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## **WORKSHOP REPORT**

**ON**

### **FORESTS AND NATURAL DISASTERS IN THE PACIFIC**

Organized by Food and Agriculture Organization of the United Nations (FAO) and Secretariat of the Pacific Community (SPC)  
29-30 July 2015, Nadi, Fiji,

#### **Introduction**

Increasing frequency and intensity of natural disasters all over the world have drawn attention to the need for a more holistic approach in dealing with such natural disasters including floods, landslides, storm surges, tsunamis, earthquakes, cyclonic winds and wildfires. In the period 2002–2011, the International Emergency Disasters Database (EMDAT) recorded an annual average of 396 disasters. The average annual total of disaster fatalities in the period is 114,500 people. Average annual economic losses total more than US\$142 billion. Annually, 268 million people have been affected by disasters during 2002-2011. Floods and storms account for most of the fatalities and damage to property.

Most recent assessments indicate that anthropogenic factors have significantly enhanced the severity of these disasters and many so-called natural disasters are triggered by human actions, often driven by population expansion and economic development. In the wake of increasing losses of life and damage to property, many countries are making efforts to take preventive measures to minimize damage and to improve their abilities in disaster management, i.e. preparedness, response and recovery.

While disasters have always occurred, there are indications that their frequency and intensity are increasing. In particular, climate change is expected to increase the frequency and intensity of disaster events in the future. The most vulnerable in this regard are the small island developing states (SIDS). Their very existence is being called into question in the context of rising sea levels and the potential for recurring disasters such as typhoons and storm surges. There are also clear indications that the impacts of natural disasters are particularly severe on the poorer segments of society. They often live in the most hazard-prone areas and their ability to take appropriate measures – even when early warnings are available – remains limited.

Land uses in hazard-prone areas are a critical issue, both in reducing the severity of natural disasters and in the speedy recovery of affected populations. Forests and forestry often can play crucial roles – but, also have limitations – in mitigating some natural disasters and their impacts, and in post-disaster reconstruction and recovery. Evidence

from the Asia-Pacific region demonstrates that forests, when appropriately planned and managed, can withstand and protect against natural disasters of varying degrees and types including tsunamis, storm surges, cyclones, landslides, and floods. Appropriately planned forests and tree planting can mitigate the spread and impacts of wildfires, rehabilitate landslide-affected areas, help to stabilize slopes, and protect riparian zones. It is in this context that this workshop aims to assess linkages between people, forests and natural disasters and identify what forests and forestry can do to avert or reduce the impacts and help in the relief and rehabilitation including preventing future recurrence of disasters.

This workshop will build on the collaborative International seminar on the role of forests in natural disasters and revival of forests and forestry held in Sendai, Japan in February 2012 and a pre-session seminar of Forests and Natural Disasters held prior to the 25th session of the Asia-Pacific Forestry Commission in Rotorua, New Zealand. It will raise awareness and build capacities relating to the use of trees and forests in mitigating the impacts of natural disasters in Pacific countries with a particular emphasis on tsunami and cyclones.

### **Natural disasters in Pacific countries**

Pacific island countries are susceptible to the full gamut of natural disasters including tsunamis, storm surges, cyclones, landslides, wildfires and floods. In many instances, sound forest management can help to protect and mitigate against severe impacts of these disasters.

The Pacific islands' particular vulnerability to cyclones and potential vulnerability to tsunamis direct the focus of the workshop towards these two types of disaster events and the roles trees and forests can play in mitigating the impacts of these events. Relationships between forests and floods, landslides, and storm surges will be explored as subsidiary topics.

#### **(a) Cyclones**

Cyclones are a regular occurrence for many Pacific Island countries. A designated "Southern Pacific Ocean tropical cyclone basin" lies between 160°E (Hawaii, Kiribati, Cook Islands) and 120°W (Philippines, Sulawesi).

Since 2010, the region has recorded 26 tropical cyclones and 14 severe tropical cyclones. There have been 62 cyclone-related deaths and more than US\$450 million worth of damage to property and infrastructure. Severe Tropical Cyclone Pam, which struck Vanuatu in March 2015 is the most destructive cyclone event of the past 5 years and is regarded as one of the worst natural disasters in the history of Vanuatu.

#### **(b) Tsunami**

In September 2009, an 8.1  $M_w$  submarine earthquake occurred in the Samoan Islands region generating a severe tsunami that caused substantial damage and loss of life in Samoa, American Samoa, and Tonga. A death toll of at least 189 people was recorded killed; 149 in Samoa, 31 in American Samoa, and 9 in Tonga. The Government of Samoa estimated the damage to property and infrastructure in Samoa at US\$147.25 million.

## **Objectives**

The workshop has three main objectives, namely:

- (i) To increase technical capacities and share experiences in relation to the use of trees and forests to mitigate the impacts and reduce risks associated with tropical cyclones and tsunami in Pacific island countries;
- (ii) To provide hands-on training in mapping risk areas, designing tree and forest protection systems and enhance capacities in preparing readiness and response plans as part of broader land-use planning;
- (iii) To obtain Pacific island country inputs and recommendations into the design of an Asia-Pacific Regional Strategy on Forests and Natural Disasters.

The workshop was held from the 29<sup>th</sup> to 30<sup>th</sup> of July 2015 at Novotel Hotel in Nadi. It was implemented as a partnership between the FAO Regional Office for Asia and the Pacific and the Secretariat of the Pacific Community with funding support from the USAID Project on Climate Change and Food Security. It was attended by 35 participants with representatives from 10 Pacific Island Countries (PICs), invited participants from, international organizations, SPC and FAO staff (29 males and 6 females),

The first day of the workshop comprised of technical presentations, experience sharing presentations and open discussions to meet objectives (i) and (ii) and provide a foundation for practical training on Day 2. The second day of the workshop included practical training exercises in mapping risk areas, designing tree and forest protection systems, and preparing readiness and response plans. The workshop also sought the reaction of participants to the Roadmap for an Asia-Pacific Regional Strategy on Forests and Natural Disasters and provided inputs and recommendations for the development of a broader strategy.

## **Proceedings of the Workshop:**

### **Opening Ceremony:**

#### **A. Welcome Address by Sairusi Bulai (SPC):**

Mr. Sairusi Bulai, the acting Deputy Director of the Land Resources Division of SPC warmly welcomed all the participants and guests to the workshop. He emphasized the importance of the workshop particularly to the Pacific Region which is vulnerable to the adverse effects of climate change.

#### **B. Opening Address by Patrick Durst (FAO):**

On his Opening Address, Patrick Durst provided an overview of the topic of forests and natural disasters in the Pacific with emphasis on the scope and scale of natural

disasters in the Asia-Pacific region, institutional focus on natural disasters particularly FAO's increased focus on natural disasters and building resilience against them, and risks in the Pacific region.

