such as subsistence, leisure, tradition, religion or others) saw climate-related reductions in their agricultural or livestock yield in the past five years. This may have led to severe impacts on their wellbeing, as for most of them, agricultural and livestock activities were their main source of personal income. This is particularly true for women, who were more likely than men to depend on agriculture as their main income source. Reductions in yields are a worst-case scenario outcome that occurs when applying more pesticides, using more fertilizer, or spending more time performing these activities, for instance, fail to mitigate climate effects. Thus, many more people were likely affected by climate change, even if they were able to avoid a reduction in yields.

Figure 24: Proportion of land or livestock users who saw climate-related drops in yield in the past 5 years, by sex and whether this was their main source of income (percentage)



To mitigate some of the effects of climate change on crop and livestock yield, farmers have increased their efforts to conserve seeds and planting materials, or to find alternatives such as switching to climate-resilient crops, or moving their livestock to a different place. Where climate change has severe effects on agricultural operations, such as in areas exposed to sea level rise or frequent flooding, or where farming areas are exposed to pollution or other environmental degradation, farmers may have to relocate their agricultural operations. This is a more common practice among men than women, as it is costly and men often have better access to credit and are more likely to own assets that can be used as collateral for loans or to acquire new land. Further, women in Tonga are more likely to engage in home-based operations, for instance growing kitchen gardens, or tending to chickens or other small livestock. Therefore, changing locations is not always a possibility.

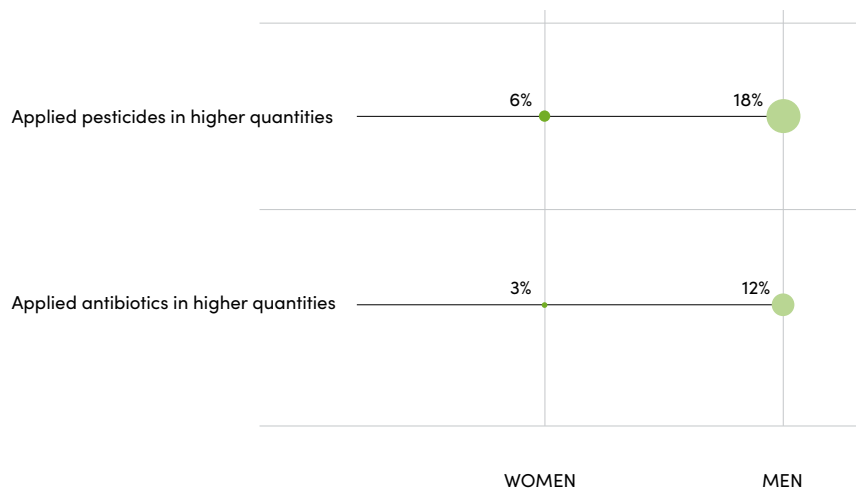
Figure 25: Proportion of land or livestock users who conserved seeds, switched crops or moved operating locations to deal with the consequences of climate change, by sex and activity (percentage)



CLIMATE CHANGE IS PROMPTING FARMERS TO USE MORE PESTICIDES AND ANTIBIOTICS, FURTHER CONTRIBUTING TO ENVIRONMENTAL DEGRADATION.

Increasing temperatures, ecosystem loss, severe weather and many other climate-change related hazards put agricultural activities at stake. For women and men who grow crops or raise livestock, a coping mechanism may be to increase the use of pesticides or antibiotics in their operations. This contributes to further damaging the environment, especially since increasing temperatures are known to result in more pesticide volatilization, increased rates of bacterial growth and heightened spread of antibiotic-resistant microorganisms. Furthermore, other climate-change related hazards, such as severe rain events, are known to carry pesticides into waterways and increase exposure risks for humans, animals and overall ecosystems. In Tonga, an estimated 6 per cent of women and 18 per cent of men raising crops increased their pesticide use, and 3 per cent of women and 12 per cent of men raising livestock increased their antibiotic use. Men may be more likely to increase the use of these substances because of larger purchasing power and disproportionate engagement in industrial or other large-scale operations. It is important to note, however, that the use of pesticides and antibiotics in Tonga is substantially lower than in many other countries, both as a result of affordability and availability in the country.

Figure 26: Proportion of land or livestock users who attributed their increased use of pesticides or antibiotics to the effects of climate change, by sex and effect (percentage)

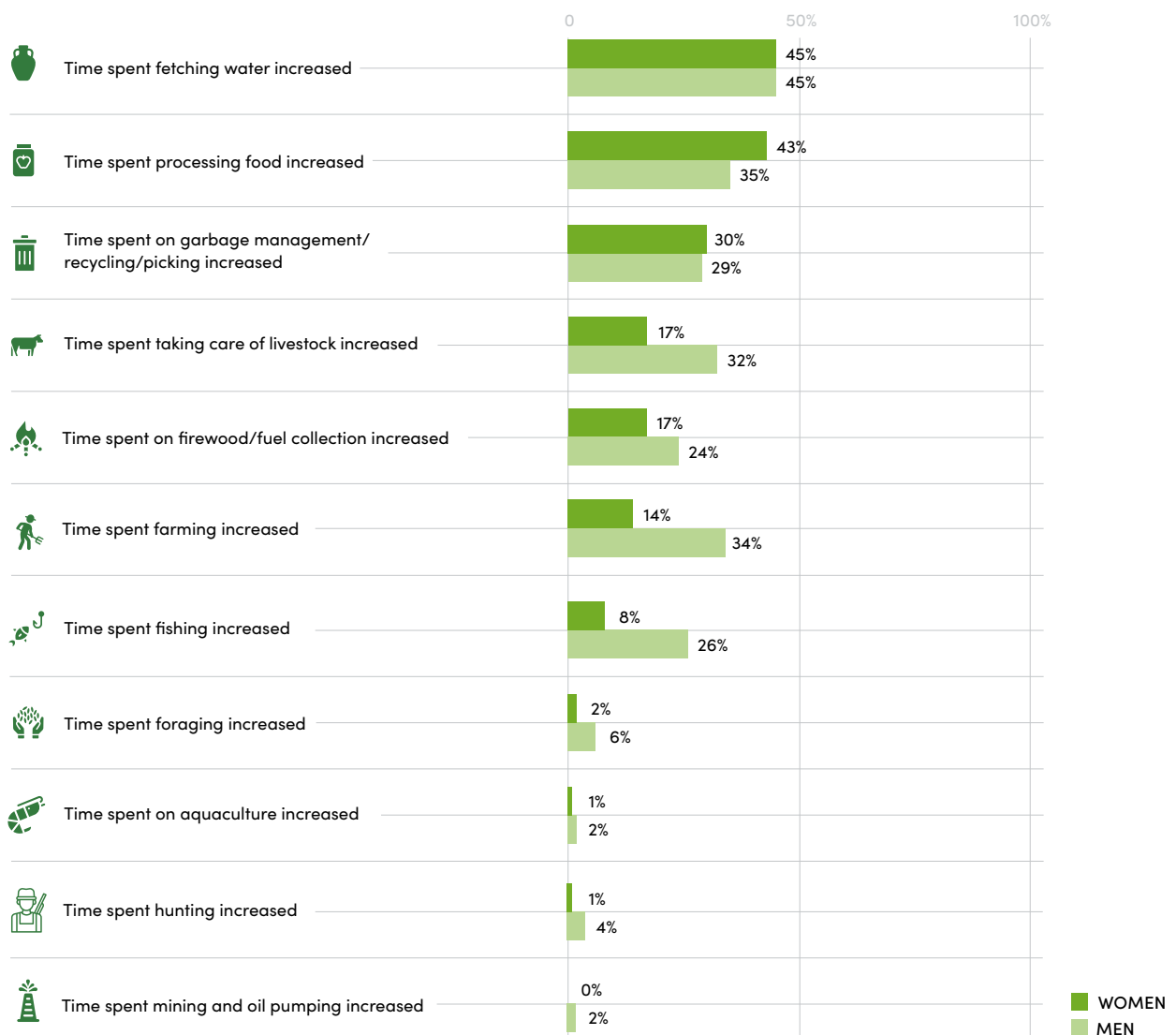


CLIMATE CHANGE IS LENGTHENING THE TIME NEEDED TO MAINTAIN ENVIRONMENT-RELATED LIVELIHOODS.

Climate change is affecting the availability and quality of water sources, and those who lack clean water at home are seeing substantial increases in the time spent fetching water. The same is true for those who have to manually gather fuels, a number that may increase during crises as economic stressors and climate impacts on livelihoods make cleaner fuels, such as electricity, unaffordable. Although the increases in water collection burdens

are shared equally between women and men in Tonga, burdens of fuel collection are taken up mostly by men. In turn, women are more likely to see increased burdens related to food processing or waste management, as a result of climate change. Those engaging in fishing, aquaculture, farming, gardening or livestock raising are noticing increases in the time allocated to these activities if they wish to maintain yields, with men noticing these the most as they engage in these activities more often than women to earn an income. As climate change brings about erratic and severe weather, biodiversity loss, disease and scarcity, those without alternatives to maintain their yields have no choice but to allocate more of their time to these chores. Different climate hazards may also result in different time burdens. For instance, changes in temperatures were the climate-related phenomena that triggered the largest increases in time spent processing food and farming.

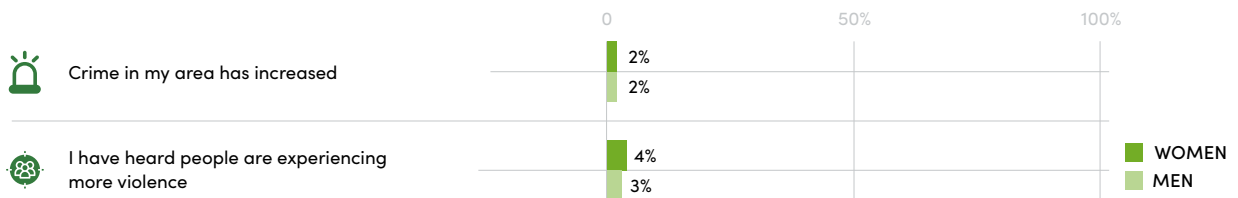
Figure 27: Proportion of the population whose time spent on the production of environmental goods increased as a result of climate change, by sex and type (percentage)



CLIMATE-RELATED CRIME AND VIOLENCE MAY BE INCREASING IN TONGA.

