INTERNATIONAL HYDROLOGICAL PROGRAMME

14th IHP Regional Steering Committee meeting for Southeast Asia and Pacific

Bangkok, Thailand, 19-20 October 2006

FINAL REPORT

IHP-VI Regional Steering Committee Meeting | No. 14
Regional Steering Committee for Southeast Asia and the Pacific
UNESCO Jakarta Office, 2006

CONTENTS

ANNEXES

The 14th IHP
Regional Steering Committee Meeting for
Southeast Asia and the Pacific

Bangkok, Thailand,
19-20 October 2006

Chairman:	Mr Eddy Djajadiredja (Indonesia)
Secretary:	Prof Kaoru Takara (Japan)
UNESCO Representatives:	Mr Giuseppe Arduino (Jakarta Office) Mr Hans Decker Thulstrup (Apia Office) Mr R. Jayakumar (Beijing Office)
Countries Represented:	Australia, Cambodia, China, Cook Islands (Pacific Island countries), Indonesia, Japan, Korea (Republic of), Lao PDR, Malaysia, Mongolia, Myanmar, New Zealand, Papua New Guinea, Philippines, Vietnam, Thailand. (See Annex 1 for list of participants)

Observing Countries and Organizations: SOPAC (Mr Marc Overmars)

1 OPENING

The Chairman Mr Eddy Djajadiredja (Indonesia) opened the meeting at 09:10am. He welcomed the participants noting that the region faced a range of problems and the meeting was an opportunity to learn from each other and improve hydrological understanding so these problems can be resolved. The Thailand National Committee and the Asia Pacific Association of Hydrology and Water Resources were thanked for organizing the conferences and meeting.

2 ELECTION OF RAPPORTEUR

It was agreed that the task of Rapporteur would be shared between Mr Ross James, Mr Trevor Daniell, Mr Bob Curry and Mr Hans Thulstrup.

3 ADOPTION OF AGENDA

The draft agenda was presented by the Chairman and it was agreed that, as the AP FRIEND Technical Sub-committee meeting was scheduled for Thursday evening, the AP FRIEND report (Agenda Item 11) would be on Friday morning. The Agenda adopted is at Annex 2.

4 APPROVAL OF NEW MEMBER FROM MONGOLIA

The Chairman welcomed the new country Mongolia to the committee and Mr Basandorj thanked the committee for inviting Mongolia as a member and enabling its participation in this very important committee. Mr Basandorj referred to the need to improve water management in Mongolia and hoped that participation in the RSC would help achieve this.

5 SECRETARIAT REPORTS

5.1 UNESCO JAKARTA OFFICE REPORT

Mr Arduino reviewed the status of the action items from the 13th RSC meeting in Bali, Indonesia, and reported on the activities carried out in the region since the last RSC meeting. Mr Arduino highlighted the two training courses held during the year; 15th IHP Nagoya Training Course "Water and Carbon Cycles in Terrestrial Ecosystems", Nagoya and Chiba, Japan, from 26 February to 11 March 2006 and the Training Course on "Isotopes Methods in Hydrogeology", Ho Chi Minh City from 5 to 9 June 2006 and informed the meeting that 3 people plus the AP FRIEND TSC Chairman Mr Daniell will receive support to attend the 5th FRIEND Conference in Cuba during December.

Mr Arduino completed his report with a description of the status of efforts to trace students who had participated in the Nagoya training Courses conducted since 1991 and obtain feedback on benefits received from participating in the course. The complete report, including status of action items, is included as Annex 3.

5.2 UNESCO APIA REPORT

Mr Thulstrup introduced the participants from the Pacific at the meeting; Mr Virobo (PNG), Mr Parakoti (Cook Islands) and Mr Overmars (SOPAC Fiji). Mr Thulstrup informed the meeting that partnerships were the major means for delivering projects in the Pacific and that the Regional Action Plan on Sustainable Water Management provided the guiding principles for these projects. UNESCO is a partner in two large projects currently commencing in the Pacific; the GEF funded Integrated Water Resources Management Project, and the European Union funded Pacific HYCOS Project.

Mr Thulstrup briefly described a number of activities undertaken during the year including; the 3rd and final year of the SOPAC/WMO/UNESCO/NIWA Hydrological Training Course on Surface & Groundwater in Fiji, UNESCO-SOPAC JFIT project on Biosphere Reserves for Sustainable Community-Driven Management of Natural Resources in Micronesia and the Groundwater Resource Assessment and Monitoring Program being undertaken on Niue under a UNESCO Participation Programme Grant.

The value of the email discussion forum Small Islands Voice for the exchange of information and ideas was described and meeting participants were referred to the website www.sivglobal.org for more information about the forum. Mr Thulstrup also advised the meeting that UNESCO had republished the much-requested report *Hydrology and Water Resources of Small Islands: A practical guide - UNESCO IHP Studies and Reports in Hydrology 49, Editor: A. Falkland* and copies were available from SOPAC or UNESCO Apia Office.

The complete report is included as Annex 4.

5.3 UNESCO BEIJING REPORT

Mr Jayakumar described the countries the Beijing Office covered and the different offices he liaised with. The major focus of the Beijing Office was described as capacity building and Mr Jayakumar briefly described four training programs as examples of this:

- International Training Workshop on Watershed Eco-environment and Water Resources Management, Sept. 11-19, 2005, IRTCES Beijing, China;
- National Workshop on Advanced Sediment Measurement Techniques, IRTCES, China
- National Training Course for Capacity Building on Flood Disaster Prevention Preparedness in Pyongyang, D. P. R. Korea

- National Training Course for Capacity Building on Groundwater Hydrology and its Management in Mongolia

The visit by Mr Matsuura, the Director General of UNESCO, to Mongolia during July which resulted in the creation of the UNESCO Chair in Groundwater Management and other financial support from UNESCO was described by Mr Jayakumar.

Mr Jayakumar informed the meeting about the UNESCO project *Water Science Education at School Level* which is developing Chinese language education and learning material for school children to improve the teaching and understanding of water issues. The project is being sponsored under a bilateral agreement between the governments of Italy and PR China.

UNESCO support for the development of a flood model for the Daedong River in DPR Korea was briefly described and more detail is provided in Mr Jayakumar's complete report which is included as Annex 5.

6. REPORT FROM THE IGC VICE CHAIRPERSON

Mr Keizrul Abdullah briefly reported on the 17th Session of the IHP Intergovernmental Council which was held in Paris 3-7 July 2006. Mr Alhaji Muhktari S Shagari, the Minister for Water in Nigeria was elected Chairperson. The Vice-chairperson from Group IV (Asia-Pacific region) is Mr. Keizrul Abdullah from Malaysia.

Mr Abdullah informed the meeting that the IHP 7th Phase commences in 2008 and runs until 2013. He briefly summarized the themes of the previous IHP Phases, the overall 7th Phase theme of *Water Dependencies: System under Stress and Societal Responses* and the taskforce process that was adopted for the development of the Strategic Plan. Delegates were informed of the five themes that make up the 7th Phase and also of the Cross-cutting Programmes (HELP and FRIEND) and the links to the larger number of Associate Programmes.

The long discussion on IHP Governance, the objectives of the proposed changes and the different views expressed during the IGC meeting were briefly described. Mr Abdullah informed the meeting that the IGC resolved to return the issue to the Bureau for further consideration.

7 COUNTRY REPORTS

All country reports are included as Annex 6.

7.1 AUSTRALIA

Mr Ross James referred to the report (included in Annex 6) and highlighted the web links to a number of Cooperative Research Centres, including the eWater Cooperative Research Centre and briefly described the formation of a National Water Commission and the objectives of a national Water Initiative being now implemented in Australia. Mr Ross James highlighted the severe drought that Australia is undergoing. This drought has provided an opportunity for increased awareness of water resource issues at all levels of government within Australia.

