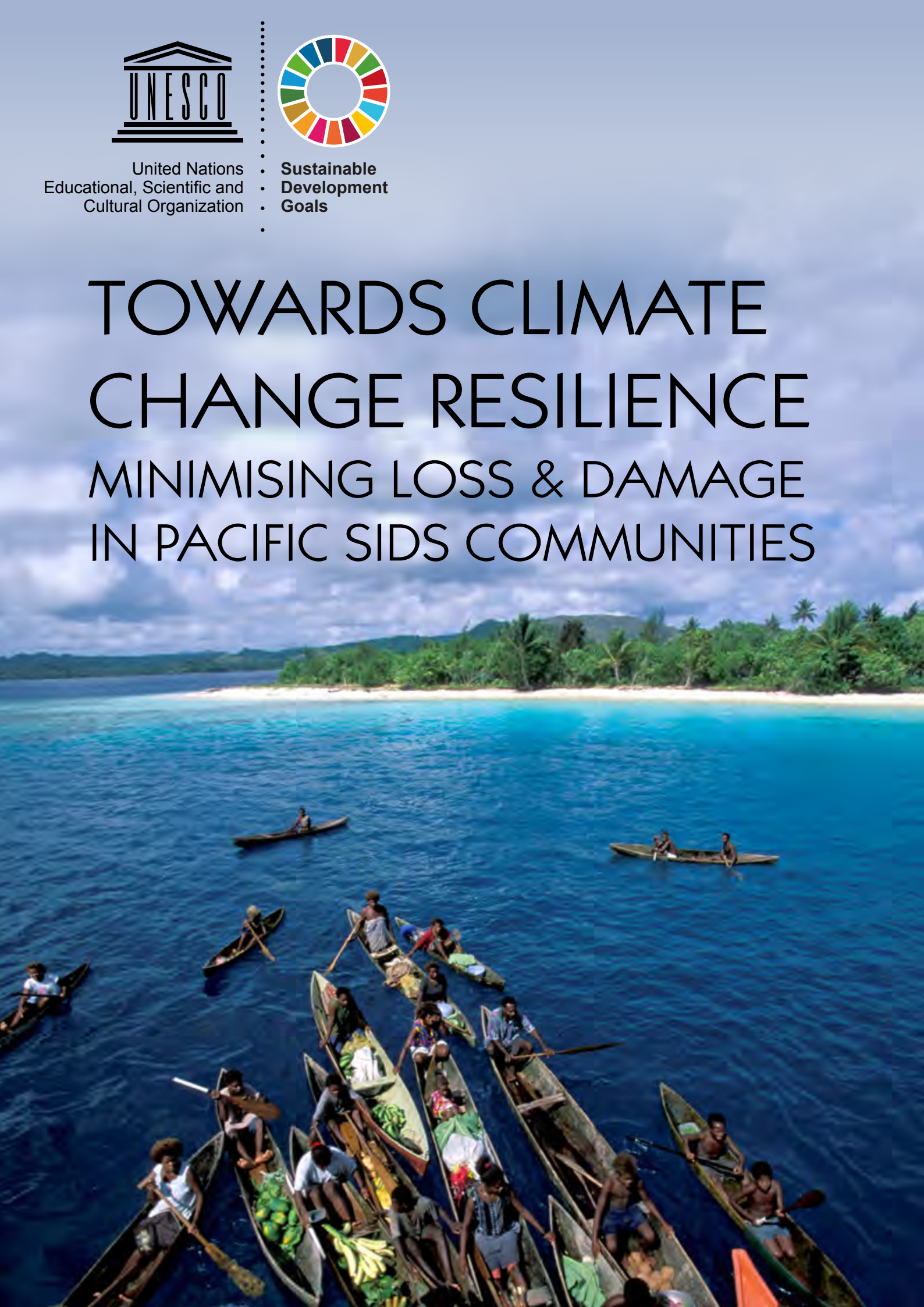
United Nations
Educational, Scientific and
Cultural Organization

**Sustainable
Development
Goals**

TOWARDS CLIMATE CHANGE RESILIENCE

MINIMISING LOSS & DAMAGE IN PACIFIC SIDS COMMUNITIES



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FOREWORD

I am delighted to present this summary report, which synthesises the main outcomes of the project *Towards climate change resilience: Minimising loss and damage in Pacific SIDS communities*, implemented from July 2014 to December 2016.

In 2012, the United Nations Framework Convention on Climate Change highlighted key gaps in our understanding of loss and damage in small islands due to the negative effects of climate change, including: a scarcity of quality climate and vulnerability information in developing countries; a lack of globally available data on the slow onset impacts of climate change; and the need to analyse the impacts on complex systems (such as communities, societies and ecosystems) in a holistic way.

The project was established in response to this identified gap. Specifically, the overall goal of the project was to generate and share new knowledge and raise awareness on loss and damage caused by the adverse impacts of climate change, particularly in Pacific Small Island Developing States (SIDS), one of the most vulnerable areas in the world. The project focused on loss and damage in two of the most important economic sectors in the region: agriculture and tourism.

In addition to undertaking a literature review, organising regional consultations and carrying out awareness-raising activities in the five participating countries, the project has developed a community-based assessment toolkit for climate change related loss and damage, which has been trialled in communities in five Pacific SIDS: Cook Islands, Fiji, Samoa, Solomon Islands, and Timor-Leste. The toolkit methodologies and results of the community assessments are summarised herein.

I am extremely grateful to the government of Malaysia, who provided financial support for this project through the Malaysia-UNESCO Cooperation Programme MUCP. I am also grateful to the many partners and stakeholders who worked with the University of the South Pacific in implementing the project. Their cooperation and insights have been invaluable, and I hope that together we can continue to make a constructive contribution for minimising loss and damage from climate change.

SHAHBAZ KHAN
Director and Representative,
Regional Science Bureau for Asia and the Pacific

1. INTRODUCTION

The United Nations Framework Convention on Climate Change (UNFCCC) process has agreed on mitigation and adaptation approaches to deal with climate change. However, due to delays and difficulties in implementing change on both fronts, negotiators under the UNFCCC have recognised that the 'adverse effects of climate change includes, and in some cases involves more than that which can be reduced by adaptation' (UNFCCC 2013), causing harm to the lives and livelihoods of millions of people all over the world and leading to loss and damage associated with the adverse effects of climate change.

