WORLD METEOROLOGICAL ORGANIZATION

COMMISSION FOR BASIC SYSTEMS

MEETING OF THE REGIONAL SUBPROJECT MANAGEMENT TEAM (RSMT) FOR THE SEVERE WEATHER FORECASTING AND DISASTER RISK REDUCTION DEMONSTRATION PROJECT (SWFDDP) FOR THE SOUTH PACIFIC ISLANDS

WELLINGTON, NEW ZEALAND, 1-4 NOVEMBER 2010

FINAL REPORT

(Back row) Toshiyuki Kurino, Linda Anderson-Berry, 'Ofa Fa'anunu, James Lunny, Rick Jones, Ian Shepherd, Filomena Nelson, Penehuro Lefale, Beth Ebert, Arona Ngari, Sionetasi Pulehetoa, Alipate Waqaicelua, Eric Lau, Tareti Kireua, Manoah Tepa, Tauala Katea, Ausetalia Titimaea, and Benoit Broucke.

(Front row) Ian Lisk, Haleh Kootval, Alice Soares, Peter Chen, Steve Ready, Neil Gordon, Peter Fisher, Ray Tanabe, and Fred Jockley.

EXECUTIVE SUMMARY

The meeting of the Regional Subproject Management Team (RSMT) for the Severe Weather Forecasting and Disaster risk reduction Demonstration Project (SWFDDP) for the South Pacific Islands was held in Wellington, New Zealand from 1 to 4 November 2010. Participants included representatives of:

- Global products centres (JMA (Japan), Météo-France (New Caledonia), Met Office (UK), and NOAA/NWS (USA));
- Regional centres (RSMC Darwin, RSMC-TC Nadi, and RSMC Wellington); and,
- National meteorological centres of Cook Islands, Fiji, Kiribati, Niue, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu;

and the WMO Secretariat (DPFS and PWS programmes).

The meeting reviewed the progress in the implementation of the SWFDDP for the South Pacific Islands. It assessed the SWFDDP's achievements in its pilot phase relative to the project's goals and concluded that it has been progressing well in the participating countries.

The meeting discussed the synergy of the SWFDDP with the RA V Tropical Cyclone Committee activities in RA V, and acknowledged there were benefits in forging stronger links between the two groups. The meeting felt there was no additional benefit to be gained from a separate RA V TCC Task Team to deal with implementation of the SWFDDP, and that forging close links between the two groups through the two chairpersons would suffice. In addition, the meeting felt that there could be merit in an RA-V body, such as the RA-V TCC, developing a medium term strategy for operational forecast and warning services in the South Pacific (including tropical cyclones), taking into account the experiences of the SWFDDP, and aligning this strategy with CBS's review of the GDPFS.

The meeting discussed issues related to sustainability of the SWFDDP, such as adequate funding to enable essential work to be carried out under SWFDDP, including ongoing upgrades to the project website, *MetConnect Pacific*, and essential training to prepare participants with the vast array of new products available. The meeting acknowledged the uncertainty in how the role of RSMCs, especially those with Geographical Specialization might evolve in the next few years as a result of burgeoning SWFDPs. The meeting recommended that SWFDDP continue as a Demonstration Project until such time as WMO RA V had developed a strategy to progress the project into routine operations. Noting that the SWFDDP is run under the direction of WMO CBS but in time, it probably needs to fall under the auspices of RA V, the meeting requested the RA V management group to consider assisting in resource mobilisation for the SWFDDP. Additionally, the meeting strongly felt that adequate and secure funding from the WMO budget should be provided to support the SWFDDP, including for training activities, given its proven results to date and the expected future benefits to the region.

The meeting discussed the implementation of new and powerful products generated by satellite data-processing systems for very short-range forecasting, as well as the potential linkage and future trialling of GIFS-TIGGE products within the SWFDDP framework.

The meeting review the respective roles and capacities in the cascading forecasting process involving participating centres, with respect to severe weather forecasting, production and dissemination of warnings. The meetings discussed the main operating aspects of the project, including:

- *MetConnect Pacific* Web site;
- Criteria for alerting to severe weather in the *RSMC Daily Severe Weather Forecasting Guidance Products* or *South Pacific Guidance* (SPG) charts;

- Severe weather events reporting and 4-monthly project reporting templates;
- Verification of forecasts and warnings; and
- Liaison with media and disaster management and civil protection authorities.

In this context, the meeting reviewed and updated the Regional Subproject Implementation Plan, considered the *SWFDP Guidebook for Planning Regional Subprojects* (Rev. 2010), and discussed all components of the Implementation Plan, including the following aspects:

- Membership, chairperson of the RSMT, and the members' responsibilities*;*
- Lead RSMC responsible for SWFDDP's "cascading process", being RSMC Wellington;
- Criteria for alerting severe weather in the SPG charts, which would be *Heavy Rain (≥ 100mm in 24 hours), Strong Winds (≥ 30knots), Large Waves (≥ 2.5m north of 15ºS and ≥ 3.5m at and south of 15ºS)*, to be implemented on 1 December 2010;
- Developments of the *MetConnect Pacific* website;
- Responsibilities and products provided by global, regional and national centres;
- Liaison with media and disaster management and civil protection at national level;
- Operational contacts for SWFDDP forecasting centres (e-mail, telephone, etc.);
- Verification aspects, monitoring and evaluation, and reporting (severe weather events, and progress reporting of project);
- Training aspects and plans;
- Timetable of implementation (milestones and responsible member);
- Costing and funding sources.

The Regional Subproject Implementation Plan for the full demonstration of the SWFDDP is available at:
http://www.wmo.int/pages/prog/www/CBS-Reports/documents/ImpPlan_SWFDDP_Nov2010.pdf.

Finally, the meeting discussed how an SWFDDP – western window would fit into the overall SWFDP which could have four interconnecting subproject domains covering the Asia-Pacific region. The meeting recognized that inclusion of the Philippines in a new subproject would significantly increase the size and scope of a new subproject, as it would include both northern and southern hemisphere severe weather seasons. This could also impose additional development load on global centres providing data for the new domain. The meeting expressed its support in principle for the proposed western window subproject and recognized that benefits for participating countries could be expected from a "western window" subproject in the same way as they do in existing SWFDP subprojects. Nevertheless, the meeting discussed its limited mandate in the establishment of a new subproject as all potential participants were not present. It agreed that the initiative for an extended subproject should come from interested meteorological services through RA V and evaluated by the Steering Group for the SWFDP. The meeting also agreed that a separate Regional Subproject Management Team should be established for a "western window" as its focus areas could be different to the south Pacific region. However, it is likely that there would be some overlap in membership.

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING

1.1 The meeting of the Regional Subproject Management Team (RSMT) for the Severe Weather Forecasting and Disaster risk reduction Demonstration Project (SWFDDP) for the South Pacific Islands was opened by its Chairperson, Mr Steve Ready (New Zealand), at 09.00 hours on Monday, 1 November 2010, at the James Cook Hotel Grand Chancellor, in Wellington, New Zealand. Mr Ready welcomed participants to the meeting, and introduced Dr Neil Gordon, the Permanent Representative of New Zealand with WMO, to address the meeting.

1.2 Dr Gordon welcomed all participants to the second meeting of the Regional Subproject Management Team for the SWFDDP and noted that there had been an extraordinary amount accomplished since the first meeting in April 2009. He recalled that the pilot phase of the SWFDDP had been up and running for the last year, which took in-country training, production and delivery of many products including those from RSMC Wellington, and ongoing development and use of the *MetConnect Pacific* Portal. Dr Gordon thanked all the people and organizations involved in these developments, and noted that there was much more to do in moving into the full demonstration phase of the project, by expanding it to address nine countries and introducing new elements to the SWFDDP. In this context, Dr Gordon highlighted that the meeting would discuss issues related to: (1) governance; (2) geographic coverage; (3) service delivery; (4) innovation; and (5) technical aspects of the project. He concluded by welcoming again participants to Wellington and by wishing them a very productive meeting.

1.3 Mr Peter Chen, on behalf of the Secretary-General of the WMO, Mr Michel Jarraud, welcomed participants to the meeting and expressed appreciation to Dr Neil Gordon, Permanent Representative of New Zealand with WMO, for hosting this meeting in Wellington and for providing these excellent facilities. Mr Chen also thanked the staff of the Meteorological Service of New Zealand Ltd (MetService) for their work in organizing the local arrangements, and Mr Steve Ready, the Chairperson of the Subproject Management Team for the SWFDDP, for guiding the work of this meeting.

1.4 Mr Chen explained that the Severe Weather Forecasting Demonstration Project (SWFDP) initiative is intended, to (1) further explore and enhance the application of outputs of existing NWP systems, available through WMO's Global Data-Processing and Forecasting System (GDPFS), in the improvement of severe weather forecasting in countries where sophisticated NWP outputs are not currently used, or poorly used, and (2) improve warning services through the Public Weather Services Programme (PWSP). He noted that the SWFDP had been implemented successfully in southern Africa and a second project (this project) was in progress for the South Pacific Islands. Following the request by the WMO Executive Council to further expand the SWFDP to other WMO Regions, plans had initiated to consider SWFDP regional subprojects for Southeast Asia and for Eastern Africa. Mr Chen noted that the WMO Executive Council agreed that the SWFDDP for the South Pacific Islands should initiate a full demonstration beginning November 2010, which could include all South Pacific Islands of the project's geographical region. He recalled that the initial evaluation of the pilot phase of the SWFDDP had shown that the project had commenced to demonstrate how developing countries, including Small Island Developing States (SIDS), could increase their capacity in operational severe weather forecasting, and enhance their national weather warning services. In concluding, Mr Chen encouraged the meeting to agree to expand the SWFDDP to include all South Pacific Islands of the project's domain and to address technical aspects that are critical to improving the application of science and technology that supports forecasting and severe weather warning services, including the use of satellite-based products and the application of innovative GIFS products for operational weather forecasting.

2. ORGANIZATION OF THE WORKSHOP

2.1 Adoption of the agenda

2.1.1 The meeting adopted the provisional agenda, as provided in Annex I.

2.2 Working arrangements

2.2.1 All documents submitted for the meeting are referenced and hyperlinked in the Documentation Plan (INF. 1), which had been posted on the WMO web site at:

http://www.wmo.int/pages/prog/www/DPFS/Meetings/RAV-SWFDDP-RSMT_Wellington2010/DocPlan.html

2.2.2 The participants agreed its hours of work and other practical arrangements for the meeting, including the tentative work programme. Noting that a number of participants were new to the RSMT for the SWFDDP, they briefly introduced themselves, to facilitate interactions throughout the meeting. The list of participants in the meeting is provided in Annex II.

3. INTRODUCTION TO THE SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP)

3.1 Overall Framework

3.1.1 The Secretariat provided an overview of the CBS Severe Weather Forecasting Demonstration Project (SWFDP), including its background, related reports, status information, and relevant decisions of the WMO Fifteenth Congress (May 2007) and the sixty-second session of the Executive Council related to the SWFDP (June 2010), noting broad support expressed for the continuation of the development of the SWFDP.

3.1.2 The meeting noted that SWFDP aims to contribute to capacity-building and to help developing countries in particular to have available and implement the best possible use of existing NWP products for improving and increasing lead times of warnings of hazardous weather conditions and weather-related hazards. Global-scale products, as well as data and information provided by other regional centres, are integrated and synthesized by a designated Regional Specialized Meteorological Centre (RSMC), which, in turn, provides daily guidance for short-range (days 1 and 2) and medium-range (out to day-5) on specified hazardous meteorological phenomena (e.g. heavy rain, strong winds, etc) to participating NMHSs of the region, who will then add value and pass the appropriate warnings to the respective DMCPAs. This is a “Cascading” concept of the forecasting process, which is further discussed under item 7.

3.1.3 The meeting recalled that in addition to this project, the SWFDP had been implemented successfully in southern Africa. Plans had been initiated to consider SWFDP regional subprojects for Southeast Asia and for Eastern Africa. The meeting reviewed the progress and benefits of the SWFDDP for the South Pacific Islands under agenda item 3.2, and discussed experiences and lessons learnt from the pilot phase of the project. The meeting agreed that verification activities should be an integral part of the project, which among other aspects, would contribute to increasing visibility, credibility, authority and value of meteorological services in public and economic sectors, and forecasters’ confidence in their warnings

3.1.4 With the high likelihood of the globe experiencing a changing occurrence of extreme weather, the meeting agreed that the goals of the SWFDP, and the results being achieved, contribute to climate change adaptation through ever more skilful and useful prediction services, with increasing resolution of all scales of modelling including for climate, increasing forecast lead-times in the medium-range, and beyond, and increasing accuracy to widen the scope of

applications. In this context, the meeting also agreed that any proposal for developing the SWFDP, could be associated with its contribution to climate change adaptation.