All the above-mentioned economic stressors, coupled with the increasing scarcity of environmental resources driven by climate change, may be exacerbating inequalities and feelings of anxiety and stress, which are known drivers of crime and violence. When people in Tonga were asked if they noticed worsening crime in the area where they live or work, 2 per cent of people reported that crime had increased, and 4 per cent of women and 3 per cent of men had heard that people are now experiencing more violence as a result of climate change. Quantifying the incidence of crime and violence accurately requires the use of specialized surveys designed to obtain frank responses on such sensitive topics. General questions in multi-purpose surveys are known to produce underestimations of these rates, and thus these percentages should not be understood as prevalence rates. However, they signal the likelihood of crime and violence somewhat increasing as a result of climate change: a topic that requires further research

Figure 28: Proportion of the population who saw increases in crime and violence as a result of climate change, by sex (percentage)



III. Natural resources, biodiversity loss and environment-related livelihoods

MANY TONGANS ARE DEPENDENT ON NATURAL RESOURCES, HIGHLIGHTING THAT ENVIRONMENTAL DEGRADATION COULD HAVE DEVASTATING EFFECTS.

Heavy reliance on environmental resources makes the population in Tonga substantially vulnerable to climate change and environmental degradation. Almost every individual relies on at least one environmental activity for their livelihood. Although many Tongans have multiple sources of income, environmental activities still make up bulk of the income for almost half of men and one third of women. Women, in addition, are more likely to engage in the creation of cultural products for non-income generating purposes (1.9 per cent of women and 0.9 per cent of men engage for subsistence, leisure, tradition, religion or other purposes).

More than 8 in 10 women and 7 in 10 men rely on food and beverage processing and preservation for their livelihoods, and more than 7 in 10 rely on water collection. Many are also reliant on agriculture, with men more likely than women to engage in agricultural activities. Given that Tonga is an island country, fishery related livelihoods are also widespread. Although men are more likely than women to fish for a living, women are more likely than men to engage in fish processing and marketing operations.

Figure 29: Proportion of the population whose main source of income is environment-related, by sex (percentage)

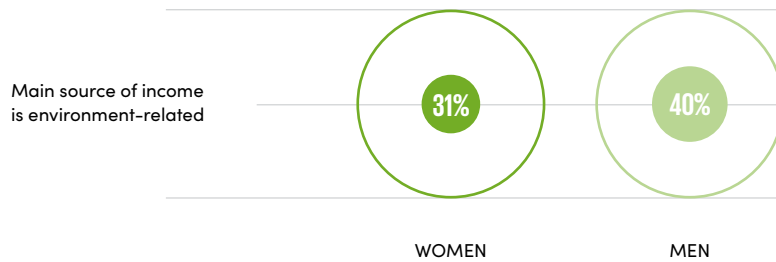
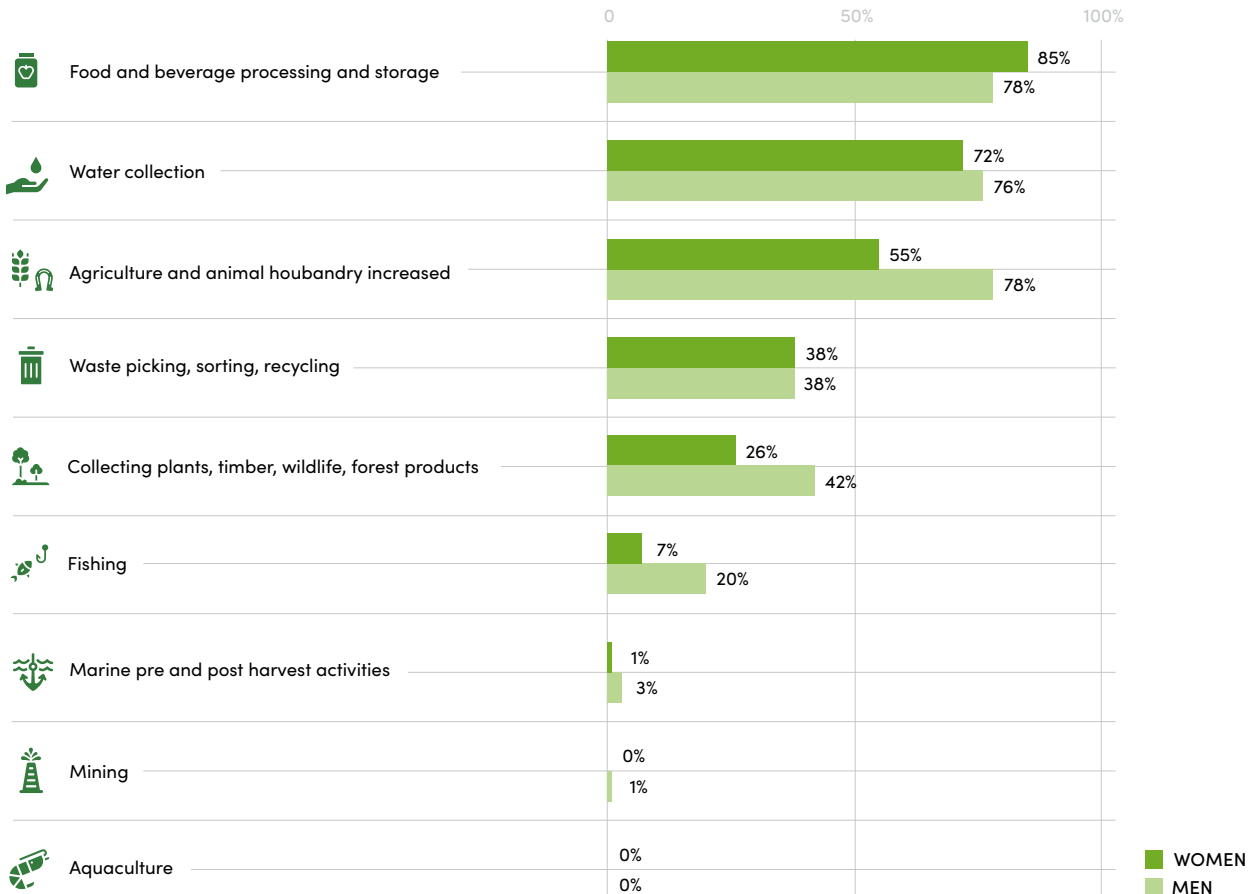
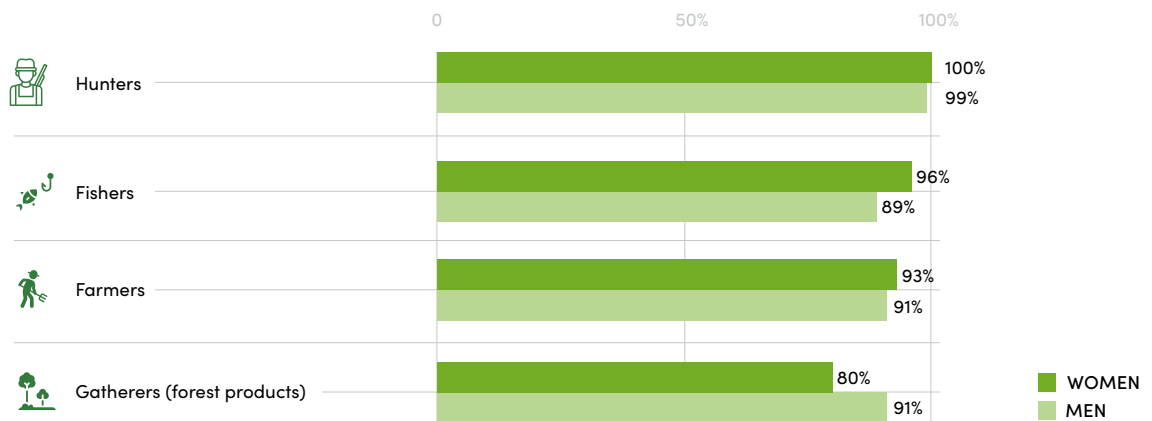


Figure 30: Proportion of the population relying on natural resources for their livelihood, by sex and type (percentage)



Furthermore, many Tongans engaging in environmental livelihoods still rely largely on small operations, with very few people engaging in large agroindustry corporations. As many as 100 per cent of women and 99 per cent of men farmers are subsistence farmers, and as many as 96 per cent of fishermen do it for their own subsistence as well. The lack of engagement in large corporations is encouraging from an environmental protection and management point of view, but it also means that the bulk of the population are highly vulnerable to environmental degradation, as they may not have alternative sources of income or resources to switch jobs if needed. Land ownership in Tonga is highly concentrated in the hands of men, and therefore women subsistence farmers may find it particularly challenging if they must find alternative growing locations as a result of environmental degradation.

Figure 31: Proportion of the population engaging in environmental livelihoods that are subsistence farmers, fishers, hunters and gatherers, by sex (percentage)



Note: the differences between women and men hunters are not statistically significant at $\alpha=0.05$.

WILD FORESTS PLAY A CRITICAL ROLE IN MAINTAINING PEOPLE’S LIVELIHOODS.

Wild areas, such as forests, pastures, mangroves or other forms of wooded land, are essential to preserve biodiversity. A native forest includes a larger variety of species of trees, plants, birds, amphibians and mammals. These are critical sources of food, firewood and construction material. Native forests, pastures wooded land and mangroves also provide essential protective roles against the effects of climate change and contribute substantially towards maintaining ecosystem productivity. Men engaging in harvesting activities are, overall, more likely to use wild forests than women, particularly those engaging in the collection of firewood and fuels. However, as women diversify their income sources less than men, most of the women who gather materials from wild forests, depend on this activity for the majority of their income, making them substantially vulnerable forest degradation.

