

WORLD METEOROLOGICAL ORGANIZATION

Weather, Climate and Water



WORKING GROUP ON HYDROLOGY

**REGIONAL ASSOCIATION V
(SOUTH-WEST PACIFIC)**

Nadi, Fiji, 17-21 October 2005

FINAL REPORT

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1. OPENING OF THE MEETING (*agenda item 1*)

1.1 The sixth session of the Working Group on Hydrology (WGH) of the WMO Regional Association V (South-West Pacific) (RA V) was held at the premises of the Fiji Meteorological Service (FMS) in Nadi, Fiji from 17 to 21 October 2005. Twenty-four participants attended the meeting. The list of participants is provided in Annex 1 of this report.

1.2 The Chairman of the Working Group, Mr R. Raj, welcomed the participants and thanked them for participating in the session and wished them successful deliberations and a pleasant stay in Nadi.

1.3 Mr Raj expressed his thanks and appreciation to the WMO Secretariat for its efforts in ensuring and supporting the participation of the Working Group members. He also thanked the Government of Fiji for hosting the session and the Fiji Meteorological Service (FMS) for assisting with the organization of the meeting.

1.4 Mr M. Tawfik, on behalf on the Secretary-General of WMO, added his words of welcome to the participants. He expressed WMO's appreciation to the Government of Fiji and in particular to the Fiji Meteorological Service (FMS) for hosting the meeting and helping with the arrangements. He outlined the purpose of the meeting and the expected outcome. Mr Tawfik urged the participants to reinforce the role of the Working Group and to ensure that its activities are targeted at the needs of the region. He concluded by assuring the participants of WMO's support for their activities and wished them successful deliberations.

1.5 Mr R. Prasad, the Director of FMS and the Permanent Representative (PR) of the Government of Fiji with WMO officially opened the session. He welcomed the participants to Nadi and to the Meteorological Service and outlined the importance of water issues in the region. Mr Prasad pointed out that many of the RA V countries had fragile environments and that the combination of climate change and growing populations were placing increased pressure on valuable and scarce water resources. He referred to recent flood and drought events in the region and also highlighted the implications in the region of the 2004 tsunami in the Indian Ocean.

2. ORGANIZATION OF WORK OF THE SESSION AND APPROVAL OF AGENDA (*agenda item 2*)

2.1 The meeting agreed on the organization of work for the session and adopted the agenda as given in Annex 2. The session was divided into three parts. The first two days were for reviewing the work that had been carried out by members of the group, agreeing on the steps to complete their respective assignments and establishing a proposed workplan for future activities to be submitted to the fourteenth session of RA V for consideration. The third day was allocated to discussions on the Pacific-HYCOS proposal. The fourth and fifth days were devoted to a workshop on Integrated Water Resources Management (IWRM) and a review of the report of the meeting.

2.2 The WMO Secretariat informed the meeting that all the documents had been circulated by email prior to the meeting and distributed a hardcopy of these documents to all participants. The meeting was also informed that a number of WMO reference documents and meeting reports were available for use during the meeting and that a copy of the report on Integrated Flood Management was available for interested members of the Working Group.

3. CONSIDERATION OF RELEVANT DECISIONS OF Cg-XIV, XIII-RA V, CHy-XII AND ECs-LIV, LV, LVI, LVII (agenda item 3)

3.1 The WMO Secretariat informed the meeting of major decisions taken by Cg-XIV, XIII-RA V, CHy-XII, EC-LIV, EC-LV, EC-LVI and EC-LVII, which were relevant to regional aspects of hydrology and water resources programmes. Some of these decisions are summarized below.

3.2 The meeting noted that the thirteenth session of the Regional Association V (South-West Pacific) was held in Manila, Philippines (May 2002) where resolution 14 (XIII-RA V) was adopted re-establishing that the Working Group on Hydrology was open to all Members of the Region, with a core membership composed of a chairperson and seven expert members. It agreed to and endorsed WGH training proposal.

3.3 The meeting noted that the fourteenth World Meteorological Congress (Cg-XIV) met in Geneva in May 2003 and adopted Resolution 24 (Cg-XIV) to use the subtitle "Weather, Climate and Water" on all official documentation, correspondence and publications. It was agreed that the adoption of the subtitle has improved recognition of the role of the WMO in the field of water both within and outside the organization.

3.4 The meeting also noted that a comprehensive report on the status of HYCOS projects has been prepared by the Secretariat and was discussed during CHy and presented to the fifty-seventh session of the Executive Council. The report covers the current status of implementation of the regional components, their successes and pitfalls, challenges, international exchange of data, standardization issues and how the global concept of the project will be retained. The EC-LVII discussed the report and encouraged the Secretary-General to strengthen efforts towards the implementation of HYCOS projects.

3.5 The meeting was pleased to learn that Mr B. Stewart (Australia) and Mr J. Wellens-Mensah (Ghana) were elected respectively President and Vice-President of the Commission. Mr Stewart briefed the meeting on the output of the twelfth session of CHy. More information on CHy activities is provided under agenda item 6.

3.6 Participants recalled the proposal of CHy for the establishment of national committees to coordinate hydrological activities and water-related matters and requested all international and regional agencies within the region that carry out programmes in hydrology and water resources, coordinate their activities through integrated work programmes. It felt that formation of national committees to coordinate water-related activities of regional (SOPAC, SPREP) and international (WMO, UNESCO) organizations and provide guidance in the formulation of national inputs to regional programmes would contribute substantially in improving the current situation.

3.7 The participants realized that there is a need for the results and achievements of decisions made at XIII-RA V in Manila to be considered when the Working Group plans new areas of activities. In this regard, the meeting requested WMO and SOPAC to conduct an evaluation of the training courses to assess impact and value of such activities.

3.8 The Chairman stated that recommendations from WGH to RA V for the last 6 intersessional periods have been very similar and that a lot of effort has gone into defining what is needed within the region. He noted that although there were noticeable achievements in the area of training and development of Pacific-HYCOS, there had been limited success in other activities. The meeting requested the President of CHy and the WMO Secretariat to increase their efforts within WMO to secure additional resources for hydrology within the region. Participants agreed

that the topic of strengthening visibility of WMO in hydrology in the Region should be discussed further when considering Future Work Programme under agenda item 9.

3.9 The meeting was informed how SOPAC continues to make considerable efforts to plan its activities in cooperation with other organizations such as SPREP, UNESCO and WMO, in part through the Pacific Partnership Initiative on Sustainable Water Management. The meeting noted that if the Pacific- HYCOS might provide a good opportunity to support hydrological activities in the region. Participants agreed that the needs of Asian members of the region; (Malaysia, Indonesia, Singapore and Philippines) should be considered in developing other HYCOS component.

3.10 The meeting was informed about a range of mechanisms that were available to improve communications between members and other related groups and organizations. While noting that these mechanisms were available, participants still felt that improved communications between all parties were essential for a reduction in duplication of effort and ensuring progress in the Region. This cooperation could be facilitated by the identification of concrete actions such as the Hydrology Training course and the Pacific-HYCOS proposal. All participants agreed that close cooperation and improved communications were keys to successful activities in the Region. They felt that only one Working Group meeting every four years did not facilitate improved cooperation and communication and urged the WMO Secretariat to seek additional opportunities for the Working Group members to interact.

3.11 The meeting was informed of discussions held at EC-LVII to encourage Technical Commissions and Regions to work more closely together. Mention was also made of the different budget sources for funding which make it difficult to achieve cooperation and that by aligning Working Group activities with CHy activities can reduce duplication of effort and maximize opportunities to access additional resources.

3.12 Participants expressed concern about WMO's mechanisms of communication and urged the WMO Secretariat to establish direct links with the Working Group. The WMO Secretariat outlined processes of communication with participants. All correspondence is addressed to the Hydrological Advisors (HAs) and hydrological experts where they are known as well as Permanent Representatives. In order to achieve this, up-to-date coordinates of all HAs and experts were essential. Participants thanked the Secretariat for its efforts to improve communication and requested it to distribute an updated list of members' coordinates so that the Working Group members are regularly informed of changes. The regular update of this information may also prompt Working Group members to contact each other to seek advice about problems or issues and share information.

4. REPORT OF CHAIRMAN OF WORKING GROUP (*agenda item 4*)

4.1 Chairman of Working Group, Mr Raj, started his presentation with an overview of the structure and objectives of WMO Hydrology and Water Resources Programme and the Sixth WMO Long-Term Plan 2004-2011. He also reminded the meeting about the structure, function and responsibility of the Working Group. He briefed the meeting on the relationship between WGH and the CHy.

4.2 He reminded the meeting of the terms of reference of each rapporteur and sub-group and reported on activities of the group during the last intersessional period. He expressed concern about the lack of progress in some areas and urged participants to take every

opportunity to promote hydrology in the Region and assist in the coordination of WMO and UNESCO initiatives. The Chairman noted that the most successful activities in the past eight years had stemmed from the WMO workshop held in 1999 when the Hydrology Training course and Pacific-HYCOS proposal had been initially developed. These two activities are now progressing well and strengthened the case for increasing the frequency of meetings, targeted at achievable outcomes.

4.3 He also pointed out that there were many other opportunities for associating activities of the Working Group with those of other groups such as GCOS and weather and climate related working groups within the Region.

4.4 He expressed concern about the level of representation of members from RA V at CHy-XII and urged participants to attend future CHy meetings and ensure that Regional needs were identified and addressed by the workplan of the Commission.

4.5 The participants congratulated the Chairman on what he had achieved in the Region, especially in having the Pacific-HYCOS proposal included in the 3rd World Water Forum and agreed that it was of great benefit for the WGH Chairman to be involved in activities of other RA V groups as each of these has some links with water. Such an involvement would raise the profile of hydrology in the region.

4.6 Participants agreed that in considering any future programme of work they would focus on targeted activities and identify actions that are consistent with the role of WMO.

4.7 The SOPAC representative expressed the view that the Working Group had been very successful in a number of areas and that it had provided a key input to both the Hydrology Training course and the Pacific-HYCOS proposal. He also expressed appreciation to the Chairman for his role in promoting these activities. He urged participants to provide feedback from their countries about benefits of the training and other needs of the Region.