7.2 CAMBODIA

Mr Long Saravuth described the structure of the Ministry of Water Resources and Meteorology and its relationship to the IHP NatCom and summarized activities undertaken and proposed. In 2006 World Water Day was celebrated in Phnom Penh at a National Level that involved many ministries and organizations. Mr Long summarized the activities that were anticipated to be held in 2007 with

a significant project to facilitate the collection, archiving, and analysis of hydro-meteorological data and information which will help with the preparation of data for AP FRIEND projects.

7.3 PR CHINA

Mr Chen Yuanfang informed the Delegates of the appointment of a new Chairperson of the National Committee, Mr Deng Jian, Director-General of the Bureau of Hydrology. Mr Chen highlighted a number of major conferences that were held in China. A web page has been established for the Chinese IHP committee with the support of the UNESCO office Beijing. A wide range of water related activities is undertaken by many agencies in China, including participation in international activities and these were elaborated on. The IHP National Committee often acts in an advisory role, including on issues of bilateral cooperation and some of these were described.

7.4 COOK ISLANDS (PACIFIC ISLAND COUNTRIES)

Mr Ben Parakoti emphasized the importance of partnerships between organizations such as UNESCO, SOPAC, and WMO in successfully implementing projects in the Pacific. The status of a number of priority activities and projects and the many aid programs of particular countries that assisted in advancing water resource activities in the Pacific were described. The projects include; the Pacific Hydrological Training Program, A Water Demand Management Program, Water Quality Monitoring Capacity Building, Pacific HYCOS and the Niue Groundwater Investigation and Monitoring Program. Mr Parakoti advised the meeting that the Pacific HYCOS project has been funded by the European Union and the inception meeting will be held during April 2007. The meeting was reminded that there was a rotation of representation for the Pacific Islands at the RSC.

7.5 INDONESIA

Mr Jan Sopaheluwakan reported on changes to the structure of the National Committee in the light of the IHP Phase VII program and to improve participation of key stakeholders. Dr Hery Harjono will be the next Chairman of the committee. A number of important activities in Education and Training and in ecohydrology were referred to. Mr Sopaheluwakan raised the activities which were undertaken as part of World Water Day in 2006 and advised that, within Indonesia, there is a plan to coordinate the activities of the IHP National Committee and those of the WMO which operate in similar areas. Many current and future activities revolve around the Centre for Ecohydrology which has be to established in the Cibinong Science Centre.

7.6 JAPAN

Mr Kaoru Takara outlined the changes that were made to the National IHP committee under the chairmanship of Mr Takeuchi. Mr Takara informed the meeting of a number of meetings and training courses that had been organized and specifically a course in Mongolia that was organized between UNESCO Beijing office and Japan. The series of meetings that resulted in ICHARM being officially established in March 2006 was described. Cooperation between the Japanese IHP and the UNESCO Office in Beijing was highlighted as was a proposal to conduct research with Mongolia.

7.7 LAO PDR

Mr Manoloth Soukhanouvong presented an overview of and the responsibilities of the Department of Meteorology and Hydrology (DMH) in improving water resources management, flood forecasting and training. The assistance from external sources is extremely important for the work of DMH. Assistance has been received from countries such as China, Japan, UK, France, Australia and Vietnam through either the WMO or bilateral cooperation programs.

Mr Soukhanouvong presented the status of efforts to establish an IHP National Committee in Lao since the RSC meeting in Bali. Following a number of meetings and a letter to the Ministry for Agriculture and Forestry it is likely that a single UNESCO committee with responsibility for both Man and Biosphere and IHP will be established. Two sub-committees may then be formed with each responsible for a separate activity. Mr Soukhanouvong emphasized that the Ministry had not yet responded to the letter so the final decision was still not known. Concern was expressed by the meeting at the length of time taken to establish the IHP National Committee.

7.8 MALAYSIA

Mr Keizrul Abdullah, Chairman of the National Committee, reported on a number of projects carried out under IHP VI, described the range of activities undertaken for World Water Day and highlighted some student education programmes. Attendance at a number of International meetings was reported on as well as some future activities including an "Eco-Hydrology Expedition for Regional (S.E.A) Student Exchange Programme which is planned for 2007.

7.9 MONGOLIA

Mr D Basandorj outlined a number of steps required for development of the water sector. These included implementation of the new water law, establishment of a new water agency, increasing investment and capacity development. A range of courses, projects and meetings at the national, regional and international level were presented. Mr Basandorj outlined the countries objectives of improving IRBM, strengthening groundwater management, improving capacity building and increasing cooperation at the regional and international level and concluded by thanking Japan for assistance in improving water management through a high level workshop that resulted in some very helpful outputs.

7.10 MYANMAR

Mr Htay Oo Kyi described the formation of the national IHP committee and presented the objectives which the committee had established. Mr Htay Oo Kyi listed the range of departments responsible for water management services in Myanmar and then outlined in detail the climate, hydrology and water resources of the country as well as the distribution of rainfall and streamflow stations with some analytical aspects of the records that exist in Myanmar.

7.11 NEW ZEALAND

Mr Richard Ibbitt summarized activities including the status of development of a national soil moisture network commenced in 2000 and in the Pacific Islands with Fiji for the development and validation of a Stream Health Monitoring Assessment Kit. The impact of the infestation of NZ rivers with the northern hemisphere diatom *Didymosphenia geminata* was described and he referred to the significant effort being undertaken to try and contain the infestation and to the programs to learn how to control it. Mr Ibbitt also informed the meeting about Eco-Connect which allows forecasting for environmental purposes from a global weather model. Future activities include the NZ Hydrological Society Annual Symposium which covers a large range of hydrological issues. Another major research activity in NZ referred to by Mr Ibbitt is the establishment of a snow and ice monitoring network monitoring to assess whether there is any long term change in glaciers as a result of global warming.

7.12 PAPUA NEW GUINEA

Mr Maino Virobo described the membership of the IHP National Committee but noted that there were no meetings in the last year. Mr Virobo highlighted the proposal to engage with SOPAC to re-establish the hydrometric network as part of the Pacific HYCOS program. Re-establishment of the network on the Ramu River will also be undertaken with funds from the European

Development Fund. Efforts will be made to contribute to the next volume of the Catalogue of Rivers and to the regional data base.

7.13 PHILIPPINES

Mr Leonardo Liongson reported that two additional universities were added to the Philippines National Committee. He then described a number of international activities in which the committee was involved including, AUN-SEED-Net Joint Mini-Seminar on Environmental Technology, 4th World Water Forum, investigation of the Leyte landslide and the NARBO Water Allocation and Water Rights workshop. The local activities were numerous with the Philippine Water Partnership Program providing a direct link to the Government's Ministers. Mr Liongson informed the meeting that the contribution to Volume 6 of the Catalogue of rivers is underway and that he has data for the basin in Volume 5 for inclusion in the Water Archive.

7.14 KOREA (REPUBLIC OF)

Mr Hongkee Jee presented the activities outlined in the country report and drew the Delegates attention to the fact that an IHP Committee had been in continuous existence since 1964. The national activities detailed in the tables in the report were then presented along with the research programme that has been followed for 6th Phase. Mr Hongkee Jee informed the RSC of participation in IHP activities and a number of International and local scientific meetings. He concluded by referring to the development of a research program for IHP Phase VII, continued participation in the AP FRIEND project and the organization of two international symposia and a workshop to be held during 2007.

7.15 THAILAND

Mr Virat Khao-Uppatum spoke to the country report noting the membership of the National Committee. The status of IHP activities was described, including the implementation of the project to establish 29 river basin management committees in 25 basins and the completion of an Integrated Water Management Plan in 25 river basins. Mr Khao-Uppatum reported on a range of research projects supported by the National Committee: such as the study of an Antecedent Precipitation Index for flood and landslide warning and summarized future activities which included strengthening cooperation with other countries in the Lower Mekong Basin as well as raising public participation programs in Integrated Water Resources Management. Mr Khao-Uppatum noted that the list of publications in the report included publications which had been omitted from reports in previous years.