Figure 32: Proportion of the foraging, logging, hunting or livestock grazing population using wild forests, pastures or wild wooded land for livelihoods, by sex (percentage)

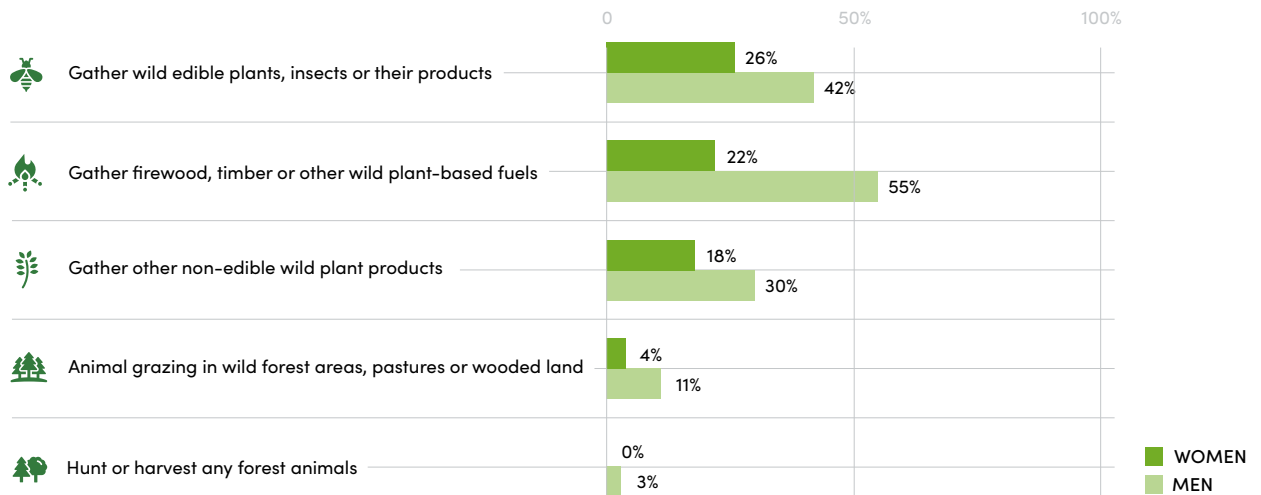
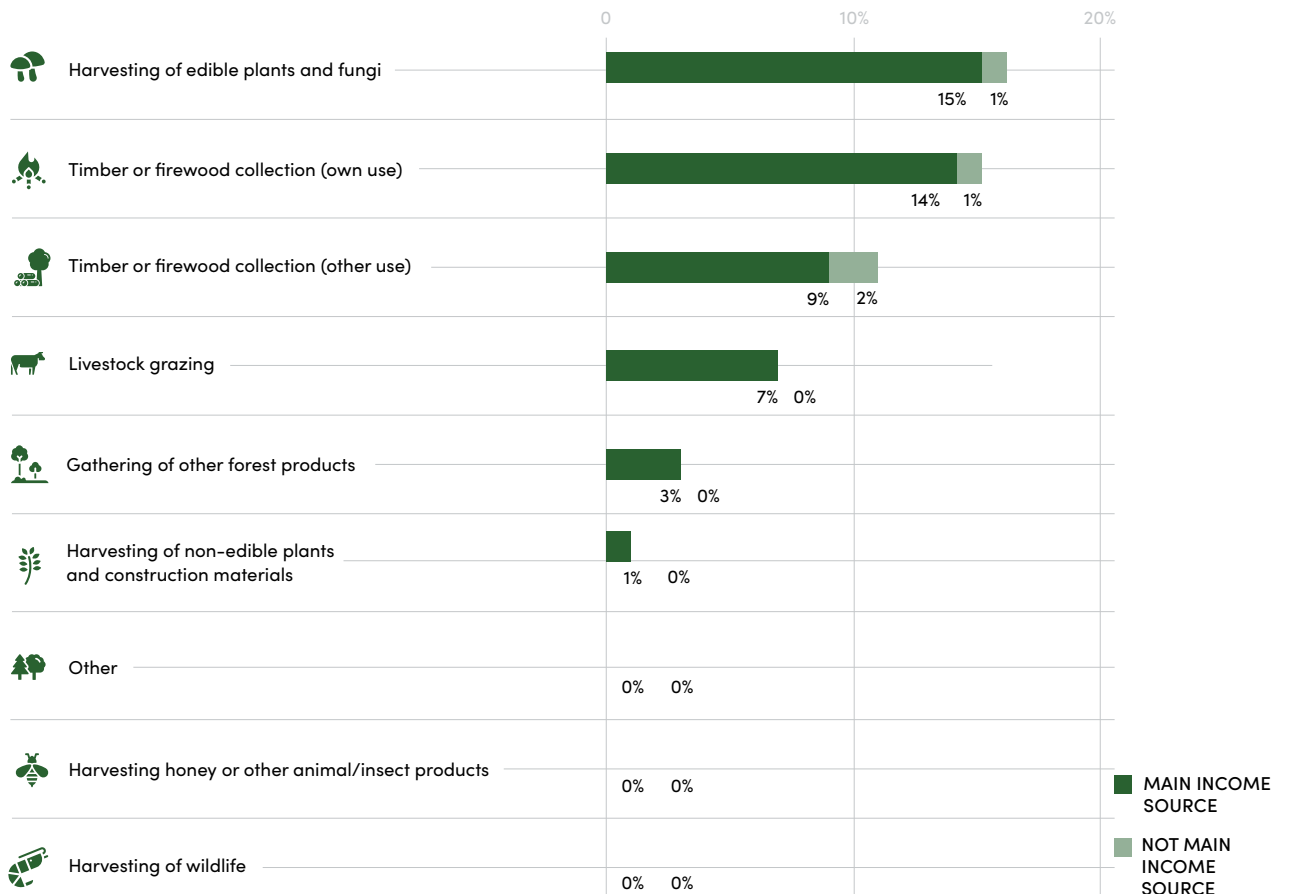


Figure 33: Proportion of the population using wild forests that are women, by type of use and main source of income (percentage)



MORE WOMEN THAN MEN ARE NOTICING DEFORESTATION AND RELATED BIODIVERSITY LOSS.

Due to land transition, overexploitation and climate change, the size and composition of forest areas are changing worldwide. As the total forest area decreases over time and wooded land gets partially or fully developed, the number of species calling forests their homes is decreasing rapidly. This has considerable consequences for ecosystem production, and women have been more likely than men to notice these effects. This is likely because fewer women than men own productive assets, thus making them more reliant on wild forests. Almost half of all women using wild forests saw degradation of the forest area used.

The most commonly noticed degradation phenomena included decreases in total forest area, often linked to land transition due to urbanization or for agricultural purposes; biodiversity loss, often related to urbanization, use of pesticides in nearby areas, or poor forest management practices; and changes in relative aridity. Both women and men noted they cannot find the same variety and quantity of animals and plants in forests.

Figure 34: Proportion of wild forest users who saw degradation of the forest area used, including drops in total area and biodiversity loss, by sex (percentage)

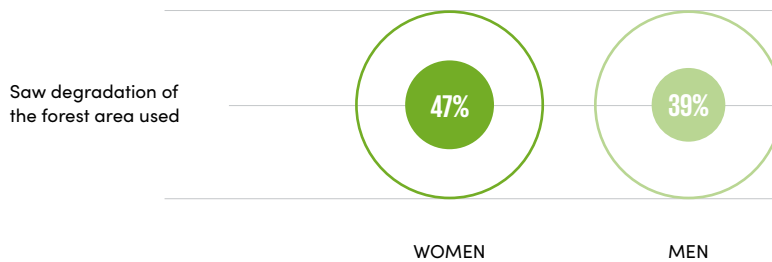
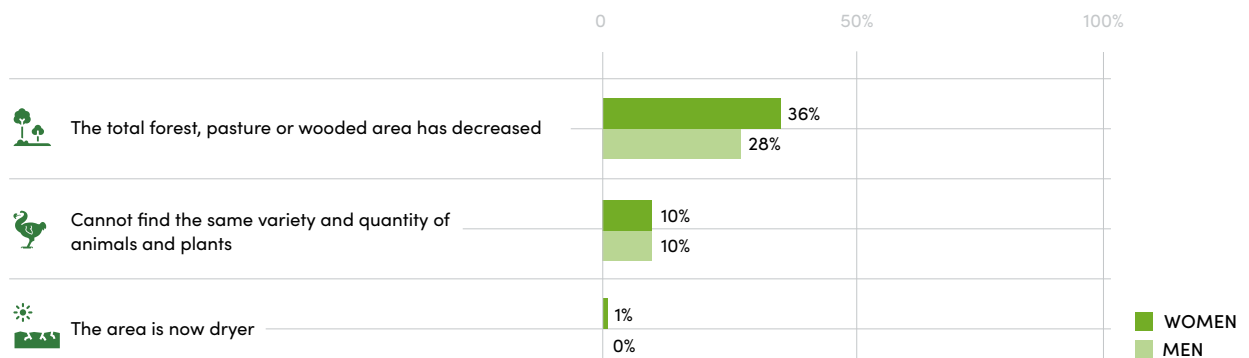


Figure 35: Proportion of wild forest users who saw degradation of the forest area used, by sex and type of degradation (percentage)



SOIL DEGRADATION AND WATER SHORTAGES ARE INCREASINGLY NOTICEABLE AND AFFECTING PEOPLE'S LIVELIHOODS.

Associated with climate change, pollution, and biodiversity loss, farmers in Tonga are increasingly noticing that the land they use for agriculture and livestock grazing is increasingly being degraded. Key markers of soil degradation may include fertility decline, changes in the soil acidity or alkalinity, vulnerability to erosion, increased susceptibility to hosting pests, loss of organic matter, and overall biodiversity loss. These may have substantive impacts on agricultural and livestock yield and the health and quality of agricultural and livestock products. Because men in Tonga engage in agricultural operations professionally more often than women, they were also more likely to notice soil degradation. As many as one in two men engaged in these activities noticed it. Farmers were also likely to notice shortages in the availability of irrigation water. In Tonga, piped water, fresh water from open sources, and rainwater are the three most common water sources for land irrigation. Farmers using rainwater for irrigation were the most likely to notice such shortages, as climate change, changes in ocean temperatures, land transition, water pollution and overconsumption all contribute to droughts, shortages and erratic precipitation patterns. It is notable that only women use graywater (wastewater from household use, such as water from sinks, kitchen appliances and other sources without faecal contamination) for irrigation. Among those that use it, an estimated 37 per cent also noticed shortages in its availability. Agricultural use of water may be further contributing to these shortages in Tonga.

