NIWA
Taihoro Nukurangi

Final Report

Climate Early Warning System and Tourism in Samoa

Prepared for Samoa Tourism Authority

September 2016

Prepared by:
Shaun Williams; Andrew Tait; Juli Ungaro; Alan Porteous; Bernard Miville; Doug Ramsay

For any information regarding this report please contact:

Alan Porteous
Climate Scientist
Climate Data and Applications
+64-4-386 0533
Alan.Porteous@niwa.co.nz

National Institute of Water & Atmospheric Research Ltd
PO Box 8602
Riccarton
Christchurch 8011

Phone +64 3 348 8987

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	Formatting checked by:	Tracy Webster
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Cover photo:

West view from the terraced deck, Rock Pool Bar, Return to Paradise Resort, Samoa (Photo: Shaun Williams 2016).

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Executive summary

- NIWA was commissioned by the Samoa Tourism Authority (STA) to identify the potential for deriving tourism tailored information from the climate early warning system (CLEWS) in Samoa.
- This work formed part of the STA executed project 'Enhancing the Resilience of Tourism Reliant Communities to Climate Change Risks', funded by the Global Environment Facility – Least Developing Countries Fund (GEF-LDCF) via the United Nations Development Programme (UNDP).
- This report is the final deliverable for this project. It summarises the core methods, findings and outcomes regarding the development and sustainability of an initial suite of tourism-tailored CLEWS information products for Samoa.
- A phased approach was used to achieve the project objectives as listed below:
  - Phase 1: Situation analysis that focussed on reviewing and assessing existing CLEWS information products relevant to the needs of tourism planners and operators, particularly in identified tourism development areas (TDAs). This was carried out via desktop reviews and direct stakeholder consultations in May 2016, with recommendations feeding into the implementation plan for products development.
  - Phase 2: Implementation plan for developing an initial suite of prioritized tourism-tailored CLEWS products targeted at meeting the information needs of tourism planners and operators identified in Phase 1.
  - Phase 3: Development of prioritized tourism-tailored information products that were outlined in the implementation plan.
  - Phase 4: Operationalisation and sustainability, which involved an operations simulation exercise between STA and the Samoa Meteorology Division (SMD). This phase also included the delivery of this 'Final Report' for the project.
- Results of the project included:
  - Delivery of a 'Situation Analysis Report' detailing the relevance of existing CLEWS information to Samoan tourism planners and operators, and identification of potential products for development aimed at addressing these needs.
  - Delivery of an 'Implementation Plan' detailing an initial suite of prioritized tourism-CLEWS information products for development within the practical scope and timing of the project.
  - Development and provision of an initial suite of tourism-tailored CLEWS information products that included: 1) Water Conservation Alert and associated Drought Risk Indicator template; 2) Samoa weather and climate brochure; 3) Climate change factsheet for Samoa; 4) tailored monthly seasonal outlook template; 5) tailored 7-day extended weather forecast template; 6) Draft tourism-CLEWS 'Memorandum of Agreement' between STA-SMD; and 7) Direction on good-practice rainwater harvesting.

- Development of an operations framework and delivery of an 'Operations Simulation Exercise' in order to familiarize/orient relevant STA and SMD personnel with the tourism-CLEWS information tailoring and dissemination process. This also included the delivery of an 'Operations Guide'.
- Delivery of this 'Final Report' which includes suggested monitoring and evaluation tools, as well as identification of potential challenges, resolutions and support mechanisms.

- Initial products that are included within the ongoing developmental STA-SMD operations framework are listed below:
  - Water Conservation Alert (and associated Drought Risk Indicator).
  - Tailored monthly seasonal forecasts.
  - Operations guide.
  - Draft Tourism-CLEWS Memorandum of Agreement between STA and SMD, providing the overarching framework that enables operational flow and development.
- Products developed as general information education and communication material provide baseline templates which could be modified/adapted and updated by relevant STA and SMD personnel as required. These include:
  - Samoa weather and climate brochure for tourists.
  - Tailored climate change factsheet for Samoa.
  - Direction on good-practice rainwater harvesting.
- Gender sensitivity is inherently encompassed within the approach used for this project, including all of the products developed, via the application of non-discriminatory methods of acquiring and interpreting the information collected, as well as ensuring equal access to information produced under the provisions of this commission.
- An example monitoring and evaluation framework tool tailored to this project is provided in Section 4. It is designed to enable STA, SMD and stakeholders to review the uptake and impact of the developed products and refine them over time.
- Potential future challenges regarding the sustainability of services developed include:
  - Formalisation of operational service arrangements via 'Memorandum of Agreement'.
  - Refinement and implementation of the monitoring and evaluation framework provided for consideration in Section 4.1.
  - Ensuring ongoing operability and development of Samoan CLEWS services.
  - Incorporation of tourism CLEWS services into annual and sector STA and MNRE plans.

- Automation of tourism CLEWS services through future STA and SMD development projects.

- The core conclusion of this report is the outcomes, findings, activities and challenges of this project provide a basis that will enable STA and SMD to continue work towards refining and developing a sustainable tourism CLEWS service for Samoa.

1 Introduction

This document reports the approach used to develop an initial suite of tailored climate information products derived from the Samoa Climate Early Warning System (CLEWS)[1] for the Samoan tourism sector, particularly tourism planners and operators. Emphasis is placed on the information products developed as well as implementing selected products between the Samoa Tourism Authority (STA) and the Samoa Meteorology Division (SMD). A monitoring and evaluation framework is provided in order to enable STA, SMD and stakeholders to review the uptake and impact of the developed products and to refine them as required. Potential challenges, resolutions, available support mechanisms, and conclusions are also provided in order to enable STA and SMD to continue the dialogue regarding the future development and sustainability of existing and/or additional information products.

1.1 Tourism CLEWS project

Tourism in Samoa contributes to more than 20% of the Gross Domestic Product (GDP) and is a mainstay of the Samoan economy (Adapt Asia 2012). The majority of tourism operators are located within 100 m of the coastline and less than 10 m above sea level (Figure 1-1). Due to their coastal locations, many operators are highly exposed and vulnerable to the impacts of weather/climate-related extreme events such as storms (including Tropical Cyclones - TCs) and high seas, incremental climate change such as long-term sea level rise, and other geophysical hazards. This was clearly demonstrated by the recent 2009 Samoa tsunami, which devastated many tourist operations along southern Upolu, and the 2012 tropical cyclone Evan, in which the interlinking tourism, manufacturing, and commerce sectors suffered approximately 20% (US$41 million) of the total damage and losses sustained. Prolonged periods of drought, often associated with the El Niño climate phenomenon, also detrimentally impact tourism operators, requiring water conservation and rationing activities, sometimes for several months. A more resilient tourism industry has enormous implications for increasing socioeconomic and environmental resilience in Samoa.

Increasing knowledge and understanding of the impacts of climate change on the tourism sector is reflected in the Samoa Tourism Development Plan (2009-2013), which incorporates climate change adaptation and disaster risk mitigation considerations into tourism planning frameworks.

Through the STA's project 'Enhancing the Resilience to Tourism Reliant Communities to Climate Change Risks', funded by the Global Environment Facility – Least Developing Countries Fund (GEF-LDCF) via the United Nations Development Programme (UNDP), the Samoan tourism sector seeks to:

1. mainstream climate change adaptation into tourism-related policy instruments and public-private partnerships; and,
2. increase adaptive capacity to climate change and disaster risks of tourism reliant communities, particularly those located in identified Tourism Development Areas (TDAs).

The development of CLEWS over the last decade in Samoa provides an excellent opportunity to enhance the tourism sector's resilience to climate change by incorporating tailored climate

[1] See Appendix G for a list of acronyms used in this report.

information products (e.g., tourism-tailored climate forecasts and information products) into tourism operational decision-making and longer-term strategic planning.

1.2 Report structure

This report is structured as follows:

- Section 2 summarizes the overarching approach/process used to develop an initial suite of tourism-tailored climate information products derived from the Samoa Climate Early Warning System (CLEWS).
- Section 3 details the project outcomes and results, with specific emphasis on the information products developed. The operationalisation of selected products is also discussed along with operational materials and training.
- Section 4 outlines an example monitoring and evaluation framework tailored to this project which could be used by STA and SMD to review the uptake and impact of the developed products and refine them as required.
- Section 5 outlines potential challenges regarding the sustainability of systems established through this project.
- Final remarks and overarching project conclusions are provided in Section 6.