He highlighted a number of worst natural disasters in the first fifteen years of this new millennium, including the 2004 Indian Ocean earthquake and tsunami, which ranks as the eighth worst natural disaster in history in terms of death toll, with more than 280,000 people killed.

There had been many major flooding incidents and natural disasters that had happened in Asia and the Pacific in the past years. In just the past six years, the Pacific has been affected by cyclones with the most recent Cyclone Pam which hit Vanuatu and several other countries earlier this year.

FAO is increasing attention to natural disasters and how organizations can work to minimize the impacts of such disasters on local people, increase resilience, and support more effective recovery and rehabilitation. One of FAO's five new Strategic Objectives is to "Increase the resilience of livelihoods to threats and crises", which very clearly links our work in forestry to assisting countries develop capacities in preparedness, response and recovery from natural disasters. FAO has also been specifically requested by the 33 member countries of the Asia-Pacific Forestry Commission to give more attention to this important topic.

He pointed out the three quick lessons to learn during the workshop, namely:

- The first lesson is we can do things to mitigate the effects of natural disasters.
- The second lesson is that forests, trees and wood can play significant roles in this, including in the rehabilitation and reconstruction efforts that follow. It's very important that we are aware of forestry's potential and that we raise awareness of forestry's roles and potential.
- The third lesson is that it is also important that we raise awareness of forestry's limitations – including among practitioners within the sector. Forestry should usually be part of a wider set of management measures that will mitigate the impacts of natural disasters. We need to be careful not to over-sell forestry's capacities and benefits, and we particularly need to be wary of some common misperceptions about the disaster mitigation capacities of forests, which are not backed up by science.

## **Session 1: (Facilitated/moderated by Mr. Aru Mathias of FAO)**

### **A. “How tsunamis damaged coastal forests and how coastal forests decreased the damage caused by tsunamis” - Dr. Tomoki Sakamoto, FFPRI**

On March 11, 2011, 14:46, a huge earthquake occurred, resulting in a large tsunami and that led to the worst disaster of the postwar period on the Pacific coast in east Japan. Many lives and much property and social infrastructures were destroyed.

Coastal forests were also considerably affected in a wide area between Aomori and Chiba Prefectures. In particular, forests located between Iwate and Fukushima Prefectures were severely damaged. On the other hand, coastal forests revealed tsunami damage-reducing functions such as diminishing wave power, capturing drifting objects, and regulation of land use. Evidence suggests they might also provide means of escaping from tsunami, such as by climbing, holding, and soft landing. However, in the Japan tsunami these life-saving functions were likely limited due to lower atmospheric and water temperatures compared with areas affected by the Indian Ocean Tsunami. In other instances, trees could not survive the tsunami in many locations due to its huge scale.

Coastal forests in Japan have served as a form of disaster prevention against wind, tide, and blown sand as well as providing landscape amenities and places for recreation until their multifaceted functions were destroyed in the tsunami. Considering these lost functions, regeneration of these coastal forests is essential in the post-earthquake recovery process. It is desirable that these forests be regenerated not only for restoring them to their condition before the tsunami but also for improving them.

### **B. Country Presentations on the Impacts of Tsunami:**

#### **a. The Impacts of the 2009 Tsunami in Samoa (Tito Alatimu)**

The Tsunami of 29 September, 2009 affected parts of the main island of Opolu in Samoa. An earthquake struck at 6.48 am and was measured at 8.0 magnitude. It created two tsunami waves that caused considerable damage to infrastructure and loss of human life.

There were 143 deaths, 5 missing and 310 injured people reported, with many surviving victims receiving major injuries and treated at the other hospitals and in the main hospital in town. One district hospital was completely destroyed.

There was significant damage to crops and livestock apart from the destruction to farm inputs, tools, fishing boats and fishing gear; and damage and destruction to agricultural amenities in the coastal land area by waves and salty water was noted.

Of the 155 commerce enterprises and small enterprises that operate within the affected area, 52 were severely or partially damaged.

One of the most affected areas is a popular tourism destination with well-developed tourism facilities. Some facilities were completely destroyed with the biggest impact on the beach fale accommodation category.

The natural environment was noted to suffer the greatest damage and the most impacted sector as damage was noted from the marine ecosystem right up to the terrestrial environment.

The total damage and losses to the Economy as a result of the Tsunami was valued at SAT \$ 310.16 million (US \$ 124.06 million).

**b. Tsunami in Solomon Islands (Mr. Gordon Konairamo):**

In Solomon Islands, there were 31 recorded tsunamis from 1768- Jan 2010, with 18 of them classified as locally generated tsunamis.

On the 2<sup>nd</sup> of April 2007, a magnitude 8.2 earthquake occurred in the Solomon trench, triggering a tsunami that impacted parts of Western Province and South Choiseul, 10 minutes after the origin of the earthquake. 54 deaths were recorded.

In 1960, a Chilean earthquake (magnitude 9.5) generated a tsunami that reached SI after 18 hours, 4 metre wave run-ups were recorded, which inundated some coastal areas.

Tsunamis are a serious concern for Solomon Islands' human, socio-economic, natural and built environment given that 99% of Solomon Islands population and infrastructure are located on low lying coastal areas.

- Human and Social Impacts.
  - People become traumatized due to the severity of these impacts and the financial burden caused by the damage.
- Impacts on the Economy and Built Environment
  - Tsunamis cause extensive damage to coastal communities including community and public infrastructure, agriculture, fisheries and tourism. Given that the major source of income for SI economy is from agriculture, fisheries and tourism, destruction of these income earners has extreme impacts on SI economy and infrastructure
- Impacts on Natural Environment
  - The beauty and natural features of beaches deteriorated and rate of coastal land erosion increased. Consequently, coastal communities lost more lands.

**c. Damage Assessment Report from the Niuatoputapu Tsunami on 30<sup>th</sup> September 2009, Tonga Island (Heimuli Likiafu)**

The Pacific tsunami hit the island of Niuatoputapu, Tonga and other nearby islands on the morning of 30 September 2009. Total estimated cost of damage was at TOP\$18.2 million with nine (9) fatalities and more than 60% of Niuatoputapu residential homes

either destroyed or seriously damaged. There was extensive damage to agriculture and infrastructure.

**C. “The science of tsunami – cause, and generation from seismic events, and potential impacts” by Mr. Ifereimi Dau, IUCN**

A tsunami is defined as a great sea wave produced especially by submarine earth movement or volcanic eruption (*Merriam-Webster Dictionary*) generated by either undersea earthquake, submarine landslide or an undersea volcano

On May 22, 1960 a Magnitude 9.5 Mw earthquake, the largest earthquake ever instrumentally recorded, occurred in southern Chile. The series of earthquakes that followed ravaged southern Chile and ruptured over a period of days a 1,000 km section of the fault. The number of fatalities associated with both the earthquake and tsunami has been estimated to be between 490 and 5,700. Reportedly there were 3,000 injured and initially there were 717 missing in Chile. The main shock generated a tsunami that was not only destructive along the coast of Chile, but also caused numerous casualties and property damage in Hawaii and Japan, and was noticeable along shorelines throughout the Pacific Ocean area.