3.2 Summary of experience and progress of the Severe Weather Forecasting and Disaster risk reduction Demonstration Project (SWFDDP) for the South Pacific Islands (RA V)

3.2.1 The meeting was informed of the experiences and progress of the SWFDDP for the South Pacific Islands, which in its pilot phase involved the national meteorological services of Fiji, Samoa, Solomon Islands and Vanuatu, and RSMC Nadi-TCC (Fiji), RSMC Darwin (Australia) and RSMC Wellington (New Zealand), as well as the global products centres of Met Office (UK) and ECMWF.

3.2.2 The meeting noted that the pilot phase of the SWFDDP had provided an opportunity to trial everything associated with the project from the exchange of data on the project website – *MetConnect Pacific* (http://swfddp.metservice.com/) – to the roles played out by the various centres, the evaluation and reporting carried out by RSMCs and NMHSs every four months, which are available at: http://www.wmo.int/pages/prog/www/CBS-Reports/DPFS-index.html. The meeting was pleased to note that the SWFDDP had got off to a very good start and all participating countries seemed to be making use of the various Numerical Weather Prediction (NWP)/Ensemble Prediction System (EPS) products and the processed information available on the South Pacific Guidance (SPG) charts produced by RSMC Wellington. The meeting noted that the SWFDDP was geared towards severe weather forecasting associated with tropical cyclones and non-tropical cyclone weather systems; and NMHSs needed to consider how they might use the information on *MetConnect Pacific* to produce severe weather forecasts and warnings containing specific wind speeds, wave heights and rainfall amounts that can be verified.

3.2.3 The meeting recalled that the first RSMT meeting (Wellington, April 2009) finalized the Implementation Plan for the pilot phase of the SWFDDP, which outlined the roles and responsibilities of participants and how the various components of the Plan would fit together. The meeting noted that during the pre-pilot phase (from March to October 2009), the project website – *MetConnect Pacific* – was built from scratch, with a layout designed to reflect the flow of information in the *Cascading Forecasting Process*. A special tool for RSMC Wellington forecasters to generate and display the *South Pacific Guidance* (SPG) charts was developed. During this period, global products centres (UKMO and ECMWF) provided NWP/EPS products in a form that was readily useable and displayable on the project website. The meeting also noted that in-country training initiatives were carried out for the NMHSs in the Fiji, Samoa, Solomon Islands and Vanuatu, to enable them to utilize the products on *MetConnect Pacific* for generating their own forecasts and warnings.

3.2.4 The meeting noted that the pilot phase of the project was carried out from 1 November 2009 to 31 October 2010. During this period, RSMC Wellington produced (and displayed on the project website) daily SPG charts around 03:00 and 15:00 UTC containing an interpretation of the global and regional guidance out to 5 days. Information on *Heavy Rain (> 50mm in 24 hours), Strong Winds (≥25knots), Large Waves (≥ 2.5m) and Tropical Cyclones (one exists or is expected to form)* was included whenever the criteria (in brackets) were expected to be met. If none of the criteria applied on any one day, a chart would display *'NilSig'*. For all phenomena except tropical cyclones, a forecaster's expression of confidence was given by one of these terms: Low (1 chance in 5), moderate (2 chances in 5) and high (3 chances in 5). Noting the huge amount of information to wade through by the RSMC Wellington forecasters in producing a set of SPG charts, the meeting agreed to discuss a way to assimilate the increasing amounts of data being implemented during the full demonstration phase of the project under agenda item 11, when developing the Implementation Plan. The meeting also agreed to further review the outcomes of and evaluate the pilot phase of the SWFDDP under agenda item 4.

3.3 Synergy with the Tropical Cyclone Committee activities in RA V

3.3.1 The meeting acknowledged there were benefits in forging stronger links between SWFDDP and the RA V Tropical Cyclone Committee with both groups aspiring to similar goals and a large number of members involved in both. It considered there was merit in the chairpersons of both groups attending each other's sessions to ensure close collaboration between both groups. As the existence and membership of SWFDDP RSMT is specially defined by WMO CBS, the meeting felt there was no additional benefit to be gained from a separate RA V TCC Task Team to deal with implementation of the SWFDDP, and that forging close links between the two groups through the two chairpersons would suffice. Nonetheless, the meeting did feel that there could be merit in an RA-V body, such as the RA-V TCC, developing a medium term strategy for operational forecast and warning services in the South Pacific (including tropical cyclones), taking into account the experiences of the SWFDDP, and aligning this strategy with CBS's review of the GDPFS.

3.4 Sustainability of SWFDDP

3.4.1 Experience in the past 18 months to the end of the pilot phase has raised issues with obtaining adequate funding to enable essential work to be carried out under SWFDDP, including ongoing upgrades to the project website, *MetConnect Pacific*, and essential training to prepare participants with the vast array of new products available.

3.4.2 The meeting acknowledged the uncertainty in how the role of RSMCs, especially those with Geographical Specialization might evolve in the next few years as a result of burgeoning Severe Weather Forecasting Demonstration Projects. The meeting recommended that SWFDDP continue as a Demonstration Project until such time as WMO RA V had developed a strategy to progress the project into routine operations. At the moment, SWFDDP is run under the direction of WMO CBS but in time, it probably needs to fall under the auspices of RA V. With that in mind, the meeting requested the RA V management group to consider assisting in resource mobilisation for the SWFDDP.

3.4.3 Much of the ongoing costs are absorbed by participating countries and met by WMO from rather limited regular budgets. To keep the Project fresh and vibrant, support needs to be found to ensure a continuous cycle of improvement is maintained. Training for NMHSs, with a strong preference for this to be done in-country and upgrades to the project website, *MetConnect Pacific*, need to be adequately funded to ensure the viability of SWFDDP. The meeting strongly felt that adequate and secure funding from the WMO budget should be provided to support the SWFDDP, given its proven results to date and the expected future benefits to the region. It also thanked major contributing Members for their support, including New Zealand, Australia, UK, USA and Japan; and the ECMWF, and urged that this support be continued.

4. EVALUATION OF THE PILOT PHASE OF THE SWFDDP FOR THE SOUTH PACIFIC ISLANDS (RA V)

4.1 The meeting reviewed the outcome of the pilot phase of the SWFDDP for the South Pacific Islands and considered the 3rd progress report with a view to provide input to the development of the Implementation Plan for the full demonstration of the SWFDDP, to be discussed under agenda item 11.

4.2 The meeting noted that during the pilot phase of the project, three progress reports were produced based on input provided by the RSMCs and NMHSs, covering the periods: 1 November 2009 to 28 February 2010; 1 March to 30 June 2010; and 1 July to 30 September 2010. The meeting noted that feedback from the participating NMHSs was generally very positive about the guidance and model products. Mr Steve Ready presented the results of the subproject evaluation based on the 3rd progress report. The achievements relative to the project's goals were summarized (and assessed):

- Improve ability of NMCs to forecast severe weather events (Significantly improved – SWFDDP increased the skill and confidence of forecasters);

- Improve lead-time of alerting (Significantly improved – SWFDDP products had helped to trigger an earlier response and facilitated longer lead times);

- Improve interaction of NMHSs and DMCPAs (Significantly improved in most countries – SWFDDP products have re-ignited links with their national DMCPA);

- Identify gaps and areas for improvement (Progressing – severe weather events and in-country training had helped to identify areas for improvement, and the need to revise thresholds related to the SPG charts);

- Improve the skill of products from Global Centres and RSMCs through feedback from NMHSs (Area for improvement – proposed changes to the criteria for alerting to severe weather in the SPG charts is addressed under the agenda item 11).

4.3 The meeting noted that the following actions were pending from what was agreed in the Implementation Plan for the pilot phase:

- *MetConnect Pacific* upgrade to address a number of issues that had arisen during the pilot phase of the project;
- Revision of criteria for production of SPG charts;
- Extension of TC outlook to 5 days; and,
- Additional information on SPG charts during TC Outlook phase.

4.4 Main issues, future plans and challenges identified from the SWFDDP include:

- Access to additional sources of NWP/EPS products (i.e. from NOAA/NWS and JMA) – addressed under agenda items 5 and 7.1;
- Prospects for a new subproject, known as a 'Western Window' – addressed under agenda item 12;
- Sustainability of the SWFDDP – discussed under agenda item 3.4;
- Verification of severe weather forecasts and warnings – discussed under agenda item 8; and,
- SWFDDP to be used as a testing ground for new GIFS-TIGGE products – discussed under agenda item 6.

5. SATELLITE DATA-PROCESSING SYSTEMS AND PRODUCTS FOR VERY SHORT-RANGE FORECASTING, INCLUDING NOWCASTING, IN RA V

5.1 The meeting was informed that JMA had operated geostationary meteorological satellites for more than 30 years providing cloud images over East Asia and West Pacific regions, including the RA V. JMA switched the operational use of the Multi-functional Transport Satellite-1R (MTSAT-1R) imaging function over to MTSAT-2 on 1 July 2010. MTSAT-2 operated in geostationary orbit at 145 degrees east, and MTSAT-1R had been on standby in geostationary orbit at 140°E since the switchover of the imaging function.

5.2 In order to improve the accessibility to the imagery, the Meteorological Satellite Centre (MSC) of JMA provides MTSAT real-time images clipped for various areas in RA-V on its website (http://mscweb.kishou.go.jp/sat_dat/img/reg/sat_img.htm). These include:

- Australia;

- New Zealand;
- Pacific Islands 1 (130°E, 25°N - 165°E, 5°S);
- Pacific Islands 2 (155°E, 20°N - 175°W, 5°S);
- Pacific Islands 3 (140°E, 0 --160°W, 25°S);
- Pacific Islands 4 (172°E, 9°S - 167°W, 26°S);
- Pacific Islands 5 (156°E, 9°S - 178°E, 26°S); and
- Pacific Islands 6 (149°E, 1°S - 178°E, 26°S).

The web page contains the latest 24 hourly images, which can be animated. Viewers can select MTSAT observing channel imagery including: visible reflectance (0.73 µm), infrared brightness temperature in the atmospheric window band (11µm) and water vapour absorption band (6.7 µm). The meeting noted that JMA/MSC was also willing to make available additional image sectors depending on user requirements, and therefore requested JMA/MSC to consider making available specific MTSAT real-time images for the SWFDDP geographical footprint. Any difficulties in downloading these image files should be addressed within the SWFDDP.

5.3 The meeting noted that JMA/MSC was planning to provide a new satellite product that was intended to support severe weather monitoring in the South-west Pacific region. The new product, named "Deep Convective Cloud Information", would be provided to give the information of deep convective clouds overlaid on an infrared window image behind. The image data would be provided in some standard image data format such as PNG, JPEG or GIF. The coverage would be from the Equator to latitude 30ºS and from longitude 150ºE to 160ºW. The spatial resolution of the image pixel is 0.05 degrees in both latitude and longitude. Noting that according to the users' requirement, the coverage can be adjusted or be divided into several small areas covering the South-west Pacific Islands, the meeting recommended that this product be provided for the SWFDDP geographical footprint, even though that deep convective clouds analyzed by this algorithm do not always agree with the area of heavy rainfall; shallow convective clouds may be undetected; clouds smaller than the spatial resolution of satellite observations (4km at sub-satellite point) may be undetected; and dense cirrus may be misclassified as deep convective clouds.

5.4 The meeting noted that JMA had been providing the Virtual Resource Library (VRL) on MSC's website (http://mscweb.kishou.go.jp/VRL/index.htm), which includes: (1) the outline of meteorological observation by satellite; (2) the introduction to remote sensing; (3) the objective cloud analysis; and (4) microwave remote sensing. JMA's VRL website also provides a software package named SATAID (Satellite Animation and Interactive Diagnosis) for use of satellite imagery with geophysical data, such as radar imagery or gridded NWP data, in order to produce integrated imagery for the advanced analysis and interpretation (http://www.jma.go.jp/jma/jma-eng/satellite/ds.html). Other satellite meteorology training activities had been carried out by JMA in collaboration with partners, and some of the training materials are available at the VRL website and could be used in support of the SWFDDP training activities.