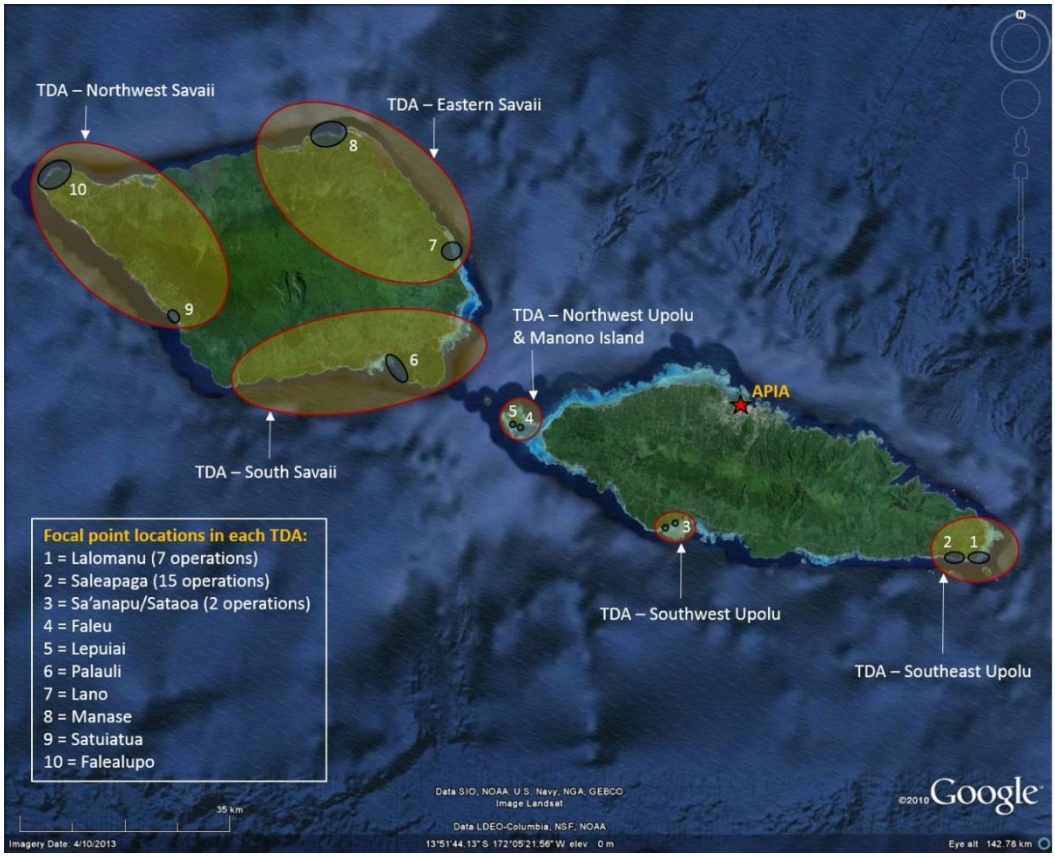

Figure 1-1: Map of Samoa showing the locations of Tourism Development Areas, including potential focal point locations in each TDA (numbered).

2 Approach and methodology

Work proceeded through four core phases to achieve the objectives within the project timeframe (Figure 2-1).

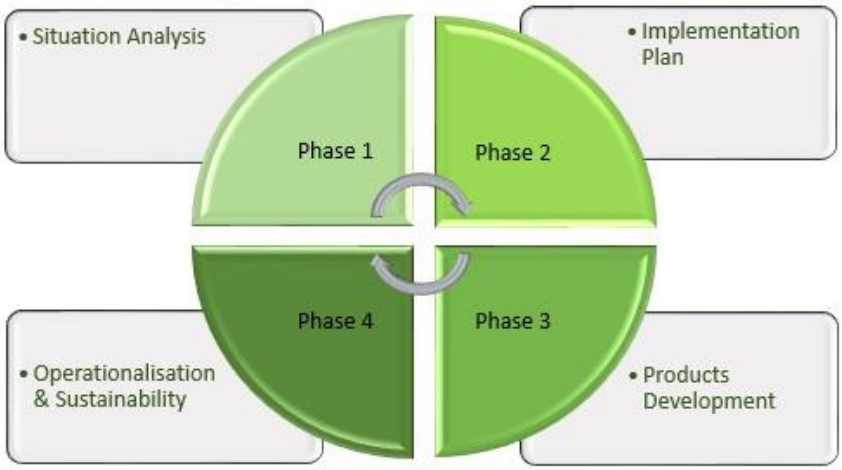

Figure 2-1: Four-phased approach used to achieve the project objectives. Grey arrows indicate stepwise flow from Phase 1 to Phase 4. Monitoring, evaluation, review and future development and/or inclusion of new products enables reassessment and reproducibility of the process from either Phase 1, 2 or 3 depending on the review/development findings.

2.1 Phase 1: Situation analysis

A situation analysis was undertaken to review and assess existing CLEWS information and products in relation to the needs of tourism planners (i.e., STA) and local tourism operators particularly in identified tourism development areas (TDAs; see Figure 1-1).

Relevant information was collected via desktop reviews of academic literature and available Samoan government reports, as well as direct stakeholder (operator) interviews throughout Upolu, Savaii and Manono in May 2016.

The same set of interview questions was used (see Appendix B in Williams et al. 2016a) to guide each stakeholder conversation (or depth interview), with the interviewer guiding the discussion only to ensure that all key topics were covered. Some of the interviews were conducted in Samoan, while others were in English. A list of the tourism operators who were consulted is provided in Appendix A.

Interviews were also held with representatives from STA, SMD, Water Resources Division (WRD), Disaster Management Office (DMO), Fire and Emergency Services Authority (FESA), and the United Nations Development Programme (UNDP).

Findings were collated and communicated via a 'Situation Analysis Report' (see Williams et al. 2016a), and included recommendations to address key gaps and needs identified. These recommendations formed a framework for developing an 'Implementation Plan' for the development of an initial suite of tourism-CLEWS products for development.

2.2 Phase 2: Implementation plan

Recommendations from in the situation analysis were prioritised through further interviews with STA and SMD representatives. Emphasis was placed on prioritizing an initial suite of products which could be practically and feasibility implemented within the scope and timeframe of the project using existing resources. Five priority climate and CLEWS products were identified for development under Phase 3 of this project (i.e., development of priority tourism-CLEWS products). These included customised and gender-sensitive products).

Additionally, a list of tourism-CLEWS activities and general tourism related activities that were beyond the scope of this project, but which should be considered for future implementation, was also provided.

2.3 Phase 3: Development of tourism-tailored products

Prioritized products identified in the implementation plan were developed/tailored by NIWA and refined via further consultations with STA and SMD between June and August 2016. Products were broadly grouped into:

- Products developed for weekly to monthly use and which involve an ongoing operational process flow between STA and SMD.
- Products developed for general information and education communication. These would also serve as templates for subsequent collaborative refinement by STA, SMD and stakeholders, based on new information, and/or adapted for use in new localities.

Details of these products are provided in Section 3.3 of this report.

2.4 Phase 4: Operationalisation and sustainability

Products that were developed and designed for ongoing operational use were complemented by the development of an operations framework and guide. An operations simulation exercise involving STA and SMD was held in August 2016. This exercise familiarized and oriented key STA and SMD personnel with tailoring and disseminating the tourism CLEWS products (see Appendix B for details on the exercise programme). As part of this exercise, trial CLEWS products were disseminated to end-users and feedback was incorporated. Further details are provided in Section 3.4.

3 Outcomes and results

3.1 Situation analysis

Essential aspects and findings in this phase of the project are outlined below:

- Core stakeholders who were consulted (see Appendix A) included STA planners, local tourism operators, Samoa Meteorology Division (SMD) climate forecasting and applications personnel, and other relevant organisations such as the Water Resources Division (WRD), Disaster Management Office (DMO) and Fire and Emergency Services Authority (FESA).
- Climate and CLEWS information currently available in Samoa included:
  - the provision of seasonal rainfall and temperature outlooks.
  - Tropical cyclone (TC) outlooks.
  - Sea surface temperature outlooks.
  - Forest fire weather index bulletins.
  - Coral bleaching warning system information.
  - El Niño Southern Oscillation (ENSO) summaries.
  - Sea level predictions for Samoa.
  - Monthly climate data summaries.
  - Drought warning bulletins.
  - Afulilo Reservoir Outlook (which is currently in the development stages).
- Available climate and CLEWS information was primarily disseminated via web-based products and with public accessibility via the SMD website.
- A formal framework for directly disseminating climate and CLEWS information to the tourism sector was identified as a gap.
- Whilst CLEWS information was available in Samoa, the awareness, use and uptake of the information by the tourism sector for strategic operational/resources planning and management was relatively low, particularly in terms of translating the information into applicable and tangible management/mitigation actions.
- Provision of tailored climate information, particularly related to seasonal forecasts of drier-than-normal conditions that impact drinking water availability and management, was identified as extremely important.
- In addition to climate and CLEWS services, Samoa via SMD offers a range of weather related information services for the general public including monitoring and warnings of Tropical Cyclones (TCs) and related hazards (e.g., storm surge, coastal flooding, etc).

- Such information was of direct relevance to all sectors of society, including the tourism sector.
- Weather related information was being communicated via the SMD website as well as via radio, television, newspaper and, more recently, via SMS text messaging bulletins.
- The dependence on internet web-based products as a primary mechanism for generating and disseminating climate and CLEWS information was found to underpin the importance of establishing fast and reliable internet connectivity for the whole country by all internet service providers, particularly to areas that currently do not have reliable internet access (e.g., west Manono).
- The dependency on access to internet web-based information means that larger operations within TDAs are generally better placed to be considered for development into focal point locations (i.e., intermediaries or CLEW hubs) for the receipt of CLEWS information from STA and dissemination to operators within their TDA.
- Larger operations generally have greater means to subscribe to faster and more reliable internet connectivity plans, and are perhaps better placed to serve as CLEWS information hubs or focal points for respective TDAs (e.g., Sinalei Reef Resort for south/southeast Upolu TDA, or Vaimoana Seaside Lodge for west Savaii TDA).
- Recommendations provided in the Situation Analysis Report were based on core gaps and needs identified through the consultation process. These formed a framework to develop an implementation plan (Phase 2) regarding the customization of CLEWS products to meet the tourism sector demand.