4.8 The participants thanked NZAid for funding the implementation of the Hydrology Training course and expressed appreciation for their substantial support towards capacity building in the region. They also acknowledged initial support from WMO in developing the initiative and the role of SOPAC in implementing the training course. They requested WMO and SOPAC to continue supporting the training course.

4.9 The SOPAC representative stressed the importance of coordination and collaboration in hydrological programs as developed and implemented by WMO, UNESCO and SOPAC in recognition of the small size of Pacific Island countries. He also made reference to the joint UNESCO/SOPAC circular that was sent to all national representatives of UNESCO/SOPAC and WMO in order to promote collaboration via the hydrological focal point in each country and urged participants to send official nomination of the focal points. It is recommended that HAs be nominated to be the focal points to ensure better coordination between WMO and UNESCO.

4.10 The meeting was pleased to note that the good coordination between meteorologists and hydrologists in activities of the typhoon committee had continued.

5. REGIONAL ASPECTS OF HOMS, GUIDE TO HYDROLOGICAL PRACTICES, TECHNICAL REGULATIONS AND INFOHYDRO (*agenda item 5*)

HOMS

5.1 The meeting was informed that the HOMS Reference Manual (HRM) is currently having 180 components after being revised and updated after 2001. Unfortunately replenishment of the HRM with new components is not satisfactory as very few national HOMS National Reference Centres (HNRC) are contributing. The Secretariat urged and encouraged RA V WGH to contribute new components to HRM.

5.2 The meeting also noted that CHy-XII recommended that the HRM components for which technical support was no longer available from the originating NHRC but which had proven very useful and were in high demand by HOMS users be retained. It also decided to modify the HOMS selection criteria, by adding a new, general section to the HRM for components "under testing". The meeting agreed that the HOMS concept was still a fundamental pillar of capacity building activities of the HWRP and encouraged participants to use HOMS components when needed. The meeting also urged members to contribute new components in selected areas to HRM.

5.3 Participants agreed that materials produced through the activities of the RA V WGH should be considered as HOMS components.

5.4 The meeting noted that there were both successful and unsuccessful outcomes flowing from the use of HOMS and that while the use of the Internet was a significant advancement, the WMO Secretariat should consider that not all countries have similar access capabilities. The participants suggested that the Secretariat monitor the Internet access to HOMS and provide a report on the level of activity and agreed that information on successful implementation of components would be valuable.

5.5 The SOPAC representative informed the meeting that the HOMS CD and other material received from WMO was distributed to participants at workshops and meetings in the region. Participants urged the WMO Secretariat to consider making HOMS a more encompassing method for accessing hydrological technology and techniques and asked the Secretariat to distribute the soon to be updated CD as widely as possible, making use of a full range of opportunities for distribution in the region, but noting that not all countries have high speed links to the Internet.

5.6 The meeting requested the WMO Secretariat to identify a moderator to facilitate access to HOMS products relevant to small island countries and requested SOPAC to assist in this activity, making use of existing communications (e-network) between hydrologists.

Guide to Hydrological Practices, Technical Regulations and INFOHYDRO

5.7 The meeting noted that AWG, in cooperation with the Secretariat, had decided to give priority to the preparation of the sixth edition of the Guide. A Review Committee had been established under the chairmanship of Prof. K. Hofius and composed of experts from India, South Africa, Uganda, Canada and Venezuela.

5.8 The meeting also noted that the first meeting of the Review Committee was organized in Geneva in July 2003 to develop structure and table of contents of the new edition. The new edition will be in two volumes; Volume I Hydrology for measurements to hydrological information

(10 chapters), and Volume II Management of water resources and application of hydrological practices (7 chapters). The Review Committee also identified a lead author for each chapter. The Secretariat informed the meeting about the current status of the draft and appreciated contributions from experts in the group on specific chapters.

5.9 The meeting was informed that the CHy had decided to assign the responsibility to the AWG of making recommendations and amendments to the Technical Regulations considered to be urgent. It also noted that once the revised and simplified version of INFOHYDRO is ready the RAs WGH should contribute to the revised version in each region and the Vice-President with assistance from WMO Secretariat should compile a global version.

5.10 The meeting appreciated efforts made by the CHy AWG in updating the Guide and asked AWG to ensure that the Guide continued to be provided as a CD version and be available for access through the Internet.

6. WMO CHy ADVISORY WORKING GROUP ACTIVITIES *(agenda item 6)*

6.1 Mr Stewart , President of the WMO Commission for Hydrology, (CHy) briefed the meeting on the output from CHy activities over the past four years and also outcomes of the twelfth session, establishment of the Advisory Working Group and establishment of the Open Panels of CHy Experts (OPACHE).

6.2 The meeting was informed that highlights of the past four years had been:

- acceptance by Congress of the sub-title “Weather, Climate and Water” for WMO and that this was due to strong efforts of the past President of CHy, Mr Rutashobya;
- compilation and distribution of a CD on manual for assessing capability for Water Resources Assessment including workshop notes and test exercises;
- review and revision of the Guide to Hydrological Practices;
- preparation of a draft manual on Probable Maximum Precipitation estimation;
- progress in reviewing techniques for Quantitative Precipitation Estimation and Forecasting;
- development of automated rating curve derivation; and
- contributions to WMO disaster mitigation programme.

6.3 The meeting noted that the Commission had established an Advisory Working Group (AWG), composed of nine members, and five Open Panels of CHy Experts (OPACHE) on five thematic areas: basic systems (hydrometry and hydraulics), water resources assessment and water use, hydrological forecasting and prediction, disaster mitigation – flood and droughts (hydrological aspects) and analysis of hydrometeorological data for variability and trends. The Commission also included in its future plan of work activities associated with WHYCOS, international data access and exchange, capacity building and technology transfer, and development of the sixth edition of the Guide to hydrological Practices.

6.4 The meeting requested that, in order to streamline the process, when members of the WGH are appointed, it should include endorsement of them to become members of relevant CHy OPACHes. This will enable improved cooperation and collaboration of RA V WGH with activities of CHy.

6.5 The meeting appreciated the Commission's concerns regarding the decline of financial support provided to the organization of sessions of Regional WGH. The meeting requested the Regional Hydrological Advisor to the President of RA V to ensure concrete inputs to the report of the president of RA V to EC in order to reflect hydrological and water issues in the region. The meeting also requested that RA V be included in the WMO Flood Forecasting Initiative and, noting that flooding was a major issue in RA V countries, strongly recommended that a Regional Workshop be held in RA V similar to those being held in other RAs.

6.6 It was noted that the Commission adopted a WMO Strategy on Education and Training in Hydrology and Water Resources. The strategy aims at assisting Members in assessing their education and training needs so that NHSs can effectively contribute to integrated water resources management in their countries. The primary target group of the strategy is represented by technical staff of the NHSs at all professional levels, followed by academic and other government agencies involved in hydrology and water resources activities. Education and training supported by WMO should be in principle demand driven and therefore RA WGHs are requested to provide inputs for identifying priority areas of action. A questionnaire was circulated to participants to prioritize education and training activities supported by WMO in the next biennium 2006-2007. The meeting requested that when acting on the survey every effort should be made to build on training activities already implemented in the region.

6.7 The meeting noted that CHy recognized the increasing need for education and capacity building to support sustainable development and need for improved interdisciplinary approach, adopted a recommendation Rec. 3 (CHy-XII) inviting the Executive Council to widen the scope of the WMO Regional Meteorological Training Centres (RMTCs) in order to accommodate other scientific and technical disciplines under WMO activities, e.g. by modifying the title of WMO Regional Training Centres (RTCs) and by modifying criteria of their recognition. The meeting was informed about the existence of national Hydrological Training Centre in Indonesia and welcomed a proposal by Indonesia to upgrade this to a WMO Regional Hydrological Training Centre and recommended RA V to consider the offer during the next session of RA V.

6.8 The meeting noted that results of the questionnaire on the exchange of hydrological data and products were circulated to all Members including Region V. The results showed that there is a widespread need for international data exchange and that a majority of the respondent countries are satisfied with the present level of exchange, although almost all of them place restrictions of some sort on it. Resolution 25 (Cg-XIII) was reasonably widely known, and most of the countries recognized its potential positive impact on the exchange of data and products. Types of data most commonly exchanged are water level and discharge, while the strongest needs expressed are for more timely forecasts and information on water quality, including warnings on accidental pollution of water bodies.

6.9 The meeting agreed that exchange of hydrological data and products is a vital requirement to reduce flood losses, maximize successful management of rivers and support hydrological studies and also for improving the understanding potential changes in the global water and energy cycle. It also requested Member countries to implement Resolution 25 (Cg-XIII) in dealing with data exchange activities with other countries, the research community and international data centres. The meeting also noted that many NHSs were facing problems in developing standards for hydrological data and information exchange and invited the Secretariat to develop further efforts in that direction, in cooperation with NHSs.

6.10 Participants were informed that the CHy AWG was focussing on the following activities over the first two years of its operations:

- An Intercomparison of Hydrological Information Systems;
- Compilation of a Manual on Streamflow Gauging;
- Further Development of Automated Hydrometric Data Production Software;
- Scoping of purpose and content of guidance for Water Resources Assessment;
- Compilation of a Manual on Flood Forecasting;
- Development of further guidance on hydrological applications of QPF and QPE;
- Compilation of a Manual on Estimation of Design Floods;
- Compilation of a Manual on Estimation and Prediction of Low Flows; and
- Identification of Pristine River Basins.

6.11 The meeting noted that CHy requested AWG to compile a discussion paper on the advantages and disadvantages of changing the name of the Commission for Hydrology to "Commission for Hydrology and Water Resources", in line with the programme and department names and the inclusion of the term "water" in the Organization's subtitle. The President of CHy requested members of the Working Group to convey their views on this matter to him by e-mail not later than 31 November 2005.