7.16 VIETNAM

Mr Tran Thuc presented the country report describing a number of research projects that had been either supported or sponsored and a number of meetings and workshops that involved collaboration with other national and international organizations such as WMO and Lund University. Mr Tran highlighted the publication of the book *Illustration Handbook of Water Resources of Viet Nam* which will be distributed to schools and informed the meeting that several Vietnamese had participated in IHP courses and workshops during the past year.

8 REPORTS FROM UNESCO CATEGORY II CENTRES

International Centre for Water Hazard and Risk Management in Japan

Mr Akira Terakawa outlined the establishment in Japan of the International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO and thanked the RSC for their support of the centre.

The Japanese proposal for the ICHARM Centre was accredited at the 33rd UNESCO General Conference in October 2005 by 191 member countries and the agreement between UNESCO and the Japanese Government was signed on 3 March 2006. The Centre commenced operations in March 2006 at the Public Works Research Institute in Tsukuba, but was not officially opened until 14 September 2006. The opening in Tokyo was marked by an Inaugural Symposium with the theme "Alliance for Localism" at which there were 6 keynote speakers.

Mr Terakawa then briefly outlined the Public Works Research Institute which was established in Tsukuba in 1927 and has 9 research groups, 24 teams, a staff of nearly 400 people and an annual budget (2006) of US$80M. He further advised of the objectives of ICHARM, its guiding principles and membership of the Advisory Board; and described its research, capacity building and information networking activities. Further details can be found on web site: http://www.unesco.pwri.go.jp

Mr Terakawa also described the Asia-Pacific Water Forum (APWF) which was launched during the World Water Forum in Mexico. He advised that further details can be found on web site: http://www.apwf.org

The Humid Tropics Centre in Malaysia

Mr Mohammed Nor reported on activities since the last meeting in Bali and tabled his report (refer Annex 7). He worked through the report, highlighting the various achievements, the most notable of which was the shifting of the APFRIEND Water Archive onto a new Server at address: http://www.htckl.org.my/apfriend/wa and the Malaysian Government's approval of USD 1.3 million under the 9th Malaysia Plan for expansion and extension of additional building facilities. Mr Nor explained that the 9th Plan includes the construction of a mini-convention centre used for training courses, seminars, workshops and meetings and that the Department of Irrigation and Drainage Malaysia has commenced the planning and design of the new facilities.

Centre for Small Island Countries

Mr Ben Parakoti, representing the Pacific Island countries, proposed to UNESCO that SOPAC be recognised as a Regional Centre for water resources in small island counties in the Pacific.

Mr Daniell enquired the name of the Centre and Mr Overmars replied that there was no intention to set up a new organisation but to formalise recognition of the existing Water Resources Unit as a focal point for Pacific Islands water resources activities and existing collaboration with UNESCO .

Mr Daniell asked whether it was envisaged that the Unit become a Category II Centre to which Mr Thulstrup replied that UNESCO would investigate a mechanism for developing recognition of the water sector within SOPAC as a category II centre for Small Island Hydrology and Water resources in the Pacific.

Mr Keizrul noted that SOPAC was a broad organisation whereas Centres were very focused.

Mr Thulstrup confirmed broadness, with water as a speciality, and that any Centre would focus on the water sector.

Chairman Djajadiredja noted the Pacific Islands Water Resources Centre proposal and agreed that the UNESCO Secretariat be asked to explore the possibility of the creation of a Category II Centre within SOPAC to formalise SOPAC's Water Resources Unit's role as focal point for water resources in the Pacific Islands.

⇒ **ACTION: UNESCO Secretariat to investigate the creation of a Category II Centre to formalise SOPAC's focal point for water resources in the Pacific Islands.**

Asia-Pacific Centre for Eco-hydrology in Indonesia

Mr Jan Sopaheluwakam outlined the status of planning for the proposed Asia-Pacific Centre for Eco-hydrology in Indonesia. He noted that the Centre had adopted an integrated approach and was making good progress in the continued development of a research programme for the demonstration site in the upper Cibinong basin, where they wanted to apply the eco-hydrology principles.

Mr Jan reported that planning was still in progress and that discussions with UNESCO Jakarta office were on-going. He explained that they were currently carrying out a series of stakeholder discussions, which should be completed by November 2006, and he was hopeful of receiving final approval from UNESCO for a Category II Centre by March 2007.

9 PROGRESS OF THE ESTABLISHMENT OF IHP NATIONAL COMMITTEE IN LAO, PDR

This item was discussed under Item 7 – Country Reports and is recorded under item 7.7.

10 CATALOGUE OF RIVERS FOR SOUTHEAST ASIA AND THE PACIFIC, VOLUME VI

Mr Chikamori presented an overview of the 5 published volumes of the Catalogue of Rivers which includes data and information from 114 rivers in the region and a proposal for revision of the Catalogue of Rivers. Mr Chikamori's proposal recommended selecting target river basins and observing stations previously published in Volumes I-V and updating the information with the additional records. He explained that countries should select river basins with a catchment area of 500-5000 km^2 and should have at least one runoff station with >20 years of record and associated rainfall and evaporation records. Mr Chikamori outlined the need to have at least daily data but preferably hourly data, and suggested that formatting of the new volume be finalized by February 2007.

Mr Daniell noted that IDF rainfall data were available down to a 6 minute interval, and that the recording interval would be relative to catchment size.

Mr Chikamori commented that data in the previous volumes was very valuable as it had been corrected so it should be exploited for the new volume.

Mr Chen enquired what type of evaporation data was required and which estimation method should be used. Mr Xu suggested that the model for calculating evapo-transpiration should be specified.

Mr Tachikawa asked Mr Nor about the status of the data on the HTC Water Archive with respect to the River Catalogue volumes and Mr Nor replied that there was a certain amount of duplication with the various archive nodes.

Mr James wished to clarify the situation with respect to the Water Archive and advised the meeting that the data held was often incomplete with both the quality and duration of the data needing improvement. He noted that last year it was agreed to update the Catalogue of Rivers datasets to as high a standard as possible.

Much discussion followed with delegates expressing some confusion as to the exact nature of the Catalogue of Rivers proposal. Mr Thuc suggesting the need for the proposal to be reviewed by the TSC and Mr Daniell agreed that the guidelines proposed needed to be tightened. He further commented that there was a need to improve the data we have to work on and that the specification for submissions needed to be amended and be more explicit in order to provide useful datasets.

Chairman Djajadiredja summarized, and suggested that there was a need for more discussion and suggested that a small working group (Messrs Danniell, Soontak Lee, Nor, James. Tabios & Chikamori) get together at the end of the day's session of the RSC meeting to discuss details and report their recommendations back to the RSC the following morning before the next item on the agenda, item 11 – The Report of the APFRIEND.

Mr Soontak Lee noted that as the Catalogue of Rivers is part of the APFRIEND it should be reported on at that time.

Chairman Djajadiredja advised that item 10 would be continued as the first item on the following morning.

The meeting was adjourned at 6:15 pm

FRIDAY 20 OCTOBER (2nd day) – meeting reconvened at 08:30 hrs

Mr Chikamori commenced by outlining the results of the working group on the Catalogue of Rivers held the previous evening. Points covered were as follows:

- Due to there being some confusion over the new style of publication a name change was suggested;
- Volume VI to be published as a CD only;
- Volume VI to be in two parts: –
  - Part 1 – Catalogue of Rivers – new or updates to existing basins in Volumes I-V.
    Mr Chikamori noted that the river basins included will be a mixture of rivers selected from Volumes I–V with updated higher resolution data, and additional information and possibly some new rivers selected by individual countries;
  - Part 2 – Hydrological data used in Part 1 in Excel format;
- The river basins should include a catchment with 500-5000 km^2 with descriptions and data time series including rainfall, discharge, evaporation and soil moisture;
- Observation data requirements were presented;
- Additional information is to be provided for the river basins (compared with previous volumes) and the data is to be the highest resolution each country can agree to provide.
- Further guidelines of the required data for rainfall, discharge and evapotranspiration for the river basins including discussion on length of data, data required and updating the river data that is already in the Catalogue of Rivers Archive.
- Editors proposed for the publication were Messrs Chikamori, Daniell, Tachikawa, Thuc, Pawitan and Liongson.
- Mr Chikamori advised that the time-frame for publication was proposed as follows:
  - 19, 20 October 2006 (RSC 14)
  - 31 October 2006 – Format to be advised by Mr Chikamori
  - 31 December 2006 – Countries to provide basin information to Mr Chikamori
  - 28 February 2007 - Finalise formatting and send to publisher
  - 31 March 2007 – Volume VI published on the Internet

There was much discussion about the format of the two parts and Mr Chikamori clarified that Part 1 was the same as previous Catalogues of River volumes and that Part 2 was time series data.