3.2 Implementation plan

Essential aspects in this phase of the project are outlined below:

- NIWA delivered an 'Implementation Plan' of activities associated with the development of an initial suite of tailored CLEWS information products targeted at addressing gaps and meeting the needs of tourism planners and operators in Samoa (see Williams et al. 2016b).
- Development actions provided in the implementation plan were identified through consultations carried out with tourism planners and operators during Phase 1 of the project, and were based on climate/CLEWS information needed to support planner/operator operational planning and longer-term strategic decisions.
- Prioritisation of development actions were based on:
  - Climate/CLEWS information products which could be practically developed within the overarching scope and timing of the project.
  - Development of an initial suite of identified products which would support the immediate climate information needs of tourism planners and operators.
- Five priority development actions were identified for implementation between June to August 2016, which included the development of:

1. Water Conservation Alert product template.
2. Drought Risk Indicator.
3. Weather and Climate of Samoa brochure.
4. Climate Change factsheet for Samoa.
5. Tailored monthly seasonal forecasts of rainfall and sea surface temperature template.

- The priority actions above were considered important in supporting the short- to medium-term operational planning needs of tourism operators, which in turn would help to foster longer-term strategic planning and decision making.
- Additional products that were identified for development and which could be practically implemented within the scope of the project included:
  - Tailored 7-day extended weather forecasts.
  - Draft Tourism-CLEWS Memorandum of Agreement between STA and SMD.
  - Direction on good-practice rainwater harvesting.
- It was recognized that some of the products earmarked for development were 'living products' that required ongoing operational workflow/exchange between STA and SMD. Hence, the development of a tourism-CLEWS Memorandum of Agreement between STA and SMD (as listed above) was considered important in providing the overarching framework for ongoing/future STA-SMD tourism-CLEWS operations and development.
- An operations training activity and associated materials were also identified for implementation in order to familiarize relevant STA and SMD tourism-CLEWS personnel of the developed operations process, including sustainability considerations.
- In addition to the products prioritized for development in this project, six other tourism-CLEWS related development actions were identified as falling outside of the project timeframe, but were suggested for implementation consideration at a later time under the broader STA-led "Enhancing the Resilience to Tourism Reliant Communities to Climate Change Risks" project.
- Further, seven development actions were identified as being beyond the tourism-CLEWS scope of this project, but were suggested for implementation consideration through alternative financing mechanisms within the broader context of building climate and disaster resilience in general.

3.3 Tourism-tailored CLEWS products

Priority actions described in sub-section 3.2 above were developed in this phase of the project (i.e., Phase 3). Developed products were classed according to two broad categories (Figure 3-1).

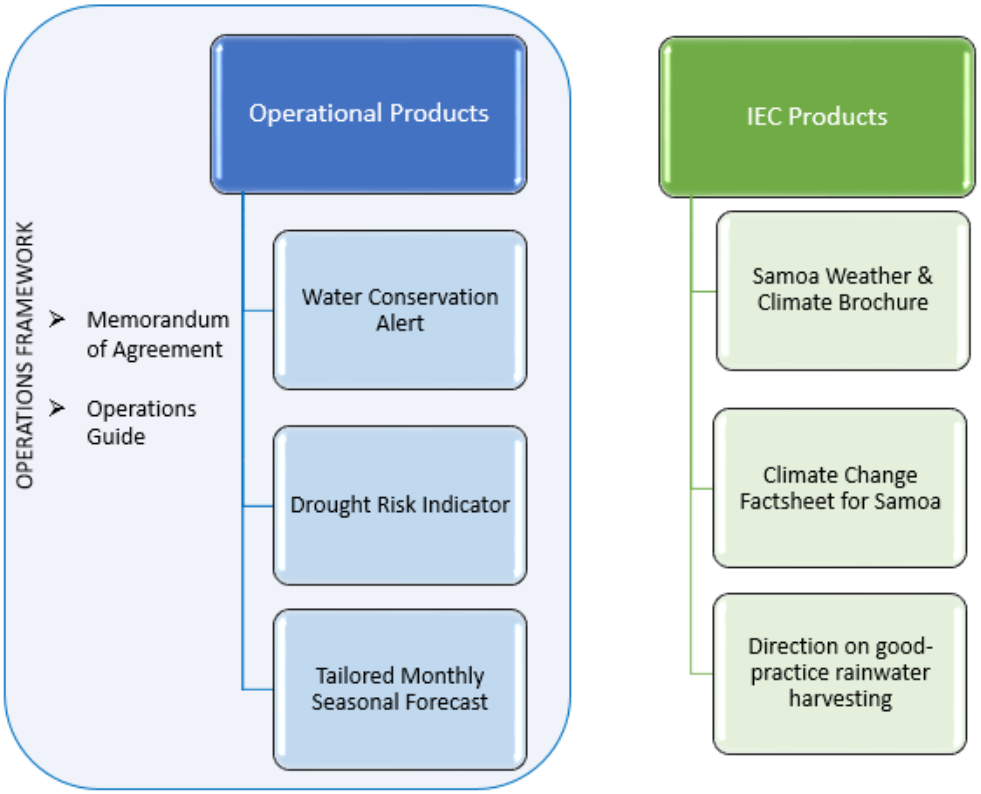

Figure 3-1: Categories of developed tourism-CLEWS products.

The living products developed for weekly to monthly use which would involve ongoing operational process flow between STA and SMD, include:

- Water Conservation Alert (and associated Drought Risk Indicator).
- Tailored monthly seasonal forecasts.
- Tailored 7-day extended weather forecasts.
- Draft Tourism-CLEWS Memorandum of Agreement between STA and SMD, providing the overarching framework to enable operational flow and development.
- Operations Guide.

Products developed for general information and education communication (IEC):

- Weather and Climate of Samoa brochure for tourists.
- Tailored climate change factsheet for Samoa.
- Direction on good-practice rainwater harvesting.

These products are described in more detail in subsequent sub-sections below.

3.3.1 Water Conservation Alert (WCA)

This product addresses the core gap/need identified through operator consultations in Phase 1 of the project. This need centred on the limited availability of water resources during times of drought; a case that was identified as a recurring issue by the majority of operators consulted. Thus, the development of an 'alert' product informing operators of ensuing drought conditions, as well as simple but practical measures which could be taken in order to minimize the impacts of water-cuts or shortages on their operation, was identified as being of high importance.

This WCA involved the development of a Microsoft Word template that is designed to provide a 1-page tailored information bulletin (saved as a PDF document) based on current drought conditions and seasonally-forecasted rainfall. The product template is to be updated and distributed to tourism operators via email by STA's designated climate counterpart(s) only when drought conditions are prevalent and the updated seasonal outlook indicates a high likelihood of continued dry conditions. The WCA is a regionally tailored product, so only operators located in areas of Samoa facing high or extreme drought risk will receive the product each month.

The WCA is based on proven and accepted methods of drought definition. The forecast rainfall is taken from currently operational seasonal outlook methods, and provides operators with science-based information from a trusted local/relevant source in order to support water resource management and conservation within the operation. Operationalisation of the WCA between STA and SMD is reported in Section 3.4. See Appendix C for an example of the WCA.

3.3.2 Drought Risk Indicator

Associated with the WCA is the development of a web-based[2] 'Drought Risk Index' service that uses data from climate stations with more than 10 years of historical data that have been collected and stored in the CLIDE climate database (see Figures Figure 3-2 and Figure 3-3). At each location, the index indicates the risk of a drought occurring within the next 90 days, with the risk portrayed as 'low', 'medium', 'high' or 'extreme.'

3.3.3 Weather and Climate of Samoa brochure

This product was designed to be a standard-format printed brochure with information geared towards local and overseas tourists in addition to planners/operators. The brochure was formatted to provide a description of the general climate of Samoa, including information on El Niño Southern Oscillation (ENSO) and the generic effects of El Niño and La Niña on Samoa in terms of seas surface temperature (SST), tropical cyclones (TCs), drought, and other climatic extremes. Specific emphasis was placed on informing and promoting the use of weather and climate forecast services available via the SMD website.

Stakeholders who were consulted had indicated their interest and desire for such a product, particularly given that brochures are commonly used/accepted within the Samoan tourism sector as an information source for visitors and the general public (e.g., brochure rack located at the STA Visitor Centre in Apia, and brochure stands commonly found at hotel reception areas). The brochure was/is intended to be a printed product that is disseminated via the STA Visitor Centre as well as the reception areas of individual operations (see Appendix D to view the developed brochure).

[2] See http://www.samet.gov.ws/climate/drought.html for an example of the Samoa Drought Index Map and associated Drought Risk Indexes for stations across Samoa that have more than 10 years of data collection and storage.