The Boxing Day tsunami happened at 7.59am on the 26th December 2004 and was the result of the Indo-Australian plate being subducted beneath the Eurasian plate 240km off the coast of Indonesia. The earthquake measured 9.1 on the Richter scale according to the USGS and caused a 20 metre uplift all along the 1,000km fault line.

The impacts of the Tsunami on Boxing Day 2004 were described as follows:

- a. Social Impacts:
  - Over 220,000 people died in 14 countries
  - 650,000 were seriously injured
  - Up to 2 million were made homeless
  - Identification of the dead on such a massive scale was difficult
  - Families grieving for lost family members
  - Livelihoods destroyed
  - Diseases such as cholera and dysentary spread due to the lack of sanitation and contaminated floodwaters
- b. Economic Impacts:
  - Public buildings including schools and hospitals were wiped out in some areas
  - 1,500 settlements were wiped out in Banda Aceh
  - Coastal tourist hotels damaged
  - Railway lines and roads washed away
  - Fishermens' boats were destroyed
  - Crops destroyed/farming land flooded
  - Hotels lost income
- c. Environmental Impacts:
  - Highest wave to come ashore was over 25m

- Coral reefs damaged
- Thousands of rice, mango and banana plantations in Sri Lanka destroyed
- Water wells contaminated by seawater and dirt
- Debris washed up on beaches
- Places as far away as Fiji, American Samoa, New Zealand and Hawaii which lie up to 12,000km from the tsunami, saw the seas rise.
- In India saltwater from the ocean contaminated freshwater supplies

#### **D. “The Pacific Tsunami Warning System” by Mr. Rajendra Prasad, UNESCO**

Historically, from 2000 BC to AD 2014, seventy-one percent of the worlds’ confirmed tsunamis have occurred in the Pacific Ocean and its marginal seas. 99% of the deadly tsunamis were caused by local or regional tsunamis which attack within minutes! Though there is no solid evidence to suggest that the number of tsunamis is increasing in the Pacific, there have certainly been some deadly events recently in the Pacific and other ocean basin that have taught some hard-learnt lessons! Since most of the people in the smaller islands reside on coastal land, which generally has the most fertile soil for agriculture and forestry, mitigation from a tsunami disaster is of profound importance.

The Pacific Tsunami Warning and Mitigation System (PTWS) has been functioning since 1965 and recently commemorated its 50th Anniversary under the Intergovernmental Oceanographic Commission (IOC) of the United Nations Education, Scientific and Cultural Organization (UNESCO). A number of warning/advisory centres serve within the PTWS for different parts of the Pacific, including the Hawaii-based Pacific Tsunami Warning Centre (PTWC) which has provided tsunami Warnings and Watches for the Pacific Island Countries (PICs) for several decades.

Recently, the PTWS underwent a major change whereby the PTWC ceased its Warning/Watch services and instead implemented PTWS Enhanced Products from 01 October 2014. The Warning bulletins have been replaced by Tsunami Threat Messages that place countries under one of the four forecast wave amplitude categories adopted under the PTWS: less than 0.3m, 0.3m to 1.0m, 1.0m to 3.0m, Over 3.0m. This text product includes tsunami arrival times for various locations and is available to all, being in the public domain. Other forecasts in graphical and text form are only available to the Tsunami Warning Focal Point(s) designated by each country to the IOC, and are intended for use by the National Tsunami Warning Centre (NTWC) of the respective country. The products for restricted dissemination include Deep Ocean Tsunami Amplitude Forecasts, Coastal Amplitude Forecasts, Threat Maps based on Coastal Tsunami Amplitude Forecasts, and Polygon Tables that indicate forecast amplitude values (maximum, mean, median, standard deviation offshore and at coast.

The PTWS Enhanced Products provide very useful guidance for an impending tsunami threat, but leave the “decision call” in terms of issuing national, regional or local warnings to the NTWC of the respective country. The availability of reliable coastal inundation models provides a very useful tool for hazard mapping/zoning which is



increasingly being deployed for evacuation planning and other mitigation measures including for safeguarding agriculture and forestry.

## **Session 2: (Facilitated/moderated by Mr. Cenon Padolina of SPC)**

### **A. “Forests and Cyclones” by Alan Reid of New Zealand**

This presentation focuses on the role for forests in protection from the effects of cyclones and some practical approaches in Pacific Island countries. Key considerations for this role include the need to:

- take a holistic approach and a goal that emphasizes creating resilient forests that provide a barrier to storm impact, resist damage, recover quickly, and which are well integrated with communities and landscapes;
- establish the right “tree system” in the right place;
- reduce long lead times required to get it right;
- work with trees and forests that can adapt and perform a useful protective function – but understanding the limitations of trees as well as the benefits;
- mainstream multi-purpose forests into policy;
- plan tree systems across whole landscapes and at all scales;
- use the best available species/site information from local knowledge, and scientific evidence, and
- ensure that disaster preparedness, response and recovery provides for anticipated forest damage, and re-establishment/regeneration.

There is an expanding knowledge of how cyclones form and move in regions of the globe, improved monitoring, tracking and mapping tools and a better understanding of the effects of wind speed, rainfall, storm surge.

There is also a growing and valuable body of knowledge globally about the role that forests can play in offering some protection from cyclones. However it is crucial to translate this knowledge to tailor the type of tree system to specific sites, threats and situations. Implicit in this is understanding how forests and trees behave in storms, their capacity to withstand damage and deflect the impacts of storms, including wind, torrential rain and associated storm surge and flooding and soil erosion while also minimizing their own destructive potential.

It is equally important to minimize forests recover from storm damage and how this can be best managed.

The adaptability of species, both indigenous and introduced to a variety of, often extreme, sites, their survivability, the structural and physiological attributes of trees as “natural engineered structures” and the collective benefits tree systems (woodlots, shelterbelts, extensive plantations and urban trees) are key attributes. Using mixed species systems and avoiding potentially invasive species are important considerations

## **B. “Lessons from Typhoon Haiyan, Philippines” by Mr. Patrick Durst, FAO**

Typhoon Haiyan is the strongest typhoon ever to make a landfall with sustained winds of 315+ km/hr and wind gusts in excess of 375km/hr. It left more than 6,200 people dead, 14 million people directly affected with cost of recovery to about US\$ 12-15Billion.