Mr Soontak Lee advised that in the case of providing data for a new basin, the March 2007 deadline was too tight and suggested December 2007 to be a more realistic deadline.

Mr Chikamori advised that data for existing basins could go into Volume VI whilst data for the new basins could go into the following volume (VII).

Mr James asked whether any countries proposed new basins and Mr Virobo advised that PNG would have to submit a new basin. Mr Arduino suggested new countries could submit their basins in the old format but Mr Tachikawa asked if new basins could be sent in the new format.

Mr Nor confirmed that March 2007 was too close to do a good job of analysis and proposed that the deadline for publishing be moved closer towards the next RSC meeting in November 2007.

Mr Liongson agreed the deadline was tight as much of the electronic records for the old volumes had been lost and would need to be re-digitised.

Chairman Djajadiredja summarised and suggested that the publication date be shifted from March 2007 to October 2007 – immediately prior to the next RSC meeting.

Mr Chikamori advised that in order to meet the new October 2007 publication date the data would now not need to be received from the countries until 30 June 2007 and formatting etc would need to be completed by 31 August 2007.

Mr Daniell advised that instructions on data submissions would need to be reissued and Mr Thuc advised that the editors would need to discuss the data structure and advise all countries. Mr Takara asked if all countries would contribute, to which the Myanmar delegate – Mr Ookyi replied that he would need to check with his Minister; and the Mongolia delegate – Mr Basandori replied that his country will try to participate.

Chairman Djajadiredja summarised by agreeing with the revised timeframe and hoping that all countries can contribute.

Revised Timetable:

- 30 June 2007 – Countries to provide basin information to Mr Chikamori
- 31 August 2007 - Finalise formatting and send to publisher
- 30 October 2007 – Volume VI published on the Internet

⇒ **ACTION: Mr Chikamori to advise all countries of the new format for the Catalogue of Rivers and the new timetable for country submission.**

11 REPORT ON THE ASIAN PACIFIC FRIEND

Mr. Daniell provided a report of the AP FRIEND TSC meeting held the previous evening (Annex 8) noting that the TSC is almost identical to the RSC. Progress of the IFD project was discussed. A commitment by the participating countries was made to ensure that the remaining results (description of national methodology and analysis of data sets) will be passed on to Mr. Tabios by November. Mr. Tabios will prepare a final report so that the analysis of IFD can be finalized and countries that are not directly participating in the project can make use of the results, thus providing a transfer of knowledge component to the project.

As soon as the IFD analyses have been received from the countries, Mr. Daniell will distribute a research proposal for the flood frequency project.

Mr. Daniell suggested that the TSC be disbanded as its membership has grown to be almost the same as the RSC and the discussion is also very similar to that which occurs in the RSC. He proposed the establishment of smaller Working Groups under the RSC to address specific research topics.

In response to a query from Mr Lee, Mr James advised that the minutes of the TSC meeting were not yet available for circulation.

A discussion involving a number of Delegates ensued to clarify what was intended by the use of Working Groups. Following this discussion it was agreed that:

- Small Working Groups will be created and disbanded as required by the RSC to carry out specific research projects.
- The Working Groups will report to the RSC.
- Initially two Working Groups will be established to work on the Rainfall IFD project and the Flood Frequency project respectively.

With respect to the Rainfall IFD project, Mr Tabios summarized the required action as follows:

- Countries will forward the analyses by dates agreed in the TSC meeting.
- Mr Tabios will prepare a report of the results and forward it to Mr Daniell for refinement. Hopefully this will be completed by mid January 2007.
- Mr Daniell will distribute the report to the countries and arrange the knowledge transfer activity.
- The Working Group will be disbanded.

ACTION:
1. Countries to submit IFD analyses as agreed in the TSC meeting.
2. Mr Tabios and Mr Daniell to prepare and distribute a project report
3. Mr Daniell to arrange IFD knowledge transfer activity (also an action under Item 12)

12 TECHNICAL PROPOSAL FROM THE RSC FOR IHP-VI (2002-2007). IHP VII (2008-2013) AND RELATED ACTIVITIES

Mr Takara inquired what activities will be funded by UNESCO Jakarta Office for the remainder of IHP-VI and the beginning of IHP-VII.

Mr Arduino responded that, in addition to support being provided for Malaysia, China and Thailand to attend the global FRIEND conference in Cuba, funding is available for both an AP FRIEND activity and the next volume of the Catalogue of Rivers. Approximately USD 15000 is available for use by the end of 2007.

During the discussion that followed:

- Mr Takara requested that consideration be given to supporting the participation of the new countries, Myanmar and Mongolia, in the next RSC meeting and in other activities;
- Mr Nor requested support for a project on flood forecasting for the tropical region that was originally expected to be submitted for PP funding;
- A representative from Thailand requested that more emphasis be placed on IWRM implementation and improved cooperation on climate change; and
- Mr Daniell suggested that funds be used for a knowledge transfer workshop for the Rainfall IFD project; this was supported by Mr Tran Thuc.

In closing the discussion on this item the Chairman acknowledged the proposals and requests presented but there was no clear decision from the discussion which, if any, of them was agreed. However, during the discussion Mr Takara requested that proposals be submitted by 31 December 2006 to UNESCO Jakarta Office for the use of the remaining funds.

⇒ **ACTION: Proposals be submitted by 31 December 2006 to Jakarta for the use of the remaining funds**

13 ORGANIZATION OF THE 15TH RSC MEETING IN THE PHILIPPINES IN 2007

Mr Liongson presented the Philippines plans to host the 15th RSC Meeting, 19-23 November 2007, in conjunction with a conference on water resources management hazard reduction and sustainable development. The presentation included details on the nature, culture and history of Manila as well as of recent water sector conferences. A conference/circular was also distributed.

The discussion following the presentation clarified points such as the dates, the need to have a flexible schedule to allow for Working Group meetings and the preference from some countries that the conference be called 'International' rather than 'Regional'.

Mr Liongson agreed it would be an 'international' conference, informed the meeting that the conference is being supported by a UNESCO PP Grant and that two possible locations have been identified to cater for weather and political considerations. The seaside venue shown in the presentation is the preferred venue.

14 ORGANIZATION OF THE 16TH RSC MEETING IN 2008

The Chairman inquired whether any countries have expressed an interest in holding the 16th RSC meeting in 2008 and was advised by Mr Takara that no proposals have been received.

During discussion about possible venues and the host countries of previous meetings, the following options emerged:

- Beijing in conjunction with the next APHW conference;
- Japan; and
- Mongolia

There were issues to be considered with each of the options, such as the Olympics in Beijing and elections in Mongolia, and each country required further discussions before a decision to host the meeting could be made. Mr Chen also advised that, while China would consider 2008, its preference was to be host in 2009.

The Chairman listed the three possible countries (China, Japan and Mongolia) for host of the 2008 meeting, noted China's preference to host the 2009 meeting and requested that an agreement on the 2008 host country be reached before the 15th RSC in Manila.

⇒ **ACTION: China, Japan and Mongolia decide who will host the 2008 RSC meeting**.

15 ADOPTION OF RESOLUTIONS

Mr Takara described two resolutions RSC14-1 and RSC14-2 to be considered by the meeting.