7. CONSIDERATION OF WORK OF SUB-GROUPS

7.1 The Chairman of WGH informed the meeting that Resolution 14 (XIII-RA V) established a Working Group on Hydrology and assigned to it a number of specific tasks to be carried out during the period 2002-2005. RA V identified ten topics as being of relevance for WGH's future Work Programme:

- I. Hydrological Training
- II. Technology and Data Standards
- III. Hydrological Network Maintenance Support
- IV. Integrated Water Resources Management
- V. Public Awareness of the Value of Hydrological Data and Products
- VI. Climate Change and Variability (including ENSO)
- VII. Regional Information and Communication Systems
- VIII. Numerical Weather Products for Operational Hydrology
- IX. Application of HOMS
- X. Linkages with the Typhoon Committee and the RA V Tropical Cyclone Committee

7.2 The meeting noted that the Working Group was also requested to cooperate with the WMO Commission for Hydrology and other WMO bodies and other international organizations and provide assistance and advice to the President of the Regional Association on matters relating to WMO Hydrology and Water Resources Programme. These tasks have largely been carried out by the chairman of the Working Group and are reported in paragraph 4 above.

7.3 The meeting noted that, as requested by the Association, the Regional Hydrological Adviser and Chairperson of the working group identified, in consultation with the president of RA V, its top five priorities from the work programme listed above for implementation during the intersessional period. For the top five priority activities, specific objectives, implementation strategies and success criteria were developed and five rapporteurs were assigned specific tasks.

7.4 The meeting reviewed the work that had been carried out to date by the various rapporteurs on the basis of their draft technical reports which they presented. The work of each rapporteur is summarized below.

Hydrological Training & Numerical Weather Products for Operational Hydrology

7.5 Mr Raj (Fiji), as rapporteur on Hydrological Training and Numerical Weather Products for Operational Hydrology, reported on the hydrological training activities which had been undertaken in the Region since the last meeting of the RA V WGH. He noted that education and training have always been a priority issue for the region and that the need has been most pressing in the Pacific Island Countries. Two restrictions on the existing training initiatives include limited funding for scholarships and high entry qualification requirements. He added that the need to provide training at a level commensurate with the skills required, available staff, and the right environment were essential requirements of a training programme. Following the development of a Hydrological Technician Training proposal at the WMO workshop in Fiji in 1999 and with funding support from NZAid, SOPAC have implemented a four-week training course for hydrological technicians.

7.6 The meeting was pleased to note that the first four-week training course held from 19 April to 14 May 2004 at SOPAC and provided training to hydrology and water resources technicians from seven Pacific Island Countries (Fiji, Cook Islands, Samoa, Solomon Islands, Papua New Guinea, the Federated States of Micronesia and Vanuatu) was successful. The training was targeted at technicians with some experience in field hydrology, an interest in hydrology and a desire to learn.

7.7 The meeting was informed that the second year programme was a combined course on surface and ground water. It was held at SOPAC and the Fijian Mineral Resources Department over the period 4 to 22 April 2005. The course was divided into groundwater and surface water and catered for 18 participants from 13 Pacific Island Countries.

7.8 The meeting was pleased to note that feedback from all participants for both the first and second year training programmes had been very encouraging. The meeting expressed its appreciation to SOPAC for implementing the course and NZAid for providing funding.

7.9 The Chairman identified applications based training focussed on hydrological forecasting (floods and droughts), numerical methods, water quality, climate prediction and disaster preparedness and mitigation as the next major requirement for the region. He noted that the Pacific-HYCOS project would provide additional opportunities for training initiatives in the future.

7.10 He reported that issues related to hydrology and water resources continued to attract a high level of interest in WMO and that as a result, the Executive Council Panel of Experts on Education and Training had requested an expert from the hydrology domain be invited to its future sessions.

7.11 The SOPAC representative made a presentation on its activities associated with hydrological training courses (see also agenda item 8). The meeting was pleased to note the following points:

- An assessment of competences was needed
- NHSs and NMSs need to be involved in the training programme
- A questionnaire will be disseminated after the 3rd year course

- The 3rd course planned for 2006 may have separate arrangements for Northern Pacific countries
- Higher level (tertiary) education is needed
- There is a UNU distance learning course on IWRM with USP
- There is an Earth Science and Marine Geology Certificate Course through SOPAC/USP
- SOPAC/USP/UNEP have established a wastewater management training course
- Training materials are to be put on CD ROM and disseminated and will be available for other countries (e.g. Maldives, Caribbean)
- An evaluation report on the last training course will be finalised and sent to participants, partner organisations and donor agencies
- A Pacific Hydrology and Water Resources e-network has been established as a network for Pacific hydrological focal points

7.12 The meeting noted that the selection of material to be used in the hydrology training courses was left to the trainer and that unfortunately material available from WMO was not used in the course on this occasion. The meeting recommended to SOPAC that WMO material (eg. Guide to Hydrological Practices) could be provided to all participants for the next course.

7.13 Participants agreed that some form of evaluation of the impact of the training activities would be beneficial and requested SOPAC to conduct such evaluation and assessment. This could cover both, views of the participants and of their supervisors. Formal course accreditation and skills testing/evaluation was also discussed and it was agreed that while this may be an advantage, it would be a time consuming and difficult process and thus a balanced approach was necessary in terms of skills training, on-the-job training and the degree of accreditation.

7.14 The Chairman urged SOPAC and the trainers to consult with members of the WGH when planning and developing the programme and materials for the 3rd training course. He noted that the third course would be held in 2006 and that currently there were no provisions for future courses. He suggested that a proposal be developed for additional national training either through roving seminars/workshops or “train-the-trainer” workshops. It was agreed that each approach has its positive and negative side and that an ideal starting point would be an evaluation and assessment of the impact of the current three-year training program.

7.15 The participants also noted that should the Pacific-HYCOS project be implemented, the training courses could be integrated with training requirements for the Pacific-HYCOS and a Regional Hydrological Training Centre be established in the Pacific area.

7.16 Participants were informed about training available through Hydrological Services Pty Ltd in Sydney, Australia and also through the Open Training and Education Network in Sydney, Australia. They noted that “brain drain” was still a major issue for RA V countries and that training should be a continuous process targeted at all levels.

Technology and Data Standards & Application of HOMS

7.17 Mr Pearson (New Zealand) as Rapporteur on Technology and Data Standards & Application of HOMS presented his report. The meeting was informed that hydrological data standards used in RA V countries are mainly based on ISO standards, WMO guidelines and technical regulations. John Fenwick of NIWA (New Zealand) provided a draft chapter on “Data processing and quality control” for the next edition of the WMO’s “Guide to Hydrological Practices”.

A number of new technologies were used in the region, including hydrometric technology - new types of data loggers, water level probes, pressure transducers, Internet based data telemetry and acoustic flow measurement, data processing software - and new analysis tools (e.g., rainfall and flood hazard mapping).

7.18 Technology needs identified were remote sensing data and Geographic Information Systems for hydrological analysis, flood and drought forecasting, and low and flood flow frequency software for modern PC operating systems - all possible future HOMS components. Overall, there was a low level of use and awareness of HOMS. A WMO regional centre (such as a virtual "Hydrology Centre", and / or a hydrologist in the WMO RAV office) would help increase HOMS awareness and use, and, generally, provide a much needed regional focal point and communications centre for operational hydrology. The meeting suggested that the proposed virtual hydrology centre could be linked to the existing Pacific e-network on hydrology and water resources.

7.19 Participants were informed of the availability and role of WMO Technical Regulations (Hydrology) and how they referred directly to ISO standards.

Hydrological Network Maintenance Support and Climate Change and Variability

7.20 Mr Parakoti (Cook Is) as Rapporteur on Hydrological Network Maintenance Support and Climate Change and Variability presented a report focussed on hydrological maintenance of networks in a variable climatic situation. He noted the importance of hydrology for development across the region. He stated that water resources management issues varied across the countries, involving rainwater harvesting, underground water and surface water to varying degrees. The locality and size of the countries within the region and the extreme weather phenomenon they face are also key factors impacting network maintenance in the region.

7.21 He reported that lack of financial support for hydrological networks at the national and local level, low priority placed on data collection by many governments, lack of public awareness of the importance of hydrological data, lack of adequately trained staff at all levels and old or outdated equipment were all factors impacting the maintenance of hydrological networks. These factors all result in a lack of high quality long-term hydrological data being available for hydrological analysis and design of water management systems.

7.22 He requested participants to complete a questionnaire on hydrological network maintenance and funding arrangements. He will compile this information and use it in completing his report. Participants encouraged Working Group members to complete the questionnaire and return it as soon as possible.

7.23 Participants discussed the possibility of establishing a trust fund to assist NHS's in maintaining networks and requested the Chairman of the Working Group to follow up this suggestion and make a proposal to XIV-RA V (see agenda item 8).

7.24 Participants agreed that an inventory of the instruments being used in the Region would provide valuable reference material and support collaborative approaches to instrumentation. The participants requested Australia to provide information to the Chairman on functions of the Regional Instrument Centre in Melbourne, and to assist in the compilation of such an inventory.

7.25 The meeting was briefed on standards (WMO standards) to which hydrological equipment was made and facilities available for instrument calibration in Australia.

Integrated Water Resources Management

7.26 Mr James (Australia) presented a report on Integrated Water Resources Management. Material included in the report covers; a brief description of the definition and underlying principles of IWRM, relevance of IWRM to the countries in RA V, discussion of issues relevant to the application of IWRM, description of some readily accessible education and training material to guide the implementation of IWRM and identification of cases studies which may be relevant to the region.

7.27 The report emphasized that IWRM can start a process for implementing the Dublin principles which can be a beginning. It is about cooperation and joint planning activities across sectoral boundaries; integrated basin-wide planning, and community level cooperation. Most importantly, IWRM is about information, and communication; about good planning based on a sound, and broadly based understanding of people's needs, and constraints imposed by working with a finite resource. The report concluded that there is a wealth of readily accessible information to describe and guide implementation of IWRM and that while there have been failures and difficulties in transferring IWRM experience, the IWRM process will improve water resources planning and management in RA V.