5.5 The meeting noted that JMA, in coordination with KMA, had been promoting the RA-II Pilot Project to develop support for NMHSs in satellite data, products and training in RA-II. The project was established as a kind of self-help effort for NMHSs in RA II to improve the flow of satellite-related information. The major focus of the initiative is to facilitate the timely provision of satellite-related information by satellite operators themselves to users, i.e., NMHSs in RA II, especially in developing countries including LDCs. In support to this initiative, JMA had recently developed an ADDE server for training, on which MTSAT image data would be available for users accessing from McIDAS-V or McIDAS-Lite (for details, see http://www.wmo.int/pages/prog/sat/documents/RAII_PP_Newsletter_Vol-1-N5.pdf). The meeting was encouraged to make use of these tools for the SWFDDP.

5.6 The meeting was informed that JAXA (Japan Space Agency) operated GSMaP (Global Satellite Mapping for Precipitation) Near-Real Time (NRT) System based on the combined

MicroWave (MW) – Infrared (IR) algorithm to provide hourly global rainfall maps. GSMaP_NRT is distributed via Internet. The combined MW-IR algorithm with TRMM TMI, Aqua AMSR-E, and GEO IR data are documented on the GSMaP Project Website at http://sharaku.eorc.jaxa.jp/GSMaP/.

5.7 The meeting was also informed that NOAA/NESDIS had developed the "Ensemble Tropical Rainfall Potential" (eTRaP) product that could be relevant for the South-west Pacific region. The eTRaP is a simple ensemble whose members are 6-hourly totals from the single-orbit TRaPs. This ensemble approach allows for the generation of probabilistic estimates of rainfall in addition to deterministic rainfall totals similar to what is currently provided by the TRaP product. Each eTRaP is made up of forecasts using observations from potentially several microwave sensors-currently AMSU, TRMM, SSMI and AMSRE-initialized at several observation times, and possibly using several different track forecasts. The diversity among the ensemble members helps to reduce the large (unknown) errors associated with a single-sensor, single-track TRaP. The large number of perturbations leads to ensembles with many members, allowing probability forecasts to be issued with good precision and reliability. This product and detailed information about it are available at http://www.ssd.noaa.gov/PS/TROP/etrap.html. Participating countries in the SWFDDP were encouraged to make their rainfall data available for evaluation of these products over their region.

5.8 The meeting agreed to identify the SWFDDP needs for data, products and information of meteorological satellites as well as training courses when developing the Implementation Plan for the full phase of the project, under agenda item 11. The meeting was pleased to learn that in a discussion paper to be presented to the next Coordination Group on Meteorological Satellites, WMO requested a contact point with the relevant satellite operators with whom the SWFDDP could liaise for further information and possible requirements for additional imagery products and possible satellite broadcast of SWFDDP products.

6. LINKAGE AND FUTURE TRIALING OF GIFS-TIGGE PRODUCTS

6.1 The meeting was informed that WMO strongly encourages collaboration between Regional, CBS-, and CAS-related entities, with the GIFS-TIGGE Working Group to plan and execute a GIFS Development Project that will benefit Members in the developing world by transferring the outcomes of THORPEX R&D into the operational community. Regional subproject plans would be developed to address specific needs of each region in a "bottom-up" manner. GIFS prototype products would be demonstrated and evaluated through existing forecast demonstration projects such as SWFDP. The GIFS Development Project was endorsed at a joint meeting of the Steering Group for the SWFDP and the GIFS-TIGGE Working Group (Geneva, February 2010). The initial development activities would focus on ensemble-based forecasts of tropical cyclones, then move on to high impact precipitation, and then to strong winds. Other prototype products (for example, for conditions favouring severe convection) may follow later. For each of these focus areas, initial GIFS prototype products are expected to be completed within approximately 3 years of starting work, depending on available resources. Current requirements for GIFS products to support forecasting of tropical cyclones, heavy rainfall, and strong winds are given below.

Tropical cyclones

- Probabilistic position and intensity forecasts
- Cyclone-following (Lagrangian) and gridded probabilities of exceeding user-defined thresholds of
    - wind speed
    - quantitative precipitation
    - storm surge
- Strike probabilities at user defined points
- Probability of time of arrival at user defined points of
    - max rainfall
    - wind exceeding critical thresholds

Heavy rainfall

- Grids of probability of precipitation exceeding user-defined thresholds
  - 24h accumulations
  - shorter-period accumulations
- Catchment accumulations
- EPS-grams for user-defined points (e.g., cities)

Strong winds

- Grids of probability of wind exceeding user-defined thresholds for
  - sustained wind speed
  - gusts
- EPS-grams for user-defined points (e.g., cities)

6.2 GIFS prototype products would be distributed using the regional cascade approach currently used by the SWFDP, in which NWP products are generated at global producing centres, received and value-added by RSMCs, who then make the final guidance products available to NMHSs in developing nations. Evaluation of GIFS prototype products to assess their benefit and value would be done using a range of approaches including:

- Objective verification of ensemble-based products by global producing centres and RSMCs;
- Objective verification of value-added products by RSMCs and end users;
- Qualitative (subjective) verification by RSMC forecasters and NMHSs; and,
- Assessment of usefulness by NMHSs and other downstream users such as emergency managers.

6.3 The meeting was briefed on the NW Pacific Tropical Cyclone Project (http://tparc.mri-jma.go.jp/cyclone) and development of some work at NOAA/ESRL (http://ruc.noaa.gov/tracks/). Some of the products being generated and evaluated could be of interest to SWPDDP – these included TC best track, strike probability histograms and TC genesis probability. The meeting agreed that developed products and tools from the GIFS-TIGGE Tropical Cyclone Ensemble Track Information should feed into the SWFDDP.

6.4 The meeting recognized that benefits to SWFDP and GIFS-TIGGE could be expected from linkages and trialing of GIFS products in SWFDPs. The meeting thanked global NWP centres for providing regular global ensemble predictions to support the SWFDP. Noting that ensemble forecasts are transferred in near real-time from the data providers to three data archive and distribution centres, and while recognizing that may be data policy issues associated, the meeting encouraged the global centres to provide real-time access for supporting severe weather forecasting.

7. CASCADING FORECASTING PROCESS: ROLES OF PARTICIPATING COUNTRIES

7.1 Global Products Centres

7.1.1 Representatives of Global Products Centres informed the meeting of the general features of their global and regional NWP production systems, including the kinds of NWP/EPS products that were and/or could be provided to the SWFDDP, with focus on severe weather monitoring and forecasting. In the absence of the representative of the ECMWF to the SWFDDP, the Secretariat presented the report by ECMWF.

ECMWF

7.1.2 The Secretariat informed the meeting that ECMWF has a cooperation agreement with WMO and actively supports its work. For the SWFDDP for South Pacific Islands, ECMWF had been providing a range of products from both the deterministic forecasts and the Ensemble Prediction System (EPS), focusing on early warning for severe weather. These were provided as graphical products, mainly as charts focused on the region of interest for the SWFDDP. The products are accessible via the ECMWF website (http://www.ecmwf.int/about/wmo_nmhs_access/index.html), on a password-protected page. For the full demonstration phase of the SWFDDP, ECMWF would also be able to continue providing a range of products from its high-resolution deterministic forecast and its ensemble prediction system (EPS). These products would be aimed at providing indication about the risk of severe weather, and include:

- probabilities of precipitation and winds exceeding given thresholds;
- probabilities of significant wave height exceeding given thresholds;
- extreme forecast index (EFI); identifies locations where the ensemble is substantially far from the model climate, indicating potential severe event;
- tropical cyclone tracks and strike probability maps;
- site-specific forecasts for surface weather parameters (EPSgrams) for specified locations (up to 10 stations for each participating country); and,
- a set of wave EPSgrams is provided for a range of locations agreed with the SWFDDP participants.

7.1.3 The meeting noted that all products would be updated twice a day with forecasts from 00 and 12 UTC; and an archive of the previous 7 days would also be provided to assist in evaluation. All products would be provided in graphical format on the ECMWF web site (password-protected). The ECMWF contact person for the SWFDDP is David Richardson (david.richardson@ecmwf.int). ECMWF would consider requests for additional products to support the SWFDP, but the resources required to undertake the work would need to be taken into account. In this context, and taking into account the need for products that could provide information on areas with TC genesis probability over the project's region, the meeting requested the ECMWF to consider providing this type of products for the SWFDDP, in particular to RSMC Nadi. These products would assist RSMC Nadi in producing the TC outlook guidance, which would include a description of areas with low, moderate or high TC genesis probability over the forecast area out to 48 hours and a more general outlook for days 3 to 5 inclusive.

7.1.4 The meeting noted that ECMWF encouraged and supported evaluation of the SWFDDP, and requested participants to provide feedback on the application and usefulness of ECMWF products during the project. Participants were encouraged to collaborate with ECMWF in verifying forecast products, such as QPF. The meeting noted that a number of participating NMHSs were not familiar with some of the ECMWF products, including the interpretation of EPSgrams, and therefore recommended training on these aspects.

7.1.5 The meeting noted that ECMWF had prepared a guide to the use of its EPS products for WMO Members. The guide also includes the additional products that were available to the participants in SWFDDP. In addition, ECMWF runs an annual training course on the *Use and Interpretation of ECMWF Forecast Products* for forecasters from WMO Members. The purpose of the course is to train forecasters in the use and understanding of ECMWF products, especially those that may not be familiar, such as the probabilities from the Ensemble Prediction System (EPS), the EPSgrams, Extreme Forecast Index, and tropical cyclone strike probabilities. In recent years a number of participants from the SWFDDP had benefited from participating in this course. The next course would be held at ECMWF in October 2011 (see http://www.ecmwf.int/newsevents/training/). Priority would be given to participating countries in SWFDPs to attend this course.

JMA (Japan)

7.1.6 The meeting recalled that JMA expressed its support for the SWFDDP; however, some developments were required by JMA before making special contributions to SWFDDP. In this context, the meeting was pleased to note that JMA had developed a dedicated website in support of the SWFDDP (freely open), which would be accessible through the *MetConnect Pacific* website in mid-November 2011. The meeting noted that JMA would make available for the SWFDDP, products from its Global Spectral Model (GSM; TL959L60) from 00UTC (up to 84 hour forecasts) and 12UTC (up to 5 days) runs. All products would be provided in image format, with both low and high resolutions.

7.1.7 The meeting noted that JMA also operated the global ensemble prediction system for one-week forecast (WEPS). WEPS run once a day at 12UTC and the forecast range was 9 days. At present, WEPS is only run in the Northern Hemisphere and Tropics (20S-90N). The meeting was pleased to note that it is scheduled that WEPS would add the initial perturbation in the Southern Hemisphere by March 2011, and as soon the quality of WEPS products are ensured, they would be available for the SWFDDP.

7.1.8 The meeting noted that JMA also had other international services for NMHSs of relevance for the SWFDDP that might be consider in the Implementation Plan for the full demonstration of the project, under agenda item 11. These include:

(1) The Satellite Animation and Interactive Diagnosis (SATAID) Tool, which is a set of CAL software for MS-Windows that enables the use of a range of meteorological data with a focus on satellite imagery, and is part of a WMO Information System (WIS) pilot project for RAs II and V (http://mscweb.kishou.go.jp/VRL/sataid/program.htm);

(2) The High-resolution GRIB data of GSM. The resolution of the high-resolution grid-point value (GPV) data is 0.25 degree grid interval in the surface level and 0.5 degree in pressure levels. Detailed information on this service is available at http://ds.data.jma.go.jp/tl959/profile.html;

(3) Products from the Global Wave Model (0.5º resolution), which runs once a day at 12 UTC. Forecast time: 0 – 84 hours (6 hourly), 96 – 192 (12 hourly).

Météo-France (New Caledonia)

7.1.9 The meeting noted that Météo-France will implement two configurations of its Limited Area Model (LAM) Aladin (8km resolution; 70 vertical levels) covering parts of the South-west Pacific centred on: (1) New Caledonia (8ºS – 32ºS; 155ºE – 175ºE); and (2) French Polynesia (Equator – 33ºS; 165ºW – 125ºW). It is anticipated that both New Caledonia and French Polynesia would start receiving Aladin products by November 2010, and after a period of testing, they would become operational hopefully by March 2011. The meeting noted that these areas also covered other participating countries in the SWFDDP and products from the Aladin-New Caledonia and Aladin-French Polynesia would be of relevance to them. It therefore recommended that Météo-France make products from these Aladin products available for the SWFDDP via the *MetConnect Pacific* website, when they become operational. The meeting enquired about the possibility of extending the Aladin areas to cover all participating countries in the SWFDDP; however it noted that this was not possible due to computational limitations.