The impacts of climate change include slow onset events and extreme weather events, both of which may result in loss and damage. Slow onset events include sea level rise, increasing temperatures, ocean acidification, glacial retreat and related impacts, salinization, land and forest degradation, and loss of biodiversity and desertification (UNFCCC 2010). Extreme weather events (or 'rapid onset' events) may include drought, heat waves, floods, tropical cyclones and storm surges. Natural hazards arising from climate change in the Pacific include both extreme and slow onset events with multiple flow-on effects. For example, rising sea levels – a slow onset process – leads to submergence of low-lying coastal areas; saltwater intrusion of coastal rivers into groundwater aquifers;

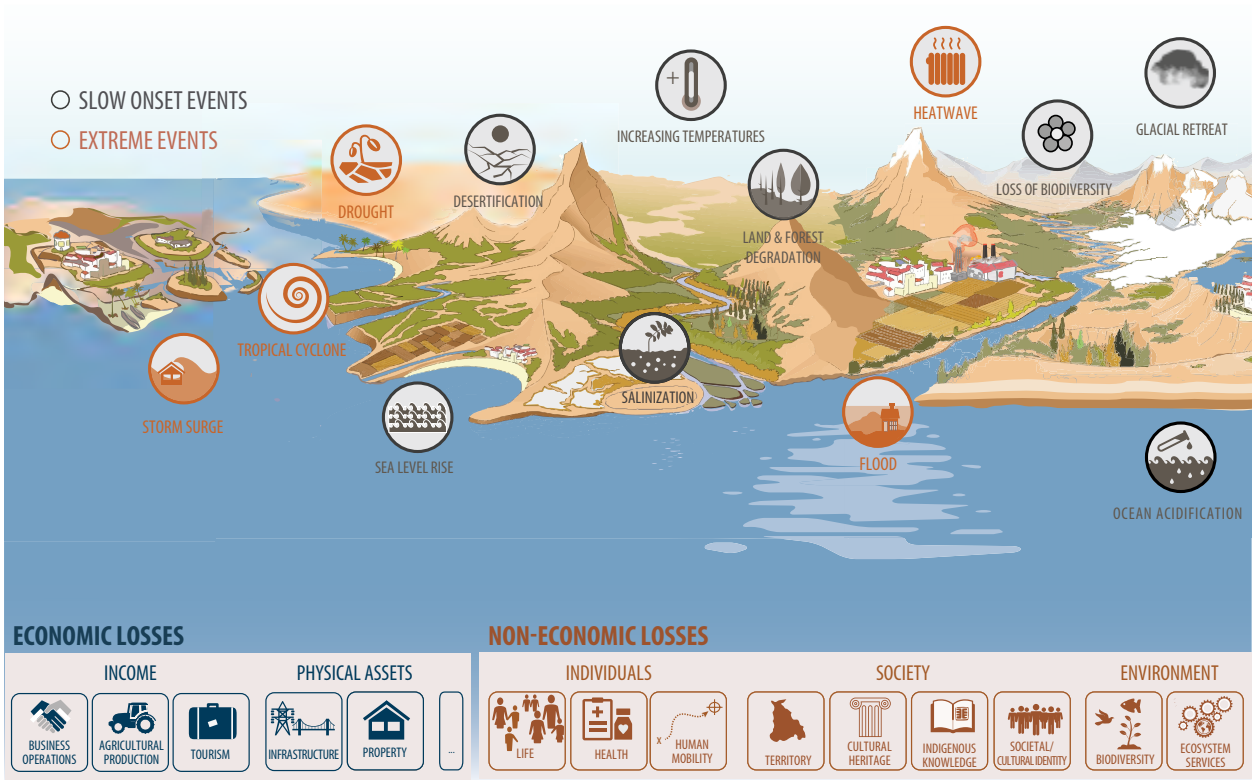

Figure 1 Overview of loss and damage due to climate change from the UNFCCC *Online Guide on Loss and Damage* (2016)

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Karoko house remnants after flooding (shores of Kubulau Peninsula, Fiji).

beach erosion; and saltwater inundation of fields leading to crop failure. Even a small rise in sea level can damage mangrove forests, which provide a wide range of ecosystem services, including for fisheries, coastal protection and carbon sequestration. Extreme events experienced in the region include floods, droughts and heat stress, cyclones and associated storm surges, which have enormous impacts on Pacific Small Island Developing States (SIDS), at the community, country and regional levels.

Understanding and assessing loss and damage associated with climate change is a complex process. Despite being discussed for over two decades under the UNFCCC, there is still no widely agreed definition of loss and damage related to the impacts of climate change. Warner and van der Geest, in their study on loss and damage in nine countries, define loss and damage as "negative effects of climate variability and climate change that people have not been able to cope with or adapt to (2013, p.369).

The negative effects include economic losses (i.e. resources, goods and services that are commonly traded in markets; loss of income through disruptions to agricultural production, business operations and tourism; and impacts on physical assets like infrastructure and property) as well as non-economic losses (including human impacts [life, health, mobility], changes at a society level [loss of territory, cultural heritage, indigenous knowledge, cultural identity] and environmental impacts on biodiversity and ecosystem services) (Figure 1).

Barriers to avoiding loss and damage include the scarcity of quality information in developing countries; a lack of available data on the slow onset impacts of climate change; and the need to analyse the impacts of climate change on complex systems such as communities in a holistic way (UNFCCC 2012; IPCC 2012).

The goal of the *Towards climate change resilience: Minimising loss and damage in Pacific SIDS communities* project was to generate and share new knowledge and raise awareness on loss and damage caused by the adverse impacts of climate change in the Pacific. The project has developed tools and approaches to better understand the dynamics leading to loss and damage in the agriculture and tourism sectors in Pacific least developed countries (LDCs) and small island developing states (SIDS); identified limits to coping and adaptation; and collected and shared information on the loss and damage affecting agriculture and tourism at community level in five Pacific SIDS: Cook Islands, Fiji, Samoa, Solomon Islands, and Timor-Leste.

2. THE PACIFIC CONTEXT

Loss and damage from climate change in the Pacific

The Pacific is considered to be one of the most vulnerable regions in the world to the adverse impacts of climate change (SPREP 2012), with loss and damage from climate change seen as a significant threat for development of Pacific SIDS.

Pacific SIDS are highly exposed to extreme events such as tropical cyclones, storm surges, droughts and floods (UNESCAP 2015: 23). The low-lying nature of islands and the fact that the majority of the population and development are near the coast also expose them to slow onset events, such as sea level rise and saltwater inundation (SPREP 2012).

The scientific consensus on the link of these events to climate change varies. For instance, the links to sea level rise and air temperature increase are well correlated and notable trends have been documented.[1] Pacific SIDS are also seeing changing precipitation patterns, which are linked to climate change, but the exact nature of the change varies from country to country (SPREP 2012, pp.59–60; IPCC 2014, p.53). Other highlighted events, such as storm surges and saltwater inundation are linked to sea level rise, but vary significantly at a local level (Nurse *et al.*, 2014, p.1619).

The data supporting trends on cyclones, floods and droughts and their link to climate change is less clear. More data is required to establish how climate change is impacting their frequency and intensity across the Pacific (Nurse *et al.*, 2014, pp. 1620). Nevertheless, these stressors were reported to be increasing by study communities in all five countries, suggesting that further research to better understand the dynamics and multiple root causes of loss and damage should be a priority.