7.28 The meeting was pleased to learn about IWRM's national and regional activities, including:

- Additional local/national IWRM (type) initiative from Fiji (Nadi River Basin, Wainimela), Cook Islands and Kiribati;
- That water Governance is unique to the region (legal pluralism) including customary law;
- Adoption of global IWRM concept for local situation: IWRM "Island Style" is needed;
- An MOU has been signed with the Global Water Partnership to collaborate further on IWRM in SE Asia and the Caribbean; and
- A GEF project for the development of a full-sized IWRM programme in Pacific Island Countries has been approved. This will allow development of an IWRM demonstration (2006-2012). Input will be required from partner organisations to assist in the design.

7.29 Participants recognised the need for an IWRM approach and noted relationships between IWRM and Integrated River Basin Management and Integrated Flood Management.

7.30 Participants recommended that the final report be available on the RA V WGH Website once it is in place and that linkages to Internet material be available.

7.31 Participants agreed that NHSs should continue to promote the role and function of data collection networks and operational hydrology in providing essential information for IWRM.

Public awareness of the Value of Hydrological Data and Products and Linkages with Typhoon Committee and RA V Tropical Cyclone Committee

7.32 Ms Bautista (Philippines) reported on public awareness of the value of hydrological data and products and linkages to Typhoon Committee and the RA V Tropical Cyclone Committee. She noted that her report was based on responses to questionnaires received from a number of countries and asked other representatives at the meeting to provide her with additional responses.

7.33 Ms Bautista reported that there is a wide range of hydrological data and products used and/or required within the region and a wide spectrum of water-related data is available. Significant efforts are made by RA V members in the collection of hydrological and hydro-meteorological data to cater for various types of hydrologic applications in the region. She noted that several members of RA V have embraced the use of remotely sensed data for application in a number of hydrological activities, including flood forecasting. Based on the preliminary results of her survey, she noted that five priority areas had been identified by members:

- Water Resources Development and Management
- Flash Flood Warning
- Flood Forecasting
- Flood Prevention Programs
- Water Use Allocation

7.34 Ms Bautista reported that many case studies emphasize the value of such hydrological data and products. She stated that the inclusion of hydrological data and products in reports, published or unpublished, is indicative of the importance of hydrological data and products. In the US, a study made by the National Hydrological Warning Council showed an annual economic benefit of \$766 M from the use of long-term hydrologic forecasts. WMO Secretariat provided participants with a copy of a report on an Expert Meeting on Economic Valuation of Hydrological Services held in Geneva in September 2005.

7.35 She reported briefly on promotional activities of hydrological data and products within RA V, noting that the promotion of hydrologic data and products is essential in the improvement of public awareness of its tangible benefits. The following were considered as the most effective modes of following hydrological applications in the RA V region:

Real-time data and products:

- a) Internet services
- b) Media

Non-real time data and products:

- a) Internet services
- b) Publicity

7.36 Ms Bautista stated that her final report would address new data products in the region and guidelines for determining the value of hydrologic data products and promoting its use. She reported also on her involvement in the Typhoon Committee Working Group on Hydrology and urged closer cooperation between RA V WGH and TC WGH and the RA V Tropical Cyclone Committee.

7.37 Participants agreed that close contact with the Typhoon Committee WGH should continue and urged the Chairman with WMO's assistance to establish relations with other relevant groups, including the WMO Disaster Prevention and Mitigation Programme.

7.38 Participants acknowledged the excellent work of the rapporteurs in compiling their reports to the meeting and recommended that final reports be made available electronically and placed on the RA V WGH website.

8. COOPERATION WITH OTHER WMO BODIES AND INTERNATIONAL ORGANIZATIONS IN PROJECTS RELATED TO HYDROLOGY (*agenda item 8*)

8.1 The meeting noted that WMO, jointly with ISDR, took the lead in planning the celebrations for World Water Day 2004 under the theme "water and disasters". The emphasis in the awareness campaign was 'be informed and be prepared'. WMO prepared an Information kit and established a website (www.waterday2004.com).

8.2 It also noted that the United Nations General Assembly has proclaimed the period from 2005 to 2015 as the International Decade for Action "Water for Life", starting on World Water Day, 22 March 2005. WMO jointly with ISDR will contribute on the theme of disaster risk reduction.

8.3 The meeting noted that the "Joint UNESCO/WMO Flood Initiative (JUWFI)" subsequently extended to other UN agencies and renamed "International Flood Initiative" (IFI) was launched during the World Conference on Disasters Reduction in January 2005 by Mr K. Matsura, Director General of UNESCO and Mr M. Jarraud, Secretary-General of WMO. The initiative will promote an integrated approach to flood management, to maximize the long-term benefits of floods and minimize hardship, loss of life and damage to goods and assets that result from floods. It will focus on research, training, information networking, promoting good governance and providing technical assistance.

8.4 The meeting noted that in recognition of the important role of the ACC Sub-committee on Water Resources, the UN Secretariat decided to re-establish the sub-committee as UN-Water. WMO's strong support and efforts were instrumental in the establishment of UN-Water. WMO has been elected as chair of UN-Water Africa for the next two years. In this capacity it will also be a member of the Governing Board of the African Water Facility for two years (2005-2006).

8.5 Participants requested to be informed of future developments and agreed that activities they may undertake in the area of flood forecasting and warning could contribute to the IFI.

WMO Flood Forecasting Initiative

8.6 The meeting noted that in 2003 WMO launched a Flood Forecasting Initiative with the principal objective of strengthening cooperation between national Hydrological and Meteorological Services to deliver timely and more accurate products and services required in flood forecasting and warning. The initiative will be implemented through the organization of a number of regional workshops, attended by experts directly involved in the preparation of forecasts, and will be concluded by a final global conference in 2006. Results of the conference will serve as input in the review of cooperation between NMHSs, and promotion of applications of NWP products for flood forecasting.

8.7 The meeting was pleased to learn that WMO is planning to organize three workshops for RA I, RA II and RA VI during 2005 and requested WMO to involve the RA V WGH in such activities and also consider organizing a workshop for RA V.

8.8 The meeting strongly recommended that consideration be given to holding a regional workshop in RA V so that RA V issues and approaches can be fully represented in a global conference. Participants also strongly encouraged improved linkages and relationships with NMSs not only in flood forecasting, but also climate outlook and drought predictions.

Associated Programme on Flood Management

8.9 The meeting was informed that the Associated Programme on Flood Management (APFM), a joint initiative of the World Meteorological Organization (WMO) and the Global Water Partnership (GWP), was established in order to promote the concept of Integrated Flood Management (IFM) and show practical steps for putting IFM concept into practice.

8.10 It noted that APFM was launched in August 2001 with funding from the Government of Japan and the Netherlands. In the framework of the programme's activities nineteen case studies on existing flood management policies have been completed (three of them in Europe: Italy, Turkey and United Kingdom) and four pilot projects have been implemented (South East Asia, Kenya, South America and Central and Eastern Europe). A concept paper on IFM has also been prepared, as well as four documents on legal, ecological, economical and social aspects of IFM.

WMO Natural Disaster Prevention and Mitigation Programme

8.11 The meeting noted that through Resolution 29 Cg-XIV WMO has established a Natural Disaster Prevention and Mitigation (DPM) Programme to develop an organization-wide coordinating framework to enhance WMO's contribution to the natural disaster risk reduction activities at the international, regional and national levels. The fifty-sixth session of the Executive Council established an Advisory Working Group with a mandate to overview activities of the Programme.

8.12 The meeting was pleased to note that in the framework of this programme a session on "Integrated flood risk management through appropriate knowledge sharing and capacity building systems" was organized by the Government of Japan, the World Meteorological Organization and the Australian Bureau of Meteorology during the World Conference on Disasters Reduction (Japan, January 2005).

8.13 The meeting was also informed that WMO has been asked to assist in the conceptual preparation of the Fourth World Water Forum (4th WWF) (Mexico, March 2006), particularly in the development of the Thematic Area on Risk Management, a clear recognition of the leading role the Organization is seen as having in this field. A Baseline Document on the subject has been prepared and assistance is being provided in the organization of thematic sessions both of the virtual forum and of the 4th WWF itself.

8.14 Participants were informed about the Pacific Island contributions to the 3rd WWF and preparations for the 4th WWF. They were requested to provide feedback and comments to SOPAC on the Pacific position paper for submission to the 4th WWF to be held in Mexico in March 2006.

South Pacific Geoscience Commission (SOPAC)

8.15 Participants were briefed on the past and future activities of SOPAC in hydrology including the Hydrological Training Programme and the Pacific-HYCOS proposal. The participants urged WMO and SOPAC to continue their cooperation to meet hydrological needs of the region.

WMO Information System

8.16 The meeting noted that WMO has started consultations among Members in view of the development of the Future WMO Information System (FWIS). The FWIS is designed to cover data

needs of all WMO programmes. To govern the process of development of FWIS an Inter-Commission Team on FWIS has been established; Mr Givone (France) has been designated by the President of the Commission for Hydrology to represent CHy in this team. Mr Givone participated in the FWIS meeting in January and October 2005. The meeting noted that developments in the FWIS might have implications for the Pacific HYCOS proposal and requested the WMO Secretariat to keep them informed of progress in this activity.

9. FUTURE WORK PROGRAMME (*agenda item 9*)

9.1 The meeting was informed that the fourteenth session of WMO Regional Association V would be held in Adelaide, Australia from 9-16 May 2006. It therefore agreed that the draft report of the sixth session of RA V WGH be finalized by the end of November 2005 and circulated to the Chairman and all working group members.

9.2 Having considered the reports of the Chairman and the rapporteurs and discussions during the session, the meeting agreed on a Future Programme of Work under six areas, namely:

- Raising the visibility of WMO in the Region
- Raising awareness in water issues at the national level
- Re-establishing the Regional Newsletter
- Targeting training and improved HR development and capacity in RA V
- Improving Network Maintenance
- Increasing knowledge on flood and drought forecasting, with a background of climate variability and change

9.3 A detailed workplan including set of strategies/actions and expected outputs/outcomes is provided in Annex 3 of this report.