7.1.10 The meeting noted that Météo-France Toulouse was developing products for prediction of tropical cyclone tracks, using the Arpège Ensemble Prediction System (PEARP). These products would soon be available in New Caledonia and French Polynesia for testing using data from previous tropical cyclone seasons in the South Hemisphere. The meeting noted that Météo-France would make these products available for the SWFDDP, after their evaluation and validation.

7.1.11 The meeting noted that Météo-France developed a website for the South Pacific Islands in 2006 (http://www.meteo.fr/special/minisites/FormationDIRNC_EPS/), following a training course in Noumea, focused on the use of EPS products, including EPSgrams, EFI, etc. Access to this website is password protected. Regarding training, the meeting noted that Météo-France conducted training for the South Pacific Islands in 2009, with attendance of many participating NMHSs in the SWFDDP. Noting that EPS products made available by Météo-France were widely used by participating NMHSs in the SWFDDP, the meeting recommended a link to the above-mentioned website from the *MetConnect Pacific* website, and encouraged Météo-France to continue to provide support to NMHSs in the South Pacific in terms of training.

Met Office (UK)

7.1.12 The meeting noted that the Met Office UK had been involved in the SWFDDP since April 2009 through active participation on the Regional Sub-project Management Team and as a global data provider ("global centre") of deterministic (through the GTS) and probabilistic products (through the MetConnect Pacific website) as described in the SWFDDP-RAV Implementation Plan. All users of the probabilistic products had been required to sign-up to an on-line data license which stipulates that these products are to be used only in support of the SWFDDP. The meeting noted that the Met Office UK would continue to respond to user requests for additional parameters from MOGREPS on a best endeavours basis.

7.1.13 The Met Office UK actively encouraged all participating NMHSs in the SWFDDP to continue to proactively provide the following:

- Feedback (particularly strengths and weaknesses) on the performance of the participating centre's models;

- Weather case-studies for the purposes of model verification and future training activities;

- Documented case-studies to include high-level testimonial evidence of the impact of the SWFDDP in terms of: (i) increasing the forecast lead time of severe weather; and (ii) increasing the visibility/integration of the capabilities of the NMHS with government and the civil protection agencies. Such evidence is crucial if the project is to build sustainable capacity whilst also attracting future resource mobilisation opportunities.

7.1.14 The Met Office UK regards the SWFDDP concept as the best practice model for the implementation of the Global Data-Processing and Forecasting System (GDPFS) of the World Weather Watch Programme and reaffirmed the points made under agenda items 3.3 and 3.4.

7.1.15 The Met Office UK regards training as key to the continuing success of the SWFDDP and had over the last 18 months assisted with funding of the in-country training events delivered expertly and effectively by MetService New Zealand staff. The meeting agreed that it is crucial that these training events be retained in a sustainable manner to ensure continuous professional development and was encouraged to consider long-term delivery and funding options for achieving this under agenda item 3.4.

7.1.16 While recognizing that ongoing training was necessary to ensure that forecasters from NMHSs participating in the SWFDDP are able to correctly interpret the various NWP/EPS and guidance products made available for the SWFDDP, and on the use of the *MetConnect Pacific* website, the meeting recommended an increased emphasis on training in public weather service delivery during the full demonstration of the SWFDDP.

NOAA/NWS (USA)

7.1.17 The meeting recalled that at the first meeting of the RSMT (April 2009), NOAA/NCEP was invited to consider providing NWP/EPS products in support of the SWFDDP, however due to ongoing commitments, it was not able to contribute to the pilot phase of the project. The meeting noted that NOAA/NWS Pacific Region had prepared an internal funding proposal to procure two workstations for running the Weather Research and Forecasting (WRF) Model in support of the SWFDDP. The proposal was approved in May 2010 and two workstations were being procured. Experimental and limited WRF runs had been conducted using a spare workstation. WRF development in support of SWFDDP will continue and be transferred to the new workstations when they arrive. The intent is to provide large domain and high resolution guidance products covering the entire SWFDDP region and have the capability to run smaller domain and very high resolution sectors for specific areas. Once the WRF outputs prove reliable and the production is automated (likely by March 2011), NOAA/NWS would discuss with MetService NZ on the possible methods to deliver WRF products to the *MetConnect Pacific* website.

7.1.18 The meeting noted that the funding proposal also included the support of MetConnect Pacific development and to training activities of the SWFDDP, including training in the NOAA/NCEP Pacific Desk for forecasters of participating NMHSs in the SWFDDP. The meeting agreed to consider this support when developing the Implementation Plan for the full demonstration of the SWFDDP.

7.1.19 The meeting noted that NOAA/NWS had been making available in its website a number of NWP/EPS products (graphical and text formats) that indirectly support the SWFDDP, including GFS model outputs, WaveWatch-III model outputs, a tool for surf forecasting, the high-seas forecast bulletin, ASCAT scatterometer (http://manati.orbit.nesdis.noaa.gov/datasets/ASCATData.php/) and other satellite imagery, etc. The meeting agreed that these products and tools should be available for the SWFDDP and would consider it when developing the Implementation Plan for the full demonstration of the project, under agenda item 11.

7.2 Regional Centres

RSMC Darwin

7.2.1 The meeting noted that RSMC Darwin contributed regional NWP guidance and tropical climate monitoring products during the pilot phase of the SWFDDP. A suite of NWP products over two Pacific domains was available to participating countries via the *MetConnect Pacific* website. Additional climate monitoring and tropical cyclone forecasting products were also available to most Pacific Island Meteorological Services via the RSMC Darwin registered-user website (http://www.bom.gov.au/nt/rsmc/; available via the *MetConnect Pacific* website).

7.2.2 The meeting noted that Australian Bureau of Meteorology (BoM) was upgrading its NWP systems. The new NWP system, ACCESS (Australian Community Climate and Earth-System Simulator) commenced operations in earlier 2010. A new suite of numerical weather and wave prediction models had replaced the GASP, TXLAPS and TC-LAPS models. The new ACCESS NWP models have shown a significant improvement in accuracy over the Bureau's old model suite. The tropical forecasting model ACCESS-T runs over a similar domain as its predecessor (TXLAPS), but at a higher resolution of 0.375° (~37.5km). ACCESS-TC, the moveable-domain high-resolution tropical cyclone model, which would replace TC-LAPS, was not yet available, but was expected to be ready for the tropical cyclone season 2010/2011. New ACCESS-T products tailored for severe weather forecasting, including diagnostic charts for forecasting convective activity, tropical cyclone genesis and heavy rainfall, were also being developed for the South Pacific region. The meeting was pleased to note these developments, taking into account the need for tools/products for forecasting the rapid onset of localized severe convective storms.

7.2.3 The meeting noted that operational NWP products from ACCESS-T had been developed for the Pacific region and were available for the SWFDDP via the *MetConnect Pacific* website. Unfortunately, the supply of RSMC Darwin charts to the *MetConnect Pacific* website was interrupted during the transition to the new model suite but was expected to resume with the upgrade to the project website in November 2010.

7.2.4 The meeting also noted that the project to redesign the RSMC Darwin website, including a page focussed on climate diagnostic products, was progressing and several climate diagnostic products had recently been converted from experimental to operational status.

7.2.5 The Australian BoM had been deeply involved in in-country training activities that support the SWFDDP, in particular focusing on the interpretation of the RSMC Darwin products, and on tropical cyclone forecasting. Additionally, BoM had provided an upgrade to the Bureau-supplied operational software, the 'TC Module', which was implemented during August/September 2010, in RSMC Nadi, and NMHSs of Samoa, Vanuatu, Tonga and the Solomon Islands. The meeting encouraged the RSMC Darwin to continue to support the training activities and to expand them for the benefit of all participating countries in the SWFDDP.

RSMC Nadi

7.2.6 The meeting noted that RSMC Nadi was expected to provide a 5-day TC Outlook for the Southwest Pacific region during the pilot phase of the SWFDDP. RSMC Nadi began providing 3-day TC Outlooks via the GTS, as well as, for the *MetConnect Pacific* website until the end of the 2009/2010 TC season. From 1 November 2010, the 3-day Outlook text version (via GTS) would continue and the graphical version would be introduced. The expectation was that the 5-day TC Outlook would be provided after certain operationally-related issues are cleared.

7.2.7 The report on the severe weather forecasting and warning services by the Fiji Meteorological Service was summarized under agenda item 7.3.

RSMC Wellington

7.2.8 The meeting acknowledged that as the lead RSMC for the SWFDDP, Wellington continued to provide a platform (the *MetConnect Pacific* website) for disseminating SWFDDP products. This website also provided helpful background material and links to other global products centres, RSMCs and the NMHSs. Twice a day the staff from the RSMC wellington produced the South Pacific Guidance (SPG) charts, which contain forecasts of severe weather phenomena with thresholds for rainfall >50mm/24 hours, winds ≥25 knots, and waves ≥ 2.5m for day 1 to day 5. Detailed information was provided under agenda items 3.2 and 4.

7.2.9 During the pilot phase of the SWFDDP, a total of 3595 SPG charts were produced by RSMC Wellington meteorologists and posted on *MetConnect Pacific* website. Of these charts, about 41% contained significant guidance (i.e. any charts with one or more of: rainfalls > 100mm, winds > 30 knots, waves > 3 metres and TC reference information), and about 43% of the significant guidance charts were for Vanuatu, mainly on large waves. About 4% displayed NIL SIG. Noting that the guidance should be focused on severe weather, the RSMC Wellington proposed changes to the criteria for alerting severe weather in the SPG charts. The meeting agreed to address this issue when developing the Implementation Plan for the full demonstration phase of the project, under agenda item 11.

7.2.10 The meeting noted that development work was currently in progress on *MetConnect Pacific* website, version 2. This new version would restore the images to the RSMC Darwin web page, include a built-in JavaScript player, update the satellite page, as well as a number of other pages to make it more user-friendly for the full demonstration phase of the project. The new version would be implemented by the end of November 2010. The RSMC Wellington confirmed its continued

commitment to run and operate the *MetConnect Pacific* website and would continue to provide support to all participating NMHSs in the SWFDDP through direct communications.

7.3 National Meteorological Centres

7.3.1 The meeting was presented with summary reports from representatives of NMHSs of Cook Islands, Kiribati, Niue, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. These reports included their respective severe weather forecasting and warning activities (i.e. current forecasting process; warning criteria), including progress (in those centres participating in the pilot phase) that had been made since their respective participation in the SWFDDP. Public weather services aspects (including dissemination of warnings to the media, and disaster management and civil protection authorities; current relationships with the media and disaster management, including feedback on services provided; etc.) were summarized under agenda items 9 and 10.

Cook Islands

7.3.2 The Cook Islands Meteorological Service (CIMS) has eleven staff members, including three with forecasting capabilities. With the completion of the in-country training in the Cook Islands (July 2010), it is apparent that the SWFDDP would assist the Cook Islands in a way that would complement the products issued by RSMC Nadi; however, the CIMS would not likely become a Forecasting Office in the near future. Nevertheless, the ability to understand the forecasting tools via the SWFDDP is sufficient for CIMS to check on the products generated by RSMC Nadi and produce some products that could be tailor-made for the general public in the Cook Islands.

7.3.3 Tropical Cyclones are the main threat for the Cook Islands, with an average of 2 cyclones per season. CIMS is the official authorized agency for alerting for tropical cyclones in the country, however since the official warnings are provided by RSMC Nadi and TCWC, any improvements in communication aspects would enhance the capability of the Cook Islands to warn the stakeholders in the country.

7.3.4 In addition to tropical cyclones, the major hazards affecting Cook Islands are high seas, strong winds, heavy rainfall, and wind shear and turbulence. Severe weather warnings for these phenomena are reliant upon information from RSMC Nadi by CIMS due to its limited forecasting capabilities. Although sufficient weather information had been received from RSMC Nadi, CIMS felt that there were gaps in the system that could be accommodated by other means. These gaps include: (1) no estimate of rainfall amount in the heavy rain warnings for the Cook Islands, which would indicate the potential for flooding; (2) lack of information for aviation forecasts, including windshear and turbulence information; (3) lack of storm surge information and potential for coastal inundation; (4) need for campaigns for public education on tsunami warnings; and (5) need for verification activities, which could raise the visibility of the CIMS among the stakeholders.