Figure 36: Proportion of the population utilizing land for agriculture or livestock grazing who saw soil degradation, by sex (percentage)

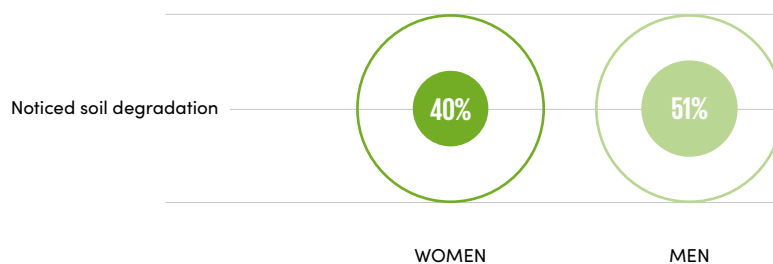
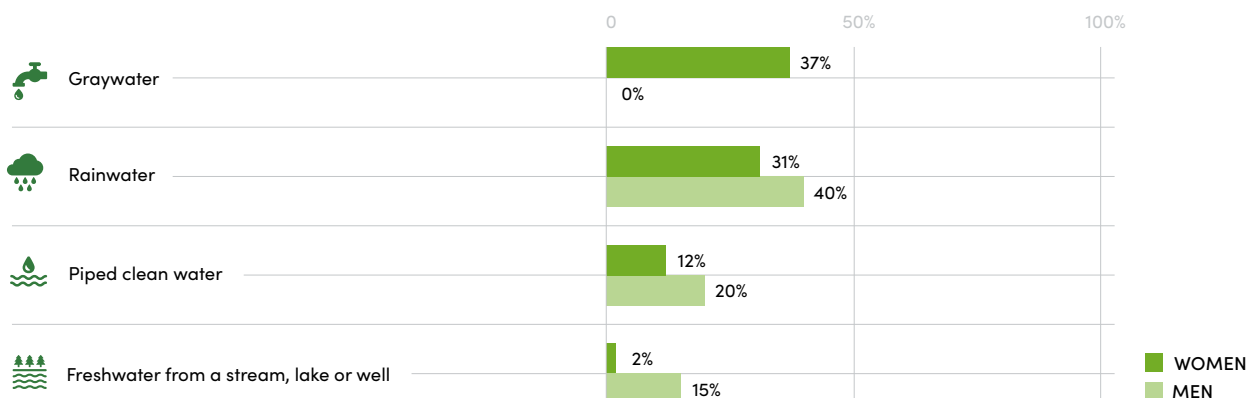


Figure 37: Proportion of the population that saw decreases in the availability of irrigation water, by sex and water source (percentage)



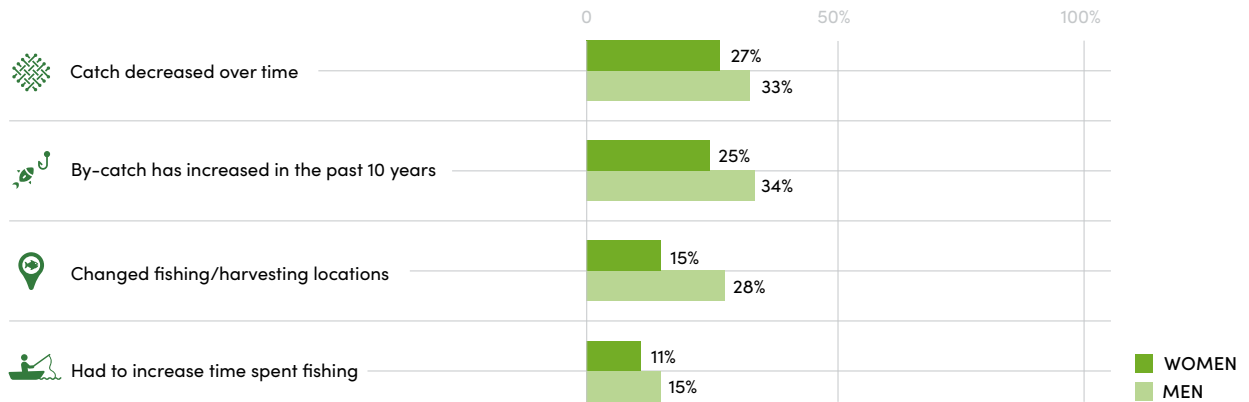
Note: Wastewater and other sources are not included in the graph as they are not used for irrigation in Tonga.

FISH STOCK DEPLETION IS OBVIOUS FOR THOSE ENGAGING IN FISHING AND MARINE HARVESTING, PARTICULARLY MEN, WHO ARE MORE LIKELY TO FISH OFF-SHORE.

As many as one in four women and one in three men engaging in fishing or marine harvesting saw their catch dwindle over the past 10 years. As women are more likely than men to fish at the shore or harvest marine resources by hand, they have fewer options to move to new locations to maintain catch levels. An estimated 28 per cent of men and 15 per cent of women changed fishing locations in the past 10 years. Their reasons ranged from fish stock depletion to pollution, environmental protection laws and regulations. Men were more likely to note that previous fisheries are now depleted, and thus they had moved to more productive locations. Women, however, were more likely to be affected by changing rules and regulations that prevent them from harvesting in previous locations, such as environmental protection rules put in place to help target species rebound.

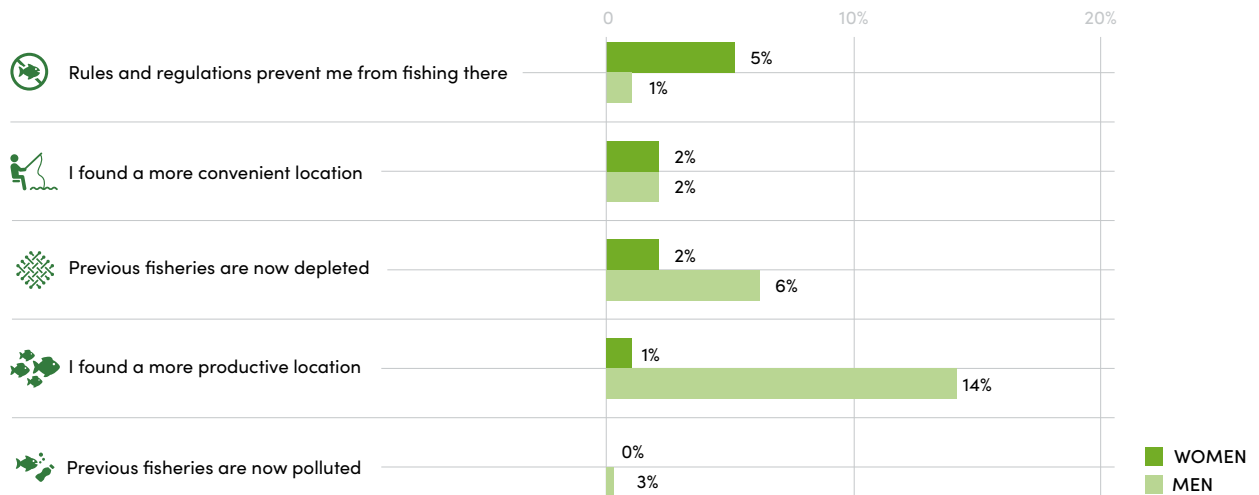
To maintain catch levels, many increased the time they spend fishing or hand harvesting. An estimated 11 per cent of women and 15 per cent of men have seen their fishing time lengthened as a result. Worryingly, many also noticed increases in the share of by-catch, with men more likely to flag this, again, due to their disproportionate engagement in commercial and off-shore fishing. Reduced availability of target species, together with the use of non-selective fishing gear for larger fishing operations (such as long lines, gillnets, drift nets or purse seine⁵, among others) contribute to increases in the share of by-catch, a clear indicator of biodiversity loss.

Figure 38: Proportion of the fishing/marine harvesting population who noticed the effects of environmental degradation and biodiversity loss, by sex (percentage)



⁵ A purse seine is a non-selective fishing method in which a floating net is deployed and sweeps large marine areas.

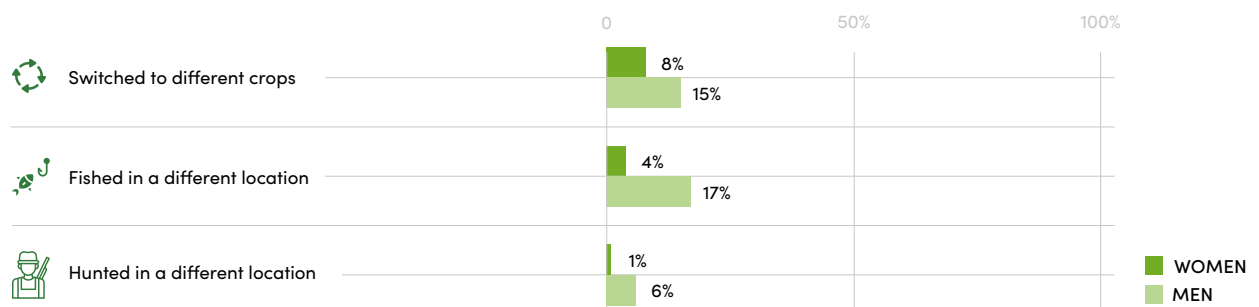
Figure 39: Proportion of the fishing population who had to change fishing/marine harvesting location in the past 10 years as a result of environmental degradation or biodiversity loss, by sex and reason (percentage)



BIODIVERSITY LOSS IS PROMPTING THOSE RELYING ON ENVIRONMENT-RELATED LIVELIHOODS TO MAKE CHANGES TO MAINTAIN YIELDS.

The aforementioned changes in the quality of soils, the availability of fish stocks, and the quality and size of forests are impacting people’s livelihoods. To maintain yields, people who cannot afford other coping mechanisms, such as applying pesticides in greater quantities or changing agricultural and fishing gear, are switching locations. In Tonga, men, who are in general more likely to engage in agriculture, fishing and hunting, have been more likely to switch locations to maintain yields. Women, who may have fewer resources and less agency to move locations, however, are switching at lower rates.

Figure 40: Proportion of fishers, hunters and gatherers who had to switch locations as a result of climate change, by sex (percentage)



EFFECTIVE WASTE MANAGEMENT IS CRITICAL TO HALT THE SPREAD OF POLLUTION AND BIODIVERSITY LOSS, BUT REMUNERATION RELATED INEQUALITIES REMAIN A CONCERN.