- Impact on the agriculture sector
  - > 600,000 ha crops destroyed
  - 44 million coconut trees downed or damaged beyond recovery
  - 30,000 fishing boats damaged or destroyed
  - US\$724 million damage in agriculture sector
- Impacts on trees and forests
  - Tens of millions of upland forest and fruit trees uprooted or damaged
  - Roughly half of plantation trees damaged in highly affected provinces
  - Coastal beach forests and mangroves suffered varying degrees of damages
  - Natural forests generally withstood wind better than planted forests
- Lessons learned
  - Coastal vegetation can protect lives and property, but must be wide enough (100m min.), densely stocked, multi-structured, with thick understory development for significant benefit
  - Early warning systems and sound evacuation procedures are particularly important when people live in high-risk areas
- Recovery Lessons
  - Don't let forestry miss the recovery train; provide data and information promptly
  - Cash for work as a common modality for recovery
  - People need shelter. Salvaged wood can be a key building material for reconstruction
  - Salvaged downed trees (coconuts, timber trees, urban trees)
- Emergencies require special attention:
  - Victims need to focus first on survival and grieving
  - “Normal procedures” don't apply
  - Rules/regulations need to be relaxed
  - Exceptional support personnel and equipment need to be mobilized quickly
- Resiliency Lessons
  - Right species in the right location in the right way: deep rooted, wind resistant species, with great commercial value; clump planting of coconuts for wind resistance.
  - Local people must be effectively involved
  - Diversification: agroforestry, intercropping, livelihoods

## **C. Country Presentations on Impacts of Cyclone:**

### **a. “Impacts of Cyclones in Fiji” by Mr. Noa Vakacegu**

The occurrence of cyclone in the Fiji islands is almost an annual event with at least one cyclone a year. The official tropical cyclone season for 2014 to 2015 extended from 1<sup>st</sup> November to 30<sup>th</sup> April with the peak period of the cyclone in between January to March. In this report three major tropical cyclones identified and highlighted to show their impact on the economy, infrastructure and livelihood of the people.

The three tropical cyclones recorded to have severe effect on Fiji include Evans, Gavin and Kevin.

The assessment carried out to determine the impact of cyclone Evans shows that damage, loss and recovery cost runs into millions of dollars. Cyclone Evans affects the livelihood of people, destroy shelters, infrastructure and pine plantations.

Data gathered shows that Tropical cyclone Gavin damage mahogany (*Swietenia macrophylla*) plantation ages 1 to 5 years. A total of 2,244 hectares of plantations damage with a total of \$156,600.00 spent for rehabilitation to this area.

Cyclone Kina has a lot of impact on mahogany plantations ages 1 to 10 years. A total area of 11,639 hectares damaged, 7,271 ha rehabilitated through firming and propping, 2,968 ha written off, 1,400 ha salvaged through logging of felled trees. The rehabilitation has done cost FJ\$226,271.

The impact of the three cyclones on Fiji has its effect on our society, infrastructure and economy. Its social impact includes damages to root crops and homes, loss of income to forest workers and access to health centers and schools affected. Damages to infrastructures include roads, bridges, water pipes and electricity lines. Economy affected due to plantations damaged and written-off. These plantations which are written off create age gap on the sustainable timber supply in the future.

### **b. “Vanuatu- Home to Tropical Cyclones” by Mr. Hanington Tamla Tate**

Tropical cyclones are a regular visitor to Vanuatu, occurring at a rate of 2.5 cyclones per year during the cyclone season which is the period from September to April each year. Tropical cyclones occur at a range of gale force winds to destructive winds. The biggest system to hit Vanuatu was the Severe Tropical Cyclone Pam, which affected the central and southern part of the archipelago on 13<sup>th</sup> and 14<sup>th</sup> March 2015, with destructive winds of up to 320 kilometers per hour. The Category 5 Severe Tropical Cyclone was reported at that time to be the strongest cyclone to have hit the Pacific Region.

Forests are very vulnerable to natural disasters, specifically due to immobility and long gestation period, particularly planted forests grown specifically for economic purposes. Tropical cyclones are a type of natural disaster that creates threats and destruction to forests in the Pacific region. Tropical Cyclone Pam which hit Vanuatu had significant

destructive effects on both natural and planted forests. The impact of the cyclone on the reforestation sector has resulted in the need to carefully refocus the future of the sector.

Future of reforestation in Vanuatu will focus on resilience against tropical cyclones. This focus will be directed towards growing products than trees. The Department of Forests is in the process of working on information to trial this strategy on five priority species. The strategy will include production of information and field trials for visual examination.

### **Session 3:** (Facilitated/moderated by Mr. Patrick Durst and Mr. Chris Brown of FAO)

#### **Draft Roadmap for an Asia-Pacific Regional Strategy on Forests and Natural Disasters**

Patrick Durst and Chris Brown introduced and facilitated an introduction to natural disaster management planning. They noted and elaborated that disaster management planning can be grouped into “Five Rs” components

- Research” – that is the basic data collection and analysis that will inform the planning.
- Risk Reduction” – actions to prevent disasters and/or lessen their impacts, before they happen.
- Readiness” - Preparing to cope with specific natural disasters
- Response” – Taking action in the face of a natural disaster
- Recovery” – After the disaster, rebuilding community welfare, infrastructure repair, and restoring damaged landscapes.

Participants were divided into groups and asked to identify important forestry activities under each component.

#### **Results**

##### Risk Reduction

- Define type of risk, scale, area (e.g. tsunami, cyclone, fire)
- Work with local politicians, planners, land-users, other stakeholders (consultation process) to include forests in overall risk planning.
- Identify who is affected by risk.
- Identify how communities, infrastructure etc may be impacted - vulnerability assessments
- Strategize how to reduce risk using protection forest systems
- Strategize on right species/management
- Implement long-term agreed policy

##### Readiness

Budget set aside

Develop a strategy

- Resources (budget, human, equipment, etc)
- Establish a task force

- Training (emergency drills, assessment, etc)
- Establish procedures
- Update baseline information
- Food security
- Water security

#### Response

- Initial damage assessment
- Gather data on available resources – manpower, transport, tools, processing facilities, nursery supplies, etc
- Recovery of fallen trees for fuel, shelter
- Access – roads, communications towers, etc

#### Recovery

- Assessment of damage
  - Planted and natural forests
  - Infrastructure
  - Employment/income
  - Effects on livelihood/environment
  - Consultations
- Planning
  - Infrastructure
  - Resource availability (budget, human resources, skills, assets)
  - Responsibility
  - Coordination
- Implementation of plan
  - Bring life to normal
  - Training
  - Procurement
  - Rehabilitation
  - Utilization of fallen trees
- Review/Update/Revise Plans

### **Session 4: (Facilitated/moderated by Ms. Christine Fung of GIZ)**

#### **a. “Pacific Climate Variability and Change” by Dean Solofa of SPC**

The presentation covered a number of climate related concepts and topics. Firstly, a detailed explanation of the climate patterns of the Pacific as observed today, was shown. In this presentation, information was shared about the key climate features that drive the weather features and climate patterns of the Pacific, namely the interannual features of the Intertropical Convergence Zone (ITCZ), the South Pacific Convergence Zone (SPCZ), the El Nino Southern Oscillation (and the El Nino and La Nina phases). Also discussed was the inter-decadal climate driver such as the Inter-decadal Pacific Oscillation (IPO). The variations in climate due to these regular features were shown in data and graphs presented, to capture the nature of the

variability of climate in the Pacific, as well as its impacts on the people and their countries in terms of extreme impacts such as droughts, flash floods, and tropical cyclones.