Fiji

7.3.5 The Fiji Meteorological Service (FMS) have been participating in the SWFDDP since its pilot phase, and have been providing evaluation reports on the performance of the guidance products available at the *MetConnect Pacific* website. This website has now been routinely used by the Fiji forecasters for operational forecasting and warning services since November 2009, together with other available model guidance. FMS indicated that a notable positive impact of the SWFDDP was the increased confidence in forecasters to issue appropriate forecasts and/or warnings to the general public, and fostering a spirit of camaraderie among them. It also improved communications between the FMS and the National Disaster Management Officers and with the media. Visibility and credibility of the FMS as authority on weather in Fiji had also enhanced when forecasters issue quality warnings earlier, which prompted communities to act.

7.3.6 For Fiji, generally, most of the guidance provided by the RSMC Wellington via the *MetConnect Pacific* website was good. However, a few cases of heavy rainfalls were totally missed. Fiji forecasters understood why guidance missed these types of events, as mainly attributable to model resolutions that were unable to resolve convective scales. Practical application of their knowledge on local meteorology was required in these situations, especially in absence of mesoscale model outputs. FMS recommended that verification activities be conducted within the SWFDDP framework, and results be made available for the benefit of all participating NMHSs in the project.

7.3.7 Noting that SIDSs are highly vulnerable to climate change and variability, FMS recommended that adaptation to climate change and variability be addressed by the SWFDDP in the near future. This would raise the attention of other stakeholders and would facilitate resource mobilization in the future.

Kiribati

7.3.8 The whole nation of Kiribati is spread out over a broad area: a few degrees above and below the Equator, and therefore influenced by: (1) ITCZ; (2) La Nina/El Nino conditions; and (3) occasionally, the periphery of tropical cyclones. Typically, the dry season is from April to September and the wet season from October to March. Strong westerly winds, heavy rain, droughts, significant Northern Hemisphere swells, and extreme high tides are the major hazards affecting Kiribati.

7.3.9 Kiribati Meteorological Service (KMS) rely upon RSMC Nadi for daily forecasts, terminal forecasts, area forecasts, tropical cyclone warnings and strong wind warnings for the country (see http://www.met.gov.fj/aifs_prods/10100.txt). KMS has experienced unreliable internet connections and power interruptions, which reduce the level of confidence of meteorological officers in forecasting. KMS' role in a disaster event is to receive the warning from RSMC Nadi, ensure that this warning is not SPAM, and update and send the warning to the Office of *Te Beretitenti*. KMS is not 24/7 and communications are not reliable.

Niue

7.3.10 Niue Meteorology and Climate Change Department (NMCCD) currently receives information on weather, severe weather warnings and other related information through its Regional counterparts. RSMC Nadi is still the major contributor to the NMCCD weather services in terms of forecasts and warnings. The Pacific Tsunami Warning Centre (PTWC) based in Honolulu disseminates Tsunami Bulletins. NMCCD continues to maintain its goal, which is to disseminate weather and climate information for the people of Niue to protect lives and properties at a timely and efficient manner. The end users of the products are the core people who should receive the severe weather warnings at first hand.

7.3.11 Through regional and international training workshops and courses, NMCCD staff are able to utilize some of the global centre models for weather forecasting. The NOAA website is vastly used, in particular, the Southern Hemisphere Page and the Ready Meteogram and Wave Bulletin that assists with the three-day Niue weather forecasts. NMCCD also accesses other products available on the Internet from NOAA, MetService NZ, ECMWF, UKMO, BoM, FMNOC and NASA. RSMC Nadi maintains its routine to develop and disseminate the Special Weather Bulletins and Warnings in force for Niue. Outside of the Tropical Cyclone season, the Strong Wind Warnings for land and marine areas are also received from RSMC Nadi. Within the Tropical Cyclone season the following Special Weather Bulletins are received from RSMC Nadi: cyclone/storm warning, strong wind warning – land and sea, gale warning, storm warning and hurricane warning.

Samoa

7.3.12 Samoa has been participating in the SWFDDP since its pilot phase. Samoa's economy is based on agriculture, fisheries, forestry and tourism. Samoa's climate is tropical and marked by two distinct seasons: wet (November-April) and dry (May-October). Temperatures are typically tropical (ranging from 24-32°C daily) and generally uniform throughout the year with little seasonal variation due to Samoa's near-equatorial location. The rainfall and humidity are usually high with the average annual rainfall about 3,000mm with approximately 66% of the precipitation occurring during the wet season.

7.3.13 During the pilot phase of the project, Samoa Meteorological Service (SMS) reported three severe weather events: (1) one during the period: November 2009 – February 2010; and (2) two non-related to tropical cyclone (one in February and another in September 2010). The guidance products available via the *MetConnect Pacific* website were critical to monitor and forecast these events, and allowed the SMS to advice the Disaster Management Office.

7.1.14 For the full demonstration of the project, SMS recommends: (1) strengthening of capacity by having regular in-country visits, at least twice during the project life time; (2) regular verbal communications; (3) extension of the "demonstration" for another year, including verification activities and focus on nowcasting aspects; and (4) regular internal consultations and discussions between weather, climate and DMO staff.

Solomon Islands

7.3.15 Solomon Islands has been participating in the SWFDDP since its pilot phase. With the project, the Solomon Islands Meteorological Service (SIMS) was able to improve its ability for forecasting severe weather and the confidence in issuing warnings by making use of the NWP/EPS products and SPG charts available via the *MetConnect Pacific* website. The in-country training was critical for these improvements. SIMS was also able to (1) improve the lead times of alerting for severe weather, by using the SPG charts, and (2) monitor 5-days ahead severe weather (strong winds and heavy rain). The relationship between the SIMS and the SI National Disaster Management Office had also improved. One of the main issues of concern is flooding in islands with high mountains, closer plains and big rivers. Aviation meteorology is also relevant for the country.

7.3.16 The SIMS has been using the *MetConnect Pacific* website. As forecasters from SIMS had participated in the NOAA Pacific Desk training in Hawaii, and are familiar with using NOAA model outputs, it recommends that these products be included in the *MetConnect Pacific* website. SIMS also recommended that more EPSgrams and soundings be included in the *MetConnect Pacific* website. Detailed evaluation of the products available on the *MetConnect Pacific* website for Solomon Islands is available on the SWFDDP progress reports. Verifying forecasts is a challenge for the SIMS due to the lack of observational data.

Tonga

7.3.17 Tonga Meteorological Service (TMS) has forecasting responsibilities up to 5 days for general public and marine since 2007, when it took over from RSMC Nadi. TMS issues warnings for (1) tropical cyclones, with guidance from RSMC Nadi and using the BoM TC module; (2) heavy rain, however without rainfall amounts; (3) strong winds (≥ 25 kts); for marine purposes, only covers the EEZ; and (4) large waves, when expect waves > 4 m. TMS has not yet implemented a mechanism for getting direct feedback from users and do not perform verification of forecasts of rainfall.

7.3.18 With the participation in the SWFDDP, TMS plans to introduce new services. These include: (1) heavy rain advisory and flash flood warning service (rainfalls > 100mm in 24h); (2) high surf advisory (significant wave height > 2.5m); and (3) 7-day outlook and prognosis. TMS' recommendations for the full demonstration of the projects are as follows: (1) explore a contingency

option for relaying *MetConnect Pacific* products when internet is not functional in Pacific Islands (e.g. EMWIN and LRIT); (2) cut lead time for forecasting severe weather events and update of products to 6-12hrs; (3) another round of in-country training/follow-up; (4) consider extreme temperature advection events and fog; (5) assist NMHSs on Verification (confidence vs accuracy); (6) include more high resolution products in *MetConnect Pacific* website; and (7) support in conducting surveys.

Tuvalu

7.3.19 The Tuvalu Meteorological Service (TMS) is a Government department within the Ministry of Communication, Fisheries and Transport, which has a total of 3 main sections namely the Weather Forecasting, Reporting and Facilities and the Technical Section. The Forecasting Section is the national meteorological service provider providing services and products for the general public, government agency, the Media, Marine, Disaster management and Agriculture Sector. Additionally, TMS is the focal point for issuing Tsunami warnings/advisories issued from PTWC Honolulu.

7.3.20 The forecast section of TMS mostly relies on internet for daily and outlook forecasting. Models used are mainly US and French as most of its forecasters were trained on these two territories. For severe weather warnings such as Tropical Depression/Cyclones mainly depend on RSMC Nadi. TMS is also providing its own local Warnings and Advisories using positions and advisories given by RSMC Nadi.

7.3.21 The Forecasting Section of TMS provides daily marine forecasts inserted in its daily weather forecast (Tuvalu waters only) for the Marine, fisherman and vessels. TMS also issues a marine forecast (up to 7 days) and advisories upon request especially for visiting mariners sailing out of Tuvalu. TMS also provides a 2 daily weather forecast and one daily 3 day forecast for the general public and to the Media to broadcast regularly on the only Radio station in Tuvalu. Aviation forecasting is mainly done by RSMC Nadi.

7.3.22 Tuvalu is mostly faced by an increase number of strong wind warnings (warning issued when 10min average wind speed >20knots) issued throughout the year. TMS therefore requests that the wind threshold on the SPG charts goes down to >20knots. It also recommended that wave heights on the SPG charts be more specific on wave source generation (wind or pressure).

Vanuatu

7.3.21 Vanuatu has been participating in the SWFDDP since its pilot phase. The Vanuatu Meteorological Service (VMS) has the national responsibility to prepare and disseminate warnings on tropical cyclones, tropical lows, strong wind (gales), heavy rainfall and tsunamis. In its forecasting services, VMS uses NWP/EPS products available via the *MetConnect Pacific* website and model outputs from BoM (Australia), Météo-France, OpenMetoc (Norway), ECMWF, FNMOC (US), JMA (Japan), and NOAA (US).

7.3.22 VMS issues forecasts for general public, marine, aviation. All forecasts can be uploaded from the VMS website (http://www.meteo.gov.vu/), except city forecasts.

8. DEMONSTRATION FRAMEWORK, FEEDBACK AND REPORTING, AND VERIFICATION

8.1 In the framework of the SWFDDP, verification of severe weather was required. Reporting and verification of severe weather events were required whether they were forecasted or not, and when they were forecasted, whether they occurred or not. Participants are required to fill out Annexes F and G of the Regional Subproject Implementation Plan. In the pilot phase of the SWFDDP, participating NMHSs did not formally verify their warnings. Earlier in the week, the meeting emphasized the importance of verification and indicated their willingness to start verification.

8.2 With this context in mind, the meeting was presented with a brief report on verification. The necessity of verification as evidence of the quality of the warning and forecasting system was emphasized. The meeting agreed that appropriate measures of performance should lead to identification of needed improvements in the quality. However, it was also noted that there are problems as to how to define a hit. Evidence of impacts from severe weather can also be used to verify a hit. The suggested approach for the verification is a simple 2x2 contingency table to verify warnings. Annexes F and G of the Regional Subproject Implementation Plan were described as part of the SWFDDP reporting tasks for the participating NMHSs.

8.3 The importance of case studies as evidence of the gaps in the forecast system or even to improve the system was underlined.

8.4 The meeting underlined the importance of impacts as evidence for an event occurring. In addition, the meeting noted with concern that the lack of observations is a problem in the verification of events, in particular observations of coastal wave action.

8.5 The meeting suggested a web based entry for the event evaluation reports (Annex F of the Regional Subproject Implementation Plan). Up until now, the forms have been available in word format. The meeting indicated that the reports took some time to especially the first one, but agreed that overall it is doable.

8.6 The meeting was informed of the Met Office 'Evaluation of Sub-project' document that was submitted to the SWFDP-RA I RSMT meeting in Maputo in 2007. The meeting agreed that participants in the SWFDDP should be encouraged to familiarise themselves with the contents of this document available at: http://www.wmo.int/pages/prog/www/DPFS/Meetings/RAI-SWFDP_Maputo2007/Doc4-4(1).doc.

8.7 The meeting was informed that a WMO joint WWRP-WGNE on Research and Forecast Verification Training Course on Forecast Verification Methods will be held in Melbourne, from 1 to 7 December 2011. Priority will be given to SWFDDP participants, who were encouraged to apply.