An estimated 38 per cent of women and men in Tonga engage in waste management. These activities are critical to deal with pollution, a key component of the triple planetary crisis. All the survey respondents who engage in waste management reported they do it without remuneration. This may be because they carry out these tasks to help others, or it may be due to discrimination. For instance, an estimated 21 per cent of women engaging in waste management reported that other people receive higher remuneration than they do for sorting and turning in the same materials. Among men, this figure was 16 per cent. Barriers to accessing higher-value waste materials are also a sign of discrimination. Women are slightly more likely than men to handle mostly cardboard, plastic or other low-value materials, while men are slightly more likely than women to handle higher value materials such as scrap metal and aluminium.

Figure 41: Proportion of the population engaging in waste management subjected to wage discrimination, by sex (percentage)

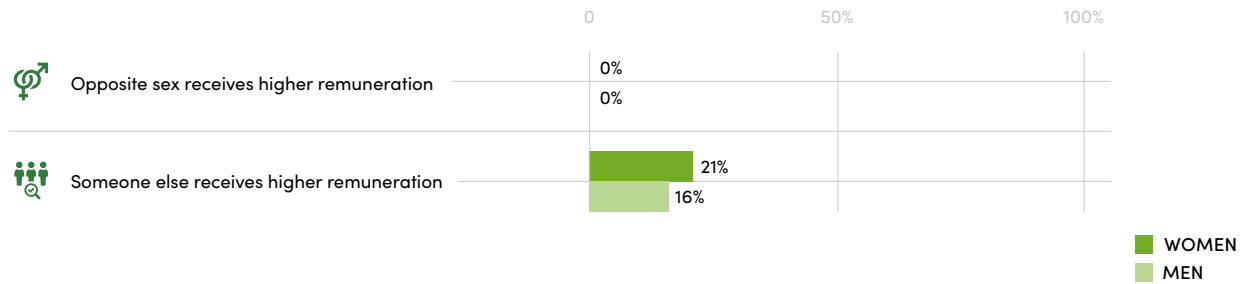
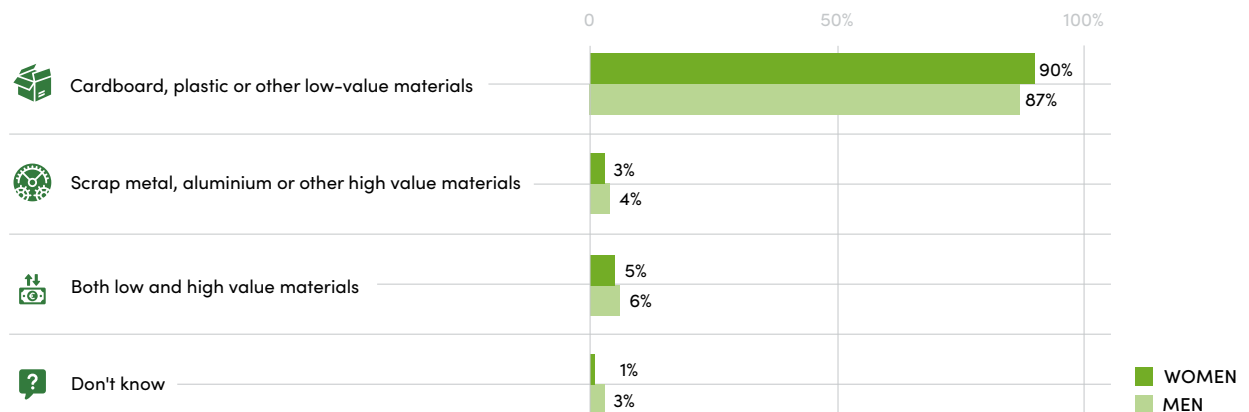


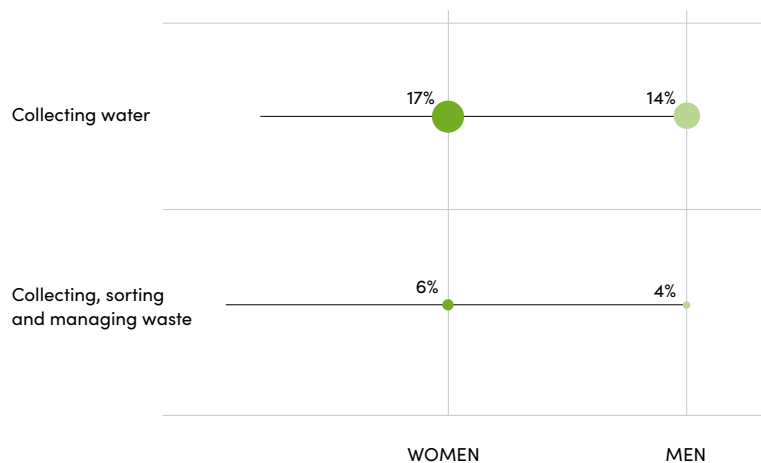
Figure 42: Proportion of waste management population that handle mostly high or low value materials, by sex and type of material (percentage)



SOME ENVIRONMENT-RELATED LIVELIHOODS CARRY IMPORTANT SAFETY RISKS, INCLUDING EXPOSURE TO DISEASE, CRIME AND VIOLENCE.

Engaging in some environment-related livelihoods can increase the likelihood of contracting disease. For instance, an estimated 27 per cent of women and 15 per cent of men engaging in mining and quarrying in Tonga experienced health issues as a result of mining. Similarly, among those engaging in water collection, 17 per cent of women felt unsafe collecting water at least once, compared to 14 per cent of men. Women when they have to walk long distances to collect and carry the water back, are more likely to be exposed to violence or other forms of crime along the way. Women in Tonga are also more likely than men to note that they have felt unsafe collecting, sorting and managing waste (6 per cent of women, compared to 4 per cent of men). Most of the women who felt unsafe while collecting, sorting and taking waste to recycling and other waste management centres, performed these activities with family members other than their partner.

Figure 43: Proportion of the population engaging in managing waste or collecting water, that felt unsafe while performing these tasks, by sex (percentage)



IV. Environmental conservation, degradation and decision-making

MEN ARE MORE LIKELY THAN WOMEN TO USE ENVIRONMENTALLY-DAMAGING FERTILIZERS, PESTICIDES AND GROWTH PROMOTERS, AND GENDER DIFFERENTIALS EXIST IN RELATED RISK MITIGATION MEASURES.

Understanding the nature, frequency and intensity of human interactions with the environment is essential to recognize the important roles that women and men can play in environmental conservation or in further environmental degradation. Gender differentials in the available options and dictate the behavior of men and women vis-à-vis natural the conservation or degradation of natural resources.

Among those growing crops or raising livestock, men are more likely than women to use synthetic pesticides, fertilizers and growth promoters (figure 44); possibly because men are more likely to afford them. The use of these substances may cause biodiversity loss, pollution, and human health concerns such as neurological and reproductive disorders. Thus, it is essential to handle these substances carefully, and put in place measures to mitigate these risks, but not everyone follows the right protocols, and there are differentials in the behaviour of women and men. For instance, to protect human health, women are more likely than men to adhere to label directions (87 per cent of women, compared to 79 per cent of men), but only 6 per cent of people overall clean and maintain the protective equipment after use, which may expose them to contamination in the future.

To protect the environment, 81 per cent of women and 93 per cent of men follow retail directions or local regulations, such as not exceeding recommended doses. Men are also more likely than women to use legumes as a crop cover, perform precision farming and sample soil every five years. Women, in turn, are more likely to adopt more economical measures, such as using organic sources of nutrients and considering soil type and climate to inform their pesticide use behaviours.

Figure 44: Proportion of the population operating land for agriculture or livestock that use synthetic fertilizers, pesticides, or growth promoter, by sex (percentage)

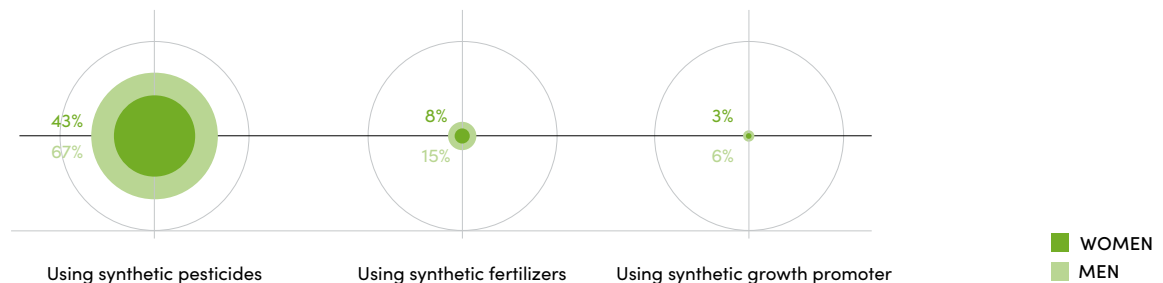


Figure 45: Proportion of the population applying synthetic or mineral pesticides that put measures in place to prevent impacts on human health, by sex (percentage)