Failed seawall

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1 Sea level in the Western pacific has risen at a rate of up to 12 mm per year since 1993, up to three times larger than the global average of 2.8–3.6 mm (IPCC 2014, p.42; Nurse et al. 2014, p.1619) – and increased storm surges are linked to this (IPCC 2014, p.53). Air temperature rose between 0.3–0.8°C for Pacific Island Countries during the Twentieth Century (SPREP 2012, p.59).

Focus on tourism and agriculture

Tourism and agriculture are important sectors for countries in the Pacific region as a whole, as well as for individual Pacific SIDS. These two productive sectors offer good opportunities for inclusive and sustainable economic growth in the region, including building resilience in rural communities, and enhancing sustainable development (FAO 2012).

Food security is particularly important for small, isolated island economies where the food supply can be completely disrupted by natural hazards such as droughts, tropical cyclones, tsunamis and unexpected environmental changes (Kakazu 2004). The agriculture sector is a major source of employment and income for households in most Pacific SIDS.

Timor Leste: a rice farmer carries away rice bundles destroyed by rain downpours

It is predicted that climate change will affect the entire food supply chain. Changes in temperature and rainfall regimes (about 70% of the Pacific's agricultural area is heavily dependent on seasonal rainfall), changes to average and peak temperatures, the loss of genetic resources and agro-biodiversity, increased salinization, more intense weather-related natural disasters, and changes in disease and pest regimes could all have significant repercussions for agricultural production (SPC 2011).

Similarly the tourism sector is a major contributor to the GDP of Pacific SIDS. In the Cook Islands, for example, tourism and related service industries have been the leading growth sector, generating an average of 80% of the country's GDP in recent years (Government of the Cook Islands 2012, p.60). Moreover, tourism is often interlinked with other economic sectors, including agriculture, and offers diverse economic benefits (UNEP 1996).

Towards climate change resilience: the project

Although awareness of climate change is high in the Pacific, not much research has been done on loss and damage in Pacific SIDS. The Secretariat of the Pacific Regional Environment Programme has carried out gap analyses in a few countries, highlighting particularly the slow onset climate stressors of greatest concern in Vanuatu and Samoa (SPREP 2015a and 2015b). The standard setting study by Warner and van der Geest of loss and damage at the community level in 9 vulnerable countries (2013)

included Kosrae in the Federated States of Micronesia as one of its case studies. Warner and van der Geest found that climate variability, socio-economic challenges and climate change-related events interacted in a complex manner which gradually eroded communities' resilience and limited their ability to cope and adapt. However, almost all the survey households in all countries experienced impacts from climate-related stressors, while a large majority of households experienced loss and damage even after the the adoption of coping and adaptation measures (Warner and van der Geest 2013). These conclusions exactly match the findings of the "Towards Climate Change Resilience" project.

The *Towards climate change resilience* project is aligned with the first priority action area identified by the Warsaw International Mechanism (WIM), namely: to "enhance the understanding of how loss and damage associated with the adverse effects of climate change affect particularly vulnerable developing countries, segments of the population that are already vulnerable owing to geography, socioeconomic status, livelihoods, gender, age, indigenous or minority status or disability, and the ecosystems that they depend on, and of how the implementation of approaches to address loss and damage can benefit them" (UNFCCC 2013).

This project contributes to economic resilience in the Pacific and South-east Asia by aiming to reduce risk of loss and damage in the tourism and agriculture sectors from extreme and slow-onset events through improved assessments and education. A toolkit was developed to assess loss and damage at community level. The results of the community awareness-raising and assessments provide new knowledge and insights into loss and damage being experienced by communities from both slow and rapid onset events. This will contribute to analysing the challenges faced by the agriculture and tourism sectors in adapting to the effects of climate change. A deeper understanding of the impacts of climate change, and the limits of adaptation measures, can support planning to build community resilience and assist in minimising loss and damage where possible

This project was implemented by UNESCO's Office for the Pacific States and the University of the South Pacific's Centre for Environment and Sustainable Development (USP-PaCE-SD). A number of other partners participated in or contributed to the planning, implementation, data collection and review of the project, including government representatives of the five selected countries, representatives of regional and international agencies, and community members (see complete list of partners on p.27).

Working with many and varied partners in the Pacific SIDS has contributed to on-going awareness-raising and capacity development for a wide range of stakeholders. Through workshops and on-the-ground cooperation, local, national and international partners learned more about the issues surrounding climate change loss and damage and how communities in their countries are affected. They also contributed their expertise and perspectives to the development of the toolkit, the results of the research, and determining priorities for next steps.

Adaptation methods

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Community capacity-building

While the results of the project contribute to a technical understanding of loss and damage in the Pacific region, by working directly with communities the project has also made a significant contribution to capacity-building at local level. Communities can benefit from exercises which help them to translate scientific and technical data to planning and adaptation: it is essential for communities to make local sense of climate change, in a relevant, meaningful and empowering way (McNamara 2013).

Awareness-raising and capacity building activities at the community level included NGOs, government departments and researchers responsible for community-level outreach, in addition to community members themselves. A significant benefit arising from the project was capacity-building carried out with USP-PaCE-SD in-country climate change coordinators in 15 Pacific countries, through regional meetings and through the participation of a range of government partners – as researchers, participants or observers – in the community-based research. Testing and improvement of the toolkit is ongoing, and it is also being included in the Pacific Islands Community Integrated Vulnerability Assessment (IVA) that is being rolled out across all countries in the region. This evolving work contributes to the sustainability and scaling up of the project.

Benefits at community level include a greater awareness of the links between types of climate change impacts, loss and damage, and community activities and strategies. This knowledge can be used to identify more successful adaptation strategies and what is needed to be able to implement those strategies.

Coastal erosion

3. ASSESSING LOSS & DAMAGE

Assessment approach

At present, there is no commonly accepted method to directly calculate the loss and damage attributed to climate change; nor is there an accepted method to attribute the impacts of extreme weather events to climate change, rather than to human development or baseline natural hazards. Calculations of loss and damage are further complicated by the need for baseline data in order to make quantitative assessment on the loss and damages faced by selected communities (by climate change impacts or natural hazards), as well as to assess the effectiveness of adaptation measures. Another challenge is the inclusion of non-economic losses in loss and damage assessment, such as impacts on tangible and intangible cultural assets. This is an important issue for Pacific SIDS, where traditional knowledge and livelihoods are disrupted due to climate change related loss and damage. A concrete example comes from the Federated States of Micronesia, where building material is scavenged from historic structures to construct seawalls, damaging valuable archeological heritage (Monnereau and Abraham 2013).