9.4 Realizing the importance of hydrological issues in the region and the vital role of WGH in assisting the region in water issues, the meeting agreed to recommend to the Regional Association that the Working Group on Hydrology be re-established by XIV-RA V for the next intersessional period. The meeting noted with thanks the valuable concrete work and achievements by Mr Raj in leading the Group and recognized with appreciation the considerable efforts he has made in fulfilling his duty as chairman. The meeting also recognized the excellent work achieved by Rapporteurs and thanked them for their valuable contribution. Experts from WGH expressed interest to be assigned as Rapporteurs for specific activities during the next intersessional period. A representative of the Secretariat informed the meeting that experts who are willing to be assigned as Rapporteur or Chairman for the Group should convey their interest to the Permanent Representative in their countries and request him to nominate them during the forthcoming XIV-RA V, Australia, May 2006.

9.5 Participants were reminded to be included as members of the CHy OPACHEs in which they have expertise and recommended that the WMO Secretariat include such a process of representation on the RA V WGH.

10. Pacific-HYCOS WITHIN WMO WHYCOS PROGRAMME (*agenda item 10*)

10.1 The WMO Secretariat briefed the meeting on the current status of the various HYCOS projects. The meeting was pleased to note that the implementation of the WHYCOS programme

has continued with the development of new components, mainly in Africa, Asia and Central America with financial support from the EU, Governments of France and the Netherlands.

10.2 The meeting also noted that a comprehensive report on the status of the HYCOS components is being prepared and submitted to EC in May 2005. The report covers the current status of implementation of regional components, their success and failures, issues of data exchange and standardization, and the long-term sustainability. WMO Secretariat is also preparing guidelines on the development, implementation and governance of HYCOS components.

10.3 The meeting noted with satisfaction that WMO is preparing guidelines on the development, implementation and governance of HYCOS components and special web page for the WHYCOS. These two important products will be launched during the next WIAG meeting to be organized in November in Geneva. The meeting commended the WMO Secretariat on the preparation of this material and was pleased to hear that it will be available for use in the Pacific region.

10.4 The SOPAC representative briefed the meeting on the current status of developing the Pacific-HYCOS project in collaboration with WMO. The project has been submitted to EU-Water Facility for funding. The meeting was pleased to note that WMO Secretariat is cooperating with SOPAC in securing funds for the project and requested them to continue their efforts to ensure successful implementation of the project.

11. TRAINING WORKSHOP ON IWRM (*agenda item 11*)

11.1 The fourth and fifth day of the session were devoted to a training workshop on Integrated Water Resources Management. The following presentations were made:

- Introduction to IWRM (Mr Ross James, Australia)
- IWRM Pacific Style (Mr Marc Overmars, SOPAC)
- IWRM – GEF Project (Mr Marc Overmars, SOPAC)
- Groundwater training (Mr David Scott, New Zealand)
- Kiribati Water Sector Review, (Mr Eita Metai, Kiribati)
- Water Policy in the Solomon Islands (Mr Charlie Bepapa, Solomon Islands)
- National Water Initiative Australia (Mr Bruce Stewart, Australia)
- Rainfall Networks in Micronesia (Mr Seperiano John, Micronesia)
- Hydrological Networks in Papua New Guinea, (Mr Maino Virobo, Papua New Guinea)
- IWRM in the Cook Islands (Mr Ben Parakoti, Cook Islands)
- Hydrological Activities in New Caledonia (Mr Geoffroy Wotling, New Caledonia)
- Flash Flood Warning in French Polynesia (Mr Yves Gregoris, French Polynesia)
- Flash Flood Warning in the Philippines (Ms Margaret Bautista, Philippines)
- Catchments and Communities in Vanuatu (Mr Ericson Sammy, Vanuatu)
- Water and Health in Tonga (Mr Saimone Helu, Tonga)
- AusAID Climate Prediction Project (Mr Bruce Stewart, Australia)
- Fiji Application of AusAID Project (Ms Ritshni, Fiji)
- Climate and Water (Ms Komal Raman, SOPAC)
- Climate and water Dialogue (Mr David Scott, SOPAC)

A summary of the outcome of the training workshop is provided in annex 4 to this report.

12. ANY OTHER BUSINESS (*agenda item 12*)

12.1 The meeting appreciated WMO's support to the participants to enable them to participate in the meeting and recognized the vital role of WMO's Sub-regional office in coordinating their activities. In this regard, the meeting recommended RA V to request the Secretary-General of WMO to urgently consider strengthening the sub-regional office with professional staff for water related issues as agreed to by XIII-RA V.

13. ADOPTION OF THE REPORT AND CLOSING SESSION (*agenda item 13*)

Recommendations

13.1 Working Group members recommended that, in reporting to XIV-RA V, the Chairman of the WGH strongly propose and support the following recommendations:

- XIV-RA V agrees to and support a dedicated hydrology position for the Sub-regional office in Apia as agreed to by XIII-RA V. This position would strengthen the role of WMO in regional hydrological activities, for example in hydrological training, operation of NHSs in the Region and implementation of Pacific-HYCOS.
- XIV-RA V requests WMO Secretariat to ensure that all HAs and regional members of the Commission for Hydrology receive copies of all relevant WMO communications. This will ensure that all NHSs are kept up to date and informed of the activities of the WMO.
- XIV-RA V considers the establishment and operation of a trust fund to contribute to the maintenance of regional hydrological networks. This will enable the region to address network issues at critical times, such as disasters.
- XIV-RA V supports the establishment RHTCs in Indonesia and the Pacific and a proposal to establish a Pacific-HYCOS. This will improve access to training courses for hydrologists in the Region.
- XIV-RA V encourages members of RA V WGH, WMO Secretariat and the Commission for Hydrology to seek opportunities for a targeted workshop or conference that would enable members of RA V WGH to meet for an additional time during the intersessional period. The additional Meeting of Experts held in Fiji in 1999 resulted in a Hydrological Training Course and the Pacific-HYCOS project proved to be very useful.
- XIV-RA V requests the WMO Secretariat and SOPAC to continue their efforts in promoting the Pacific-HYCOS project with donor agencies as a priority and seek funding for its implementation (subject to the outcome of the current funding proposal).
- XIV-RA V notes progress achieved in hydrological technician training in the Pacific Island Countries, express appreciation for the role played by SOPAC and funding provided by NZAid and urges the WMO Secretariat, SOPAC and UNESCO to continue their efforts in promoting this training initiative with donor agencies as a high priority and seek funding for its expansion.

Adoption of Report and Closure of the Session

13.2 The Working Group adopted the report of its session and requested WMO Secretariat to make any editorial changes deemed necessary and to circulate it to all participants and Members of RA V.

13.3 At the closing session, on behalf of WGH, the Chairman, Mr Raj, expressed his thanks to Fiji Meteorological Service for hosting the meeting and providing such excellent facilities. He observed that hosting Hydrology and Water meetings in NMSs are of great value in promoting cooperation between NMSs and NHSs. The WMO representative, Mr Tawfik, thanked participants for their active participation in and valuable contributions to the meeting. He again conveyed WMO's appreciation to Mr Rajendra Prasad, the Director of FMS and the Permanent Representative of the Fiji Government with WMO for hosting the meeting and providing excellent facilities.. He also thanked the staff of the FMS for their cooperation and hospitality and the excellent support provided to the session.

13.4 The session closed at 14h00 on Friday 21 October 2005.

LIST OF PARTICIPANTS

CHAIRMAN	
Mr Rishi RAJ 86D Shakespeare Avenue, Upper Hutt WELLINGTON New Zealand	Tel: (64 4) 976 93 45 E-mail: rishi004@paradise.net.nz
AUSTRALIA	
Mr Bruce STEWART Assistant Director National Operations Branch Bureau of Meteorology G.P.O. Box 1289 MELBOURNE, Vic. 3001	Tel: (61 3) 96 69 41 79 Fax: (61 3) 96 69 47 25 E-mail: b.stewart@bom.gov.au
Mr Ross JAMES Hydrology Unit Bureau of Meteorology GPO Box 1289 MELBOURNE Vic. 3001	Tel: (61 3) 96 69 46 05 Fax: (61 3) 96 69 47 25 E-mail: r.james@bom.gov.au
COOK ISLANDS	
Mr Ben PARAKOTI C/o PR of Cook Islands with WMO Ministry of Works P.O. Box 102 Avarua RAROTONGA	Tel: (682) 200 34 Fax: (682) 211 34 E-mail: hydro@oyster.net.ck
FIJI	
Mr Ashok KUMAR Hydrologist Department of Water & Sewage P.O. Box 56 LAUTOKA	Tel: (679) 666 05 63 Fax: (679) 666 85 94 E-mail: hydrology@connect.com.fj
FRENCH POLYNESIA	
Mr Yves GREGORIS Inter-regional Director of MétéoFrance in the French Polynesia BP 6005 98702 FAAA	Tel: (689) 803 301 Fax: (689) 803 309 E-mail: yves.gregoris@meteo.fr
INDONESIA	
Mr Joesron LOEBIS Research Institute for Water Resources Jl. Ir. H. Juanda 193 BANDUNG 40135	Tel: (62 22) 250 40 53 Fax: (62 22) 250 01 63 E-mail: joesron@melsa.net.id