(1) RSC14-1: Invitation of Lao PDR and the Union of Myanmar to RSC

Following presentation of the resolution, Mr Lee questioned the need for it as Lao PDR has participated in RSC meetings for more than 10 years even though they do not have a IHP National Committee. He felt it should be sufficient for the RSC to simply agree that they be members.

Mr Takara expressed the view that a Resolution is a more visible statement by the RSC and can be used to encourage action by a country such as establishing an IHP National Committee.

Following further discussion that resulted in some minor adjustment to the wording of the resolution and, in the absence of any further disagreement, the Chairman announced that Resolution RSC14-1 was adopted. The Resolution is included in Annex 9.

(2) RSC14-2: Asian Pacific FRIEND project

The Chairman requested that Mr Daniell present the modified version of Resolution RSC14-2. Mr Daniell advised the meeting that this resolution built on Resolution 13-2 which was discussed but not adopted at the previous meeting and explained the changes that had been made.

As a result of a request from Mr Nor, the text referring to the Humid Tropics Centre (HTC) was adjusted to make its meaning clearer.

Mr Takara said he would like to encourage the Director of the HTC to make use of this Resolution to contact IHP National Committees to seek additional data for the Water Archive.

Mr Ibbitt reinforced this view by requesting that the letter sent by the HTC to each country not simply ask for data, but to detail what data are already included and clearly detail what data are required from the country.

The Chairman inquired of the Delegates whether the Resolution was acceptable and, in the absence of any dissent, announced Resolution RSC14-2 adopted (Annex 9).

16 ELECTION OF RSC SECRETARY FOR 2006-2008

The Chairman informed the meeting that the term of office of the current RSC Secretary, Mr Takara, had expired and asked for nominations for the position of RSC Secretary for the period 2006-2008.

Mr Thuc proposed the nomination of Mr Takara as Secretary for another term which was accompanied by applause from all Delegates.

On the basis of this acclamation the Chairman declared Mr Takara elected to the position of RSC Secretary for the period 2006-2008.

Mr Takara thanked the Delegates and said he would do his best. However, he informed the meeting that he is becoming increasingly busy and, if some additional responsibilities should occur, he may have to resign which will require someone else to step into the position.

17 OTHER ISSUES RAISED

The Chairman inquired of the Delegates if there were any other item of business to be raised.

Mr Thuc expressed the view that Agenda Item 12 had not been completed as a decision had not been made about the Rainfall IFD Knowledge Transfer Workshop.

Following a brief discussion it was agreed that a workshop would be held, most likely in June 2007 and the selection of the right people to participate and the details of the meeting would be organized between Mr Daniell and Mr Arduino.

⇒ **ACTION: Mr Daniell and Mr Arduino to arrange the Rainfall IFD Knowledge Transfer Workshop.**

Mr Basandorj advised the meeting that, following discussions and encouragement from many people during the coffee break, Mongolia would host the 16th RSC Meeting in 2008. This announcement was greeted with applause from the Delegates and the Chairman thanked Mongolia for agreeing to host the 2008 meeting.

18 CLOSING OF THE MEETING

The Chairman thanked Thailand for hosting the meeting and the excellent organization, thanked the Delegates for their contributions during the meeting, expressed the hope everyone would again meet in Manila and closed the meeting.

ACTION ITEMS	BY WHOM	DATE
1. Investigate the creation of a Category II Centre to formalise SOPAC's focal point for water resources in the Pacific Islands.	Jakarta Secretariat	
2. Advise all countries of the new format for the Catalogue of Rivers and the new timetable for country submission	Chikamori	31October 2006
3. Concerning APFRIEND IFD Project; a) Countries to submit IFD analyses as agreed in the TSC meeting, b) Prepare and distribute a project report.	Countries, Mr Tabios and Mr Daniell	Mid January 2007
4. Proposals be submitted by 31 December 2006 to Jakarta for the use of the remaining funds.	Countries	31 December 2006
5. China, Japan and Mongolia decide who will host the2008 RSC meeting.	China, Japan and Mongolia	Before RSC15
6. Arrange the Rainfall IFD Knowledge Transfer Workshop.	Mr Daniell and Mr Arduino	

ANNEX 1
PARTICIPANTS, 14TH MEETING OF THE IHP REGIONAL STEERING COMMITTEE FOR SOUTHEAST ASIA AND THE PACIFIC

NAME	COUNTRY
ROSS JAMES	AUSTRALIA
TREVOR DANIELL	AUSTRALIA
LONG SARAVUTH	CAMBODIA
CHEN YUANFANG	CHINA
ZONGXUE XU	CHINA
BEN PARAKOTI	COOK ISLANDS
MARC OVERMARS	FIJI - SOPAC
AGUNG BAGIAWAN	INDONESIA
EDDY A. DJAJADIREDJA	INDONESIA
GADIS SRI HARYANI	INDONESIA
JAN SOPAHELUWAKAN	INDONESIA
AKIRA TERAWAKA	JAPAN
HIDETAKA CHIKAMORI	JAPAN
KAORU TAKARA	JAPAN
KEIKO KANZAKI	JAPAN
TAKAHIRO SAYAMA	JAPAN
YASUTO TACHIKAWA	JAPAN
MANOLOTH SOUKHANOUVONG	LAO PDR
KEIZRUL ABDULLAH	MALAYSIA
LEE BEA LEANG	MALAYSIA
MOHAMED FERDAOS	MALAYSIA
MOHAMMED NOR MOHAMED DESA	MALAYSIA
MUHAMMAD AL-MUZAMMIL CHU AHMAD	MALAYSIA
D. BASANDORJ	MONGOLIA
HTAY OO KYI	MYANMAR
BOB CURRY	NEW ZEALAND
RICHARD IBBITT	NEW ZEALAND
MAINO VIROBO	PAPUA NEW GUINEA
GUILLERMO TABIOS	PHILIPPINES
LEONARDO Q. LIONGSON	PHILIPPINES
HONGKEE JEE	REPUBLIC OF KOREA
SOONTAK LEE	REPUBLIC OF KOREA
SACHA SILTHAPUTRA	THAILAND
SUKONTHA AEKARAJ	THAILAND
VIRAT KHAO-UPPATUM	THAILAND
TRAN THUC	VIETNAM
HANS THULSTRUP	UNESCO - APIA
GIUSEPPE ARDUINO	UNESCO - JAKARTA
R. JAYAKUMAR	UNESCO - BEIJING

ANNEX 2

AGENDA, 14 TH MEETING OF THE IHP REGIONAL STEERING COMMITTEE FOR SOUTHEAST ASIA AND THE PACIFIC

Thursday 19 October 2006

1) Opening
2) Election of the Rapporteur
3) Adoption of the Agenda
4) Approval of new member (Mongolia, Prof. Basandorj)
5) Secretariat reports
6) Report from an IGC Vice Chairperson (Dr. Keizrul, Malaysia)
7) Country Reports
8) Reports from UNESCO Category II Centres (HTC, ICHARM, etc.)
9) Progress of the establishment of IHP National Committee in Lao, PDR
10) Catalogue of Rivers, Volume VI

Friday 20 October 2006

11) Report on the Asian Pacific FRIEND
12) Technical Proposal from the RSC for IHP-VI (2002-2007), IHP-VII (2008-2013) and related activities
13) Organization of the 15th RSC Meeting in the Philippines in 2007
14) Organization of the 16th RSC Meeting in 2008
15) Adoption of Resolutions
16) Election of the RSC Secretary for 2006-2008
17) Other issues raised
18) Closing of the Meeting

ANNEX 3

SECRETARIAT REPORT
BY
UNESCO JAKARTA OFFICE

14TH IHP REGIONAL STEERING COMMITTEE MEETING FOR SOUTHEAST ASIA AND THE PACIFIC

Bangkok, Thailand, 19-20 October 2006

TABLE OF CONTENTS

1. ACTIVITIES CARRIED OUT SINCE THE LAST REGIONAL STEERING COMMITTEE MEETING

1.1 Follow-up to the 13th IHP-RSC meeting

A number of actions to be followed-up were identified during the 13th RSC meeting (UNESCO Office, Jakarta, 2005). Here below is a brief report on the current status:

1. *Regularly update NatCom contact list*
   The list is circulated within the delegates at the RSC Meetings, then consolidated and sent to Paris HQ to Mr. Vincent Leogardo, from the IHP secretariat, v.leogardo@unesco.org who regularly upload the list in UNESCO's water portal, IHP National Committees.