9. PUBLIC WEATHER SERVICES (PWS)

9.1 The meeting supported the focus of the PWS component, which is equipping the participants in the SWFDDP-RAV with knowledge and information to implement the PWS-related activities of the Project, in particular issues surrounding the preparation, dissemination and communication of effective warnings and forecasts to a range of primary partners in the delivery of warning services, namely disaster management, media, and the public. This component addresses the issues that represent the core competency in delivering PWS that are just as essential as in accurate forecasting of hazards in ensuring that SWFDDP achieves its objectives. A very important first step in the delivery of PWS is user focus and in particular:

- Identification of the users to be served or engaged in the project and determination of their requirements through applying different methods;
- Understanding the user community;
- Understanding how the information is used in decision making;
- Ensuring that NMS staff are aware of the user needs;
- Ensuring that users are aware of potential NMHS services, as well as the limitations of those services.

The meeting identified the primary users and partners in the SWFDDP as the public, disaster management authorities and the media and agreed that different ways and means should be employed in liaising and collaborating with each main user group.

9.2 The meeting agreed that the goal of a warning issued through the PWS channels is to maximize actions taken by the responsible authorities, communities and individuals. A successful warning decision begins with a plan with which all operational staff must be familiar, which serves as a basis for training and periodic drills, and can be used for reference during a severe weather situation to ensure an appropriate response to the event regardless of the personnel on duty. In addition, information on how to contact key officials and media and knowledge of local effects, must be readily available. The components of a successful warning message, including information content, frequency of issuance and means of dissemination, have to be understood by the operational staff. This is the basis for preparation of Standard Operational Procedures (SOPs), which should exist in all forecast offices. The components of a warning system include detection of hazards and issuing warnings which are the basic functions of a forecasting service; communication of the warnings and response to the warnings. The latter depends on the content and clarity of the message, credibility of the issuing organization and state of preparedness of receiving authorities.

9.3 The meeting agreed that to be successful, a severe weather warning service should ensure that everyone at risk must receive the warning; understand the information presented; believe the information; personalize the information; make correct decisions; and, respond in a timely manner. In addition, the meeting agreed that NMHs staff should be equipped with the necessary knowledge to craft effective warning messages. When composing a warning, it is important that the heading stand alone and stand out; the components of the message are clearly defined; the message is simple; it personalizes the event, the consequences and the actions required; the most important message be placed first; allowance be made for shortening of the message by broadcasters; and, location be made relative to well-known places, etc. Examples of call to actions will be provided by the US and posted on *MetConnect Pacific* website as guidance to participating NMHSs in the SWFDDP.

9.4 The meeting fully supported that communication is one of the most necessary skills for the forecaster who is charged with service delivery tasks, but it is a skill rarely taught during academic training in Meteorology. Effective two-way communication implies listening skills as well as speaking skills. Confidence is an important element in communication, and this cannot be taught directly, but must be developed within each person. Formal communication training courses for forecasters (in whatever media they are required to operate – telephone, radio, television, etc.) are crucial in developing communication skills. Furthermore, the meeting agreed that in general NMHs seem to have difficulties in dealing with media organizations. Some of these difficulties stem from the culture differences of Meteorological Services and Media organizations. The meeting agreed that NMSs need to develop close working relationships with the media and that it could take time to build a two way trust between them and the media. NMSs need to keep in mind that's the media functions both as a "user" and a vehicle to deliver the message to "users". It would be useful for NMSs to acquire some technical knowledge of broadcast technologies, so that they could recognize the appropriate formats in which information should be supplied – the easier it is for a media organization to assimilate and broadcast (or print) this information, the more likely it is to be used. Therefore, a dialogue, or two-way communication, needs to be established with media. This is best achieved by a combination of formal (seminars, training courses) and informal (social events, familiarization visits, etc.) contacts. The meeting agreed that there was a need to improve communication skills (both written and broadcast) in the region as part of improving relationships with the media. Cook Islands which does have a TV presentation system offered to assist other participating countries with training in simple media presentation systems but pointed out that the countries need to take the initiative to make requests for building communication capacity in the framework of the SWFDDP.

9.5 The importance of the outreach to the public and other users was emphasized and the meeting agreed that it was essential to seize every opportunity to work with user communities to introduce them to the activities of NMHSs. This strategy would help create weather-aware communities who would respond better to the information and services provided by NMHSs. It

would also help users to better understand the limitations and potential of weather forecasts and warnings and to better appreciate the reasons why the forecasts may not always be accurate.

9.6 The meeting endorsed the concept of monitoring, evaluation and continuous improvement of delivering the warning and forecast services. Formal verification involves ensuring that the warnings and forecasts are accurate and skilful from a technical point of view. In addition and just as important, the assessment of the utility or value of the services to users must be built within the warning system. Service evaluation determines whether services are meeting user requirements and ascertains whether users understand the products and services provided and are making optimum use of them. To be effective the service has to contribute significant social or economic benefits to its clients. Consequently, evaluation must include an assessment of the value added to clients by the programme. The evaluation process should be kept simple with the aim of having some results available when talking to decision-makers and in response to media enquiries. Surveys are a common and effective way of collecting feedback information from users and the design and structure of an effective survey questionnaire were discussed by the meeting. Examples of such questionnaires used by a number of NMHs were also presented to the meeting. A summary guide on design of surveys and examples of questionnaires used by 7 NMHSs is available at http://www.wmo.int/pages/prog/amp/pwsp/surveys.htm.

9.7 The meeting participants provided detailed information on their national PWS programmes, including the modes of dissemination of warnings and forecasts, relationships with the media, outreach activities for primary users as well as the NMSs relationships with the disaster management authorities and the Standard Operating Procedures for such collaborations. They also indicated the gaps and problems in maintaining optimal relationships with these user sectors. This tabular information is attached as Annex III.

10. PREPARING FOR SEVERE WEATHER EMERGENCIES

10.1 The meeting was informed by the SWFDDP regional representative of the National Disaster Management (NDM) organizations in the participating countries that almost all countries have a legal framework for disaster management in the form of a disaster management Act and that some countries are in the process of reviewing the national disaster plans that identify the roles and responsibilities of each participating organization such as media, private sector, NGOs etc. Each national plan is expected to have support/contingency plans (e.g. national cyclone plans) including standard operating procedures. Most countries organize meetings and briefings between NMSs and NDM organizations and some also prepare briefings or information for TV broadcasts.

10.2 There however exist a number of practical obstacles and barriers in the relationship between NMSs and NDM management organizations. An important common problem concerns the use of technical language containing meteorological jargons as well as the need to translate the warnings from the national language to local languages. Dissemination can also pose a challenge due to the scattered nature of islands making up most of the countries in the South Pacific. The reactive nature of the local populations in most of the countries is another problem and regular communication is needed to overcome attitude and habits that prevent the public to be more proactive in taking prevention and mitigation measures.

10.3 The meeting was offered a number of recommendations from the disaster management side for addressing and eventually overcoming the challenges outlined above. These included the use of plain language by NMS staff in preparing warnings and forecasts; the use of governments' own media (radio, TV and newspaper) outlets; working with the media to waive fees for broadcasts or information programmes relating to weather; and exploring all avenues for getting the message across. The participants described the national arrangements governing working relationships between NMSs and NDM organizations, including the different national entities involved in the warning process. This information is contained in Annex III.

10.4 The overall conclusion drawn from discussion on agenda items 9 and 10 clearly demonstrated the need for addressing issues surrounding communication between NMSs, media and NDM organizations. These include the need to improve communication channels and skills, avoiding the use of complex terminology improved translation of warnings and forecasts, and improvement in the mode of interaction between NMSs and NDM.

11. IMPLEMENTATION OF THE SWFDDP IN SOUTH PACIFIC ISLANDS

11.1 The Regional Subproject Management Team

11.1.1 The meeting decided on its regional subproject management system and in particular the responsibilities of the members who were appointed to the Regional Subproject Management Team (RSMT). Membership and chairperson were confirmed and are listed in the Regional Subproject Implementation Plan, available at:
http://www.wmo.int/pages/prog/www/CBS-Reports/documents/ImpPlan_SWFDDP_Nov2010.pdf.

11.2 Development of the Regional Subproject Implementation Plan

11.2.1 The meeting reviewed and updated the Regional Subproject Implementation Plan, considered the *SWFDP Guidebook for Planning Regional Subprojects* (Rev. 2010), and discussed all components of the Implementation Plan, including the following aspects:

- Membership, chairperson of the RSMT, and the members' responsibilities*;*
- Lead RSMC responsible for SWFDDP's "cascading process", being RSMC Wellington;
- Criteria for alerting severe weather in the SPG charts, which would be *Heavy Rain (≥ 100mm in 24 hours), Strong Winds (≥ 30knots), Large Waves (≥ 2.5m north of 15ºS and ≥ 3.5m at and south of 15ºS)*, to be implemented on 1 December 2010;
- Developments of the *MetConnect Pacific* website;
- Responsibilities and products provided by global, regional and national centres;
- Liaison with media and disaster management and civil protection at national level;
- Operational contacts for SWFDDP forecasting centres (e-mail, telephone, etc.);
- Verification aspects, monitoring and evaluation, and reporting (severe weather events, and progress reporting of project);
- Training aspects and plans;
- Timetable of implementation (milestones and responsible member);
- Costing and funding sources.

11.2.2 The Regional Subproject Implementation Plan for the full demonstration of the SWFDDP is available at:
http://www.wmo.int/pages/prog/www/CBS-Reports/documents/ImpPlan_SWFDDP_Nov2010.pdf.

12. PROSPECTIVE FOR EXPANSION OF THE SWFDP INTO A "WESTERN WINDOW" IN THE AUSTRALIAN-SOUTH ASIAN REGION

12.1 The meeting was presented with an introduction to plans for a "western window" extension to the SWFDDP in the Australian – south Asian region. The proposed domain includes one Least Developed Country, Timor-Leste, the 'maritime continent' countries of Indonesia and New Guinea, the tropical parts of Australia, and possibly also the Philippines. Severe weather impacts in this region include heavy rain and strong winds associated with the monsoon, tropical depressions, convergence zones and tropical cyclones.

12.2 The meeting noted that interest in an extension to the SWFDDP has been expressed by meteorological services in Indonesia, PNG and the Philippines, which also have tropical cyclone

warning centres (Jakarta TCWC was recently established in 2007). The Timor-Leste meteorological service currently has limited forecasting capacity and requires ongoing support and assistance.

12.3 Informally, it has been suggested that RSMC Darwin could serve as the lead regional centre in a western window SWFDP subproject, providing its existing suite of analysis and prediction products, as well as, training support. Additional interpretive tropical guidance products and commentary could also be supplied by RSMC Darwin. Existing relationships between Australian TCWCs in Perth, Darwin and Brisbane with countries in the region could be further developed in the context of a "western window" subproject. The meeting noted that additional resources would be required for RSMC Darwin to fulfil the operational support role as lead regional centre. Funding sources such as AusAID are currently being investigated before further progress is made towards implementation.

12.4 The meeting discussed how an SWFDDP – western window would fit into the overall SWFDP which could have four interconnecting subproject domains covering the Asia-Pacific region. The meeting recognized that inclusion of the Philippines in a new subproject would significantly increase the size and scope of a new subproject, as it would include both northern and southern hemisphere severe weather seasons. This could also impose additional development load on global centres providing data for the new domain.

12.5 The meeting expressed its support in principle for the proposed western window subproject and acknowledged that participating countries would benefit from such a "western window" subproject in the same way as others have done in existing SWFDP subprojects.

12.6 The meeting discussed its limited mandate in the establishment of a new subproject as all potential participants were not present. It agreed that the initiative for an extended subproject should come from interested meteorological services through RA V and evaluated by the Steering Group for the SWFDP. The meeting also agreed that a separate Regional Subproject Management Team should be established for a "western window" as its focus areas could be different to the south Pacific region. However, it is likely that there would be some overlap in membership.

13. ANY OTHER BUSINESS (AOB)

13.1 The meeting noted with appreciation the offer of USA to host the next meeting of the RSMT in Honolulu in the first half of 2012.

13.2 The chairperson of the RSMT was requested to work with the Secretariat and the chairperson of the RA V TCC to decide on a suitable venue and timing for the next meeting, noting the value that could come from holding the RSMT meeting in association with the next meeting of the RA V TCC, which was also planned for early 2012.

14. CLOSING

14.1 The meeting of the Regional Subproject Management Team (RSMT) for the Severe Weather Forecasting and Disaster risk reduction Demonstration Project (SWFDDP) for the South Pacific Islands closed at 14:50 on Thursday, 4 November 2010.