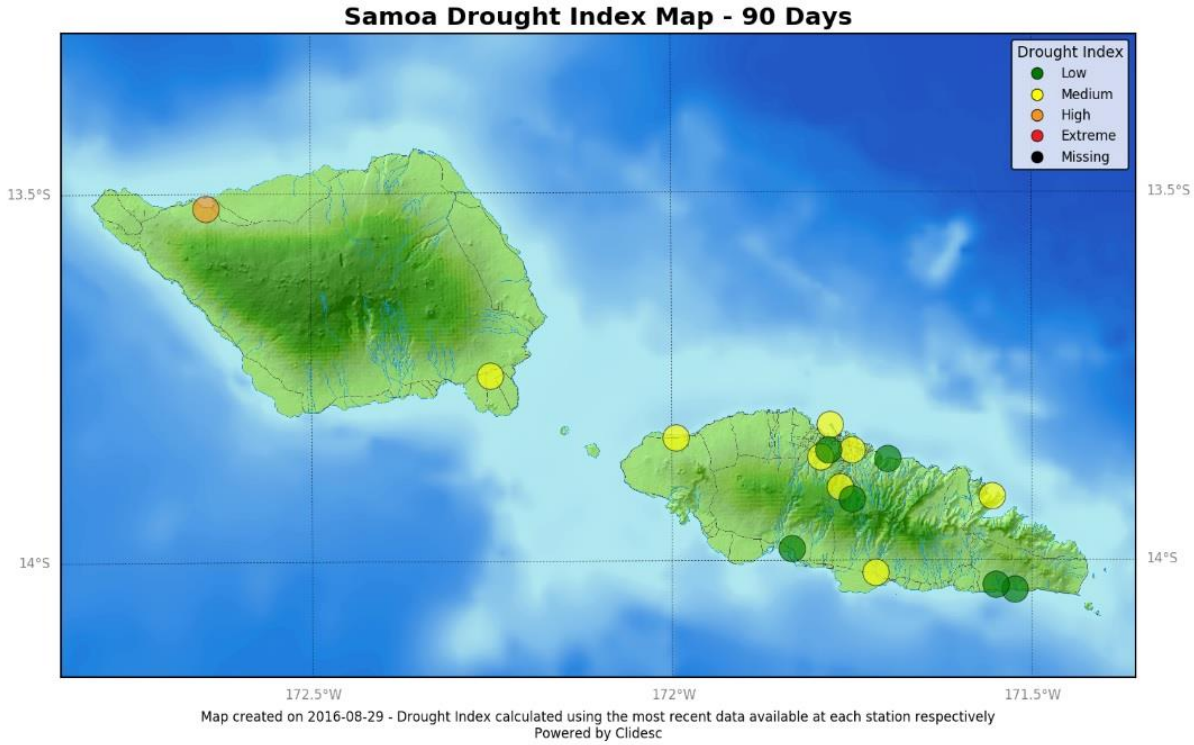

Figure 3-2: Developed interactive 'Samoa Drought Risk Index' map available on the SMD website showing locations of climate stations with more than 10 years of historical climate data collection. Operators in areas comprising stations that show high or extreme risk would be issued a WCA. The map is automatically updated daily, and clicking on a station will show the drought risk index for that station (see Figure 3-3).

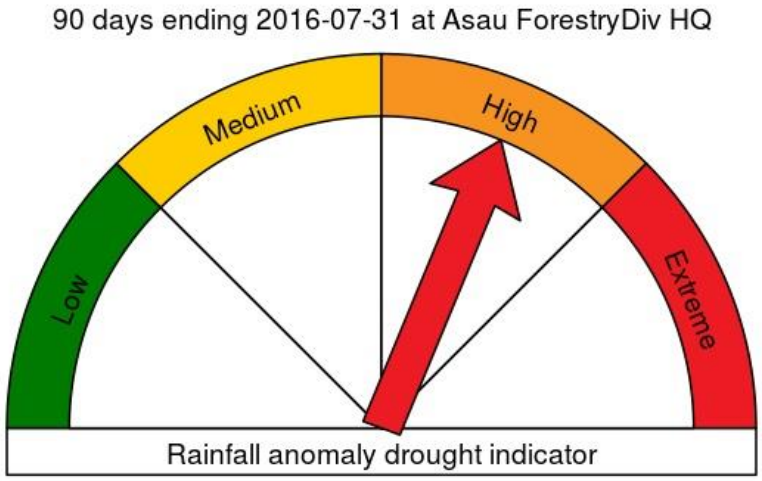

Figure 3-3: Example of web-based 'Drought Risk Indicator' for Asau Forestry Division climate station, West Savai'i.

3.3.4 Climate change factsheet for Samoa

Stakeholders, identified the importance of having such information to build general visitor and staff awareness of what climate change is and the general impacts in their TDA.

The factsheet developed provides a TDA specific one-pager with descriptive information on longer term sea level projections and implications for coastal flooding, warming SST impacts on TC intensities, and potential effects of ocean acidification on coral reef health and fisheries.

Operators will receive the factsheet via email for printing and inclusion on their reception signboards. Alternatively, the factsheet can be disseminated by STA via post to operators with no internet connection (see Appendix E to view the developed factsheet).

3.3.5 Tailored monthly seasonal outlook

This product involved the development of a tailored text statement regarding the 3-month forecasted rainfall and sea surface temperature issued by SMD, including guidance on good practice action points to assist operators in their monthly operational and resource planning.

SMD issues updated seasonal climate outlooks and sea surface temperature outlooks for Samoa on a monthly basis and posts these reports on their webpage. The information is also sent out to multiple stakeholders via email (including Samoa Tourism Authority, STA). Often, however, there is a need to simplify and tailor the information in the reports before it can be passed on to other end-users.

This is the case for the tourism sector, where the principal recipient of the reports (STA) needs to re-cast the outlook information as a simple text-based article and then include it in the STA newsletter, which is then disseminated to all the tourism operators in the country.

The tailoring process which was designed to be completed by relevant STA personnel, follows a step-by-step process which has been documented in the 'Operations Guide' associated with the developed STA-SMD tourism-CLEWS operational framework (see Section 3.4.1). See Appendix F for the tailored monthly seasonal outlook template.

3.3.6 Draft Memorandum of Agreement

It was recognised early in the project that some of the developed products would require ongoing operational data and information flow/exchange between STA and SMD in order for the intended purpose and effectiveness of the products to be realised (see Figure 3-1). Thus, it was considered important that a 'Memorandum of Agreement' (MoA) was developed and formalised between STA and SMD in order to establish the overarching framework for tourism-CLEWS operations, including the sustainability and future development of tourism-CLEWS initiatives in Samoa.

To this end, a draft 'Tourism-CLEWS MoA' between STA and the Ministry of Natural Resources and Environment (MNRE) – the government ministry which SMD is a division of – was developed. The MoA specifies party roles and responsibilities, general operations, data sharing, contingency and sustainability arrangements, as well as a process to review/update the MoA. NIWA prepared and provided a digital draft of the MoA to STA and MNRE for consideration, revision, finalisation and formalisation as deemed appropriate by both parties.

3.4 Operations framework and capacity building

As stated in sub-section 3.3.6 above, the MoA was designed to provide the overarching framework enabling tourism-CLEWS operations between STA and SMD. It was thus necessary to develop clear

operational processes encompassed within this framework, as well as adequate guidance material on these processes in order to ensure ongoing system operability in the event of unforeseen or new circumstances (e.g., new STA/SMD climate staff and/or existing staff turnover).

Operational processes and associated guidance material that were developed are described in subsequent sub-sections below.

3.4.1 Operational processes and guidance material

Core elements of the tourism-CLEWS operational system processes are shown in Figure 3-4.

Operational tourism-CLEWS activities undertaken by STA and SMD are encompassed under the MoA, with disseminated outputs intended for use primarily by, but not necessarily limited to, tourism operators (i.e., end-users).

It is important to note that the system above incorporates the initial suite of developed products that require ongoing STA-SMD operational exchange. However, the system was designed to be agile/flexible in order to accommodate the inclusion of new products in future, or the modification of initial products based on shifting operator information needs/demand.

Further, the feedback loop shown was/is intended to enable end-users to take ownership of the system through contribution/provision of constructive criticism which could then feed back into the modification/refinement of information provided through this service.

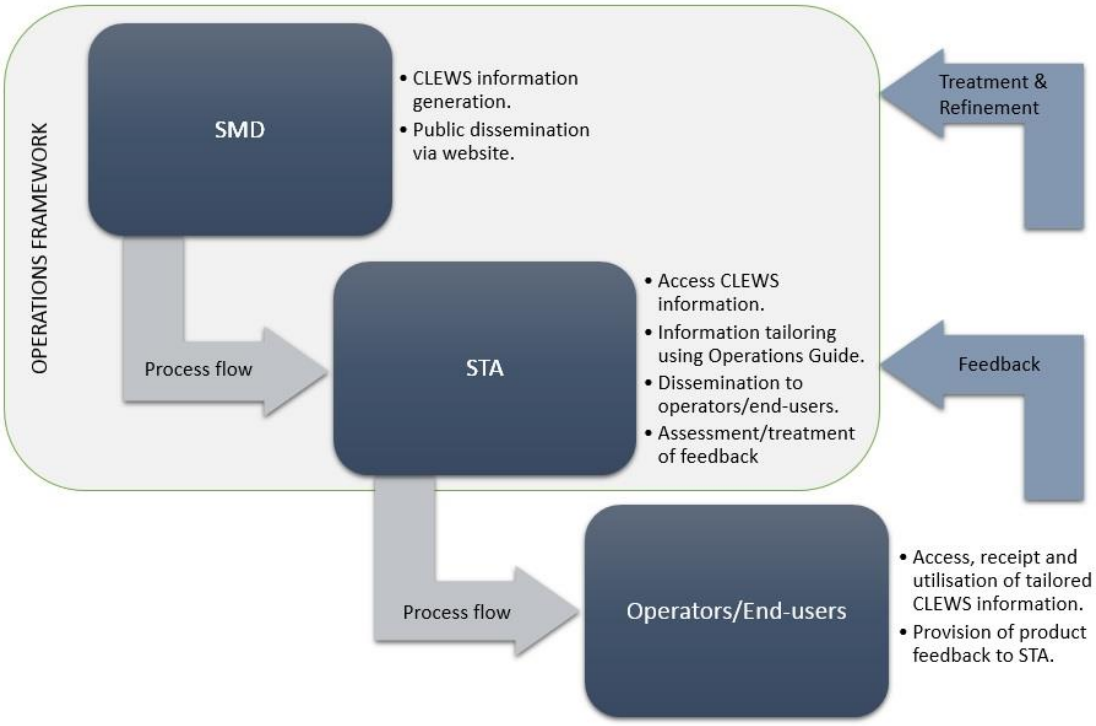

Figure 3-4: Samoa Tourism-CLEWS operational system processes and framework.