The second and final part of the presentation covered the long term observed climate trends and finally the climate change projections of the latest findings by the IPCC 5th Assessment Report (AR5). Trends measured locally were shown to be in agreement with global trends being observed, and the projections from the latest AR5 report were shown with focus given on the temperature and sea level rise rates in particular.

A brief discussion was also given in the presentation on the potential impacts, from early studies, on agriculture and forestry, with mentions to underscore the need for further research to expand knowledge to match policy decision making needs for the future, based on the new projections.

**b. “Native forests, plantation forests and trees outside forests: Their vulnerability and roles in mitigating and building resilience to climate change” by Lex Thomson and Randy Thaman**

Healthy forests and trees are a clear sign of environmental stability, resilience and human wellbeing — the antithesis of desertification, land degradation, vulnerability and poverty. The conservation and enrichment of Pacific Island forests and trees outside of forests in both rural and urban settings offers one of the most practicable, cost-effective, culturally and environmentally sound means of addressing climate, environmental, economic and social change, the impacts of which are clearly negatively synergistic. By conserving and enriching forest and arboreal resources, regardless of the main causes of change and the unclear extent to which human-induced climate change is currently and increasingly an important driver, we have an action that can be carried at national, subnational and community levels. This presentation outlined some of the existing and forecast impacts of human-induced climate change in concert with other drivers of change, and how the conservation, enrichment and sustainable utilisation of forests, trees outside of forests, and arboreal resources can address the seemingly intractable impacts of climate change.

Pacific Islands land and forestry planners and managers will need to work with resource owners, tree growers and farmers ‘to strengthen existing and planned adaptations, and develop new interventions, to minimise threats and harness opportunities associated with the direct and indirect effects of climate change’ on terrestrial ecosystems, especially forests, woodlands and agroforests. However, given the uncertainties of the magnitude and timing of the inevitable impacts of human-induced climate change on Pacific forests and trees, and interactions with other factors, the emphasis must be placed on the roles of good forestry management and agroforestry practices as a way of building resilience to all forms of environmental change, economic change, invasive species and human-induced climate change. Furthermore, it is evident that there will never be sufficient resources available to

undertake all desired research, modelling, planning, mitigation, adaptation and monitoring to address the impacts of climate and global change on Pacific Islands forests, trees and the vast array of goods and services which they provide.

More research is needed to better quantify the economic, environmental and social impacts of climate change on the forests and trees sector in the Pacific Island countries. It is noted that the main economic impacts may be indirect, related to fire, pests and diseases, and damage to ecosystem services (especially water supply) provided by forests (from fire, cyclones and flooding), and impacts on the less easily quantified informal/subsistence sectors (forest food bank, traditional medicines, rough building timbers and fuelwood). There may also be flow-on consequences on agriculture due to climate change impacts on forests such as through a reduction in beneficial predators and pollinators. Accordingly, while more research is being conducted and climate change impacts better understood, it is recommended that a limited number of high priority actions, identified in this presentation and elsewhere, need to be undertaken as follows:

1. Development and consistent application of good forestry practices, including enforcement of codes of logging practice, silvicultural prescriptions and reduced impact logging guidelines. This will require better resourcing of national forestry departments both from government budget and donors. It is especially critical to prevent logging within and felling into riparian 'buffer zones' and agricultural and other clearance of riparian vegetation, watersheds and steep slopes. Such activities have seriously undermined the ability of riparian forests to continue provision of goods and services and protection against extreme weather events.
2. Improved land use planning — governments working with land owners, farmers and communities in landscape approaches (also referred to as whole catchment or ridge-to-reef approaches) to identify those areas most susceptible and contributing to soil erosion. Those areas should preferably be either reforested and/or placed under an appropriate agroforestry/arboreal system, including vetiver grass strips. The alternative is to implement costly and less effective engineering measures.
3. Encourage the development of multispecies forest plantations and climatically-resilient agroforestry systems through use of a greater number of widely adaptable species (including more cyclone and wind tolerant species). In order to minimise damage and reduce risks from uncontrolled fire, new forest plantations and agroforests in dry and intermediate rainfall zones will need to incorporate a higher proportion of fire tolerant species, such as teak. These actions will require a more effective collaboration between government and private sectors, including provision of technical and market advice and diverse and improved tree germplasm.
4. Pacific Island countries (governments, communities and tree growers) need assistance in managing the impacts of climate change on forest genetic resources to access, promote and utilise diversity within and among tree species to help with climate change adaptation and mitigation. This would be best done through a donor-funded collaboration of SPC's Pacific Islands Tree Seed Centre and Pacific Island

Forestry Departments (with inputs from the CSIRO Australian Tree Centre and Kew Gardens Millennium Seed Project). A key objective would be to collect and evaluate populations of the most important tree species for the Pacific Islands in the face of climate change. High priority species would include *Agathis macrophylla*, *Bischofia javanica*, *Canarium indicum*, *Calophyllum inophyllum*, *Casuarina equisetifolia*, *Endospermum* spp., *Flueggea flexuosa*, *Tectona grandis*, *Terminalia richii* and *Pandanus tectorius*. There is also a need to improve and streamline sharing protocols and agreements within the region.

5. There is urgent need for better surveillance, monitoring and control of exotic forest pests and diseases and environmentally invasive weeds by government forestry and biosecurity agencies. The highest priority at present for Pacific Island forest ecosystems is the development of biological control measures for the African tulip (*Spathodea campanulata*). In the meantime, its human-aided inter-island spread needs to be halted including total elimination on any small populations where the species has yet to gain a foothold.

**Session 5:** (Facilitated/moderated by Mr. Chris Brown and Mr. Aru Mathias of FAO, Mr. Dean Solofa of SPC and Mr. Rajendra Prasad of UNESCO)

**Group Work - Exercise 1: Mapping hazard risk areas**

Chris Brown, Aru Mathias, Dean Solofa, and Rajendra Prasad facilitated a session on mapping hazard risk areas. After introductory presentations on techniques for hazard risk mapping participants were given a case study which identified various hazards present on “Bacon and Egg Island” including tsunami and storm surges, cyclones, flooding and landslides. Participants were asked to develop a hazard risk map for the island.