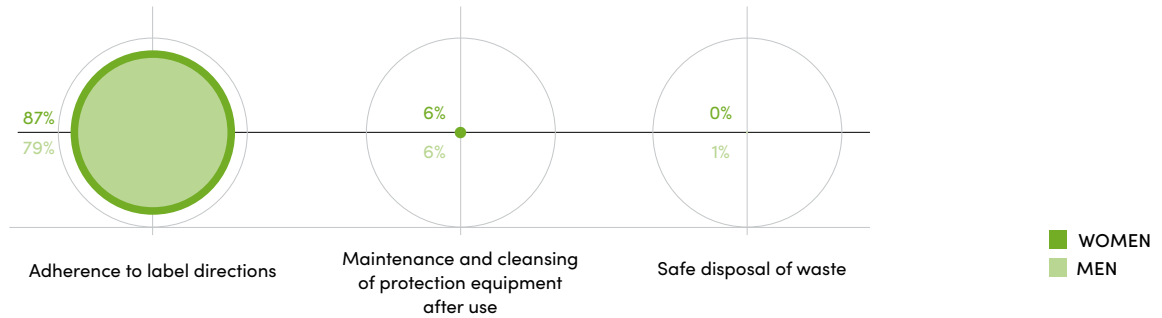
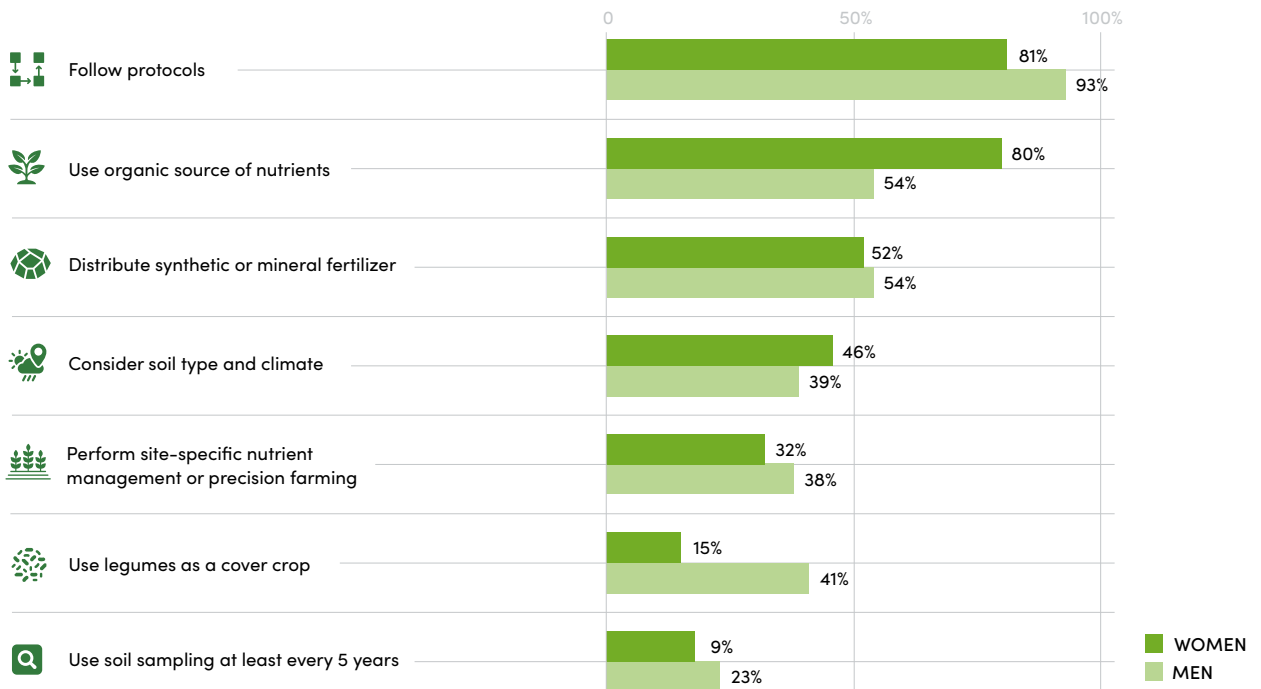


Figure 46: Proportion of the population operating land for agriculture or livestock that applied measures to mitigate fertilizer-related risks, by sex (percentage)



Note: the differences between women and men performing site-specific nutrient and distributing synthetic or mineral fertilizers are not statistically significant at $\alpha=0.05$

MEN ARE MORE LIKELY THAN WOMEN TO APPLY MEASURES TO REDUCE THE ENVIRONMENTAL FOOTPRINT OF AGRICULTURE.

The implementation of measures to reduce the environmental footprint of agriculture and livestock grazing is more common among men than women. This is likely because men are more likely to engage in larger farming operations. For instance, men are more likely to use crop spacing, mixed cropping and inter-cropping in their

agricultural practices, which are more commonly applied on large agricultural extensions. Important environmental conservation practices such as land fallowing, which allows for land nutrients to regenerate, is practiced by 62 per cent of men, compared to 33 per cent of women. As many women practice agriculture in home gardens, they are less likely to make use of fallowing.

Environmental protection practices related to livestock grazing remain quite limited in Tonga. Only 6 per cent of men and 2 per cent of women raising livestock use pasture rotation practices to suppress livestock pest populations and prevent destruction from overgrazing. Still, when asked whether their animal management practices conserve natural resources and biodiversity, 63 per cent of women and 65 per cent of men responded that they do. This may be because they forego use of antibiotics, growth hormones or other feed ingredients. However, rotation and fencing off pasture areas are rarely practiced though they are important to allow for regeneration.

Figure 47: Proportion of the population engaging in agriculture and livestock grazing undertaking measures to reduce the environmental footprint of agriculture and livestock grazing, by sex (percentage)

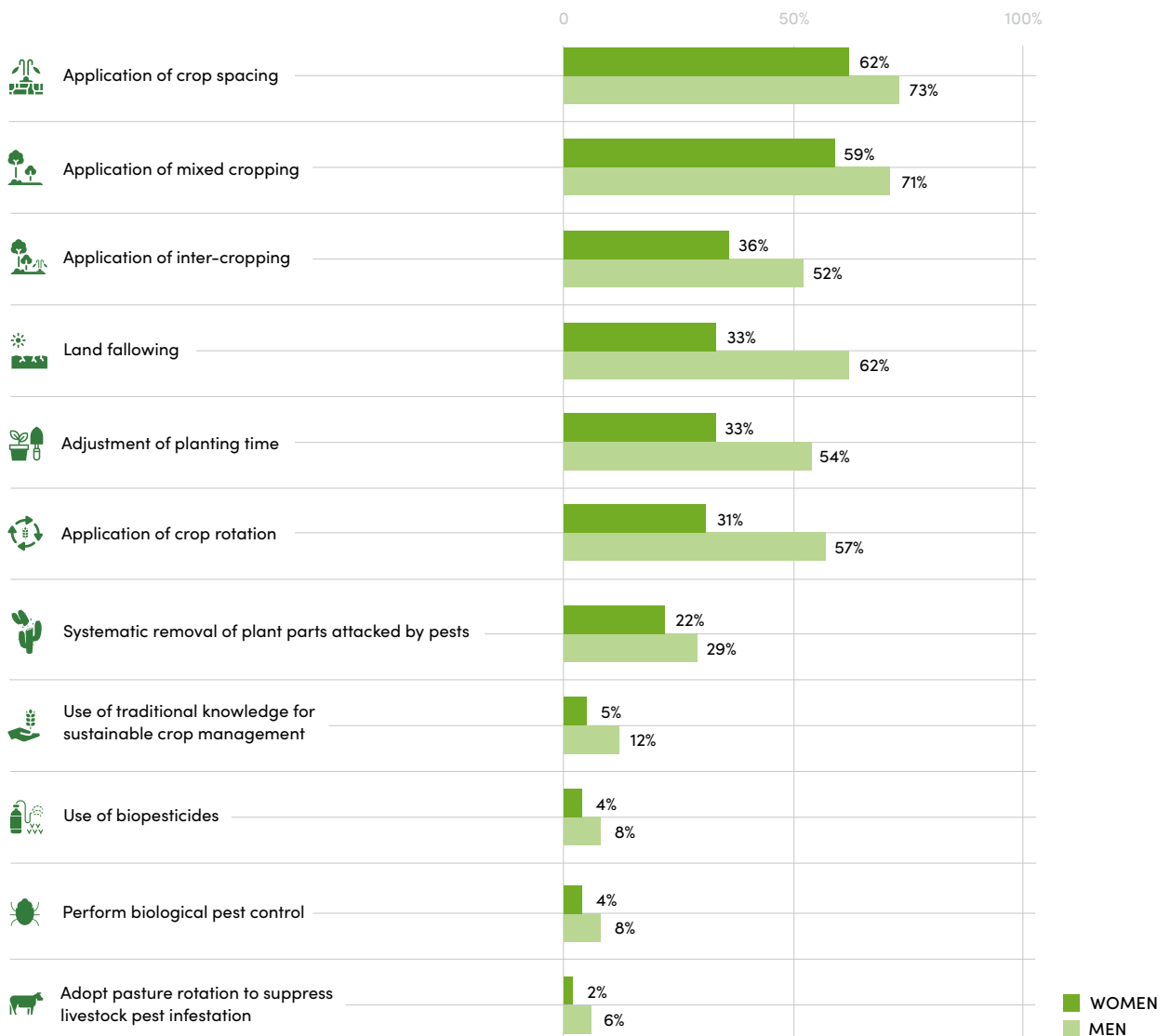
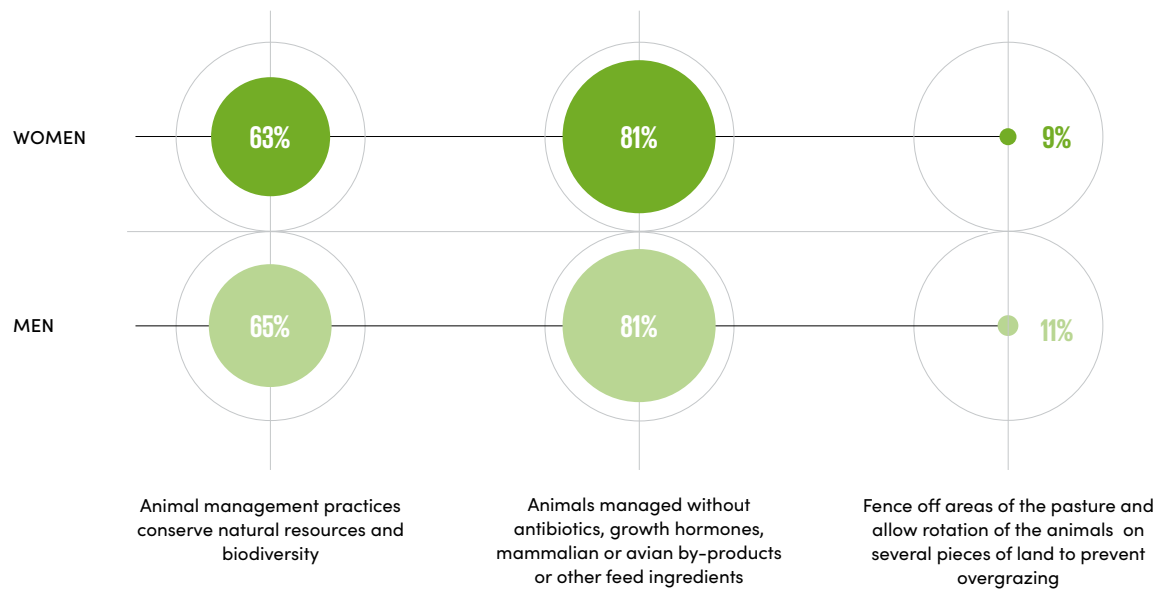
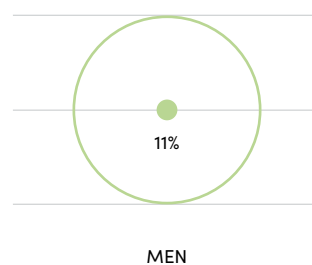


Figure 48: Proportion of the population engaging in agriculture and livestock grazing who implemented land and livestock management practices to conserve natural resources and biodiversity, by sex (percentage)



Aquaculture operations are relatively uncommon in Tonga, practiced by less than 1 per cent of men and almost no women. Aquaculture operations can be highly damaging for the environment, particularly if antibiotics or feed are used, and especially if these are practiced near bodies of water, or in the ocean. In Tonga, however, 89 per cent of those practicing aquaculture use neither pesticides nor antibiotics, and only 11 per cent of people use antibiotics. Similarly, only 11 per cent use feed in their aquaculture operations. The use of feed (usually processed pellets made with fish meal and fish oil) promotes overfishing and contributes to disease if uneaten feed remains and rots in the aquaculture pond. As such, using feed may lead to enhanced use of antibiotics to prevent disease, further damaging the nearby environment. The relatively low feed, pesticide and antibiotic use in aquaculture operations in Tonga promotes environmentally friendlier practices.