2. *Provide e-mail distribution list to Mr Jha for distribution of conference literature*
   The list was sent to Mr. Jha after the 13th RSC Bali Meeting.

3. *Send reminder letter to Lao PDR re formation of IHP NatCom*
   No related activities were implemented.

4. *Restate SEAP RSC's resolution to IGC re the status and functionality of RSC's*
   No related activities were implemented.

5. *Decide on commencement of Design Flood Project – possibly at the second IFD workshop in March/April 2006*
   The workshop was not hold. Further action is needed in order to set a meeting date and venue after the 5th FRIEND conference in Cuba.

6. *Cost estimate to produce 1,000 CDs for Catalogue of Rivers Volume VI*
   One quotation was received by the HTC in Kuala Lumpur, and refers to the production of 1,000 CDs for the cost of approximately USD 1,100 (RM 4,000). This cost includes the hard cover paper but not the contents editing.

7. *Discuss with Japan Water Forum RSC booth and session participation at the 4th WWF*
   As UNESCO IHP had a stand at the WWF, this action was dropped.

8. *RSC write to countries to request Governments support participation at the 4th WWF*
   Chairperson……

9. *Discuss financial matters of RSC 14 and symposium with Thai IHP*
   This was done starting from January 2006.

1.2 Workshops, training courses, symposia and travel grants

1.2.1 15th IHP Nagoya Training Course "Water and Carbon Cycles in Terrestrial Ecosystems", Nagoya and Chiba, Japan, from 26 February to 11 March 2006

The general aim of the 15th IHP short course was to help participants to develop their basic knowledge of the Water and Carbon Cycles in Terrestrial Ecosystems to contribute to solve current global environmental problems. To detect and predict responses of terrestrial ecosystems to global change are one of the important scientific issues in global environmental studies. To cope with such issues, basic understanding of physical and biogeochemical nature of water and carbon cycles in various terrestrial ecosystems are required. The micrometeorological and biogeochemical knowledge or techniques, including uses of stable isotopes of H_2O and CO_2 and numerical model, are the basis for the understanding.

The course has focused on two major subjects. First to examine leaf- and canopy-scale exchange processes of heat, water vapor, and carbon dioxide with surrounding atmosphere. Second, to study relationships of the vegetation dynamics with climate feedbacks in future. The lectures and practices will be conducted in Nagoya University and Chiba University.

The training course was attended by 14 participants from China (2), Indonesia (2), Lao PDR (1), Myanmar (1), Nepal (1), Philippines (2), PNG (1), Thailand (1), USA (1) and Viet Nam (2). UNESCO office, Jakarta, through the Japanese Fund in Trust from the Ministry of Education, Culture, Sport, Science and Technology (MEXT) was able to support the participation of 7 participants.

1.2.2 Training Course on "Isotopes Methods in Hydrogeology", Ho Chi Minh City from 5 to 9 June 2006

The training course on "Isotope Methods in Hydrogeology", held from 5 to 9 June 2006 at the Institute of Environment and Resources of the University of Ho Chi Minh City, Viet Nam, was attended by 26 postgraduate participants coming from different national institutions, research institutes and private sector.

In the framework of the Grant from the Italian Ministry of Land and Territory to Viet Nam, the training course was held by Prof. Paolo Bono, from the Department of Earth Sciences, Universita' La Sapienza, Roma, Prof. Gian Maria Zuppi, from the Università Ca' Foscari, Venezia and Dr Fabrizio Gherardi from the Institute of Geosciences and Earth-Resources (CNR), Pisa.

Due to the fact that few students knew English, the lectures were entirely translated from and to English and Vietnamese languages.

The training course was divided into basic lectures concerning the distribution and use of stable isotopes in water and in practical examples and case studies from different groundwater occurrences and major basin aquifers all over the world (Nubian, Guarani, central Italy karst aquifers), with particular reference to the ongoing research project on Artificial Groundwater Recharge project in Binh Thuan Province, Viet Nam.

1.3 Travel grants

UNESCO Office, Jakarta, provided several travel grants to regional scientists in the framework of the IHP Programme, within international events. In particular:

- 2 scientists attended the CSIRO Interpretation and Data Analysis Training on Managed Artificial Recharge of Groundwater", held in the Commonwealth Scientific and Industrial Research Organisation – CSIRO Land and Water Adelaide Laboratory in Urrbrae, South Australia, from 5 to 25 February 2006.
- 2 scientists attended the "International Workshop on Impacts on Reforestation of Degraded Land on Landscape Hydrology in the Asian Region" held in Roorkee, India, from 6 to 10 March 2006
- 2 scientists attended the HELP 2nd meeting of the Steering Committee from 15 to 17 March, 2006, adjoining the 4th World Water Forum HELP Session on March 18, 2006
- 1 scientist attended the 4th WWF session on "Fostering Sustainability in Arid and Scarce zones through local actions" on 20 March 2006, in Mexico City.
- 2 scientists attended the "3rd Annual Meeting of the Asia Oceania Geosciences Society (AOGS), in Singapore, from 10 to 14 July 2006.

1.4 Asian Pacific Flow Regimes from International and Experimental Network Data (AP FRIEND)

1.4.1 UNESCO - APFRIEND Preparation to the 5th FRIEND World Conference" Water Resources Variability: Processes, Analyses and Impacts"

Following discussions during the 11th RSC Meeting in Fiji, October 2003, and examination of the survey results of the member countries, it was decided that themes such as high flows and low flows (including droughts) should be continued from phase 1 to phase 2 of APFRIEND. The theme of anthropogenic effects in terms of urbanization and changing land uses would be embedded in these themes. Because rainfall analysis is an essential input to prediction of high flows, low flows and drought analysis and had been surveyed as a priority in many countries, it was proposed that activities initially be focused on rainfall, specifically in terms of:

a) what data are available in countries in the region;
b) how accessible is the data for research within each country;
c) how accessible is the data for research outside the country;
d) availability and origin of design rainfall guidelines/standards in countries; and
e) investigation of development of regionally consistent rainfall design techniques and guidelines.

The report (RSC-APFRIEND, 2005) summarizes the activities carried out in the initial stage of the Asia Pacific FRIEND Phase 2 and the results presented at the "Intensity Frequency Duration and Flood Frequencies Determination Meeting" held in Kuala Lumpur in June 2005. Nine countries participated and contributed to the data set for further analysis.

The initial stage of the AP FRIEND Phase 2 has been followed by the redaction of the chapter 7 for the 5th world conference, that was sent to the Organising Committee by the AP FRIEND Chairman Mr. Trevor Daniell last April. This chapter will be integral part of the general FRIEND report 2006.

1.4.2 Catalogue of Rivers for Southeast Asia and the Pacific

Actions concerning the publication of the Catalogue of Rivers, Volume VI, will be taken in the course of the present meeting. A proposal and revision from Hidetaka Chikamori and Yasuto Tachikawa was sent to IHP National Committees in September, and will be discussed later in this meeting.

1.5 Activities within UNESCO Jakarta

1.5.1 Hydrogeological project for artificial aquifer recharge in Hong Phong District, Binh Thuan Province, Viet Nam

The Binh Thuan Province, whose principal city is Phan Tiet, is located along the coastal plain in the lower part of Central East Viet Nam. It extends for approximately 8,000 km^2, with a total population of one million. The Province is divided in 7 districts, each of them subdivided in further sub districts. Hong Phong sub district (Bac Binh District), located at 25 km NE from Phan Tiet and reaching a height of approximately 200 m above sea level, has an area of approximately 300 km^2 and comprises 3 villages.