Annex I

AGENDA

1. OPENING

2. ORGANIZATION OF THE MEETING
- 2.1 Adoption of the agenda
- 2.2 Working arrangements

3. INTRODUCTION TO THE SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP)
- 3.1 Overall framework
- 3.2 Summary of experience and progress of the Severe Weather Forecasting and Disaster risk reduction Demonstration Project (SWFDDP) for the South Pacific Islands (RA V)
- 3.3 Synergy with the Tropical Cyclone Committee activities in RA V
- 3.4 Sustainability of SWFDDP

4. EVALUATION OF THE PILOT PHASE OF THE SWFDDP FOR THE SOUTH PACIFIC ISLANDS (RA V)

5. SATELLITE DATA-PROCESSING SYSTEMS AND PRODUCTS FOR VERY SHORT-RANGE FORECASTING, INCLUDING NOWCASTING, IN RA V

6. LINKAGE AND FUTURE TRIALING OF GIFS-TIGGE PRODUCTS

7. CASCADING FORECASTING PROCESS: ROLES OF PARTICIPATING COUNTRIES
- 7.1 Global: ECMWF, Met Office (UK), NOAA/NCEP (USA), Météo-France (New Caledonia or French Polynesia), JMA (Japan)
- 7.2 Regional: RSMC Wellington, RSMC Darwin, RSMC Nadi
- 7.3 National Meteorological Centres: Cook Islands, Fiji, Kiribati, Niue, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu

8. DEMONSTRATION FRAMEWORK, FEEDBACK AND REPORTING, AND VERIFICATION

9. PUBLIC WEATHER SERVICES (PWS)
- 9.1 Delivery of Warning Services
- 9.2 Dissemination and Communication
- 9.3 Working with primary partners in the delivery of warning services (Disaster Management, media, the public)
- 9.4 Public education and awareness raising programmes
- 9.5 Service evaluation

10. PREPARING FOR SEVERE WEATHER EMERGENCIES
- 10.1 Analysis of Disaster Risk Management (DRM) institutional capabilities
- 10.2 Standard operating procedures between NMHSs and DRM Agencies

11. IMPLEMENTATION OF THE SWFDDP IN SOUTH PACIFIC ISLANDS
- 11.1 The Regional Subproject Management Team
- 11.2 Development of the Regional Subproject Implementation Plan

12. PROSPECTIVE FOR EXPANSION OF THE SWFDP INTO A "WESTERN WINDOW" IN THE AUSTRALIAN-SOUTH ASIAN REGION

13. ANY OTHER BUSINESS (AOB)

14. CLOSING

Annex II

LIST OF PARTICIPANTS

WMO SECRETARIAT	
7 bis avenue de la Paix Case postale 2300 1211 **GENEVE** 2 Switzerland	**WWW website** www.wmo.int/web/www/www.html
Mr Peter **CHEN**	Tel: +4122 730 8231 Fax: +4122 730 8128 Email: pchen@wmo.int
Mrs Alice **SOARES**	Tel: +4122 730 8449 Fax: +4122 730 8128 Email: asoares@wmo.int
Ms Haleh **KOOTVAL**	Tel: +4122 730 8333 Fax: +4122 730 8128 Email: hkootval@wmo.int
Mr Richard **JONES (WMO Consultant)** 205 Rowan avenue **BEACONSFIELD** QC Canada H9W 1J7	Tel: +514 694 3909 Fax: Email: Rickjones205@yahoo.com
PARTICIPANTS	
Dr Linda **ANDERSON-BERRY** National Programme Manager Disaster Mitigation and Emergency Management Coordination Bureau of Meteorology GPO BOX 1289 **MELBOURNE VIC 3001** Australia	Tel: +613 9669 4585 Fax: +613 9669 4695 Email: l.anderson-berry@bom.gov.au
Mr Ian **SHEPHERD** Senior Meteorologist Severe Weather Bureau of Meteorology PO Box 40050 Casuarina, N.T. 0811 **DARWIN**	Tel: +618 8920 3821 Fax: +618 8920 3829 Email: I.Shepherd@bom.gov.au

Australia	
Dr Elizabeth E. **EBERT** Research Program Leader, Weather and Environmental Prediction Centre for Australan Weather and Climate Research (CAWCR) Bureau of Meteorology GPO BOX 1289 **MELBOURNE VIC 3001** Australia	Tel: +613 9669 4688 Fax: +613 9669 4660 Email: e.ebert@bom.gov.au
Mr Arona **NGARI** Director Meteorological Service P.O. Box 127 **RAROTONGA** Cook Islands	Tel: +682 20603 / 25920 Fax: +682 21603 Email: angari@met.gov.ck
Mr Alipate **WAQAICELUA** Acting Director Fiji Meteorological Service Private Mailbag (NAP 0351) **NADI** AIRPORT Republic of Fiji Islands	Tel: +679 6724 888 Fax: +679 6720 430 Email: Alipate.waqaicelua@met.gov.fj
Mr Toshiyuki **KURINO** Senior Coordinator for Meteorological Satellite Systems Japan Meteorological Agency (JMA) 1-3-4 Otemachi, Chiyoda-ku **TOKYO** Japan	Tel: +813 3201 8677 Fax: +813 3217 1036 Email: tkurino@met.kishou.go.jp
Mr Tareti **KIREUA** Chief Met Officer Met Office P.O. Box 486 **TARAWA** Kiribati	Tel: +686 26511 Fax: +686 26089 Email: tkbanaua@gmail.com
Mr Peter **FISHER** International Operations Manager METSERVICE 30 Salamanca Road PO Box 722 **WELLINGTON** New-Zealand	Tel: +644 470 0805 Fax: +644 473 5231 Email: peter.fisher@metservice.com

Dr Neil **GORDON** Permanent Representative of New-Zealand with WMO METSERVICE 30 Salamanca Road PO Box 722 **WELLINGTON** New-Zealand	Tel: +644 470 0762 Fax: +644 473 5231 Email: Neil.gordon@metservice.com
Mr Penehuro **LEFALE** Manager International Cooperation and Development METSERVICE 30 Salamanca Road PO Box 722 **WELLINGTON** New-Zealand	Tel: +644 470 0818 Fax: +644 473 5231 Email: Pene.lefale@metservice.com
Mr Steve **READY** Manager RSMC Wellington METSERVICE 30 Salamanca Road PO Box 722 **WELLINGTON** New-Zealand	Tel: +644 470 0737 Fax: +644 471 2078 Email: Steve.Ready@metservice.com
Mr James **LUNNY** Meteorologist METSERVICE 30 Salamanca Road PO Box 722 **WELLINGTON** New-Zealand	Tel: +644 700 700 Fax: +644 473 5231 Email: James.lunny@metservice.com
Mr Benoit **BROUCKE** In charge of Forecasting Department 2 Rue Vincent Auriol BP 151 98845 **NOUMEA** Nouvelle Calédonie	Tel: +687 279303 Fax: +687 279327 Email: Benoit.broucke@meteo.fr
Mr Sionetasi **PULEHETOA** Niue Meteorological Service Hannan Airport P.O. Box 82 **ALOFI** Niue	Tel: +683 4600 Fax: +683 4602 Email: sionetasi.pulehetoa@mail.gov.nu
Ms Filomena **NELSON** Principal Disaster Management Officer Meteorology Division Ministry of Natural Resources and Environment **APIA** Samoa	Tel: +685 20856 Fax: +685 23176 Email: Filomena.nelson@mnre.gov.ws

Mr Ausetalia **TITIMAEA** Assistant CEO – Meteorology Division Ministry of Natural Resources and Environment P.O. Box 3020 Meteorology **APIA** Samoa	Tel: +685 20856 Fax: +685 20857 Email: Ausetalia.titimaea@mnre.gov.ws
Mr Manoah **TEPA** Solomon Islands Meteorological Services P.O. Box 21 Vavaya Ridge Road **HONIARA** Solomon Islands	Tel: +677 27658 Fax: +677 23029 Email: Forecast@met.gov.sb Manoahtepa@gmail.com
Mr Ofa **FA'ANUNU** Director Tonga Meteorological Service Domestic Termainal Fua'Amotu Airport Fua'Amotu **TONGA TAPU** Tonga	Tel: +676 35355/35123 Fax: +676 35123 Email: ofaf@met.gov.to
Mr Moleni **TUUHOLOAKI** Senior Meteorologist Tonga Meteorological Service Domestic Termainal Fua'Amotu Airport Fua'Amotu **TONGA TAPU** Tonga	Tel: +676 2323314 Fax: Email: molenit@gmail.com
Mr Tauala **KATEA** Scientific Officer Tuvalu Meteorological Service Office of the Prime Minister Vaiaku, **FUNAFUTI** Tuvalu	Tel: +688 20736 Fax: +688 20090 Email: Tauala.k@gmail.com tkatea@gov.tv
Mr Raymond **TANABE** Director of operations National Weather Service Central Pacific Hurricane Center 2525 Correa Road Suite 250 **HONOLULU**, HI 96822 United States of America	Tel: +808 973 5273 Fax: +808 973 5271 Email: Raymond.tanabe@noaa.gov

Mr Eric **LAU** Scientific Services Meteorologist National Weather Service Pacific Region Headquarters 737 Bishop Street, Suite 2200 Pacific Guardian Center, Mauka Tower **HONOLULU**, HI 96813 United States of America	Tel: +808 532 6413 Fax: +808 532 5569 Email: Eric.lau@noaa.gov
Mr Ian **LISK** Volcanic Ash Coordination Programme Manager Met Office Fitzroy Road EX1 3PB **EXETER** United Kingdom	Tel: +44 1392 885 135 Fax: +44 1392 885 681 Mobile: +44 7753880672 Email: Ian.lisk@metoffice.gov.uk
Mr Fred Robert **JOCKLEY** Principal Scientific Officer Vanuatu Meteorological and Geohazards Department PMB 9054 Lini Highway **PORT VILA** Vanuatu	Tel: +678 24686 Fax: +678 22310/27414 Email: fjockley@meteo.gov.vu

Annex III

DETAILED INFORMATION ON NATIONAL PWS PROGRAMMES

Relations DM Kiribati

Dissemination Channels	Collaboration with DM?	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	Outreach and sensitization with DM? What?	DM feedback?	How? How often?
Website	Poor as we are in different ministries	No , Still on draft	Disaster Management is NOT very active since there is no disaster plan	Training, briefings,	Yes, verbal via phone or face to face discussion and during briefings, disaster committee meetings	Outreach is through DM community and public awareness - TV and radio Advertisements - Village awareness workshops - School visits - Stakeholder workshops	Yes - Language used in weather bulletins, needs to be simplified so that public or any user can understand	Regular and when the need arises
Email								
Radio								
TV								
Newspaper								
Telephone								
SMS								

Relations DM Niue

Dissemination Channels	Collaboration with DM?	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	outreach and sensitization with DM? What?	DM feedback?	How? How often?
Telephone	Good	No, a TC/tsunami warning plan only	DM not always acknowledge warning message received from Met Service	None	Yes, through meetings and emails	Invite DM to visit and discuss various weather-related issues	During radio talk back shows	DM contact the Met Service if they have a complaint
E mail								
Fax								
Meetings								
Internet								

Relations DM Samoa

Dissemination Channels	Collaboration with DM?	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	Outreach and sensitization with DM? What?	DM feedback?	How? How often?
Telephone, Email, Website, face to face meeting	Excellent as DM is part of Met.	Not necessary, as it is part of NDMP and Met response plan and Tropical Cyclone Plan which are legal documents	None	Training, briefings,	Yes, verbal via phone or face to face discussion and during briefings, management meetings	Outreach is through DM community and public awareness - TV and radio Advertisements - Village awareness workshops - School visits - Stakeholder workshops	Yes - Language use in weather bulletins, needs to be simplified so that public or any user can understand	Regular and when the need arises - During management meetings

Relations DM Solomon Islands

Dissemination Channels	Collaboration with DM?	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	Outreach and sensitization with DM? What?	DM feedback?	How? How often?
Telephone	Good collaboration since both are under the same ministry	Yes	No specific problems	Meetings between the two	Face to face meetings	Through meetings	Yes	As need arises
Fax								
Personal meetings								

Relations DM Tonga

Dissemination Channels	Collaboration with DM?	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	outreach and sensitization with DM? What?	DM feedback?	How? How often?
Website	Good	NDM Plan contains all plans	DM difficulty in understanding terminology used in forecasts and warnings	Monthly Consultation meeting	By phone when error or timeliness of website products are late	Joint DM and climate change awareness programmes as part of Climate change awareness	Adhoc basis with no regular requirements for feedback. Although feedback after an event is required, this does not usually happen	Adhoc via phone
SMS	Good	NDMP						
RANET (including EMWIN, Chatty beetle and HF Radio)	Good	NDMP	Response time to Met warnings not always optimal					
Telephone	Good	NDMP	Slow to dissseminate Met warnings					
Fax	Good	NDMP						
Email	Good	NDMP have			Adhoc feedback	Adhoc use of email for		