Step-by-step procedures associated with the generation and dissemination of each product shown in Figure 3-1, as well as the means by which end-users could provide feedback, have been provided in the accompanying tourism-CLEWS 'Operations Guide' that has been supplied to STA and SMD.

3.4.2 Capacity building

In order to orientate STA and SMD with the developed tourism-CLEWS operational system and guidance material, NIWA along with STA and SMD co-facilitated a hands-on 'operations simulation exercise' (Figure 3-5). The exercise was targeted at familiarising key STA and SMD tourism-CLEWS personnel with the operational procedures associated with the generation and dissemination of information products described in section 3.3.

The exercise involved a walk-through of the operations guide as well as simulation of real-life operational procedures to be carried out on a regular basis. Information products were disseminated to selected operators/end-users (i.e., potential TDA focal points) who were willing to participate in the simulation and provide feedback. General STA procedures regarding the receipt and treatment of end-user feedback were also covered in the exercise.

Figure 3-5: Key STA and SMD operations personnel, including NIWA facilitators and a UNDP observer, undergoing the operations simulation exercise held at the Samoa Meteorology Division compound, 23 August 2016.(Photo: Shaun Williams 2016).

4 Monitoring and evaluation

This section outlines a potential monitoring and evaluation (M&E) process-framework and associated tools to support STA, in collaboration with SMD, to:

- Assess and review the uptake and impacts of CLEWS information products developed through this project.
- Assess and review the effectiveness of information dissemination channels.

The framework outlined in subsequent sub-sections has been designed for the programme level and has been adapted from available and relevant M&E frameworks (Bours et al. 2014; UNDP 2009; UNFCCC 2013). Monitoring that can be conducted by STA during period site visits has also been incorporated into the framework.

4.1 Framework tool

A results process framework involving an indicator/log-frame approach is suggested for use by STA to monitor the effectiveness of information products developed as well as channels of dissemination. Key processes incorporated in this framework include:

- Identifying what is being monitored and establishing a clearly defined goal that can be translated into monitoring and evaluation targets.
- Core stakeholder identification, engagement and participation.
- Setting the target results to be achieved.
- Selecting relevant indicators, establishing baselines and targets to measure progress and achievements, as well as identification of data sources and methods for collecting data.
- Analysing and interpreting the results.
- Sustaining a replicable M&E system.

Each component of the framework listed above is explained in more detail below within the context of this project.

4.1.1 What is being monitored?

Of paramount importance in any M&E framework is establishing what is being monitored. For this project, the question of ‘what is being monitored?’ has already been identified. This includes:

- The uptake and impacts of CLEWS information products developed through this project.
- The effectiveness of information dissemination channels.

These provide guiding points for the consolidation of why this is being done and who it is being done for (i.e., identifying the stakeholders). Further, they provide targets for the derivation/framing of M&E goals.

Note that the above guiding points inherently have sub-component activities which will be considered later in sub-section 4.1.4.

4.1.2 Stakeholders

Identifying who the key players are in the programme helps to set the contextual boundaries of the M&E framework. CLEWS information products developed in this project were customized according to end-user needs within the Samoan tourism sector, with particular emphasis on tourism operators and planners.

Thus, two broad groups of direct stakeholders can be categorized:

- CLEWS information producers and disseminators (e.g., SMD, STA).
- CLEWS information end-users (e.g., operators, planners, tourists/visitors).

Additionally, indirect stakeholders include practitioners from cross-cutting sectors that are either:

- Engaged and active in climate and disaster risk reduction (e.g., Disaster Management Office – DMO).
- Have vested interests in CLEWS applications to their particular sector (e.g., agriculture, health, water resources, fire and emergency services, environmental conservation, utility providers, etc).

Whilst the indirect stakeholders are important, focus for this M&E framework is placed on the direct stakeholders who are inherently vested at the programme level for this project.

4.1.3 Goal

The overarching goal sets the scene for all other activity components of the M&E framework, as each activity should invariably be aligned to achieving the goal.

In this project, an overarching goal which can be derived/translated from the guiding points in sub-sections 4.1.1 and 4.1.2 is:

- An effective Tourism CLEWS information generation and dissemination system that is useful for operator planning.

This goal will be used in demonstrating the M&E framework for the purposes of this report, but can be revised at a later date by STA in collaboration with SMD as required.

4.1.4 Target results

The next step is to identify the key results which the programme is targeting in order to achieve the overarching goal. Whilst this typically involves the establishment of a results framework, this is not necessary for this project as the results (or outputs) have already been developed and provided for the programme. These include:

- The development of operational tourism CLEWS products:
  - Water Conservation Alert and associated Drought Risk Indicator.
  - Tailored monthly seasonal climate forecasts.
- The establishment of an operations framework for information tailoring and dissemination of operational products:

- Memorandum of Agreement between STA and SMD.
- Tourism CLEWS Operations guide.

- The development of IEC products:
  - Samoa weather and climate brochure.
  - Climate change factsheet for Samoa.

Note that only the outputs level of results is sufficient for this M&E framework as it is developed for the programme level to be measured at short- to medium-term timeframes (i.e., ≤ 10 years).

In future, more results levels that include longer term outcomes might be established depending on shifting needs and increased capacity to monitor activities at timescales greater than 10 years.

4.1.5 Outputs and tasks

Target results identified in the previous sub-section can now be framed/translated into development outputs (i.e., what achievements are aspired?). Tasks/activities that are required to realise each development output should be identified, including pathways for initiating and maintaining them.

Table 4-1 provides an example of the general tasks that are required to realise the development outputs within the context of this project. Whilst serving as examples, they can be considered and refined by STA in collaboration with SMD for actual M&E activities in the tabulated format provided.

Table 4-1: M&E outputs, tasks, and task initiation pathways.

Output	Tasks required to achieve output	Pathways for initiation of activity
Output 1		
Tourism CLEWS operational services maintained and used.	1. Sustain/maintain CLEWS services at SMD: - 'Drought Risk Index' web-link monitored and updated on SMD website. - 'Seasonal Rainfall Outlook' (SRO) and 'Seasonal Temperature Outlook' (STO) web-link monitored and updated on SMD website.	1.1 Activity already initiated within the Climate Services Section of SMD: - Activity to be operationally sustained within budgetary framework of SMD.
	2. Sustain/maintain CLEWS services at STA: - Dissemination of monthly tailored climate outlooks via the STA Newsletter and email to operators and/or focal points (CLEWS hubs) in accordance with monthly SRO and STO updates. - Dissemination of 'Water Conservation Alerts' via email to operators and/or focal points in accordance with monthly SRO and STO updates.	2.1 Activity already initiated within STA: - Dedicated team to be assigned operational responsibility. - Activity to be operationally sustained within budgetary framework of STA.

Output	Tasks required to achieve output	Pathways for initiation of activity
	3. CLEWS information used by operators and planners: - Measures taken and impacts (positive or negative) from using the information. - Measures to conserve water and/or other measures taken after receiving a 'Water Conservation Alert'.	3.1 Information dissemination and stakeholder buy-in: - Operator awareness/buy-in of tourism CLEWS operational services via periodic face-to-face site visits by STA, including relevant meetings and/or workshops. - Operator use of information and measures taken to be observed and recorded for noticeable impacts (positive or negative).
Output 2		
Operations framework maintained and developed.	1. Memorandum of Agreement (MoA) between STA and MNRE signed and honoured: - Including ongoing review/update of MoA relevance in accordance with tourism CLEWS operational services development.	1.1. Draft MoA has been developed and is pending STA and SMD finalisation and formalisation. - Both parties to ensure a smooth process to formalisation. - Both parties to carry out periodic review for relevance.
	2. 'Tourism CLEWS Operations Guide' periodically reviewed/updated in accordance with tourism CLEWS operational services development.	2.1 Operations Guide for tourism CLEWS operational services has been developed. - Both parties to carry out periodic review for relevance.
Output 3		
IEC products disseminated and used.	1. 'Samoa Weather and Climate Brochure' printed/disseminated, stocked and distributed by operators and visitor centres. - Including entry ports (e.g. Faleolo international and Fagalii inter-island airports.	1.1. Samoa Weather and Climate Brochure already developed. - STA to print and disseminate to operators and entry ports for stocking/ distribution.
	2. 'Samoa Climate Change Factsheet for Samoa' printed/disseminated and stocked by southeast Upolu operators. - Including the adaptation and development of similar 1-page factsheets of relevance to other TDAs.	2.1. Samoa Climate Change Factsheet for Samoa already developed. - STA to periodically print and disseminate to operators and entry ports for stocking and visitor distribution.

4.1.6 Indicators and measurement

The outputs above can now be assigned indicators, baselines and targets that can be used to measure the progress of milestones listed above (see Table 4-2).

Table 4-2: Indicators, baselines, targets and data collection.