Before 1975, the area was covered by a dense forest, which was abruptly cut to make place to rice pads which were never developed and resulted massive desertification took place. Due to an uneven rainfall distribution (1112 mm/year of average) and a three months period (from December to March) characterized by very little precipitation (23 mm in 4 months averagely), the area suffers considerable water shortage during the dry season, never experienced prior the complete removal of the land cover (forest). Due to the particular geological settings (permeable sands) and the impossibility to storage surface water during the dry season (due to rapid run-off and high evaporation rates), an artificial recharge and further water storage in the sand aquifer is envisaged.

The project consists of three major components, as follows:

1. Research and investigation carried out by Vietnamese and foreign experts
2. Development of a pilot project with the aim of supply water to the Hong Phong sub district
3. Capacity building through different international and local training courses/workshops. Participation of Vietnamese scientists to international conferences/symposium and meetings on MAR (Managing Aquifer Recharge) techniques is also envisaged.

The 3rd phase of the project, started in April 2005, included:

a. The geophysical investigation of the area between Bau Noi and Bau Trang;
b. Connection of Bau Noi to Hong Phong through a water pipeline to deliver the 220 m^3/day water supply system

c. The drilling of 3 observation wells;
d. Chemical analyses (normal chemical analyses and isotope analyses);
e. Microbiological analyses;
f. The installation (rental) of temporary meteorological stations.

As part of the capacity building activities, one workshops scheduled in Ho Chi Minh Universities (5-9 June 2006) on "Use of Isotopes in Hydrogeology" was addressed to approximately 26 postgraduate participants from different national institutions, research institutes and private sector.

This project, which is currently under implementation, is co-funded by the Vietnamese Government, UNESCO Office, Jakarta, ICSU (International Council for Science) and the Italian Ministry for the Environment and Territory.

1.6 Review and Evaluation Meeting on IHP Activities supported by the Japanese Fund in Trust (FIT)

An evaluation report on the activities implemented within the framework of the IHP Programme and supported by the Japanese FIT during the period 2005-2006, was presented by UNESCO Office, Jakarta, at the meeting held in UNESCO Office, Jakarta, from 18 to 19 May 2006. The report describes the activities carried out in the Asia Pacific Region within two main areas:

– the Regional Steering Committee (RSC) of IHP for Southeast Asia and the Pacific and
– the IHP Training Courses**,** annually organised by the Nagoya University in Japan.

The resolutions adopted during the meeting are as follows:

1.1. IHP committee will call on Nagoya University to complete the textbook publication and provide it before the 16th training course.

2.2. JAK will make an effort to trace participants of training courses as far as possible, i.e. to build up a data base with contact details, scientific and professional background of participants of IHP training courses to improve the accountability and visibility of these courses. As a start, a preliminary database with the possibility to up-date contact details may be provided on the UNESCO Jakarta website.

3.3. JAK will revise the final reports, i.e. to highlight remarkable achievements describing not only the scientific benefit but also the social impact, and the follow-ups of the project. All activities will be described; including those which are not JFIT funded such as AP-FRIEND (other funding sources should be mentioned when appropriate).

4.4. Collaborative activities of IHP and MAB will be highlighted and included in the reports submitted to the intergovernmental IHP and MAB councils. In the ongoing review of the science programme this will be emphasized.

5.5. Jakarta Office will include more detailed information on participants of RSC, IHP training course in the implementation report.

1.7 IHP Nagoya Training Courses Databases

Since 1991 the Institute of Hydrospheric-Atmospheric Sciences of Nagoya University in Japan and UNESCO Office Jakarta, have been organising the IHP Nagoya Training Courses. This was made possible with a financial support provided by a Trust Fund to UNESCO from the Ministry of Education, Culture, Sports, Science and Technology of the Japanese Government (MEXT).

So far 15 courses of the average duration of 2 weeks have been organised and approximately 200 students from over 22 countries mostly in Southeast Asia and the Pacific were trained in the different hydrological disciplines.

In order to improve the accountability and visibility of these courses, as well as in the attempt to evaluate the potential impact these courses have had on the participants' career and scientific enhancement, and in order to trace the participants of the courses as far as possible, it was decided to set up a database that should contain up-to-date contact details and scientific and professional experience of the attendees.

A first step of the process included the setting up of a questionnaire on the Nagoya courses, which is now available on UNESCO Office Jakarta website at http://www.unesco.or.id then SCIENCE and then WATER SCIENCE and finally IHP Nagoya Training Courses (complete website address http://www.unesco.or.id/activities/science/water_sci/ihp/300.php).

Since 1991, approximately 161 scientists from 25 countries have attended the IHP Nagoya Training Courses. Among them are university lecturers, decision makers, engineers as well as students. So far, 81 have been contacted from which 25 have already filled in the questionnaire. For 80 participants current contact details are lacking.

The ongoing evaluation of the questionnaire shows that participants have been very satisfied with the training courses and the knowledge and new experience gained. Many participants have disseminated the knowledge gained to their colleagues and incorporated into their research work. The training courses also helped them in developing and implementing new project ideas or in enhancing education materials.

2. PUBLICATIONS SINCE NOVEMBER 2005

Proceedings of the International Symposium on Ecohydrology, Kuta, Bali, Indonesia, 21-26 November 2005. Edited by Hehanussa P.E., Haryani G.S., Pawitan H. and Soedjatmiko B. IHP-VI Technical Documents in Hydrology, No. 4. RSC for Southeast Asia and the Pacific. UNESCO Office, Jakarta, 2005.

13th IHP Regional Steering Committee meeting for Southeast Asia and the Pacific. Bali, Indonesia, 24-25 November 2005. Final Report. IHP-VI. No. 13. UNESCO Jakarta Office, 2005.

Asian Pacific FRIEND, Intensity Frequency Duration and Flood Frequencies Determination Meeting, Kuala Lumpur, Malaysia, 6-7 June 2005. IHP-VI Technical Documents in Hydrology, No. 5. RSC for Southeast Asia and the Pacific. UNESCO Office, Jakarta, 2005.

3. CONTACT REFERENCES

UNESCO Office, Jakarta
Regional Science Bureau for Asia and the Pacific
Jalan Galuh (II), n. 5
Kebayoran Baru
Jakarta 12110, Indonesia
P.O. Box 1273/JKT
Tel. (+62 21) 73 99 818
Fax (+62 21) 72 79 64 89
Home Page: www.unesco.or.id
E-mail: jakarta@unesco.org

Hydrology Unit

Programme Specialist in Hydrological and Geological Sciences
Mr. Giuseppe Arduino
E-mail: g.arduino@unesco.org
☎ (+62 21) 73 99 818, ext. 837

Programme Assistant for Hydrology and Geology
Mrs. Mona Pattipeiluhu
E-mail: m.pattipeiluhu@unesco.org
☎ (+62 21) 73 99 818, ext. 818

Junior Project Assistant for Hydrology
Ms. Pungky Utami
E-mail: p.utami@unesco.org
☎ (+62 21) 73 99 818, ext. 863

Correspondence via fax: Fax no. (+62 21) 72 79 64 89, attn: Mr. Giuseppe Arduino

ANNEX 4

SECRETARIAT REPORT
BY
UNESCO APIA OFFICE

14th IHP REGIONAL STEERING COMMITTEE MEETING FOR SOUTHEAST ASIA AND THE PACIFIC
Bangkok, Thailand, 19-20 October 2006

Hans Dencker Thulstrup
Science Programme Specialist

1. Introduction

The Pacific sub-region is represented at the 14th RSC by Mr. Ben Parakoti of the Cook Islands as per the agreement reached between Pacific representatives at the 11th RSC in Fiji, 2003. The main report on IHP activities in the Pacific sub-region will be delivered by Mr. Parakoti. The present report of the UNESCO Apia Office (UNESCO Office for the Pacific States) should be seen as an appendix to this main account of Pacific IHP activities.