KIRIBATI	
Mr Eita METAI Ministry of Works and Utilities P.O. Box 498 Betio, TARAWA	Tel: (686) 250 15 Fax: (686) 261 72 E-mail: we.mwe@tskl.net.ki
MALAYSIA	
Mr Azmi JAFRI Hydrology and Water Resources Division Department of Irrigation and Drainage Km. 7 Jalan Ampang 68000 Ampang KUALA LUMPUR	Tel: (603) 42 55 26 72 Fax: (603) 42 60 12 79 E-mail: azmijafri@water.gov.my
MICRONESIA	
Mr Seperiano JOHN Weather Bureau Weather Service Office P.O. Box 69 KOLONIA 96941	Tel: (691) 320 22 48 Fax: (691) 320 57 87 E-mail: seperiano.john@noaa.gov
NEW CALEDONIA	
Mr Geoffroy WOTLING DAVAR BP 256 NOUMEA	Tel: (687) 25 51 38 Fax: (687) 25 51 29 E-mail: geoffroy.wotling@gouv.nc
NEW ZEALAND	
Mr Charles PEARSON National Institute of Water and Atmospheric Research (NIWA) P.O. Box 8602 Riccarton CHRISTCHURCH	Tel: (64 3) 348 89 87 Fax: (64 3) 348 55 48 E-mail: c.pearson@niwa.co.nz
PAPUA NEW GUINEA	
Mr Maino VIROBO Department of Environment and Conservation P.O. Box 6601 Boroko, NCD 111 PORT MORESBY	Tel: (675) 325 01 98 Fax: (675) 325 01 82 E-mail: wrmb@daltron.com.pg
PHILIPPINES	
Ms Margaret BAUTISTA C/o Philippine, Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) WFFC Bldg, BIR Rd, Diliman QUEZON CITY	Tel: (632) 926 50 60 Fax: (632) 926 31 51/50 60 E-mail: mpb_hisss1@yahoo.com
SOLOMON ISLANDS	
Mr Charlie BEPAPA Water Resources Division Ministry of Energy, Water and Minerals P.O. Box G37 HONIARA	Tel: (677) 215 21 Fax: (677) 258 11 E-mail: c_bepapa@mines.gov.sb

TONGA	
Mr Saimone HELU Tonga Water Board P.O. BOX 92 NUKU'ALOFA	Tel: (676) 232 99 Fax: (676) 235 18 E-mail: twbhelu@kalianet.to
VANUATU	
Mr Erickson SAMMY Department of Geology, Mines and Water Resources PMB 9001 PORT VILA	Tel: (678) 224 23 Fax: (678) 222 13 E-mail: amapelao@yahoo.com
ASSOCIATION OF HYDRO-METEOROLOGICAL EQUIPMENT INDUSTRY (HMEI)	
Mr William BARRATT 48 – 50 Scrivener Street P.O. Box 534 WARWICK FARM 2170 ALEXANDRIA Australia N.S.W 2015	Tel: (61 2) 96 01 20 22 Fax: (61 2) 96 02 69 71 E-mail: bill_barratt@bigpond.com
SOUTH PACIFIC APPLIED GEOSCIENCE COMMISSION (SOPAC)	
Mr Marc OVERMARS South Pacific Applied Geoscience Commission Private Mail Bag GPO SUVA Fiji Islands	Tel: (679) 338 13 77 Fax: (679) 337 00 40 E-mail: marc@sopac.org
Ms Komal Raman South Pacific Applied Geoscience Commission Private Mail Bag SUVA Fiji Islands	Tel: (679) 338 13 77 Fax: (679) 337 00 40 E-mail: komalr@sopac.org
Mr David Scott c/o SOPAC 9 Chorley Place CHRISTCHURCH New Zealand	Tel: (64) 3 332 43 59 Fax: (64) 3 324 43 60 E-mail: david.scott@chch.planet.org.nz
WMO SUBREGIONAL OFFICE FOR THE SOUTH-WEST PACIFIC	
Mr Henri Kwai TAIKI Programme Officer P.O. Box 3044 SPREP Centre APIA Samoa	Tel: (685) 257 06 Fax: (685) 202 31/ 25 771 E-mail: wmo.srop@sprep.org.ws htaiki@wmo.int
WMO SECRETARIAT	
Mr Mohamed Tawfik Chief, Hydrology Division Hydrology and Water Resources Department World Meteorological Organization 7 bis avenue de la Paix Case Postale No. 2300 1211 Geneva 2 Switzerland	Tel: (41 22) 730 83 30 Fax: (41 22) 730 80 43 E-mail: mtawfik@wmo.int

<p>Ms Françoise Fol Administrative Assistant Hydrology and Water Resources Department World Meteorological Organization 7 bis avenue de la Paix Case Postale No. 2300 1211 Geneva 2 Switzerland</p>	<p>Tel: (41 22) 730 84 79 Fax: (41 22) 730 80 43 E-mail: ffol@wmo.int</p>
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AGENDA

1. OPENING OF THE MEETING
2. APPROVAL OF THE AGENDA AND ORGANIZATION OF THE WORK
3. CONSIDERATION OF THE RELEVANT DECISIONS OF Cg-XIV, XIII-RA V, CHy-XII AND EC-LIV, EC-LV, EC-LVI AND EC-LVII
4. CONSIDERATION OF THE ACTIVITIES OF THE WORKING GROUP
 - 4.1. Report of the Chairman of the Working Group (R. Raj)
 - 4.2. Hydrology Training (R. Raj)
 - 4.3. Technology and Data Standards (Ch. Pearson)
 - 4.4. Hydrological Network Maintenance Support (B. Pakoti)
 - 4.5. Integrated Water resources management (IWRM) (R. James)
 - 4.6. Public Awareness of the Value of Hydrological Data and Products (M. Bautista)
 - 4.7. Climate Change and Variability (including El Niño/Southern Oscillation (ENSO)) (B. Pakoti)
 - 4.8. Regional information and Communication Systems (R. James)
 - 4.9. Numerical Weather Products for Operational Hydrology (R. Raj)
 - 4.10. Applications of the Hydrological Operational Multipurpose System (HOMS) (Ch. Pearson)
 - 4.11. Linkage with the Typhoon Committee and the RA V Tropical Cyclone Committee (M. Bautista)
5. DISCUSSION ON THE IMPLEMENTATION OF THE HYDROLOGY AND WATER RESOURCES PROGRAMME IN RELATION TO THE NEEDS OF THE REGION
 - 5.1. Cooperation with regional and international Organizations
 - 5.2. Floods (WMO Flood Initiative and Associate Programme on Flood Management)
 - 5.3. Guide to Hydrological Practices
 - 5.4. WHYCOS and other cooperation projects
 - 5.5. WMO Natural Disaster Prevention and Mitigation Programme
 - 5.6. WMO Information System
6. DISCUSSION OF FUTURE ACTIVITIES OF THE REGIONAL ASSOCIATION VI IN THE FIELD OF HYDROLOGY AND WATER RESOURCES
7. ANY OTHER MATTERS
8. ADOPTION OF THE REPORT AND CLOSURE OF THE MEETING

ANNEX 3

DRAFT

**RA V Working Group on Hydrology (WGH)
Future Programme of Work (2005-2009)**

OBJECTIVES	STRATEGIES/ACTIONS	OUTPUTS/OUTCOMES	RESPONSIBILITY
Raising visibility of WMO in the Region	<ul style="list-style-type: none"> Maintain and build on existing or establish new links with national, regional and international groups within the Region and where appropriate seek RA V WGH representation at meetings, workshops, conferences, etc. Propose options for increased hydrological support for the WMO RA V sub-regional Office. 	<ul style="list-style-type: none"> Increased hydrological support for water technicians and professionals involved in hydrology water resources in the Region. Increased recognition and visibility of the role and responsibilities of WMO. 	Chair of RA V WGH with the support and advice from RA V WGH members
Raising awareness in water issues at national level	<ul style="list-style-type: none"> Promote development of a forum for addressing water issues in the Region. Organise meetings for different stakeholders and workshops at national level. Work with other regional and international organisations to establish a regular forum to address hydrology and water resources issues (all stakeholders). 	<ul style="list-style-type: none"> Increased awareness of water issues among decision makers and key stakeholders Development of solutions to water issues 	Chair of RA V WGH with support and advice from RA V WGH members
Re-establishing Regional Newsletter	<ul style="list-style-type: none"> Publish a regional, quarterly newsletter focussed on relevant national, regional and global news, HOMS and other items of interest to members of RA V WGH. Circulate newsletter by e-mail to PR, HA, WGH members, WMO HQ, Apia, SOPAC, UNESCO, Typhoon Committee WGH, Tropical Cyclone Committee. 	<ul style="list-style-type: none"> RA V WGH members, HAs, PRs, and others would be informed of RA V WGH activities and other related news 	Dedicated member of RA V WGH with assistance from the WMO Secretariat and other WGH members

OBJECTIVES	STRATEGIES/ACTIONS	OUTPUTS/OUTCOMES	RESPONSIBILITY
Establishing a Virtual Centre	<ul style="list-style-type: none"> • Use an existing or create a new e-mail group to enable improved communication between RA V WGH members, their work associates and other people involved in operational hydrology. • Establish a RA V WGH web page (possibly on the WMO website) • Establish a mechanism for maintaining and regularly updating information available on the website. 	<ul style="list-style-type: none"> • Availability of information and access for RA V WGH members, and others involved in operational hydrology. • Better communication between WGH members and other Groups in the region. 	Dedicated member of RA V WGH with assistance from WMO, SOPAC Secretariats and other WGH members
Improved training and HR development and capacity in RA V	<ul style="list-style-type: none"> • Facilitate and encourage participation of NMHS staff in training activities in the Region, such as the SOPAC Hydrology Technician Training Course. • Promote and support the development of RHTCs in the Region, including Indonesia. • Compile an inventory of relevant trainers and courses in the Region. • Explore the possibility of using the WMO Strategy on Education and Training in Hydrology and Water Resources and access to WMO Education and Training Programme resources to develop computer assisted training programs to complement the SOPAC facilitated Hydrology Technician Training Course 	<ul style="list-style-type: none"> • Better skill levels in operational hydrology in the Region. • Increased capacity to deliver training for NMHSs. 	Dedicated sub-group of members of RA V WGH with assistance from WMO and SOPAC Secretariats and other WGH members
Improving Network Maintenance	<ul style="list-style-type: none"> • Facilitate and encourage participation of NMHS staff in training activities in the Region, such as the SOPAC Hydrology Technician Training Course. 	<ul style="list-style-type: none"> • Functioning hydrological networks in member countries. • Loss of hydrological data is minimised; 	Sub-group of members of RA V WGH with assistance from WMO and SOPAC Secretariats and other WGH members