Output	Indicator(s) and Timeframes	Baselines and Targets	Methodology & Data Sources
Output 1			
Tourism CLEWS operational services maintained and used.	1. CLEWS services at SMD: - 'Drought Risk Index' web-link updated daily. - 'Seasonal Rainfall Outlook' (SRO) and 'Seasonal Temperature Outlook' (STO) web-links updated monthly.	1.1 Drought Risk Indicator: - Baseline: new service (operational on 23 Aug 2016) – unknown disruption days. - Target: less than 25 disruption days per year. 1.2 SRO and STO: - Baseline: Monthly (issued within 2 weeks at start of new month). - Target: Monthly (issued within 1 week at start of new month).	1.1.1 Ongoing internal operations. 1.2.1 Ongoing internal operations.
	2. CLEWS services at STA: - Tailored climate outlooks issued monthly to operators/focal points via the STA Newsletter and email. - 'Water Conservation Alerts' issued monthly as warranted via email to operators and/or focal points.	2.1 Monthly issuance of tailored climate outlooks: - Baseline: 0. - Target: 12 per year. 2.2 Water Conservation Alert issued as warranted: - Baseline: 0. - Target: 6 per year.	2.1.1Ongoing internal operations. 2.2.1 Ongoing internal operations.
	3. CLEWS information used by operators and planners: - Measures taken (annually) and impacts recorded (positive or negative) from monthly receipt of tailored climate outlooks over 1 year. - Measures to conserve water and/or other measures taken and impacts recorded after receiving a 'Water Conservation Alert'.	3.1 Monthly receipt of tailored climate outlooks: - Baseline: 0 - Target: 2 to 5 measures per operation and impacts recorded over 1 year. 3.2 Water Conservation Alerts (WCA): - Baseline: 0 - Target: 3 to 5 measures taken per operation after receipt of each WCA, and impacts recorded over 1 year.	3.1.1 Information survey forms collected by STA during periodic TDA site visits*. - Number of outlooks received. - Number of measures taken. 3.2.1 Information survey forms collected by STA during periodic TDA site visits*. - Number of WCAs received. - Number of measures taken per WCA receipt.

Output 2			
Operations framework maintained and developed.	1. Memorandum of Agreement (MoA) between STA and MNRE signed and honoured: - Including ongoing review/update of MoA relevance in accordance with tourism CLEWS operational services development.	1.1. Signed MoA: - Baseline: Not signed. - Target: Signed, dated and periodically reviewed (e.g., every 2-3 years).	1.1.1 Ongoing internal operations.
	2. 'Tourism CLEWS Operations Guide' periodically reviewed/updated in accordance with tourism CLEWS operational services development.	2.1 Updated Operations Guide: - Baseline: Operations Guide current as of Sept 2016. - Target: Reviewed and updated annually or every few years.	2.1.1 Ongoing internal operations.
Output 3			
IEC products disseminated and used.	1. 'Samoa Weather and Climate Brochure' printed/disseminated, stocked and distributed by operators and visitor centres. - Including entry ports (e.g. Faleolo international and Fagalii inter-island airports.	1.1. Weather and Climate Brochure stocked/distributed: - Baseline: 0 - Target: 5,000 to 10,000 brochures printed and distributed over 1 year.	1.1.1 Internal STA data collection: - Number of brochures printed. - Number of brochures distributed and stocked by each outlet.
	2. 'Samoa Climate Change Factsheet for Samoa' printed/disseminated and stocked by southeast Upolu operators. - Including the adaptation and development of similar 1-page factsheets of relevance to other TDAs.	2.1. Climate Change Factsheet for Samoa stocked and distributed: - Baseline: 0 - Target: 1 x factsheet printed per Southeast Upolu operation and displayed. 1 x factsheet printed and displayed in 1 other TDA.	2.1.1 Information survey forms collected by STA during periodic TDA site visits*: - Number of factsheets printed and displayed. - Number of factsheet/s printed/displayed for other TDA/s.

* STA should consider developing simple survey templates using Microsoft Word or Excel to collect these information (i.e., Output 1 - 3.1.1 and 3.2.1; and Output 3 – 2.1.1) during periodic site visits, and tabulating the results using Microsoft Excel in order to track, analyse and measure progress against the targets.

4.1.7 Work plan

The indicators, baselines and targets established in sub-section 4.1.6 provide an example log-frame for STA to track and measure the reach, effectiveness and impacts of products developed in this project on an annual timeframe. Findings via the above approach can be used to set new annual targets and refine the outputs and associated log-frame accordingly.

4.1.8 Capacity

Of particular importance is the need for the M&E approach and activities above to be absorbed/embedded within ongoing operations and budgetary frameworks of STA and SMD, respectively. This includes, but may not be limited to:

- The allocation of dedicated personnel/teams within STA and SMD with clearly defined roles and expectations to carry out the tourism CLEWS services and M&E activities.

4.2 Sustainability and reproducibility

The M&E framework in Section 4.1 provides an example of a reproducible approach that has been tailored to the Samoa tourism CLEWS project, and which should be considered and refined for use by STA. Sustaining the system will require dedicated commitment by both STA and SMD to absorb the developed processes into organisational operations in order to realise and develop the target results, outputs and M&E activities over time. STA should consider sustaining tourism CLEWS services/activities through absorption by existing research and information technology resource departments within the organisation.

5 Future challenges

Potential challenges to consider regarding the sustainability of the system include:

- CLEWS development: underpinning the system is the continued operability and development of the Samoan CLEWS and associated services at SMD, including the ongoing development of service quality and delivery.
- Tourism CLEWS operational services: incorporating these services into annual and sector STA and MNRE plans, further helps to consolidate partnered service operability, development, quality and delivery.
- Alignment with complementary efforts in climate and disaster risk reduction and resilience building.
- Automation of tourism CLEWS services through future STA and SMD development projects.

6 Conclusion

- The objective of this report is to summarize the core methods, findings and outcomes regarding the development and sustainability of an initial suite of tourism-tailored CLEWS information products for Samoa.
- The approach and method used involved four key phases each comprising targeted outcomes:
  - Phase 1: Situation analysis that reviewed and assessed existing CLEWS information products and gaps in relation to the needs of tourism planners and local tourism operators.
  - Phase 2: Implementation plan for the development of an initial suite of tourism tailored CLEWS products based on the findings and recommendations in Phase 1.
  - Phase 3: Development and delivery of an initial suite of tourism tailored CLEWS products based on the prioritised operational and information education and communications products identified in Phase 2.
  - Phase 4: Operationalisation of tourism services within STA and SMD, including monitoring, evaluation and sustainability consideration.
- Key project outcomes and deliverables include:
  - Delivery of a 'Situation Analysis Report' (Section 3.1).
  - Delivery of an 'Implementation Plan' (Section 3.2).
  - Delivery of an initial suite of tourism tailored CLEWS products (Section 3.3).
  - Delivery of tourism CLEWS operational services framework and processes, including monitoring and evaluation tools (Sections 3.4 and 4).
  - Delivery of this 'Final Report'.
- Key challenges for STA and SMD consideration regarding the sustainability of the system developed though this project include, but are not limited to:
  - Formalising operational service arrangements through the 'Memorandum of Agreement'.
  - Refining and implementing the monitoring and evaluation framework provided for consideration in Section 4.1.
  - Ensuring ongoing operability and development of Samoan CLEWS services.
  - Incorporation of tourism CLEWS services into annual and sector plans.
  - Aligning efforts with complementary developments in climate and disaster risk resilience.
  - Automating tourism CLEWS services through future STA and SMD development projects.

- The outcomes, findings, activities and challenges reported in this report provide an information basis to enable STA and SMD to continue the dialogue and efforts regarding the future development and sustainability of tourism CLEWS services in Samoa.

7 Acknowledgements

NIWA acknowledges the help and support provided by the Samoa Tourism Authority and the Ministry of Natural Resources and Environment (Samoa Meteorology Division) throughout this project. Local tourism operators consulted are acknowledged and thanked for their time and inputs provided during consultations. Erika MacKay and Mark Tucker of NIWA are acknowledged for graphics design support.

Figure 7-1: STA Visitor Information Centre (foreground) and FMFMII Government Building (background), Apia. STA headquarters is located on the ground floor of the FMFMII Government Building. (Photo: Shaun Williams 2016).

8 References

Adapt Asia. (2012) Economic Valuation Report Under the UNDP/Samoa Project: Enhancing the Resilience of Tourism-Reliant Communities to Climate Change Risks.

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UNFCCC (United Nations Framework Convention of Climate Change). (2013). Module 4: Tracking progress, monitoring and evaluation. LEG training workshops for 2012-2013, training module. 15p.

Williams, S., Tait, A., Porteous, A., Miville, B., Ramsay, D. (2016a). Situation Analysis, Climate Early Warning System and Tourism Sector Needs in Samoa. Prepared for Samoa Tourism Authority. *NIWA Client Report No. CHC2016-045, SAM16501.* 46p.

Williams, S., Porteous, A., Tait, A., Miville, B., Ramsay, D. (2016b). Implementation Plan, Climate Early Warning System Products Development for the Tourism Sector in Samoa. Prepared for Samoa Tourism Authority. *NIWA Client Report No. CHC2016-047, SAM16501.* 14p.