**Session 6:** (Facilitated/moderated by Mr. Chris Brown of FAO and Mr. Alan Reid of New Zealand)

**Group Work - Exercise 2: Designing tree and forest protection systems**

Chris Brown and Alan Reid facilitated a session on Designing tree and forest protection systems. Building on the first exercise participants were given a second case study detailing socio-economic objectives for a forest restoration programme on Bacon and Egg Island including disaster mitigation measures, production forestry, agriculture and tourism. Participants were asked to develop a forest system taking into account these various complementary and competing objectives.

**Session 7:** (Facilitated by Mr. Patrick Durst and Mr. Chris Brown of FAO)

**Group Work - Exercise 3: Draft Roadmap for an Asia-Pacific Regional Strategy on Forests and Natural Disasters**

Patrick Durst and Chris Brown introduced and facilitated an exercise to identify types of forestry assistance needed in the Pacific to strengthen resilience against natural disasters.



Their presentation briefly outlined the development of a draft Roadmap for an Asia-Pacific Regional Strategy on Forests and Natural Disasters and provided some ideas on the types of assistance that could be provided under such a regional strategy. Participants identified a range of activities that would be of value in strengthening resilience in the Pacific.

**1. Generic areas in which assistance is high priority:**

- Cyclones
- Droughts
- Landslides
- Coastal Flooding and storm surges
- Tsunami
- Sea-level rise
- Fire

**2. Policy development assistance**

- Forestry policy to identify needs and activities
- Policy development relating to cyclones, droughts, floods, tsunami
- Development of policies to assist through climate change (adaptation)
- Sea-level rise – policy advice
- Strategies and action plans
- Response plan on cyclone impacts on low-lying islands

**3. Technical publications**

- Information on species change and variability in response to climate change
- Field assessment guidelines or a plan to be used by forestry staff (Cyclones)
- Documentation and sharing of lessons learned within Pacific countries and others
- Native forest tree species susceptibility to increasing temperatures/climate change

**4. Training and capacity building**

- Tsunami – baseline info/data assessment training
- How to cope with climate change
- Drought – needs assessment training
- Roles, functions and potentials of coastal forests vis-à-vis natural disasters
- How to engage in broader post-disaster processes (calls for funding, needs assessments, etc)
- Training in damage assessment
- Build capacities on assessment and reporting of different natural disasters
- Coping with sea-level rise
- Dealing with coastal flooding, tsunami and storm surges

**5. Project support**

- Funding of tree-planting efforts
- Development and implementation of financially viable protection planting schemes/mechanisms such as PES
- Plantation and conservation of forest in coastal areas by local people
- Coping with sea-level rise

## **6. Others**

- Research into selection of appropriate species balancing financial viability (profitability) with disaster mitigation ability
- Data information systems incorporating indigenous knowledge management + institutional strengthening
- Institutional mapping – Who does what? Who provides what support? Where can I get help?
- Identify potential tree species resilience to natural disasters
- Community awareness raising
- GIS/RS technology to support data collection and recovery plan
- Better data collection after natural disasters
- Cyclone tree system needed
- Landslide risk mapping e.g. using GIS
- Highlight economic opportunities from forests after cyclones (to be fed into national policy)
- Design planting method that can reduce impacts of natural disasters
- Cyclones – Policy development, Aid, Assess damage, Action Plan
- Collaboration/Cooperation/Promotion (developing a preparedness/response and recovery plan)
- Facilitating applications for funding
- Plain language translation of research

Dr. Sakamoto provided some general principles to help in prioritizing projects:

- Individual cases are all different – start with generalized principles and apply specifically
- Development and survival of coastal protection forests should be highest priority
- Tough forests are more valuable for protection forests than forests with high multiple uses
- Predict what may happen and build plans on how to recover and reconstruct before the disaster happens.

## **Closing Ceremony**

Sairusi Bulai of SPC and Patrick Durst of FAO jointly thank all the participants for their active participation and great interest that contributed to the success of the two days workshop.

## **Evaluation of the Workshop:**

The participants were requested to fill up the Evaluation Form at the end of the two days workshop wherein they were asked seven (7) questions. The questions and the participants responses were noted as follows:

Q #1: Are you satisfied with the workshop content?

Response:

8 out of 22 who responded to this question rated it as Excellent, 11 rated it as Good and 3 rated it as Satisfactory

Q #2: Is there anything that you feel should be done better in terms of workshop content?

Response:

- Better explanation of the science and technical subjects
- More discussion time
- The need to include forestry in Disasters Management Planning
- Visit places (field trip) covering the theme of the workshop
- More work and regional strategy relevance of the Group Work??

Q #3: How would you rate facilitators of the workshop?

Response:

- 9 out of 18 who responded to this question rated it Excellent and another 9 also rated it good.

Q #4: How would you ensure that this momentum on the subject continues to bring changes in the country?

Response:

- Information network
- Training platform for individual institutions particularly on forestry
- More workshops and trainings
- Hold national level workshop then localized to district\ village level
- Take back and present to the politicians to know and understand more on Climate change and Disaster Management
- Need more training in the implementation level
- Continue to advocate the need to include forest as part of Disaster Management Planning
- Ideas from the Workshop are to be reflected in the (national) policy

Q #5: Were you happy with SPC's assistance in providing your travel arrangement\accommodation to attend this workshop?

Response:

7 out of 21 who responded to this question rated it excellent, 9 rated it good, 3 rated it satisfactory and 2 rated it poor (No clarification on the DSA)

Q #6: How would you rate the overall running of the workshop?

Response:

13 out of 21 who responded to this question rated it excellent and 8 rated it good.

Q #7: Any other comments that you feel can help SPC in improving the organization of regional trainings\meetings?

Response:

- Continue to include young minds so that they learn and implement changes and be sustainable in the future
- Gender balance
- Workshop need to be done at management level as well so that dissemination and understanding at all levels
- Extend duration of the workshop for another day
- Need to look into low-lying countries
- More presentations on technical effects on SFM
- DSA not enough
- Very well done
- Short, longer period
- Cocktail

**Acknowledgement:**

The organizers of the Workshop, SPC and FAO, wish to express their sincere thanks and gratitude to the USAID Project on “Climate Change and Food Security” for its financial support to the Workshop

## ANNEX 1. Workshop Programme

<b>Day 1: Wednesday 29 July</b>		
8.00 – 8:30	<b>Registration</b>	
<b>Opening Session</b>		
8:30 – 9:30	<ul style="list-style-type: none"> <li>• <b>Devotion</b></li> <li>• <b>Welcome Address</b></li> <li>• <b>Opening Address</b></li> <li>• <b>Introduction of Participants</b></li> </ul>	<p>Mr. Gewa Gamoga, PNG</p> <p>Mr. Sairusi Bulai, Acting Deputy Director, Land Resources Division, Secretariat of the Pacific Community</p> <p>Mr. Patrick Durst, Senior Forestry Officer, Food and Agriculture Organization of the United Nations</p> <p>Facilitator\Participants</p>
	<b>Session 1 –</b>	Moderator\Facilitator: Mr. Aru Mathias, Forestry Officer, FAO
	<ul style="list-style-type: none"> <li>• <b>How tsunamis damage coastal forests and how coastal forests decrease the damage caused by tsunamis</b></li> </ul>	Dr. Tomoki Sakamoto, Regional Research Coordinator, FFPRI, Japan
9:30 – 10:00	<b>MORNING TEA / GROUP PHOTO</b>	