Figure 49: Proportion of men who use feed in aquaculture operations (percentage)



Note: The survey sample did not capture any women engaging in aquaculture.

MEN'S FISHING PRACTICES ARE MORE ENVIRONMENTALLY DESTRUCTIVE THAN WOMEN'S, HOWEVER, MANY TONGANS RELY ON TRADITIONAL PRACTICES, WHICH ARE RELATIVELY SUSTAINABLE.

An estimated 7 per cent of women and 20 per cent of men in Tonga practice fishing or marine harvesting, either for subsistence, pay, profit, leisure or other reasons. While men are more likely to fish off-shore, women are more likely to harvest marine animals or seaweed on or near the shore. Thus, their fishing methods are different, as is the impact of their activities on ecosystems. For instance, 51 per cent of women and 13 per cent of men engaging in marine harvesting practice gleaning, generally considered a more sustainable practice. In turn, men are more likely than women to use long lines and dynamite fishing, which are more damaging techniques as they harvest larger shares of by-catch, and destroy coral reefs and other ecosystems. Similarly, men are more likely to use purse seines, a non-selective fishing method in which a floating net is deployed and sweeps large marine areas. These are highly destructive practices as they may capture substantial amounts of by-catch, including protected species.

Compared to people in other countries, Tongans rely substantially on traditional fishing practices, such as pole fishing, harpoon fishing and cast nets, which allow for better targeting of catch and are generally considering less damaging to marine life and ecosystems. Reliance on traditional methods is important to conserve the country's marine resources.

As men's fishing operations are normally larger than women's, men are also more likely to look at official information regarding fish stock status, both to target their catch and to prevent overfishing of overexploited or endangered species. An estimated 37 per cent of men and 22 per cent of women look at fish stock status information regularly. However, only 5 per cent of men and 2 per cent of women practicing marine harvesting generate reports on total catch and submit them to authorities. This is an important practice for the successful management of stocks and the conservation of marine biodiversity.

Figure 50: Proportion of the fishing/marine harvesting population using different fishing methods, by sex and method (percentage)

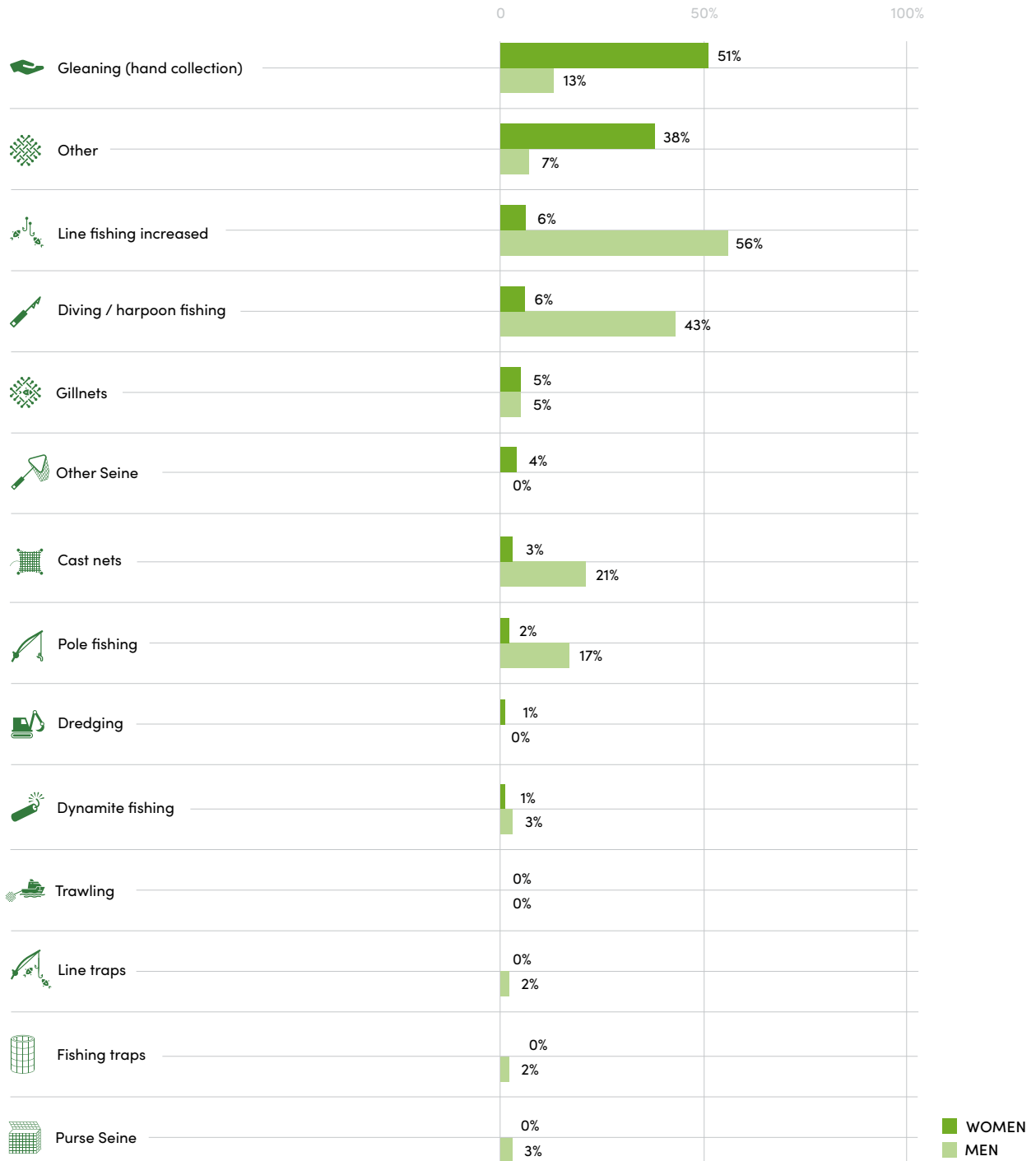
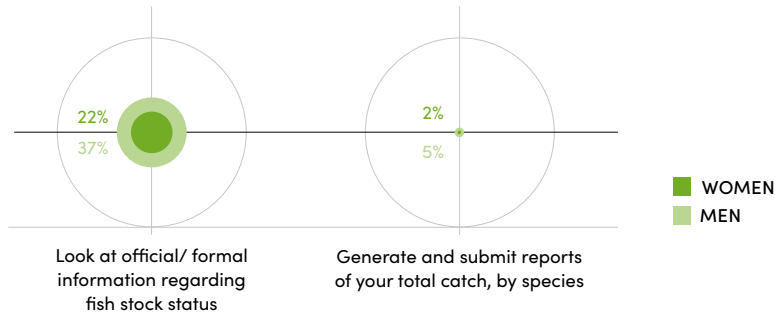
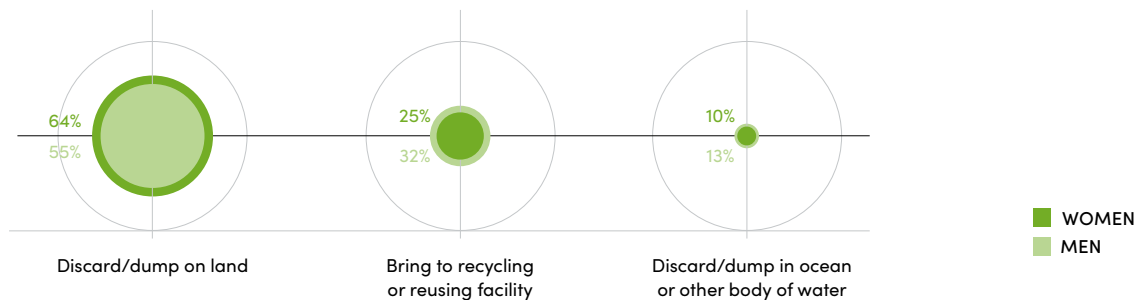


Figure 51: Proportion of the fishing/marine harvesting population who support fish stock monitoring by looking at fish stock status and reporting on catch, by sex (percentage)



Marine pollution, and particularly plastic pollution originating from discarded fishing gear, is a key problem contributing rapidly to the loss of marine biodiversity, including the disappearance of coral reefs. Among those in Tonga who engage in fishing activities, men are more likely than women to bring their spent fishing gear to a recycling facility (32 per cent of men compared to 25 per cent of women). These figures are partially influenced by the fact that women are less likely to own large fishing gear, as they disproportionately practice hand harvesting. Worryingly, an estimated 64 per cent of women and 55 per cent of men still discard their gear on land, and 10 per cent of women and 13 per cent of men dump it in the ocean or another body of water. Tackling the problem of discarded marine fishing gear is of critical importance to enable marine biodiversity and ecosystem production to rebound.