The project team carried out a literature review in 2015 to evaluate the state of knowledge on loss and damage attributable to climate change in the Pacific, with a view to identifying gaps and informing research questions and methods. Although climate change is typically described in terms of average changes in temperature and precipitation, much of the loss and damage identified in the Pacific region has resulted from shifts in the frequency and severity of extreme events, so it is often impossible to determine whether individual events are 'caused' by climate change. Nevertheless, the review concluded that the negative impacts of climate change from both slow onset and extreme events are already strongly impacting Pacific livelihoods. It also identified a gap in our understanding of how communities and small businesses are experiencing climate change and how, or indeed if, they adapt to or plan for climate change.

On the basis of this literature review, as a well as a regional training meeting held in Fiji in October 2015, a methodological toolkit was developed for use by local practitioners and researchers to work with communities to carry out preliminary climate change loss and damage assessments in the agriculture and tourism sectors. The toolkit aims to assist researchers and stakeholders to:

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- Collect relevant information and understanding of the depth and scope of vulnerability, exposure impacts and existing adaptive capacity in order to assist communities to generate better coping and adaptive lessons and applications.
- Identify limitations in coping and adaptation and where certain critical decisions must be taken to avoid further loss and damage.
- Better understand the root causes for increasing or decreasing loss and damage in order to make better decisions related to their coping and adaptive strategies.
- Seek support from partners and authorities for further assessment, planning and development actions.
- Help communities to better understand the impacts of climate change so that they may improve their adaptation strategies.

Community-based toolkit

The *Community-Based Loss and Damage Assessment Toolkit for the Tourism and Agricultural Sectors* was developed to assist facilitators to apply participatory approaches, both quantitative and qualitative, to collect information at community level. It was derived from Warner and van der Greest's study in nine vulnerable countries in Asia and Africa (2013) and was further revised following pilot testing of the toolkit in the five countries based on feedback from participating

communities. In all study communities, both men and women participated in the surveys and focus groups. However, clarifying if men and women have different perspectives proved difficult and, in some cases, sensitive. An important lesson learned was that gender issues must be handled with care and skill by the researchers.

The toolkit consists of four main parts:

- Introduction, which contains background information about the concept of climate change loss and damage; and outlines the purposes of the toolkit and its four key principles: ownership, respect, flexibility and relevance.

- 'Before the assessment' information for facilitators, including entry points to communities as well as information that should be compiled before visiting the community: baseline data, community profiles, and free prior and informed consent procedures. A key point here is to work with existing information that is available and add on the tools to complete the assessment, to avoid duplication of results and limit potential "consultation fatigue" of communities.

- Community-based assessment, including mapping climate hazards and their impacts; coping and adaptation interventions; and next steps (including a community feedback session). These data collection tools are elaborated further below.

- Analysis of findings and compilation of technical reports that can be disseminated to the community, government, NGOs and development partners.

Data collection tools

The methodological component of the toolkit contained 9 tools that may be useful for data collection at the community level. A brief introduction to each of these tools is provided in the following table.

Tool	Purpose
Seasonal mapping/calendar	A calendar template into which the community can add the events they experience each month, including seasonal and traditional events. The calendar can help to illustrate the relationship between seasonal climatic events and socio-cultural-economic activities.
Historical timeline	Documentation and reconstruction of the history of climatic stresses and their impacts, as well as the major coping and adaptation strategies that have been observed. The timeline can help to identify historical trends.
Hazard mapping	Documentation of specific hazard and climate stresses and their observed impacts on specific sectors of the community. Can help to document and record the impacts of a disastrous climatic stress or hazard on the community's agriculture and tourism sectors.
Rank matrix	Can be used in two ways: (i) to enable the community to rank the climatic stresses and hazards that affect it most in terms of impact and frequency; and (ii) to rank development needs in terms of priority, forms of coping and adaptive strategies, and available designs and resource commitments.
Physical mapping	Locates and identifies important features in the community such as cultural sites, household arrangements, agricultural sites, evacuation centres, tourist resorts, coastlines, rivers, etc. Can assist in identifying sources of risk and inform development choices.
Vulnerability/impacts mapping	Can be overlaid on the physical map, showing parts of the community that are vulnerable to hazards based on the available observed impacts and experiences of the village. Can be used to show future scenarios of impacts, and to assist in identifying vulnerabilities and how to address future risks.
Loss and damage matrix	Assists communities to link impacts before and after interventions (coping or adaptation actions), and to identify the loss and damage that occur when interventions are not enough to prevent adverse effects. Can be used to evaluate the effectiveness of interventions and identify reasons for their success or failure.
Feedback session	Presents the major findings of the assessment back to the community and initiates a discussion to confirm the finding and assessment results. It also includes a discussion of next actions to reduce loss and damage.
Household questionnaires	Collects data on experiences of loss and damage, and the level of effectiveness of coping/adaptation strategies at the household level for agriculture and tourism sectors.

4. COMMUNITY EXPERIENCES

Overview

Thirteen communities from five countries (Cook Islands, Fiji, Samoa, Solomon Islands and Timor-Leste) participated in trialling the *Community-Based Toolkit* to collect data on loss and damage in their tourism and agriculture sectors. The communities were selected at national level by the in-country coordinator and the National Project Advisory Committee in each country using three main criteria:

i. accessibility (i.e. easy to access during the project);

ii. existence of agriculture and tourism activities (except Timor-Leste, where there was no community-based tourism); and

iii. evidence of community-instigated adaptation responses to slow and rapid onset climate change events.

Between 20 and 42 households in each community answered in-depth questionnaires, and typically at least 20% of the community members participated in the focus-group discussions. Overall, the number of men and women who participated were fairly evenly split. All assessments and reporting occurred between January–September 2016. All of the communities surveyed reported significant loss and damage in both the agriculture and tourism sectors. Most of the communities reported immediate and severe impacts of rapid onset events such as cyclones and storm surges, and in many cases the primary focus on urgent problem-solving (food security, income) meant that there was reduced focus on the impacts of slow onset events such as ocean acidification. However, awareness-raising activities following the assessment process drew community attention to the significance and impact of these events.

All participating communities reported that the coping and adaptation measures employed were largely insufficient, and mostly unsuccessful in avoiding loss and damage. Using the toolkit to evaluate the effectiveness of interventions and investigate reasons for their success or failure revealed that many of the coping/adaptation behavioural strategies reported for both agriculture and tourism tended more towards 'coping' rather than 'adaptation'. In other words, they were motivated by crisis and focussed on short-term and immediate survival options, such as trading livestock for cash, or borrowing water from neighbours for crop irrigation. In several cases these changes in behaviour introduced new problems that degraded the resource base, such as cutting down

mangrove trees for rebuilding. In other cases, certain activities such as farming were simply stopped completely, with subsistence farmers being forced to look for alternative food sources. Whilst these coping strategies may have been sufficient for communities when extreme climate events occurred only every five years or so, community members reported that they are increasingly ineffective when confronted by accelerating drought, cyclone, flood and storm surge cycles.