OBJECTIVES	STRATEGIES/ACTIONS	OUTPUTS/OUTCOMES	RESPONSIBILITY
	<ul style="list-style-type: none"> • Explore the options for establishing a fund to contribute to the maintenance of regional hydrological networks. • Compile an inventory of operational hydrology equipment being used in the Region. • Collaboration amongst members and regional organisations in the area of network maintenance. 	<ul style="list-style-type: none"> • Hydrological data quality is improved and data is available for decision-making. 	
<p>Increasing knowledge on flood and drought forecasting, with background of climate variability and change</p>	<ul style="list-style-type: none"> • Assist WMO Secretariat in hosting a Regional Flood Forecasting Workshop (including meteorologists and hydrologists) under the auspices of WMO Flood Forecasting Initiative. • Contribute to the organization of Global Flood Forecasting Conference in 2007 • Develop and run a training course on flood and drought forecasting tools for subsequent implementation by NMHSs • Implement strategies to improve communications between the RA V WGH, Typhoon Committee WGH and the Tropical Cyclone Committee • Hold a workshop on application tools for flood forecasting and drought prediction with the aim of addressing operational issues (including relevant stakeholders) • Develop of tools for drought prediction 	<ul style="list-style-type: none"> • Improved linkages between NHSs and NMSs • Improved quality (accuracy and timeliness) of forecasts and warnings. • Improved disaster mitigation strategies. • Improved information for drought prediction. 	<p>Sub-group of members of RA V WGH with assistance from WMO Secretariat and other WGH members</p>

**WORLD METEOROLOGICAL ORGANISATION
WORKING GROUP ON HYDROLOGY
REGIONAL ASSOCIATION V
(SOUTH-WEST PACIFIC)
NADI, FIJI, 17-21 OCTOBER 2005**

Workshop on Integrated Water Resources Management

Introduction

These notes record some of the main points of presentations and discussion at a Workshop on Integrated Water Resources Management (IWRM), held during Thursday and Friday 20-21 October, as part of the WGH RA V meeting (17-21 October 2005). The notes are a record of the points presented and the discussions that followed only and do not represent conclusions or recommendations.

Opening (Ross James, Australia)

This was an overview of the Rapporteur's Report presented earlier in the main WGH session. A key message was the "process" emphasis of IWRM, with a people focus, accommodating the skill levels of all of the people involved.

IWRM Island-style (Marc Overmars, SOPAC)

This talk provided an overview of Pacific Island IWRM. Pacific Islands have fragile water resources, with a lack of natural storage and high demands from concentrated populations on small land areas. Water supply and waste are particularly expensive. Complex governance of water often exists, relating in some cases to rural pluralism. Significant regional IWRM initiatives have been underway since the beginning of this century. A significant meeting was held at Sigatoka (Fiji, 2002) of over 180 Pacific water stakeholders, organised jointly by SOPAC and the Asian Development Bank. A Type II Regional Action Plan was developed covering six broad small island state water themes, such as addressing issues such as pollution of coastal zones. This Plan, that includes hydrological training and Pacific HYCOS, has been recognized at the Johannesburg World Summit on Sustainable Development (2002) and the Third World Water Forum (Kyoto, 2003), and provides the platform for attracting the funding for Pacific Island IWRM (e.g. from sources such as the European Union and Global Environment Facility). IWRM developments include the hydrological training funded by NZAid, and University of South Pacific distance learning via CD-Rom, email and video links.

Groundwater management in the Pacific (David Scott, SOPAC)

The main focus of this presentation was on the groundwater training module of the 2004-2006 hydrological training. Critical ground water concepts, models, computing, methods and practical exercises were carried out in 2005. The course was split into two groups that were both trained in surface water and groundwater and then all participants (10) made presentations on what had been learnt. All participants had interests in surface and ground water. The ground water course covered a broader range of technical topics, including the use and application of Excel for data analysis. The field exercise on an island (Makuluva) near Suva linked ground water and surface water through telemetry of ground water levels back to the Suva SOPAC office. The negatives of

the course were seen to be too much lecturing, and difficulties in linking ground water and surface water topics. The challenges are managing to satisfy the training needs of the diverse participants from diverse islands with diverse geology, and the breadth and complexity of groundwater hydrology requiring many subjects (e.g., physics, chemistry, mathematics, and statistics) as background knowledge.

Discussion points were:

- Use of course participants' feedback to design the 2006 course. Case studies were seen as a good way to overcome diversity of participants and their backgrounds and islands.
- The option of having roving trainers was discussed. This was seen as one extreme, with the other being to second staff with organizations such as NIWA. The present medium standpoint of bringing together staff to Suva for training and then putting the theory into practice back at home was seen as the best option, with the important value of participant interactions and relationship building during the courses, and emailing each other and instructors when needing assistance back at home.
- Accreditation of the training courses was raised. Options included linking in with tertiary education agencies. This had not been considered with the hydrological training, and neither had testing of participants except for making presentations.
- The structure of the 2004-06 courses were considered as satisfactory, with subsequent training courses needing to consider the above discussion points.

Kiribati – Water Sector Review (Eita Metai)

The successful Kiribati IWRM case study was presented that highlighted the development of a "Roadmap" by all stakeholders in Kiribati. The Roadmap was formulated by visiting all of the relevant Kiribati ministries and clarifying their role in the water sector, and then going to the outer islands to identify the problems, issues and gaps. Agreement of the plan ahead was achieved in big all-inclusive meetings. The plan involved seven major water resource schemes with establishment of policies and institutional strengthening, with a 20 year duration, at a cost of US12M. Funding has been secured from the World Bank, the Global Environment Facility and Australia and New Zealand. The result of the plan is that the water sector is now functioning in a viable manner.

Solomon Islands – Water Policy (Charlie Bepapa)

The issue of the water governance aspect of IWRM was covered. Government policy statements can and do mean changes of water policies. The underlying legislation governing water is the River Waters Act. Some pilot projects on dealing with water governance have been carried out with SOPAC. However there is still much to be done to resolve water legislation that will enable sustainable water resources development in the Solomon Islands, with mining companies in particular waiting for permits.

Discussion points were:

- Water governance and policies are common issues for Pacific Island countries. The contrast between urban and rural water reticulation/supply was one particular area of concern.
- Difficulties were raised with how to resolve conflict over water landowners wanting compensation for the waterway pollution caused by developers' activities (e.g., mining). Was this better addressed by ministerial policy or on a case by case basis? Some solutions were discussed such as taking into account both customary and western laws –

village landowner versus the government – and allowing stronger villages to make local rules on water.

- In some countries (e.g., Tonga) recent law reform has brought water issues more out into the open for vigorous debate in parliament, with the Government taking the lead on resolving issues.
- A variety of water ownership was highlighted across the region, from no-one owns water (Federated States of Micronesia) to dual ownership of water by Government and local landowner, and related practical solutions to ownership such as “you use the water, we manage it” (Vanuatu).

Australian National Water Initiative (Bruce Stewart)

The presentation focussed on the Australian National Water Initiative which sets out objectives, outcomes and actions for the ongoing process of national water reform, and timelines to achieve this reform. The National Water Initiative outlines a number of key areas which will be critical to water reform:

- water access entitlements and planning framework
- water markets and trading
- best practice water pricing
- integrated management of water for environmental and other public benefit outcomes
- water resource accounting
- urban water reform
- knowledge and capacity building
- community partnerships and adjustment.

Discussion points were:

- The Initiative includes examples of hydrological data analysis tools, but the tools for IWRM would be developed at the local level.
- The initiative is currently more focused on irrigation allocation and scheduling, and return to river flows (highly regulated systems). Return flows may be reduced when using the Initiative because of the water efficiencies it generates (through use of market mechanisms), and this reduction could have an adverse effect on in-stream environment (possibly balanced by environment specific releases).

Federated States of Micronesia (Seperiano John)

This briefly discussed rainfall monitoring networks and the use of surface water in Pohnpei, before using ground water. Discussion was held on the philosophy of using surface water before ground water, based on easier access to surface water, and this seemed common practice across the Pacific and Southeast Asia.

Papua New Guinea – Hydrological Networks (Maino Virobo)

A background presentation was given on the current status of the hydrological networks of Papua New Guinea. The networks were designed to provide hydrological data and information for the important areas of domestic water supply, hydropower generation, transport, recreation and ecotourism. However, development has put pressure on the sustainability of the network, with changed focus of operational hydrology to include environmental monitoring for developer compliance to water quality standards. There are other national global pressures and issues, such as climate change and changing land-use, that place greater emphasis on the importance of the long-term hydrological monitoring. There is no telemetry for the networks, but this is seen

as a highly necessary advance. The advent of IWRM and Pacific HYCOS were seen as highly desirable.

Pristine Rivers - Malaysia (Azmi Jafri)

A “Love our Rivers” campaign by the Malaysian government was outlined, and linked to ongoing support of hydrological monitoring networks in Malaysia with a greater emphasis on environmental and water quality issues and monitoring.

French Polynesia - Flood Awareness (Yves Gregoris)

A web-based “nowcasting” system coupled with a hydrologic risk model has been developed for Tahiti. The underlying hydrological model has a spatial resolution of 1 km². It includes a soil moisture parameter and has been calibrated and validated against flow data, using a data set of 72 flood events. The system forecasts flood “quintiles” as severity of likely flood peaks. The system is simple, operational and web-based.

New Caledonia – Hydrological Networks (Geoffroy Wotling)

The status and extent of the hydrological networks were presented, and the many uses of the hydrological data were emphasized.

Philippines - Flash Flooding (Margaret Bautista)

Flash flood bulletins are generated and released to the media and the public by the PAGASA forecasting centre, especially for areas downstream of dams. The forecasting is based on weather situations and forecasts, and telemetered hydrological data. For non-telemetered regions, reliance is placed on communications with local communities, for ascertaining on the ground events and issuing of warnings. The Philippines is routinely severely affected by tropical typhoons (e.g. 1000 lives lost in Typhoon Winnie in December 2004).

Discussion points were:

- Who pays for the warning and telemetry systems, and how are lost telemetry stations paid for? Answer: Philippines government, and also making self-repairs of damaged rain gauges.
- The linkage and role of meteorological and hydrological services for flood warnings were emphasized.