Appendix A Stakeholders consulted during the project

Name	Role	Organisation / Operation	Contact
Papalii Sonya Hunter	CEO	STA	hunter@samoa.ws
Isamaeli Time	Project Manager	STA – Climate Change Project	isamaeli@samoa.ws
Ropeta Lei Sam	Principal Officer	STA – Climate Change Project	ropeta@samoa.ws
Kitiona Pogi	Manager	STA – Research and Statistics	kitiona@samoa.ws
Naomi Tofilau	Project Assistant	STA – Climate Change Project	naomi@samoa.ws
Mulipola Ausetalia Titimaea	ACEO	MNRE – Samoa Meteorology Division	ausetalia.titimaea@mnre.gov.ws
Tile Tofaeono	Principal Climate Officer	MNRE – Samoa Meteorology Division	tile.tofaeono@mnre.gov.ws
Muliagatele Filomena Nelson	ACEO	MNRE – Disaster Management Office	filomena.nelson@mnre.gov.ws
Malaki Iakopo	ACEO	MNRE – Water Resources Division	malaki.iakopo@mnre.gov.ws
Yvette Kerslake	Environmental Programme Officer	UNDP	yvette.kerslake@undp.org
Sara Ferrandi	Focal Point – ICCRITS Project	UNDP	sara.ferrandi@undp.org
James	Senior/Principal Officer	FESA	(+685) 20404
Lynelle Betham	Manager	Amanaki Hotel	contact@amanakihotel.com
Atarina Devay	Assistant Manager	Hotel Elisa	(+685) 21116
Sose Annandale	GM	Sinalei Reef Resort	(+685) 25191
Leilani	Owner	Manusina Beach Fales	manusinafales@yahoo.com
Sili Taufua	Owner	Taufua Beach Fales	taufuabeach@gmail.com
Tuiafutea Olsen & Jane Vaafusuaga	Owners	Lalotalie River Retreat	(+685) 7748759
Leota	Owner	Sunset View Fales	(+685) 7596240

Name	Role	Organisation / Operation	Contact
Elizabeth	Manager	Amoa Resort	(+685) 53518
Kevin	Owner	MotoSamoa Scooter Rentals	info@motosamoa.com
Joe & Falesoa	Owners	Joelan Beach Fales	joelanbeachfales@gmail.com
Tupai Saleimoa Vaai	GM / Owner President	Vaimoana Beach Fales Savaii Samoa Tourism Association	(+685) 7609089
Tuapou Warren Jopling	Owner/Operator	Savaii Natural History Tours	(+685) 7506448

Appendix B Operations simulation exercise programme and participant list

Samoa Tourism & Climate Early Warning System

Operations Simulation Exercise

Tuesday 23rd August, 2016

Time: 9:30 am – 2:00 pm

Venue: Samoa Meteorology Division Conference Fale, Mulinu'u.

Parties: Samoa Tourism Authority (STA), Samoa Meteorology Division (SMD), National Institute of Water and Atmospheric Research (NIWA)

Observers (Optional): Samoa Disaster Management Office (DMO)

Indicative Programme

Time	Activity
09:30 – 10:00	▪ Welcome & Introductions (STA, SMD, NIWA). ▪ Overview of project milestones & training programme (STA, NIWA). ▪ Overview of CLEWS information generation and accessibility process (15 mins).
10:00 – 10:15	▪ **Tea break**
10:15 – 12:00	▪ Simulation exercise (STA, SMD, NIWA): – Module 1: Water Conservation Alert template completion and dissemination (30-45 mins). – Module 2: Monthly climate forecast tailoring and information dissemination (30-45 mins). – Feedback loop (15 mins).
12:00 – 12:45	▪ **Lunch break (provided by STA/NIWA)**
12:45 – 14:00	▪ Continuation/completion of simulation exercise (STA, SMD, NIWA) (45 - 60 mins). ▪ Group/participant open discussion session (30-45 mins). – General comments and queries. – Envisaged challenges and potential resolutions. – Support/Other. – Final remarks.
14:00 (Indicative)	▪ **End of programme**

Participant List

Samoa Tourism & Climate Early Warning System

Operations Simulation Exercise

Tuesday 23rd August, 2016

Participant	Organisation	Email address
1 Tupua Schuster	STA	tupua.schuster@samoa.travel
2 Juliana Ungaro	NIWA	juli.ungaro@niwa.co.nz
3. Sara Ferrandi	UNDP	sara.ferrandi@undp.org
4. Anthony M	S.T.A	anthony@samoa.travel
5. Afapati M Sanerivi	STA	afapati.sanerivi@samoa.travel
6. Robert Ah Sam	STA	robert@samoa.travel
7 Isamaeli Time	STA	isamaeli@samoa.travel
8. Malaki Lei Sam	STA	malaki@samoa.travel
9. Shaun Williams	NIWA	shaun.williams@niwa.co.nz
10. Bernard Miville	NIWA	bernard.miville@niwa.co.nz
11. Tile Tofaeono	MNRE - MET	tile.tofaeono@mnre.gov.ws
12. Alan Porteous	NIWA	alan.porteous@niwa.co.nz
13. Faapisa Aiono	MNRE - MET	f.aiono@mnre.gov.ws
14. Naomi Tofilau	STA	naomi@samoa.travel
15. Hesed Ieremia	STA	hesed@samoa.travel
Rifua - Sufaa	"	
GT Harrington Pogi	"	kit@samoa.travel

Appendix C Example of Water Conservation Alert

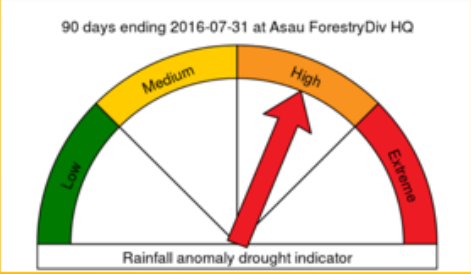
Water Conservation Alert

Asau and Western Savai'i

Issued: 23-Aug-2016
Valid until: 23-Sep-2016

1. Current Situation

Neither El Niño nor La Niña is currently dominant. During the last few months—April to June 2016- wetter than normal precipitation was recorded. The only area currently at risk of drought in Samoa is Western Savai'i, with their current drought index classified as **HIGH**.



2. Forecast for Aug - Oct 2016

Rainfall in Western Savai'i and across Samoa for Aug – Oct 2016 is forecast to be "**average to below average**" (see table below).

Region	Rainfall Prediction	Below Average	Average	Above Average
Aopo*	Average to Below Average	<430mm	430mm - 513mm	>513mm
Neiafu*	Average to Below Average	<430mm	430mm - 513mm	>513mm

3. What does this mean?

The rainfall outlook is forecast to be average to below average for all of Samoa, with western Savai'i showing a high risk of drought in the next 90 days. This means there is a high risk of drinking water shortages for western Savai'i.

At this time, it is suggested that all tourism operators in the region **take measures to conserve water**. Consider these actions:

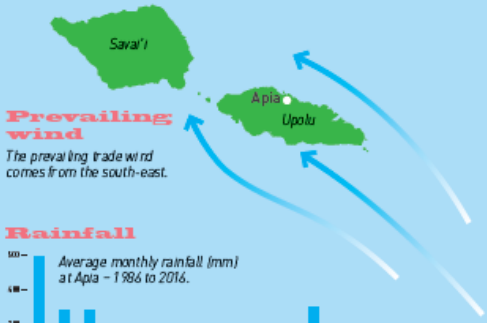
- **Do the laundry every three days instead of daily**
- **Ask guests to take short showers and not to leave taps running**
- **Don't water lawns and gardens**
- **Check for leaks**
- **Use water from rainwater tanks, where possible**
- **Arrange for water truck deliveries**

For more information, see: http://www.samet.gov.ws/.

[Demonstration Purposes Only]

Appendix D Samoa Weather and Climate Brochure

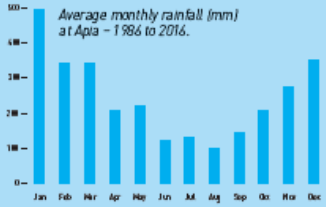
Samoa's weather & climate



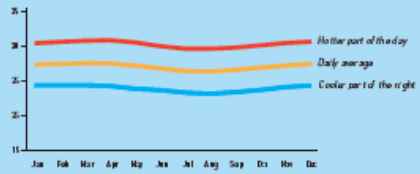
Prevailing wind

The prevailing trade wind comes from the south-east.

Rainfall



Temperature



Average monthly temperatures (°C) at Apia – 1986 to 2016.

Samoa's own weather forecast website

Save the link onto your phone

Step 1 Go to; www.samet.gov.ws

Step 2 Apple (Safari) – Click on the 'share' button

Android (Chrome) – Click on the 'more options' button

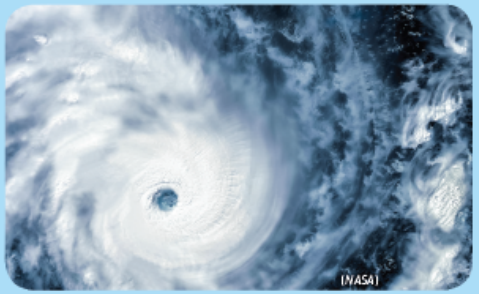
Step 3 Select 'Add to home screen'

El Niño & La Niña

Samoa's climate is affected by the El Niño – Southern Oscillation (ENSO), a natural climate and sea temperature pattern that affects weather all around the world.

During El Niños, the wet season in Samoa is generally drier-than-normal while at the same time, the risk of Tropical Cyclones is slightly higher.

During La Niñas, Samoa typically experiences wetter and cooler conditions.