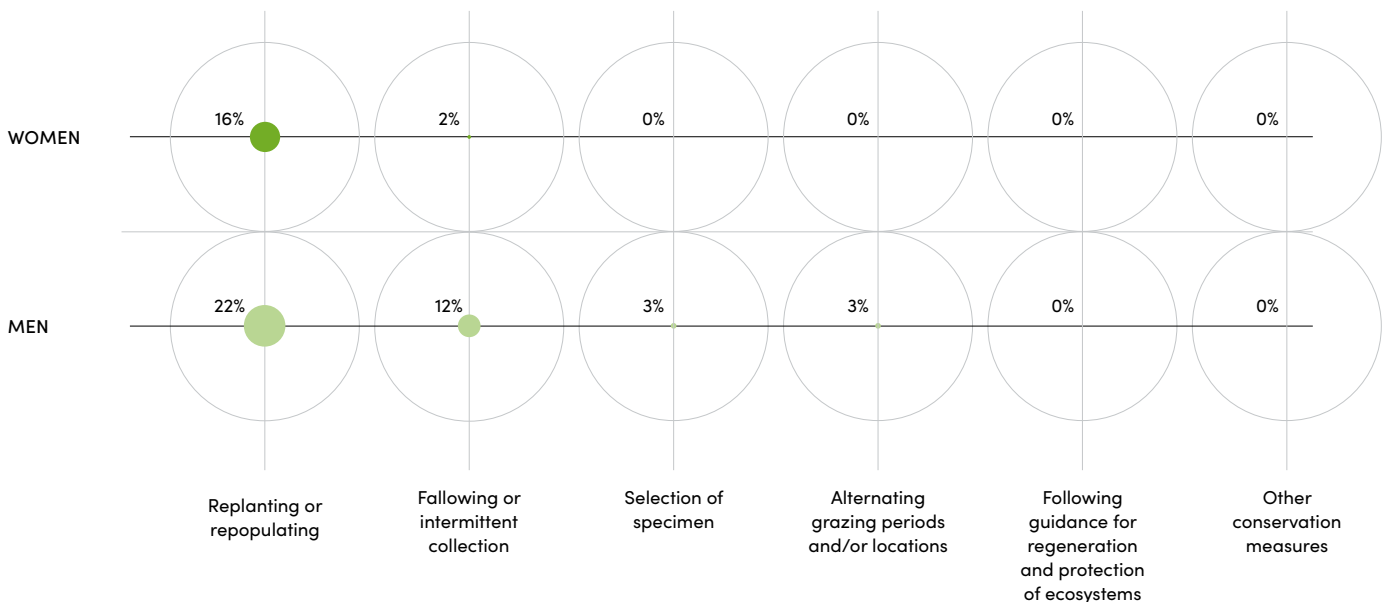
Figure 52: Proportion of the fishing/marine harvesting population contributing to recycling or reusing of gear, by sex (percentage)



FEWER THAN 1 IN 3 PEOPLE USE SUSTAINABLE PRACTICES IN WILD FORESTS: WOMEN ARE MORE LIKELY TO REPLANT BUT MORE MEN PRACTICE FOLLOWING.

Wild or undeveloped forests, pastures and wooded land play a critical role for the livelihoods of people in Tonga. Besides collecting fodder, hunting, and gathering construction materials, an estimated 7 per cent of women and 3 per cent of men in Tonga harvest forest goods in wild forests for the creation of cultural products, such as mats, belts (ta'ovala) and other products. Forest products are thus essential for livelihoods, and for traditions and cultural practices, but fewer than 1 in 3 people (19 per cent of women and 40 per cent of men) use sustainable practices when extracting products from forests. For instance, only 16 per cent of women and 22 per cent of men replant and repopulate forest areas after harvesting; while only 3 per cent of men practice specimen selection with conservation in mind. Measures such as fallowing and alternating grazing periods, which are seldom practiced in Tonga, could enable the regeneration of species, and ultimately promote forest health.

Figure 53: Proportion of wild forest users who use sustainable management practices, including traditional knowledge, by sex (percentage)



HOUSEHOLD PRACTICES ALSO CONTRIBUTE TO ENVIRONMENTAL CONSERVATION AND DEGRADATION.

The use of different power sources, cooking fuels and sanitation practices all contribute to environmental degradation at different levels. In Tonga, where the whole population has access to electricity, the electrical grid is powered mainly by non-renewable sources. According to the International Renewable Energy Agency (IRENA), 98 per cent of the total grid energy supply relies on oil, with the remaining 2 per cent coming from

renewables. As such, household use of electricity contributes to environmental degradation. Urban households largely benefit from using grid electricity, but many in rural areas still rely on generators. Among those relying on off-grid power in rural areas, 6 per cent use solar generators or other renewable energy generators.

Figure 54: Proportion of the population living in households whose off-grid electricity uses renewable energy, by sex and location (percentage)



For cooking, roughly one in eight households (13 per cent) rely on unclean fuels, such as gasoline, kerosene, coal, charcoal, wood, straw or other solid residue, which pose threats to human health. Women, who are disproportionately in charge of cooking, are overly exposed to the harmful effects of indoor air pollution when unclean fuels are used. In an estimated 79 per cent of households using clean cooking fuels, women are in charge of cooking, compared to 73 per cent of those using unclean fuels. When households do not have access to piped gas or electricity for cooking, women and men often have to go and fetch fuels. In Tonga, men are more likely than women to go and collect cooking fuels (men are in charge in 68 per cent of households, while women do it in 31 per cent of households). The use of sustainable forest management practices among those in charge of fuel collection is of outmost importance to preserve ecosystem production and forest health.

Figure 55: Proportion of households where women and girls / men and boys are in charge of cooking, by type of fuel (percentage)

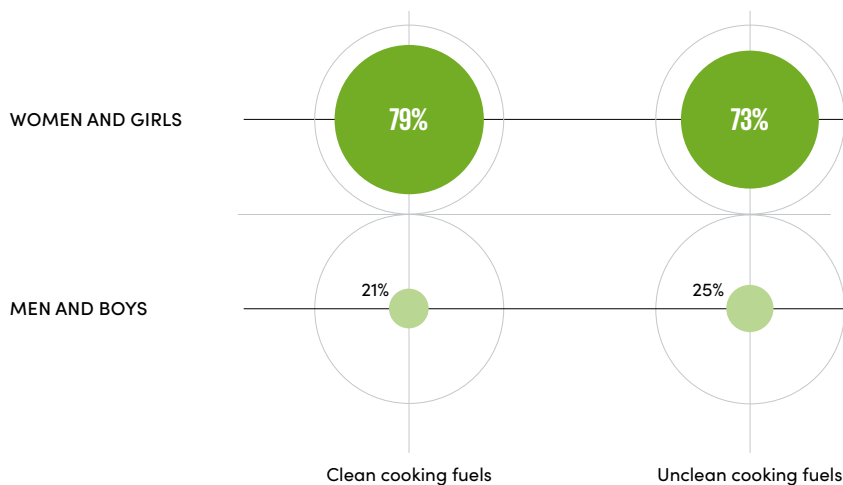
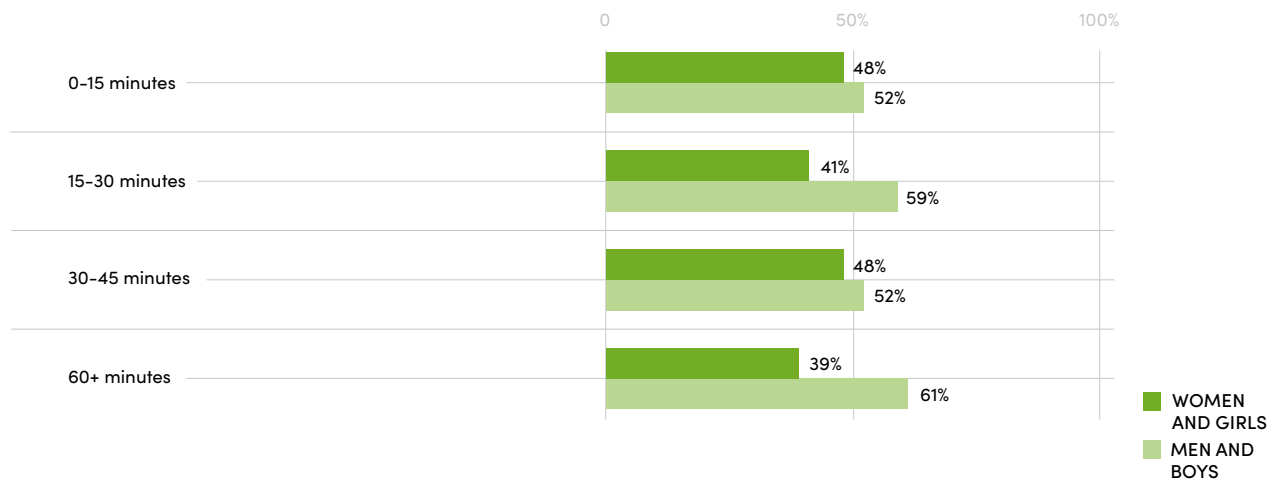


Figure 56: Proportion of households by person in charge of gathering cooking fuel, by sex (percentage)



An estimated 1 per cent of Tongan households drink water piped to their household or plot. Among those that lack water infrastructure at home, the majority rely on rainwater (85 per cent) followed by bottled water (13 per cent). Tonga faces water scarcity, as groundwater and other sources are rapidly depleting, which makes it challenging for those without piped water at home to extract water from wells or other sources. The widespread use of bottled water contributes to lower risks of water borne disease, but many people have to go and fetch the bottled water. Water collection involves an important time burden for those performing this task. Men in Tonga are more likely to take on water collection burdens. Relying on bottled water is also associated with plastic pollution and its role in environmental degradation.

Figure 57: Proportion of households where women and girls / men and boys are in charge of water collection, by sex and distance to water source (percentage)



Note: the survey sample only captured 3 households located between 45 and 60 minutes from the water source. Therefore, the category 45-60 minutes has been omitted.

WATER MANAGEMENT DECISIONS REST LARGELY IN THE HANDS OF MEN, BUT OTHER DECISIONS ARE MORE EQUALLY DISTRIBUTED.

Most of the population in Tonga do not participate in environmental decision-making in institutional settings. Only 2 per cent of people engage in groups discussing climate change and land governance, while participation in disaster / hazard response groups and fishery management groups stands at more than 5 per cent. The largest gender gaps in environmental decision-making can be observed in engagement on water management committees, where roughly 1 per cent of women who collect water get to contribute towards water management decisions, compared to 5 per cent of men. Engagement in these groups is important to ensure natural resource management decisions are in line with the needs of both women and men, and contribute to environmental conservation.

Figure 58: Proportion of the population engaging in environmental decision-making, by sex (percentage)