Vanuatu - Catchment and Communities (Erickson Sammy)

A successful IWRM “catchments” project was presented, that was funded by UNESCO in 2002 to address issues related to excess catchment logging. The aim of the project was to better link communities and water managers, for three communities of separate islands. There was three phases to the project: education and awareness, using theatre groups; construction of water level stations, using communities for the building and ongoing monitoring; and water quality and biota sampling using the New Zealand “Stream Health Monitoring and Assessment Kit” (“SHMAK”). The project funding concluded in 2004 and has now been sustained by the Vanuatu government.

Tonga – Water and Health (Saimone Helu)

The initiatives in Tonga for water quality monitoring were outlined. Ground water is the main source of water and water quality is tested daily for urban supply. Six monthly checks are carried out by Watercare (Auckland, New Zealand).

Cook Islands – Aitutaki Water (Ben Parakoti)

A successful IWRM project for the pristine island of Aitutaki was presented. The project is helping ensure that the pressures of increased tourism are having limited impact on the high lagoon water quality and clarity.

Introduction to the Water and Climate Dialogue (Komal Raman, SOPAC)

The experiences and history of the Dialogue in the Pacific region, in collaboration with the Caribbean region, were introduced. The establishment of the Regional Action Plan (see above), and the political commitment to this Plan, in Sigatoka in 2002 has provided a basis for important regional Dialogue activities, including the hydrological training (2004-2006), the continued monthly publication of the Island Climate Update, establishment of a Pacific Resource Centre on Water and Climate, support for “SCOPIC” (below) and Pacific Hycos.

Seasonal Climate Outlooks for Pacific Island Countries “SCOPIC” (Bruce Stewart)

An overview of the A\$2.2M 3-year AusAID project for “Seasonal Climate Outlooks in Pacific Island Countries”. SOPIC involves use of the BoM seasonal climate outlooks for the Pacific Islands, to apply them for rainfall terciles. Use of terciles in Australia was when terciles were up around the 70-80% marks, for say below normal rainfall over the next 3 months. SOPIC produces reports for distribution by meteorological service to key country stakeholders.

- Azmi Jafri – Could SCOPIC technology be extended to South East Asia?
- Possibly, depending on climate predictability from signals such as El Niño.

Fiji Application of SCOPIC Project (Riteshni, Fiji Meteorological Service)

The Fiji Meteorological Service is implementing the SOPIC project in Fiji. El Niño affects rainfall in Fiji because of changes to the South Pacific Tropical Convergence Zone. In particular lower rainfall is expected. In 1997-98 a significant El Niño led to a very severe drought in Fiji. This provides some predictability for use of the SOPIC tool.

Pacific Dialogue on Water and Climate (David Scott, SOPAC)

This talk was based on the information that was put forward for the Dialogue that was set up at Sigatoka 2002 and taken through to the Third World Water Forum (Kyoto, 2003), to better cope with climate variability and change, and drought. Subsequent progress has been in drought forecasting in Rarotonga and Fiji, and assessing the vulnerability of freshwater lenses on Tarawa, and development of drought planning. A Dialogue link with the Caribbean was established during 2002-2003. The relevant climate forecasting sessions at Sigatoka in 2002 were briefly covered. The need was emphasised to move from the present day “coping with” climate variability and change, to “adaptation”, particularly given increasing demand lines for water, making droughts more frequent.

In discussion, from three working sub-groups, three climate forecasting questions were addressed:

- What climate information systems and forecasts were people aware of and which ones did they access?
 - Tools and information aware of and regularly received and accessed included the SCOPIC project, the monthly “Island Climate Update” produced by NIWA and SOPAC through NZAid funding, WMO ENSO updates and web pages of ENSO forecasts such as from the European global model, etc.
- How did they use climate forecasts and what potential uses could they see?
- How have climate scenarios been used for planning etc?

To join the SOPAC hydrology email group, send an email to PICHydrologyNetwork@yahoogroups.com with subscribe in the subject line. There is also a related web page.

SUMMARY OF THE SESSION'S CONCLUSIONS AND RECOMMENDATIONS

KEY RECOMMENDATIONS AND CONCLUSIONS

1. Working Group members recommended that, in reporting to XIV-RA V, the Chairman of the WGH strongly propose and support the following recommendations:
 - XIV-RA V agrees to and support a hydrology position for the Sub-regional office in Apia as agreed by XIII-RA V. This position would strengthen the role of WMO in regional hydrological activities, like training, operation of NHSs in the Region and implementation of Pacific-HYCOS.
 - XIV-RA V requests WMO Secretariat to ensure that all HAs and regional members of the Commission for Hydrology receive copies of relevant WMO communications. This will ensure that all NHSs are informed of activities of WMO.
 - XIV-RA V considers establishment and operation of a trust fund to contribute to the maintenance of regional hydrological networks. This will enable the region to address network issues at critical times, such as disasters.
 - XIV-RA V supports the establishment RHTCs in Indonesia and the Pacific with the proposal to establish a Pacific-HYCOS. This will improve access to training courses for hydrologists in the Region.
 - XIV-RA V encourages members of RA V WGH, WMO Secretariat and Commission for Hydrology to organize a workshop or conference that would enable members of the RA V WGH to meet more often during the intersessional period. The additional Meeting of Experts held in Fiji in 1999 resulted in the Hydrological Training Course and the Pacific-HYCOS project proved to be very useful.

OTHER RECOMMENDATIONS AND CONCLUSIONS

Completion of Work for the Session

2. Participants were encouraged to complete the questionnaires circulated by Mr Parakoti (Cook Is) on hydrological network maintenance and funding arrangements, Mr James (Australia) on Integrated Water Resources Management, Mr Pearson (New Zealand) on technology and data standards and Ms Bautista (Philippines) on public awareness on the value of hydrological data and products and return them to the respective rapporteurs.
3. Participants recommended that the reports from the rapporteurs and the report of the meeting be provided electronically to all participants and included on the RA V-WGH website when it is operational.

Training

4. The meeting requested WMO and SOPAC to evaluate the training courses for impact and value of such courses.
5. Participants requested WMO and SOPAC to continue supporting the Hydrology Training course.
6. The meeting requested that when acting on the results from the WMO Education and Training Survey every effort is made to build on training activities already active in the region.
7. The meeting recommended that WMO material (eg. Guide to Hydrological Practices) be provided to all participants in the next Hydrology Training course.

Pacific-HYCOS

8. Participants requested WMO Secretariat and SOPAC to continue efforts to secure funds for the successful implementation of the Pacific-HYCOS.
9. Participants agreed that needs of the Asian members of the region; (Malaysia, Indonesia, Singapore and Philippines) should be considered in developing other HYCOS component.

HOMS

10. The meeting agreed that the HOMS concept was still a fundamental pillar of the capacity building activities of the HWRP and encouraged participants to use HOMS components when it is needed. The meeting also urged members to contribute new components in selected areas to HRM.
11. Participants agreed that materials produced through the activities of the RA V WGH should be considered as HOMS components.
12. Participants suggested that the Secretariat should monitor the Internet access to HOMS and provide a report on the level of activity and agreed that information on successful implementation of components would be valuable.
13. Participants urged WMO Secretariat to consider making HOMS a more thorough method for accessing hydrological technology and techniques and asked the Secretariat to distribute the soon to be updated CD as widely as possible
14. The meeting requested WMO Secretariat to consider identifying a moderator to facilitate access to HOMS products relevant to small island countries and requested SOPAC to assist in this activity.

Guide to Hydrological Practices

15. The meeting appreciated efforts made by CHy AWG in updating the Guide and asked AWG to ensure that the Guide continued to be provided in a CD version and be available for access through the Internet.

Hydrological Standards

16. The meeting invited WMO Secretariat to enhance efforts in developing standards for hydrological data and information exchange in cooperation with NHSs.

Integrated Water Resources Management (IWRM)

17. The participants agreed that NHS's should continue to promote the role and functions of data collection networks and operational hydrology in providing essential information in support of IWRM.

Hydrology in RA V

18. The meeting requested the President of CHy and WMO Secretariat to increase efforts to secure additional resources for hydrology within the region. Participants agreed to collaborate with WMO in strengthening visibility of WMO in hydrology in the Region.
19. Participants felt that only one Working Group meeting every four years did not facilitate improved cooperation and communication and urged WMO Secretariat to seek additional opportunities for Working Group members to interact.
20. Participants were strongly encouraged to improve linkages ties with NMSs in flood forecasting, climate outlook and drought predictions.
21. The meeting requested that RA V be included in the WMO Flood Forecasting Initiative and, strongly recommended that a Regional Workshop be held in RA V similar to those being held in other RAs.
22. The meeting requested the Regional Hydrological Advisor to the President of RA V to adopt a proactive approach and provide inputs to the president of RA V in his reports to EC.
23. Participants requested the Secretariat to distribute updated list of members' coordinates so that Working Group members are regularly informed of changes in the group.
24. The meeting suggested that the proposed virtual hydrology centre be linked to the existing Pacific e-network on hydrology and water resources.
25. Participants recommended that the WMO Secretariat assist in the development of a Web page for the RA V-WGH.

26. The WGH recommended that HAs be nominated to be the UNESCO hydrological focal point to ensure better coordination between WMO and UNESCO.
27. Participants agreed that close contact with the Typhoon Committee WGH should continue and urged Chairman to establish relations with other relevant groups, including WMO Disaster Prevention and Mitigation Programme.
28. Participants requested Australia to provide information to the Chairman on functions of Regional Instrument Centre in Melbourne, and to assist in compilation of an inventory of instruments being used in the Region.
29. The participants agreed on their proposed future programme of work as contained in Annex 3.

Cooperation with CHy

30. The meeting requested that, when members of the WGH are appointed, it should also be possible for them to become members of relevant CHy OPACHEs.
31. The President of CHy requested members of Working Group to convey their views on the proposal to change the name of the Commission for Hydrology to the Commission for Hydrology and Water Resources to him by e-mail not later than 31 November 2005.
32. The participants requested to be kept informed of developments in the International Flood Initiative and agreed that activities they may undertake in the area of flood forecasting and warning could contribute to the IFI.