	<b>Session 1 (Cont.....)–</b>	Moderator\Facilitator: Mr. Aru Mathias, Forestry Officer, FAO
10:00 - 12:30	<ul style="list-style-type: none"> <li>• <b>Country Presentations on Impacts of Tsunami</b> <ul style="list-style-type: none"> <li>- <b>Samoa</b> (<i>Tito Alatimu</i>)</li> <li>- <b>Solomon Islands</b> (<i>Gordon Konairamo</i>)</li> <li>- <b>Tonga</b> (<i>Heimuli Likiafu</i>)</li> </ul> </li> <li>• <b>The science of tsunامي – cause, and generation from seismic events, and potential impacts</b></li> <li>• <b>The Pacific Tsunami Warning System – the current state of warnings at national and regional levels, and the interpretation of warning advisories, messages, and lessons learnt from regional tsunami exercises</b></li> <li>• <b>Discussion on possible types of tree planting for tsunami protection</b></li> </ul>	<p>National Participants</p> <p>Mr. Ifereimi Dau, Energy Programme Officer, IUCN</p> <p>Mr. Rajendra Prasad, UNESCO</p> <p>Facilitator</p>
12:30 – 13:30	<b>LUNCH</b>	
	<b>Session 2 –</b>	Moderator\Facilitator: Mr. Cenon Padolina, Regional Forest Genetic Resources Officer, SPC
13:30 – 15:30	<ul style="list-style-type: none"> <li>• <b>Forests and Cyclones</b></li> <li>• <b>Lessons from Typhoon Haiyan, Philippines</b></li> <li>• <b>Country presentations on impacts of</b></li> </ul>	<p>Mr. Alan Reid, Senior Policy Advisor (retd), Ministry of Primary Industries, New Zealand</p> <p>Mr. Patrick Durst, Senior Forestry Officer, Food and Agriculture Organization of the United Nations</p> <p>National Participants</p>

	<b>cyclone</b> - <b>Fiji</b> ( <i>Noa Vakacegu</i> ) - <b>Vanuatu</b> ( <i>Hanington Tamla Tate</i> ) <ul style="list-style-type: none"> <li>• <b>Discussion on roles of trees and forest for cyclone mitigation</b></li> </ul>	Facilitator
15.30 – 16:00	<b>AFTERNOON TEA</b>	
	<b>Session 3 –</b>	
16:00 – 17:00	<ul style="list-style-type: none"> <li>• <b>Draft Roadmap for an Asia-Pacific Regional Strategy on Forests and Natural Disasters</b></li> </ul>	Mr. Chris Brown, Consultant and Mr. Patrick Durst, Senior Forestry Officer, Food and Agriculture Organization of the United Nations
	<b>END OF DAY 1</b>	

<b>Day 2: Thursday, 30<sup>th</sup> July 2015</b>		
	<b>Recap of DAY 1</b>	Ms. Christine Fung, SPC\GIZ CCCPIR,
	<b>Session 4</b>	Ms. Christine Fung, SPC\GIZ CCCPIR, Moderator\Facilitator
08:30 – 10:00	<ul style="list-style-type: none"> <li>• <b>Climatic Patterns in the Pacific</b></li> <li>• <b>Climate Change Impacts on Forests of the Pacific</b></li> <li>• <b>Discussions</b></li> </ul>	Dean Solofa, Climate Change Officer, Land Resources Division, SPC  Dr. Lex Thomson, Associate Professor, Sunshine Coast University, Queensland, Australia  Facilitator
10.00 – 10:30	<b>MORNING TEA</b>	

	<b>Session 5 -</b>	
10.30 – 12:30	<p><b>Group Work</b></p> <ul style="list-style-type: none"> <li>• <b>Exercise 1: Mapping hazard risk areas</b></li> <li>• <b>Group Presentations – Exercise 1</b></li> </ul>	<p>Aru Mathias of FAO, Dean Solofa of SPC, Rajendra Prasad of UNESCO and Ifereimi Dau of IUCN</p> <p>Participants</p>
12:30 – 13:30	<b>LUNCH</b>	
	<b>Session 6 -</b>	
13:30 – 15:30	<ul style="list-style-type: none"> <li>• <b>Exercise 2: Designing tree and forest protection systems</b></li> <li>• <b>Group Presentations – Exercise 2</b></li> </ul>	<p>Mr. Chris Brown, Consultant to FAO, Dr. Lex Thomson, Sunshine Coast University and Mr. Alan Reid, Senior Policy Advisor (retd), Ministry of Primary Industries, New Zealand</p> <p>Participants</p>
15:30 – 16:00	<b>AFTERNOON TEA</b>	
	<b>Session 7–</b>	
16.00 – 17.00	<p><b>Exercise 3: Preparation of readiness and response plans</b></p>	<p>Mr. Chris Brown, Consultant and Mr. Patrick Durst, Senior Forestry Officer, Food and Agriculture Organization of the United Nations</p>



17:00 – 17:30	<ul style="list-style-type: none"> <li>• <b>Closing Ceremony</b></li> </ul> <p><b>Closing remarks</b></p>	<p>Mr. Sairusi Bulai, Acting Deputy Director, Land Resources Division, Secretariat of the Pacific Community</p> <p>Mr. Patrick Durst, Senior Forestry Officer, Food and Agriculture Organization of the United Nations</p>
	<b>END of the WORKSHOP</b>	

## ANNEX 2. Participants List

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### **ANNEX 3. BRIEF BIODATA OF THE RESOURCE PERSONS \ SPEAKERS**

- 1. Dr. Tomoki Sakamoto**, Forestry and Forest Products Research Institute, Japan

Dr. Sakamoto works as the Regional Research Coordinator of Tohoku Research Center, Forestry and Forest Products Research Institute (FFPRI) of Japan. He is in charge of

promoting projects of FFPRI concerning tsunami and coastal forest. He is a member of various committees (country and prefectures) concerning reconstruction of coastal forests destroyed because of tsunami.

2. **Mr. Alan Reid**, New Zealand

Alan has 45 year work span, including work in New Zealand public service - South Island West Coast, Gisborne region, Manawatu and Wellington, and United States - Oregon and North Carolina.