Ecosystem-based adaptations tended to involve more planning and sustained practices, although in many cases these were also of only limited success. The most successful changes included moving the location of crops to higher ground as well as changes in management practices, while experiments with introducing drought- and cyclone-resistant crops and livestock were often hampered by high expense, low yields, and a lack of local knowledge to support them.

Infrastructure-based coping and adaptation was also typically motivated by crisis; however, several communities reported that these interventions had the most long-term positive impacts on livelihood security, with back-up generators and sea-walls being successful in reducing loss and damage in the tourism sector. However, sea walls were only successful in certain circumstances, for instance when they were particularly well built and only protected against relatively minor storm surges.

Despite these efforts, all the participating communities anticipate that they will continue to experience significant loss and damage from climate stressors.

Results from community assessments for each participating country are summarised in the following pages. The testimonials provide insight into the daily challenges faced by community members, as well as their responses. It should be noted that these results reflect an assessment process that focussed specifically on the agriculture and tourism industries. The lack of reporting on certain categories of loss and damage (such as traditional knowledge, ecosystem services, mobility, etc.) does not necessarily mean that these impacts were not experienced, merely that they were not discussed during the assessment.

Samoa villagers meeting, Saleapaga

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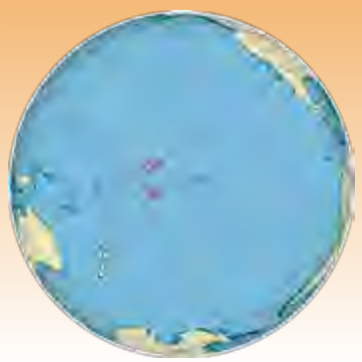
COOK ISLANDS



In the Cook Islands, the USP Climate Change in-country coordinator worked in collaboration with the Cook Islands National Council of Women, Emergency Management Cook Islands, and other officials from the Cook Islands Office of the Prime Minister, to apply the toolkit in communities on four islands in the Cook Islands: Aitutaki (Amuri and Tautu communities), Mauke, Mitiaro and Atiu. As a result of the awareness raised by the data collection and planning that the toolkit facilitated, the National Council of Women has begun using the toolkit to collect data on loss and damage in other communities (beginning with Mitiaro, Mauke and Atiu) as well as for monitoring and evaluation. Sixty percent of survey participants were women.

The primary reported climate stressors were cyclones, drought and saltwater inundation. Storm surges, increased temperature and coastal flooding were also impacting crops and businesses in the study communities. The islanders observed increased length of droughts and extreme temperatures (Figure 3).

What the climate data can tell us so far

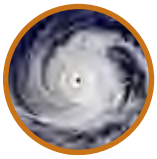
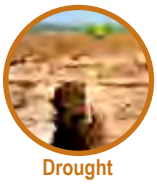
In both the Northern and Southern groups of islands, annual maximum temperatures have increased at a rate of 0.09°C per decade since 1950 (PACCSAP 2015a, p.6). Sea level has risen by about 4 mm per year since 1993 (ibid.). Although droughts are projected to increase by 2030 (National Environment Service Cook Islands 2011, p.35), data on other events, such as precipitation, cyclone frequency or intensity, are insufficient to identify clear current trends (ibid., PACCSAP 2015a, pp.2–3).

Infrastructure Manager Mitiaro Island

Our island [Mitiaro] is mostly composed of makatea [coral] and good planting soil is scarce. Land tenure is by family allocation and you cannot move to another family's allocation. Because our island relies on rainwater, our biggest problem is the long dry season that we are experiencing, which I believe is due to climate change. This has caused us to realise that we do not have much water storage... When trying to plant vegetable gardens, it is all fine when there is plenty of water, but when the water is running out we try to conserve water only for drinking, cooking and bathing by half bucket water only; even washing our clothes is also rationed.

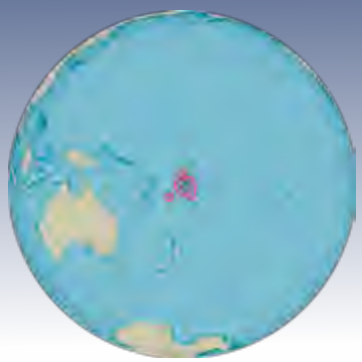
Sometimes we place dry banana or coconut leaves or pulled out weeds on the crops to stop the dehydration of water from the ground to keep the ground moist and also lessen the heat of the hot sun. This work is very tiring, but we just try our best to save our crops. Most of our food crops die.

Figure 3 | Summary overview of the Cook Islands community assessments

Main climate stressor	Main L&D by sector	Coping/ adaptation strategies	Notes
 Cyclones	**Agriculture** **Production** ➤ Reduced yield of subsistence crops (up to 100% loss) ➤ Reduced arable land near villages ➤ Loss of income for farmers **Health** ➤ Reduced food security ➤ Increased reliance on imported processed food	**Behavioural** ➤ Improve crop management techniques (manual irrigation, mulching, composting, reduced plot sizes) ➤ Change farming site (away from the sea) ➤ Stop farming completely ➤ Borrowing water for irrigation **Ecosystem-based** ➤ Cultivate drought- and cyclone-tolerant crops ➤ Adopt agroforestry and organic farming **Infrastructure** ➤ Water harvesting tools (water tanks)	Households involved in selling food to tourists suffered the double impact of the loss of their subsistence crops (direct source of food) as well as lost income from cash crops. Of the coping mechanisms employed, only the purchase of two generators to use when the electricity goes off during storms and cyclones significantly reduced the impacts of cyclones on the tourism sector.
 Drought			
 Saltwater inundation	**Tourism** **Business operations** ➤ Loss of income for tourism operators (e.g. reduced tourists) ➤ Reduced livelihood (e.g. no electricity to operate tools, no vegetables for sale) **Infrastructure** ➤ Damage or loss of infrastructure (e.g. accomodation, boat garages)	**Behavioural** ➤ Disaster preparation (e.g. tying down garages before a cyclone) ➤ Build sea wall ➤ Change business times – less active during cyclone season ➤ Some stop tourism activities completely **Infrastructure** ➤ Purchase backup power generators ➤ Cyclone-proof house ➤ Build sea walls	The main reason reported for limitation of adaptation was the increased intensity of droughts and cyclones and sea level rise experienced by communities.
 Storm surge			

Coastal protection is so important for lowlying atolls

© Tongareva Island Government, Cook Islands



FIJI

In Fiji, the USP Climate Change loss and damage field research team worked in collaboration with The Ministry of iTaukei (indigenous Fijian) Affairs to trial the toolkit in four communities: Nacekoro Village in Vanua Levu (coastal village), Nabukelevu village in Serua (inland village), and coastal tourism villages Silana and Nataleira in Tailevu. Men's, women's and youth focus groups were held and the issues and concerns raised were similar.