		MOU			usually come by email from NEMO	disseminating awareness material		

Relations DM Tuvalu

Dissemination Channels	Collaboration with DM?	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	outreach and sensitization with DM? What?	DM feedback ?	How? How often?
Email	1.Excellent 2.Legal Act in place	1.Tuvalu Met is part of the National Disaster Committee (NDC) and National Disaster Preparedness Working Group (NDPWG) 2.Updating/reporting 3.SOP stated within our National Disaster Plan	1.Only one staff manage our Disaster office. 2.More drills/committee meetings 3. MOU needed (Media)	1.Pamphlets 2.Drills 3.Briefings 4.Committee meetings 5. trainings ,workshops	1.Verbal during briefings and in committee meetings 2.Email/phone	1.Radio programs 2.Workshop 3	1Yes,weather and warning definitions	Regularly, and when needed
Telephone								
HF radio								
Fax								
FM radio								
Website								
Print hardcopies								

Relations DM Vanuatu

Dissemination Channels	Collaboration with DM?	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	Outreach and sensitization with DM? What?	DM feedback?	How? How often?
E mail	Housed in the same building under different departments so collaboration is good	Plans need to be improved	DM at times issues warnings without consulting Met Service		Work together in the same building, so feedback is in person	Work together in the same building so outreach is not needed	On-going feedback	On-going
Telephone								
In-person								

Relations media Niue

Dissemination Channels	Collaboration with media	SOP with media? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from media? How?	Public outreach and sensitization? What?	Public feedback?	How? How often?
Telephone	Good	No	Translation of warnings to local language	Discussions between media and Met Service	Telephone E mail	Public visits School visits Open house on WMD	On radio talk shows	Talk back shows on radio Not regular
E mail								
Fax								
Internet								
Radio								
TV								
Meetings								

Relations media Samoa

Dissemination Channels	Collaboration with media	SOP with media? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from media? How?	Public outreach and sensitization? What?	Public feedback?	How? How often?
Website, radio, TV, newspaper, email, telephone	Excellent, media is always on the alert when there are changes to the weather	Yes, SOP is part of the media organizations' disaster management plan	Media's understanding of terminologies used in weather bulletins or severe weather bulletins	Media training & awareness programmes	Yes, telephone, face to face discussion	Yes - Village consultations and awareness programmes - TV/radio advertisements (cyclone & storm surges or strong wave activities & flooding) - Newspaper articles - Other stakeholder workshops - Social gatherings - Face to face discussions or conversation	Yes	- Direct face to face discussions - Telephone - Newspaper articles or editorials - During social gathering, face to face conversation, - media interviews on related matters how often? Now and then….

Relations media Solomon Islands

Dissemination Channels	Collaboration with media	SOP with media? What?	Problems and gaps?	Tools used to improve relationship ? (PWS guides, training,..)	Feedback from media? How?	Public outreach and sensitization? What?	Public feedback?	How? How often?
Fax	Good	No	Re-interpretation of forecasts and warnings or official press releases	Workshops and meetings	Yes, Invited to interviews	Open house at the Met Service, educational pamphlets	No formal surveys done but informal input and responses	On on-going basis
E mail								
Radio (VH)								
Media releases								
Interviews								

Relations media Tonga

Dissemination Channels	Collaboration with media	SOP with media ? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from media? How?	Public outreach and sensitization? What?	Public feedback?	How? How often?
Website	Good	MOU about to be sign with TBC(TV and radio)	Reinterpretation of forecasts by media which is not always correct Media not 24 hours and it is upto Met Office to ask them to stay on duty in case of cyclones Not always give high priority to broadcast warnings in case there is other interesting news such as sport	Adhoc workshops	By phone when error or timeliness of website products are late	Limited public outreach on website	No mechanism to get public feedback, no surveys done and any feedback is adhoc. Public feedback on website (for those who do) is generally good.	adhoc

			-Internet connection not always reliable -Not everyone has email					
Television			Forecasts are read directly from website by TV with no graphics		TV request if TMS can provide graphics	Limited	NIL	NIL
AM Radio			Radio announcers have little to no knowlegde of weather terms. Sometimes they change terms		Good. Generally TMS will receive a phone call when the forecast is issued late	Limited to Climate change funded programs and community visists	Generally most public listen to radio if there is a warning in force. Little feedback	Limited to when/if forecasts are late
SMS					NIL	Good. Sent out on the normal phone text message	NIL	NIL
RANET					Nil		Nil	NIL
Telephone			Unreliable during strong winds (eg. TC's) & too		NIL		NIL	NIL

			many changes to phone numbers					
Fax			Unreliable during strong winds (eg. TC's) & too many changes to phone numbers		NIL		NIL	NIL
Email	Satisfactory	Only Radio and TV media have MOU	Unreliable during strong winds (eg. TC's) & too many changes to phone numbers		Adhoc feedback usually come by email from customers	Adhoc use of email for disseminating awareness material		
Newspaper	poor	No MOU	There are only weekly papers and difficult to get daily weather incorporate		NIL	Nil	Nil	Nil
Community consultations	poor	No MOU	Cannot visit everyone		Many people call AM Radio to get their weather information	Media plays big role in the public awareness that can be done. Especially radio and TV	Poor. Sometimes via phone	
FM Radio	poor	No MOU	Only open		Nil	Nil	Nil	NII

			during the day					
Chattty Beetle	Testing phase only with in Met Service	Testing phase only with in Met Service	Testing phase only with in Met Service		Testing phase only with in Met Service	Testing phase only with in Met Service		
Coast Radio	Excellent Housed together with Met Service	Part of Met Office	Old equipment		No often	No routine public Consultation only by adhoc	Feedback mostly from mariners via telephone. Marine broadcasts are routine and are picked up by mariners who use radio or phone Met Service if there is no forecast	
EMWIN	Only available within Met Service	Only Met Office tool	Not available @ all stations		Nil	Nil	Nil	I

Relations media Tuvalu

Dissemination Channels	Collaboration with Media?	SOP with Media? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from Media? How?	outreach and sensitization with Media? What?	Media feedback ?	How? How often?
Email	Good relationship No MOU sign between Media	States out in our National Disaster Response Plan within our National Disaster Plan	1.Need proper briefings on warnings, weather forecast 2.Translating technical terms (warnings) 3. MOU needed (Media)	1.Weather definitions trainings 2.Trainings	Weather definitions translation to local language	1.Radio programs 2.Workshop 3Interviews or talkback shows	1Yes,weather and warning definitions	When issuing warning and during radio prog.
Telephone								
Our Website								
Print hard copies								
Fax								

Relations media Vanuatu

Dissemination Channels	Collaboration with media	SOP with media? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from media? How?	Public outreach and sensitization? What?	Public feedback?	How? How often?
Vanuatu Broadcasting and TV Corporation	Still have some problems, but generally good	Not yet but are in the process of preparing a document	At times the media makes additions to the forecasts French language versions not always in line with English	Additional French forecaster to be recruited A tropical cyclone module version in French and Bishlama	Plans to conduct a survey to gather information about their opinions on forecasts	Open days pamphlets	Some questionnaires have been sent out in the past but not much response Based on PWS survey guidelines and examples will conduct surveys in the future	During severe weather, TC and tsunami
FM stations	Directors and managers are in charge							
Telephone								
Fax								
email								
HF radio								
Website								
SMS								

Relations with DM Fiji

Dissemination Channels	Collaboration with DM?	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	outreach and sensitization with DM? What?	DM feedback?	How? How often?
Radio (AM/FM) Short wave broadcast via RNZI and/or Radio Australia GTS AFTN EMWIN Website www.met.gov.fj Email Facebook Pollfax Manual Fax Telephone SMS Print Media Television Suva Radio 3DP – coastal marine broadcasts	Good working partnership with NDMO exists and we are always improving on these. De-briefing sessions after TC Tomas, meeting on Drought impacts in Fiji, collaboration in flood early forecasting and warning, Disaster Awareness Week are all helping build our partnership.	Not really, but we are all working from provisions of appropriate Emergency plans like Tropical Cyclones, Tsunami, Flood, etc..	High turnover of staff at NDMO always requires us to senisitise them with mode of operations. Example is when one senior staff at NDMO talked to the media about 7m storm surge – based on satellite data affecting parts of Fiji during TC Tomas. TO date they have not verified this information	Provisions of Action Plans available, training, Exercises, talk shows, Simulations, etc	Usually passed directly back to Met and in other times, via recorded media interviews	Strongly active in outreach by going out to communities including schools as and when required. We also take advantage of nationally organized events like the Disaster Awareness week to reach the last person.	Directly via phone, email and/or media interviews, including online	Interaction with the NDMO is on needs basis, but more frequent during severe weather events.

Relations with media and DM of Cook Islands

Dissemination Channels	Collaboration with media	SOP with media? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from media? How?	Public outreach and sensitization ? What?	Public feedback ?	How? How often?
Radio (AM/FM) EMWIN Website www.cookislands.pacificweather.org Email Manual Fax Telephone SMS Print Media Television	Good partnership with the media as they are the only most effective vehicle to deliver our forecasts and warnings to the general public	Relations with the media is included in SOP with Disaster Management Plan from the National Disaster Risk Management Council.	Coverage are at times not live and usually is out of date by the time they go to the public.	WMO PWS Guides, Meeting with Media organisations, Media workshops Annual event required to update any procedures.	Normally is prompt by phone so that the next media release can be sorted out. Drafts are normally agreed by all parties.	Being participants in same organization allow us to have a regular dialogue with media. Brochures and pamphlets prepared for public. We normally put into practice exercise that are carried on the National Disaster Week which is the first week of November.	Feedback is usually to attack any negative output by the office. We refrain from answering via the newspaper but clarify matters on TV to look at positive feedbacks	Needs basis and normally more regular closer to the cyclone season and when sever weather occur

Relations with DM Cook Islands

Dissemination Channels	Collaboration with DM	SOP with DM? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from DM? How?	Public outreach and sensitization wit DM? What?	DM feedback ?	How? How often?
Radio (AM/FM) EMWIN Website www.cookislands.pacificweather.org Email Manual Fax Telephone SMS Print Media Television	Good partnership with the DM. They facilitate the forming of the core team that is required to set up the Emergency Operating Centre and acts on the policies of government to alert outside assistance.	Disaster Management Plan from the National Disaster Risk Management Council.	Warnings are at times delayed by DM due to the protocol in their SOP DM sometimes want to take the role of the Met Office	WMO PWS Guides, New database for updating contacts, Table top exercise to identify who is suppose to do what. The annual event of the Disaster Week	There is regular dialogue for minor things but for major issues, these are dealt by the National Disaster Reduction Council which meets on a quarterly basis.	Being participants in same organization allow us to have a regular dialogue with media. We normally put into practice exercise that are carried on the National Disaster Week which is the first week of November.	Feedback is usually to align the process with the Disaster Plan and to be within the framework of the National Disaster Management Plan.	Needs basis and normally more regular closer to the cyclone season and when severe weather occur. National Disaster Week.

Relations with media Fiji

Dissemination Channels	Collaboration with media	SOP with media? What?	Problems and gaps?	Tools used to improve relationship? (PWS guides, training,..)	Feedback from media? How?	Public outreach and sensitization? What?	Public feedback?	How? How often?
Radio (AM/FM) Short wave broadcast via RNZI and/or Radio Australia GTS AFTN EMWIN Website www.met.gov.fj Email Facebook Pollfax Manual Fax Telephone SMS Print Media Television Suva Radio 3DP – coastal marine broadcasts	Good partnership with the media as they are the only most effective vehicle to deliver our forecasts and warnings to the general public	Not yet	Incorrect and/or irresponsible reporting by young journalists. High turnover in the media industry lands us with new, young and inexperienced journalists to deal with.	WMO PWS Guides, Meeting with Media organisations, Media workshops	Provided directly to us by phone during liaisons and sometimes through print, audio or TV (positive and/or negative)	Strongly active in outreach by going out to communities including schools as and when required. We also take advantage of nationally organized events like the Disaster Awareness week to reach the last person.	Feedback outpouring usually when Met Service makes a mistake in forecasts and/or warnings. Praises hardly received, except from members of the public who have weather at heart.	Interaction with the Media is almost on daily basis, but more frequent during severe weather events.