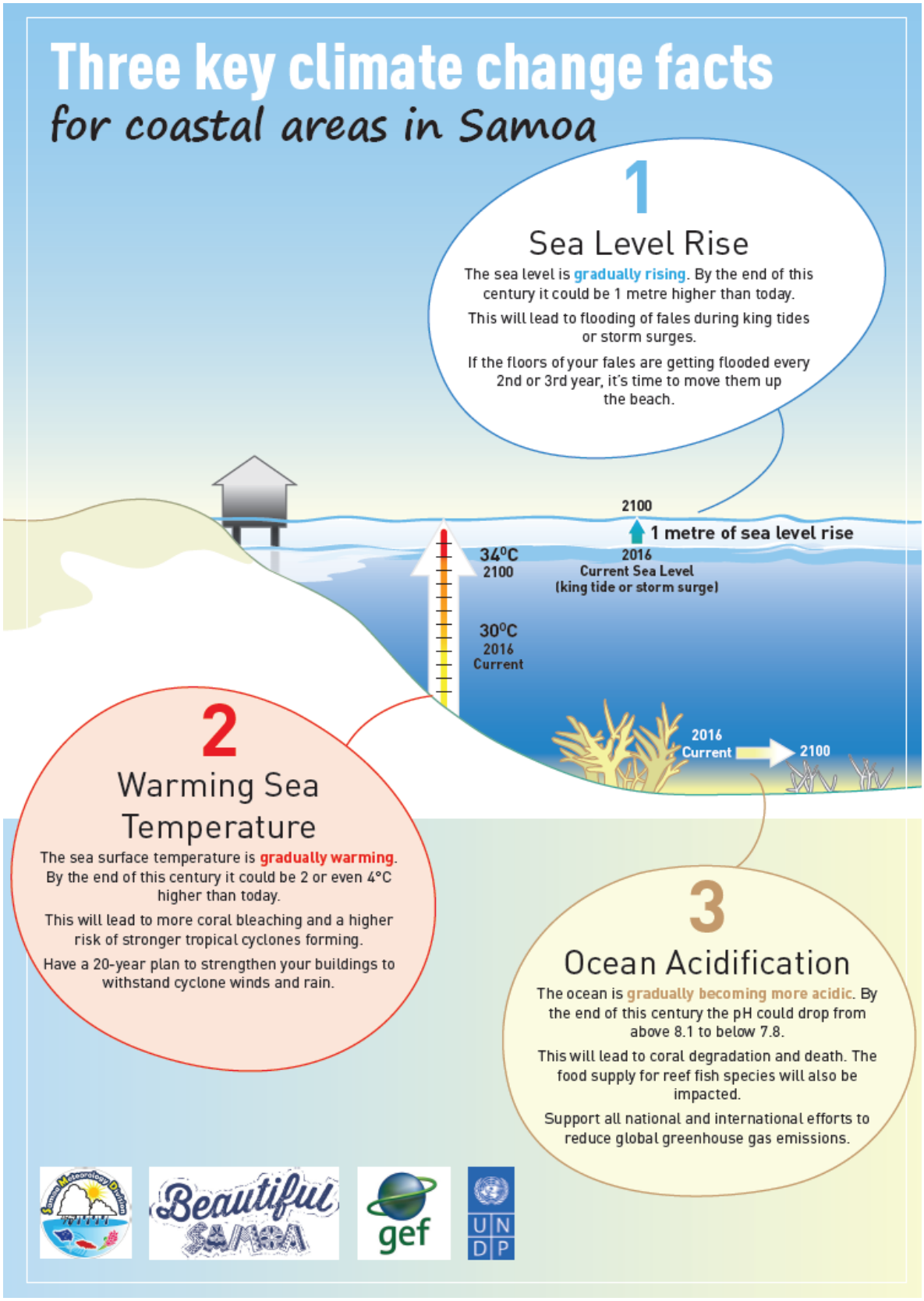


Climate change

Samoa's air and sea temperature has already risen by ~1°C since 1950, and the sea level has risen by ~15cm over the same period.

Temperatures and sea level are expected to rise more rapidly in the future due to global warming, leading to a high risk of impacts on natural ecosystems, human and animal health, and coastal environments.

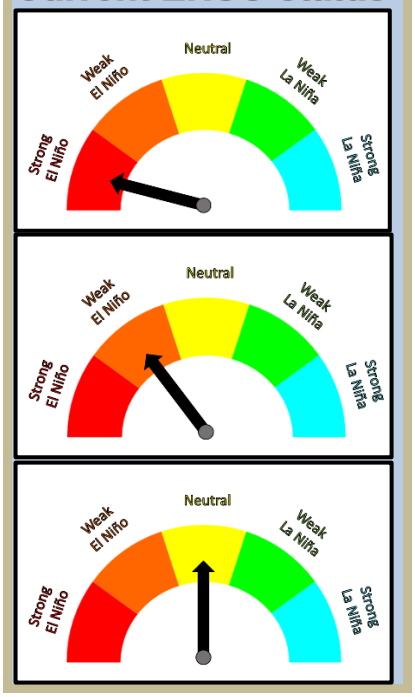
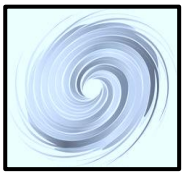
Appendix E Climate change factsheet for Samoa

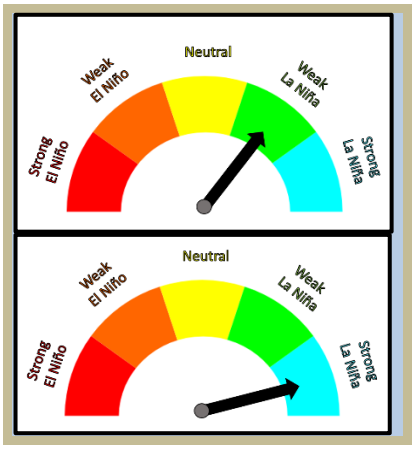


Appendix F Tailored monthly seasonal outlook template and example outlook for “average to below average rainfall” forecast

Tailored monthly seasonal outlook template

CLIMATE OUTLOOK
_____ TO _____ 20__

Rainfall outlook	**Average to below average rainfall**   **Average to above average rainfall**  
Ocean temperature outlook	**__(month)__: __-__°C** _____: __-__°C _____: __-__°C 
Current ENSO status 	**Neutral**= minimal effect **Weak El Niño=** possible increase in drought risk and cyclones in summer **Strong El Niño=** likely increase in drought risk and of cyclones in summer   **Weak La Niña=** possible increase in rainfall and cooler temperatures **Strong La Niña=** likely increase in rainfall and cooler temperatures 



Possible effects of the outlook

If rainfall continues to be below average, **there could be some problems with the fresh water supply.**

If rainfall continues to be above average, **there could be some problems with flooding.**

Actions

For below average rainfall:

- Do the laundry every three days instead of daily
- Ask guests to take short showers and not to leave taps running
- Don't water lawns and gardens
- Check for leaks
- Use water from rainwater tanks, where possible
- Arrange for water truck deliveries

For above average rainfall:

- Check and clear any blockages (e.g. tree branches) in nearby streams to prevent flooding.
- If streams are running high then drinking water quality may be poor, so consider boiling it before use.
- Prevent breeding sites for mosquitos. If there are containers or tyres nearby where water collects, empty these regularly.

For more information

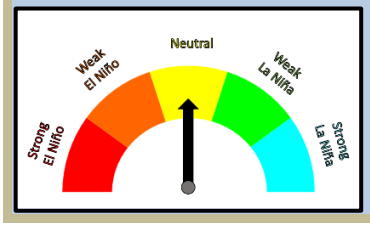
Samoa Meteorology Division:
Phone: (685) 20855/ 20856
www.samet.gov.ws

www.facebook.com/SamoaMeteorologicalServices

Samoa Tourist Authority:
Phone: (685) 63500
Email: info@samoa.travel
www.samoa.travel

Example of monthly seasonal issued outlook for "average to below average" forecast

CLIMATE OUTLOOK
AUGUST TO OCTOBER 2016

Rainfall outlook	**Average to below average rainfall** 
Ocean temperature outlook	**August:** 27-28°C **September:** 27-29°C **October:** 28-29°C 
Current ENSO status 	**Neutral**= minimal effect
Possible effects of the outlook	If rainfall continues to be below average, **there could be some problems with the fresh water supply.** 

Actions

For below average rainfall:

- Do the laundry every three days instead of daily
- Ask guests to take short showers and not to leave taps running
- Don't water lawns and gardens
- Check for leaks
- Use water from rainwater tanks, where possible
- Arrange for water truck deliveries

For more information

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[**Demonstration Purposes Only**]

Appendix G List of Acronyms

CLEWS	Climate Early Warning System
CLIDE	Climate Data for the Environment
CLIDEsc	Climate Data for the Environment services client
DMO	Disaster Management Office
ENSO	El Niño Southern Oscillation
FESA	Fire and Emergency Services Authority
GDP	Gross Domestic Product
GEF	Global Environment Facility
IEC	Information Education and Communication
LDCF	Least Developing Countries Fund
M&E	Monitoring and Evaluation
MNRE	Ministry of Natural Resources and Environment
MoA	Memorandum of Agreement
NIWA	National Institute of Water and Atmospheric Research Ltd
PDF	Portable Document File
SMD	Samoa Meteorology Division
SRO	Seasonal Rainfall Outlook
SST	Sea Surface Temperature
STA	Samoa Tourism Authority
STO	Seasonal Temperature Outlook
TC	Tropical Cyclone
TDA	Tourism Development Area
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WCA	Water Conservation Alert
WRD	Water Resources Division