On international trade and forestry & environment policy, he represented New Zealand in negotiations and discussions under United Nations Convention on Biological Diversity, Food and Agriculture Organisation (FAO) and United Nations Forum on Forests and Montreal Process (voluntary 12-country organisation on sustainable forestry).

On domestic public policy, parliamentary processes and legislation covering environment and natural resources management, he worked with Select and Cabinet Committee procedure and Treaty of Waitangi and Maori land and natural resource issues.

He worked on Urban forestry/arboriculture in USA with local communities on funding and managing community projects, forest management, forest resource planning in natural forests and steep country reforestation.

He is a graduate of M Sc in Forestry (including minor in landscape architecture) North Carolina State University December 1991, Certified Arborist - International Society of Arboriculture, November 1992. Certificate in Applied Statistics - Wellington Polytech, Wellington, New Zealand, 1973. B Sc Forestry - Australian National University, Canberra, Australia, 1970. B Sc. Botany - Victoria University, Wellington, New Zealand, 1968.

3. **Dr. Lex Thomson**, Associate Professor, University of Sunshine Coast, Queensland, Australia.

*Lex Thomson* works as a natural resource consultant and is Associate Adjunct Professor (Agroforestry) at the University of Sunshine Coast. Dr Thomson worked for five years as an agricultural-forestry trade specialist in the Land Resources Division of the Secretariat of the Pacific Community (SPC) in capacity as the Team Leader for the EU-funded Facilitating Agricultural Commodity Trade Project. Prior to that he led Bioversity International's global forestry research program and the AusAID-SPRIG project (South Pacific Forest Genetic Resources Initiative). Over the past two decades, Dr Thomson has also worked extensively on forestry, agroforestry, farm forestry and agricultural production systems including development of export markets and impacts of climate change on Pacific Islands agricultural and forestry produce. His professional career has focused on research and development, utilization, management and conservation of forest genetic resources including in more than 35 tropical developing countries in E and W Africa, S, E and SE Asia, the Indian and Pacific Oceans. Dr Thomson's clients include FAO, UNDP, AusAID, ACIAR, Asian Development Bank, Islamic Development Bank and private sector (Shell Renewables, Alcoa and Pacific Australia Reforestation Company).

4. **Mr. Ifereimi Dau**, Energy Programme Officer, IUCN, Fiji

- Currently Energy Programme Officer in the Energy Programme at IUCN Oceania Regional Office (IUCN ORO). Also focal point for land use, land and deep sea mining and climate change issues for IUCN ORO
- Previously worked as an Engineering and Environmental Geologist for the Fiji Government and rising through the ranks to become Director of Mineral Development and Director of Mines. In that post was the alternate National Contact Point for The International Co- Ordination Group for the Tsunami Warning System in the Pacific.
- In October 2008 was transferred by Government to become Director of Biofuel Development in the Department of Energy and Rural Electrification to resolve the cassava ethanol proposal then before Government. In December 2009 became Director of Energy and Biofuel Development. Also sat on the Fiji Electricity Authority Board in place of the Permanent Secretary. Left Government at the end of 2010 as part of the right sizing exercise for the Department of Energy and worked as a private consultant for mining and energy companies in 2011 before joining IUCN in January 2012

5. **Mr. Rajendra Prasad**, UNESCO/IOC Programme Officer

Mr Rajendra Prasad is a Programme Officer for DRR and Early Warning for Tsunami & Other Coastal Hazards with UNESCO-IOC and is based within the Geoscience Division of SPC. He is a former Fiji Government employee having worked for 30+ years 20 of which he served as the Director of Fiji Meteorological Service and Regional Specialized Centre in Nadi.

6. **Mr. Patrick Durst**, Senior Forestry Officer, FAO

Patrick Durst is senior forestry officer with the FAO Regional Office for Asia and the Pacific, where he has worked for the past 20 years. He coordinates and supports FAO's forestry and natural resources programs and activities in the region, and serves as Secretary of the Asia-Pacific Forestry Commission. Prior to joining FAO, he worked with USDA Forest Service and USAID forestry programs, and he served as a U.S. Peace Corps Volunteer, working on agroforestry initiatives in the Philippines. He has degrees in forest management and forest economics from the University of Wisconsin – Stevens Point and North Carolina State University, respectively.

7. **Mr. Chris Brown**, FAO Consultant

Chris trained as an economist in New Zealand and spent five years working for the New Zealand Ministry of Forestry, before being seconded to FAO in 1995. He worked in the Rome Headquarters for four years, before moving back to New Zealand. He's worked as a consultant, mainly to the FAO Regional Office in Bangkok, since 2000. He specializes in forest policy and forecasting - and raising sheep!



8. **Mr. Aru Mathias**, FAO Forest Management Officer, Apia, Samoa

Aru is currently working as FAO Forestry Officer for the Pacific region based in Apia, Samoa. Before that, he worked as Forestry Officer with Vanuatu Government

He is a graduate with BSc. Forestry from PNG University of Technology and MSc. Degree in Environment and Natural Resource Management from Australian National University.

He has worked as professional forester for over 20+ years. He has wide experience in forestry development work and his expertise covers forest inventory and mapping, forest harvesting and utilization, forest conservation and protection, sustainable land management and environment management. His interest is in forest policy related work, especially in making tree and forest resources work and contribute to small island countries.

#### **Annex IV. PICTORIALS**



Group photo of the participants to the Workshop



Mr. Sairusi Bulai, Deputy Director of LRD-SPC delivering his Welcome Address



Mr. Patrick Durst, FAO Senior Forestry Officer delivering his Opening Remarks



Mr Aru Mathias of FAO facilitating the Workshop Session 1



Dr. Tomoki Sakamoto of FFPRI presenting his paper on tsunami in Japan



Mr Tito Alatimu of Samoa on his country presentation.



Mr. Gordon Konairamo of Solomon Islands delivering his country presentation.



Mr. Heimuli Likiafu of Tonga on his country presentation



Mr. Iferemi Dau of IUCN presenting his paper on the science of Tsunami



Mr. Rajendra Prasad of UNESCO presenting his paper on the Pacific Tsunami Warning System



Mr. Cenon Padolina of SPC as moderator/facilitator for Session 2 of the Workshop



Mr. Alan Reid of New Zealand presenting his paper on Forests and Cyclones



Mr. Patrick Durst presenting his paper on Lessons from Typhoon Haiyan in the Philippines



Mr. Noa Vakacegu presenting his paper on the impacts of cyclone in Fiji



Mr. Hanington Tate presenting his paper on the impacts of cyclone in Vanuatu



Ms. Christine Fung of GIZ facilitating Session 4



Mr Dean Solofa of SPC presenting his paper on Climatic Patterns in the Pacific



Dr. Lex Thomson of the University of Sunshine Coast presenting his paper on Climate Change Impacts on Forests in the Pacific



Group works



Group works



Group works