The common climate stressors experienced by communities in Fiji were rising sea level, increased intensity of cyclones and flooding, shifting precipitation and strong storm surges. Saltwater inundation and droughts were significant for the three coastal communities. Damage to infrastructure affected tourism activities in all the communities. The communities' efforts to cope and adapt were hindered by lack of resources and land tenure issues (Figure 4).

Senior man
Nataleira Village

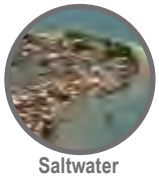
There is more rain and cloud cover than sunshine when compared to the sixties and the seventies. We have lost one important income generating product, maqodina. This area is well known for mango dina; but now it does not fruit anymore... This is also a well-known rice growing area, and the rice fields are now idle. Rice is not producing as well as before and we are still not sure as to what is the real cause. Some have said that it is the increase of salinity in the soil but we are not really sure. Peanut is also affected, with shrinking of the areas they are usually grown. The harvest every year is falling more and more.

My family still stays in the exposed section of the village, which is still with the old village site. The likelihood of being flooded from storm surges and floods or both at the same time is very high. The threat of sea level rise is very high as the area is about half a meter to one meter above sea-level.

What the climate data can tell us so far

Since 1942, temperatures in Fiji have increased between 0.04°C and 0.15°C per decade, depending on the location (PACCSAP 2015b, p.6). Sea level has risen an average 6mm per year sea level rise since 1993 (Ibid. 2015b, p.6), which has been linked to worsening storm surges and coastal flooding (ibid., p.9). The data do not as yet show a clear trend of increased frequency or intensity of cyclones, drought or shifting precipitation due to climate change (Government of Fiji 2014, p.48). However, more extreme rainfall days per year are projected (PACCSAP 2015b).

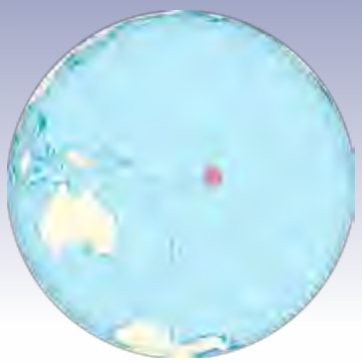
Figure 4 | Summary overview of the Fiji islands community assessments

Main climate stressor	Main L&D by sector	Coping/ adaptation strategies	Notes
 Sea level rise	**Agriculture** **Production** ➤ Reduced yield of crops, especially peanut, rice and root crops ➤ Reduced availability of arable farmland – coastal erosion and frequent inundation ➤ Fruit trees (mandarin, orange, mango, *duruka*) no longer fruit **Social/cultural** ➤ Reduced income from reduced yield of rice and other crops ➤ Impacts on traditional knowledge – variations in flowering/fruiting times for plants used as traditional indicators	**Behavioural** ➤ Abandon rice as a crop ➤ Greater dependence on cassava as cash crop & subsistence ➤ Use traditional crops and other wild products as cash items ➤ Plant in containers to reduce saltwater impacts **Ecosystem-based** ➤ Plant salt tolerant trees along the coast ➤ Move plantations inland (further away from the village) ➤ Practice mixed cropping, plant more traditional crops for subsistence (taro, cassava, sweet potato, yam) ➤ Introduce ginger as new cash crop **Infrastructure** ➤ Build a sandbank buffer into the river	Rising sea levels and extreme weather events both resulted in transfer of salt water inland into the rice fields as the water canal that feeds water into the fields is very close to the sea.
 Flooding & shifting precipitation			Variation has been observed in the flowering and fruition of certain plants, which were used as traditional indicators for planting, production or harvest of certain crops or valuable fauna on land or in the sea.
 Increased storm surges			
 Saltwater inundation	**Tourism** **Business operations** ➤ Loss of income (e.g. reduced tourists) ➤ Loss of materials for certain cultural activities **Infrastructure** ➤ Damage or loss of infrastructure (e.g. accomodation, boat garages) ➤ Longer time for rebuilding	**Behavioural** ➤ Money saving measures to survive loss of income due to temporary drop in visitor numbers (e.g. selling livestock for cash, buying less or cheaper food) **Ecosystem-based** ➤ Plant mangroves **Infrastructure** ➤ Build temporary seawall	The assessment took place a week before Severe Tropical Cyclone Winston (Category 5) destroyed the villages. They reported 100% loss and damage of their ecotourism facilities.

A Fijian village

A relocated village in Fiji

SAMOA



In Samoa, the USP Climate Change in-country coordinator worked in collaboration with the Ministry of Education, Sports and Culture and the Ministry of Women, Communities and Social Development to trial the toolkit in two villages: Saleapaga in Aleipata, and Manase in Savaii. The majority of focus group participants were women, whereas the majority of household survey respondents were men.

The major stressors reported by the villages were floods, cyclones, droughts, saltwater inundation and increasing temperatures. The villagers reported experiencing floods, storm surges and increased temperature more than once a year. They also reported an increased frequency of cyclones. As the Manase community member and Figure 5 make clear, these stressors cause big challenges for the communities.

What the climate data can tell us so far

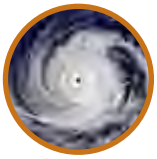
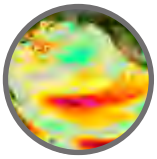
Sea level has risen in Samoa by about 4 mm per year since 1993 (PACCSAP 2015c, p.6) and rainfall has increased in Apia since 1890 (ibid., p.5). Extreme rainfall events occur with increasing frequency and increasing floods and droughts linked to climate change have been identified as key risks for the country (Government of Samoa 2010, pp. 11, 44). Despite observed increase in average temperature, data are insufficient to provide statistically significant trends. Nevertheless, temperature is projected to increase (Australian Bureau of Meteorology and CSIRO 2014: 248–9).

Manase community member

For the last 30 years our village beach has been eroded tremendously without our knowledge. Suddenly we are confronted with less sand, as if it has been sucked out of our beaches. The coconuts on the beach have their roots exposed, thus telling us that something acting very slowly is gradually eating the sand away. As a beach fale [Samoan thatch hut] operator, I noticed that the sea has moved inwards eroding most of our old beach fales. Some time ago, work was conducted by a development project near us [at a nearby operator]: ever since that work, most of our beaches have been worse off.

Beach fales in Savaii

Figure 5 | Summary overview of the Samoa community assessments

Main climate stressor	Main L&D by sector	Coping/ adaptation strategies	Notes
 Cyclones	**Agriculture** **Production** ➤ Reduced yield of subsistence and cash crops ➤ Loss of livestock ➤ Loss of arable land near village **Health** ➤ Reduced food security **Social/cultural** ➤ Reduced income ➤ Village relocation, loss of family graves, land and businesses	**Behavioural** ➤ Change cultivation methods (raised beds, pots, containers, etc) ➤ Stop farming completely and change to alternative livelihood **Ecosystem-based** ➤ Change planting and harvesting time ➤ Improve crop management (irrigation, store water, mulching etc) ➤ Plant new crop varieties ➤ Raise resilient livestock ➤ Shift to higher ground ➤ Reduce farm size	Households reported that few of the coping and adaptation methods were successful in reducing loss and damage.
 Flooding			Saleapaga Village was severely affected by the tsunami in 2009, so communities also reported earthquake and tsunami effects, despite these not being directly linked to climate change.
 Drought	**Tourism** **Business operations** ➤ Beach erosion ➤ Loss of income for tourism operators (e.g. reduced tourists) ➤ Reduced income (e.g. no electricity to operate tools, no vegetables for sale) **Infrastructure** ➤ Damage or loss of beach houses	**Behavioural** ➤ Rebuild accommodation ➤ Relocate beach houses **Ecosystem-based** ➤ Plant trees and lianas to reduce coastal erosion and provide shade during heatwaves **Infrastructure** ➤ Build sea wall	Most communities observed an increased intensity of impacts of cyclones, droughts and storm surges. The combined effects made it difficult to adapt.
 Saltwater inundation			
 Storm surge			While communities were not fully recovered from one disaster, another one hit. This led to accumulated loss and damage has left the villagers in a constant mode of recovery.
 Increased temperature			

© UNDP/ E. Adams

Manase initiative to build a seawall and walkway to protect beach fales

SOLOMON ISLANDS

In the Solomon Islands, the USP Climate Change in-country coordinator and research assistant worked in collaboration with Malaita Provincial Agriculture Division to apply the toolkit in Busu and Radeaekoa communities, both located in the Langalanga lagoon on the South Central Coast of Malaita Province. Most of the households in these communities farm and sell their produce as their main source of income. In Radeaekoa, 71% of survey participants were women. In Busu, only 43% of survey participants were women.

The communities reported that the most severe climate stressors are cyclone (both wind and storm surges) and saltwater inundation. The islanders reported that, with the rising sea level and more frequent and stronger storm surges, coastal erosion is occurring rapidly and "eating away" much of the land. Communities reported that most of the coping and adaptation techniques employed were not only of limited success, but in several cases they introduced new negative impacts. For example, changing livestock to more tolerant species had no effect on survival rates, but the new species were more expensive to feed.

What the climate data can tell us so far

Sea level has risen at a rate of approximately 8 mm per year since 1993, much higher than the global average (PACCSAP 2015d, p.6). Although the communities reported more intense rainfall in the rainy season, there are insufficient data to corroborate this trend. Nevertheless, extreme rainfall events are projected to become more frequent (Australian Bureau of Meteorology and CSIRO 2014, p.271). Temperature has increased since the 1950s at a rate of 0.120°C per decade at Honiara (PACCSAP 2015d, p.5).

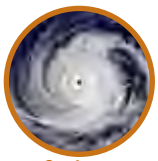
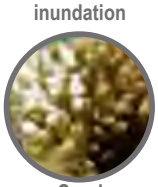
Chief Radeaekoa Community

The increasing intensity of rainfall during rainy season has resulted in a high frequency of flooding of food gardens over recent years. The flooding of community food gardens has resulted in the wilting of root crops especially kumara and cassava, with a shortage of food from gardens. And seasonal changes in weather patterns and climate are also causing changes in the seasonal fish species.

Radeaekoa Community

The change in rainfall patterns, especially the prolonging of dry seasons, has often led to extreme water shortage on the island communities of the Langalanga Lagoon, as well as other large settlement areas on the coast. This is marked by the increasing frequency of days in a month where members of the community have to travel to other water sources on the coast of the mainland to fetch quality drinking water.

Figure 6 | Summary overview of the Solomon Islands assessments

Main climate stressor	Main L&D by sector	Coping/ adaptation strategies	Notes
 Cyclones	**Agriculture** **Production** ➤ Loss of between 50–100% crops and livestock ➤ Less fish for sale and food ➤ Reduced arable land – due to coastal erosion and saltwater intrusion/inundation **Health** ➤ Reduced food security **Social/cultural** ➤ Loss of graves ➤ Loss of constructed islands	**Behavioural** ➤ Change cultivation methods ➤ Stop farming and change to alternative livelihood **Ecosystem-based** ➤ Plant new crop varieties ➤ Raise more tolerant livestock ➤ Plant new types of crops ➤ Improve crop management (e.g. irrigation) ➤ Change planting and harvesting times	Lack of land is the main issue with these communities. One of their cultural adaptations is to marry people with lands in the main Islands. This will be a "facilitated relocation" action for them.
 Storm surge			With rising sea level, coastal erosion is occurring very fast and "eating away" lots of the arable land. This is considered to be the greatest impact and risk by islanders.
 Salt water inundation	**Tourism** **Business operations** ➤ Loss of income for tourism operators (e.g. accommodation not available, cancellation of bookings) ➤ Reduced income for suppliers (e.g. no tourists to sell goods to) ➤ Increased costs (e.g. transport of repair materials) **Infrastructure** ➤ Damage or loss of beach houses	**Behavioural** ➤ Mobilise into working groups to rebuild **Ecosystem-based** ➤ Plant kitchen/home gardens near homes ➤ Plant more trees as windbreakers ➤ Use bush and reef materials to rebuild, including mangroves and coral **Infrastructure** ➤ Build sea walls ➤ Rebuild stronger homes and accommodation	Many of the coping and adaptation techniques fail due to a lack of local knowledge on how to manage new crops and livestock, or implement new techniques.
 Coral bleaching			Shifting from subsistence agriculture to new livelihood sources has resulted in new negative impacts such as overfishing and cutting down mangroves.
 Ocean acidification			Access to water and bush materials for rebuilding is reduced due to land tenure issues, as well as increasing pressure on these natural resources.

© MPL/ Woolcott Henry

Solomon island villagers selling produce

TIMOR-LESTE

In Timor-Leste, the USP Climate Change in-country coordinator worked in collaboration with researchers from the Centre for Climate Change and Biodiversity in the National University of Timor Lorosa'e to trial the toolkit in Hera village, located on the north coast of Timor Island about 12km east of the capital city of Dili. Forty seven percent of survey participants were women.

One hundred percent of the households surveyed practice crop cultivation, with non-farm activities representing only 13% of livelihood activity. Hera does not have a tourism sector, so no data was collected on tourism.

What the climate data can tell us so far

The annual mean temperature has increased at a rate of 0.016°C per year (Government of the Democratic Republic of Timor-Leste 2014, p.55). The El Niño Southern Oscillation has a notable effect on the climate of Timor-Leste with increased flooding and higher rainfall during La Niña years, while there is a greater risk of drought in El Niño years (Australian Bureau of Meteorology and CSIRO 2011, p.48). As regards droughts, data are insufficient to identify clear trends across the country. Nevertheless, greater fluctuation in rainfall is projected, with more extreme rainfall events predicted during the rainy season and possibly more droughts during the growing season (Government of the Republic of Timor-Leste 2014, p.19).

Kiosk owner
Hera village

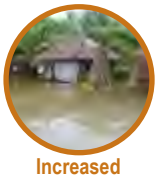
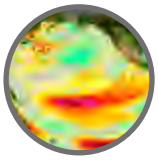
The temperature in Hera was much lower during the Indonesian time [from 1975–99]. It was not difficult to sleep at night and overall the temperature was pleasant. Now it is so hot during the day and at night that we have a hard time falling asleep, especially the children. Heavy rainfall occurs much more frequently than 20 years ago. Floods in our area have destroyed roads and my crops such as corn and potato because the ground becomes waterlogged and causes crops to rot...

© Viliamu Lese / USP

On the other hand, long droughts are occurring more often as well, which have a big impact on my crops and my animals. In the Indonesian time, my neighborhood used to be full of banana and taro, but now these crops don't grow anymore because there is not enough water. Because of this lack of water, I had to have my pump well deepened from 10 to 18 meters in order to be able to get water that we use for washing clothes, bathing, cooking and even drinking...

Another impact I am seeing is that there are more mosquitos and as a result many of my neighbors are getting malaria and dengue now. Due to the long droughts and lack of clean water, my livestock are getting infected by all kinds of different diseases which they didn't get before.

Figure 7 | Summary overview of the Timor-Leste community assessment

Main climate stressor	Main L&D by sector	Coping/ adaptation strategies	Notes
 Longer droughts	**Agriculture** **Production** ➤ Loss of yield ➤ Loss of animal feed ➤ Increased pests and diseases **Health** ➤ Reduced food security ➤ More mosquitoes **Social/cultural** ➤ Reduced subsistence crops ➤ Reduced cash crops and livestock for sale **Infrastructure** ➤ Damage to farming equipment	**Behavioural** ➤ Sell animals to buy food **Ecosystem-based** ➤ Introduce new technologies (e.g. tube well irrigation) ➤ Grow plants and trees more resistant to drought (e.g. cassava, mango, palm trees) ➤ Use biological and mechanical agents to control pests and weeds **Infrastructure** ➤ Build wall along river to protect agricultural land from flooding ➤ Use cold water and airtight containers for maize storage	Crop production has fallen for 90% of households due to drought. Vegetables, rice and maize are the most affected crops. Weeds are becoming more invasive with changing weather patterns, necessitating new control strategies. However they have been largely ineffective. Coping strategies have had limited success, particularly since few farmers have money to buy new equipment (drums, silos, irrigation systems) or have animals to sell for short-term cash injections.
 Increased floods			
 Increased temperature			

© Tessa Koppert

Timor Leste: household survey in Hera village

5. OUTCOMES

The project has generated and shared new knowledge on loss and damage in Pacific SIDS, and raised awareness on these issues in PICs. A toolkit was developed which was used to collect data with communities, identify limits to coping and adaptation, and begin contributing to a better understanding of the loss and damage being experienced at the community level.

Data collected from the assessments has revealed that many communities are mostly implementing coping strategies in reaction to extreme weather events, many of which are not effective in the face of the frequency and intensity of these events. There is a need to examine more closely the impacts of slow onset events on communities, and to focus on planning and adaptation for resilience.

The following lessons have been learned during the course of the community-based data collection.

Awareness-raising

In applying the toolkit, communities benefited from awareness-raising on climate change, including the causes, impacts and effectiveness of their coping and adaptation strategies. These sessions helped communities to take ownership of adaptation and risk reduction actions identified during

Solomon Islands community discussion group

©USP

the assessment, and also to identify the limitations of reducing loss and damage at local level. The general feeling of the participating communities had been that extreme and slow-onset events were 'normal' parts of life, and that there was nothing that could be done about it. The toolkit helped community members to identify opportunities under their control to reduce future impacts.

Detailed training and awareness-raising for professional stakeholders, including researchers and government officials, was also essential, particularly in revealing the extreme vulnerability of the agriculture and local tourism industries to loss and damage from climate change.

Socio-economic impact of climate change on small-scale agriculture

The findings of the assessment highlight the significant impact of climate stressors on small-scale farmers in Pacific Island communities.

Improving capacities for gender mainstreaming

As a new data collection toolkit was developed and trialled in this project, many lessons were learned related to the methodology. One important lesson was the importance of building the capacity of field researchers on gender-based mainstreaming. Gender relations in the Pacific are complex and sometime sensitive and eliciting gender disaggregated data proved to be more difficult than anticipated. This is a priority area for further development. Climate events are resulting in the loss of entire crops, which has the dual impact on small communities of not only eroding their food security, but also reducing their income where crops are sold.

Difficulties in estimating and attributing loss and damage due to climate change

A main discussion point raised during the feedback stage focused on the linkage between the collected information and the concept of loss and damage as used in international climate negotiations and supported by Small Island Developing States. All participants agreed that the loss and damage identified through the initial use of the toolkit did not differentiate loss and damage due to climate change from loss and damage from other causes. Based on this discussion, a new tool has been developed to estimate the root cause of the observed loss and damage at community level.

The new tool serves to map out the "root causes" of different impacts from the community perspective. It assists in identifying root causes of loss and damage after coping and adaptation and determining if they are due to direct human impacts (maladaptation, unsustainable practices), normal climate variability or climate change. This tool, associated with a simple formula, requires further testing and refining, but it may help to filter the information from the community to improve the attribution of loss and damage to climate change.

6. RECOMMENDATIONS

This pilot research has highlighted several areas of priority for future action by researchers, governments and development partners. It is recommended that stakeholders should work in partnership to:

- Undertake further research on the attribution of anthropogenic climate change superimposed on the baseline of natural climate variability in the Pacific region, as well as distinguished from the direct impacts of human activities, for example with a methodological tool to determine causation in the *Community-Based Loss and Damage Assessment Toolkit*.

- Develop methods to quantify loss and damage at the community level, for instance, through on-going monitoring.

- Undertake further research on additional sectors of focus, such as culture, education, health and traditional knowledge.

- Undertake further research to collect gender disaggregated data and analyse the differential experiences of loss and damage for men and women.

- Provide assistance to communities in moving from "coping" strategies to implementing longer term and more strategic adaptation responses.

- Build strong links and coordinate between climate change assessment activities in the Pacific region, including sharing best practices between partners, and the use of modular assessment tools that can share results across multiple stakeholders.

- Supplement our understanding of the long-term impacts of climate change on livelihoods, businesses and social well-being by collecting more quantitative and qualitative data at the community level. This should include providing communities with the skills and expertise to articulate their problems and proposed solutions, as well as to assist government and other planning bodies to take into account complex local-level impacts in their planning and response.

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