2. Partnerships

The main modality of the UNESCO Apia Office IHP programme remains the development and maintenance of regional partnerships. UNESCO Apia's continues its active participation in the **Pacific Partnership Initiative on Sustainable Water Management** under which all major donors and technical agencies working in the region cooperate on addressing - in a strategic manner - urgent needs of the region related to water resources. Activities under the partnership are coordinated by SOPAC in the context of the **Pacific Regional Action Plan on Sustainable Water Management**.

UNESCO Apia Office acknowledges the substantial coordinating role of SOPAC towards this partnership, as well as the considerable contribution of the Government and research community of New Zealand through NZAID, NIWA (the New Zealand Institute for Water & Atmospheric Research), and Landcare Research.

UNESCO Apia Office is an active partner in two major projects under the partnership currently in their initial phase – the GEF-funded Integrated Water Resources Management project and the European Union-funded Pacific HYCOS project.

Further details are available in the Pacific national report, as well as on the Partnership website: http://www.sopac.org/tiki/tiki-index.php?page=CLP+Pacific+Partnership

3. Key Activities

3.1 SOPAC/WMO/UNESCO/NIWA Hydrological Training Course on Surface & Groundwater

The SOPAC/WMO/UNESCO/NIWA Hydrological Training Course on Surface & Groundwater is a good example of an activity undertaken in the context of the Partnership Initiative.

The 3rd Course of the Hydrology Training Programme, similar in outline to the 2nd course discussed in last year's report, was split into two groups: 1) for participants from high volcanic island countries, which are dominated by surface water resources, and 2) for participants from atoll and high limestone island countries, which are dominated by groundwater resources.

The Surface Water course consisted of 3 weeks of training from 12 June to 30 June 2006 held at the SOPAC Secretariat's training room in Suva, Fiji with participants in attendance from Cook Islands, Fiji, Palau, Papua New Guinea, Samoa, Solomon Islands and Vanuatu. UNESCO and SOPAC jointly facilitated the opening session of the training course on 12 June.

The Groundwater course consisted of 2 weeks of training from 19 June to 30 June 2006 with participants in attendance from the above countries as well as Kiribati, Maldives, Niue, Tonga and Tuvalu.

Following participants' recommendations following last year's course, there were several joint sessions for both the Surface water and Groundwater groups in the 2nd and 3rd week of the course and joint field trips were organized to complete a water resources assessment exercise on one of Fiji's outer islands located near Levuka, the old capital of Fiji.

A separate course for the North Pacific Island Countries will be organized in October 2006.

3.2 **HELP in the Pacific**

The ongoing project *Catchments and Communities*, which has been implemented by the Government of Vanuatu with support from UNESCO Apia since 2000, led to the nomination of the Talise catchment area as a HELP Basin in January 2004. In order to ensure the maximum benefit of this development to Vanuatu as well as to the Pacific as a whole, UNESCO Apia Office and Landcare Research, Ltd jointly organized the Pacific HELP Symposium during 7-11 November 2005. Additional financial support was provided by the UNESCO Jakarta Office and the UNESCO Division of Hydrological Sciences.

The Pacific HELP Symposium marked the first formal event to take place under the HELP programme in the Pacific sub-region. The Symposium was hosted jointly by UNESCO Apia Office and Landcare Research, Ltd., and was held in Nelson, New Zealand, adjacent to the Motueka Demonstration HELP Basin.

One purpose of the Symposium was to develop ways in which Pacific Island agencies and communities can better manage land uses, bearing in mind their impact on rivers and coasts. This is the basis of Integrated Catchment Management and a focus of the UNESCO HELP Programme.

In particular, the Symposium focused on devising ways in which HELP can contribute to strengthening catchment area management practices in the Pacific considering the limited data collection and processing capacity in the region. The goal of the programme is to conduct multi-disciplinary, multi-stakeholder research to provide information and knowledge that will improve the management of land, freshwater, and near-coastal environments in catchments with multiple, interacting, and potentially conflicting land uses.

The Symposium was attended by a total of 9 representatives of 6 Pacific high volcanic island countries (Papua New Guinea, Solomon Islands, Vanuatu, Cook Islands, Samoa, and Fiji), by a broad range of stakeholders and scientists working in and around the Motueka Basin area, and by several specialists from other countries in the Asia-Pacific region including Japan and Australia. Unfortunately, the representative of the Federated States of Micronesia was unable to attend.

The Symposium was arranged to coincide with the Landcare Research Ltd. Annual General Meeting of New Zealand Regional Councils, allowing for an active and productive exchange between the Pacific island participants and catchment managers and scientists from all across New Zealand during two days of shared sessions.

The Pacific participants provided case studies of particular catchment management issues in their respective countries, and as part of the concluding session developed a series of draft frameworks for action under the heading “HELP in the Context of the Pacific Regional Action Plan on Sustainable Water Management – A Framework for Action”. It is expected that these draft documents will form the basis for the development of HELP activities in the Pacific over the coming five years, as well as serve as key input to the upcoming Pacific UNEP-GEF PDF-B project on integrated water resources management.

UNESCO Apia Office and Landcare Research, Ltd. are currently finalizing the Pacific HELP proceedings document. Comprised of a booklet containing the Framework for Action mentioned above as well as a CD-Rom with all presentations made throughout the week, the document will be a useful resource allowing Pacific island countries to benefit from HELP in the context of the implementation of two major water resources projects now under implementation in the region - the Integrated Water Resources Management project and the Pacific HYCOS project.

3.3 Aitutaki groundwater monitoring

As part of the AusAID funded Vaipeka Gallery Extension Project on Aitutaki in the Cook Islands, a Water Monitoring Programme was set up consisting of an extensive salinity, temperature and water level monitoring schedule. However, monitoring activities were continued after completion of the project in the year 2000 due to a lack of financial resources, human capacity and technical backstopping.

Sustainable management of Aitutaki's water resources for the use of the local population and the tourism industry cannot be achieved without ongoing monitoring to inform decision-making.

Since the end of 2004, SOPAC - with funding support from UNESCO and in cooperation with the Department of Water Works in Rarotonga - have been working with the Aitutaki Water Supply to build water resources management capacity.

The Department of Water Works have developed a GIS database of the water supply infrastructure on Aitutaki through a CIDA funded climate adaptation project and have trained local staff in its use. Local staff have also been involved in the Pacific Hydrological Training Courses facilitated by SOPAC in collaboration with UNESCO and WMO and funded by NZAID.

In addition, new monitoring equipment has been purchased and a programme mapped out to continue training and developing capacity not only to collect but to analyze and interpret monitoring data in order to be able to make informed decisions on how to best manage the water resources of Aitutaki.

3.4 UNESCO-SOPAC JFIT project on Biosphere Reserves for Sustainable Community-Driven Management of Natural Resources in Micronesia

In 2005 the Pacific sub-region's first Biosphere Reserve was established in the Federated States of Micronesia (FSM), the Utwe Biosphere Reserve in Kosrae State. An additional Biosphere Reserve, Ahnd Atoll in Pohnpei, is currently under preparation.

As contribution to UNESCO's MAB-IHP Joint Programme on **Biosphere Reserves for Sustainable Community-Driven Management of Natural Resources in Micronesia,** a national freshwater resource management study was developed by UNESCO Apia Office and submitted through UNESCO Jakarta Office for funding by the Government of Japan. The project was initiated in early 2005 in cooperation with SOPAC.

UNESCO and SOPAC worked with key partner agencies in the four states of FSM to undertake a national assessment of FSM's freshwater resources and their management. The resulting document will serve as a guideline for future UNESCO-IHP action in FSM and the wider Micronesian sub-region. The study is closely linked to the emerging Ahnd Atoll and Utwe Biosphere Reserves, which will serve as pilot sites for follow-up action

on integrated water resources management. Based on the experiences of the Ahnd Atoll and Utwe Biosphere Reserve establishment process, the study will furthermore offer comments on the potential of the Biosphere Reserve format for freshwater resource management in the small island context. It is expected that this work – and the Biosphere Reserves in FSM – will be linked to the FSM component of the regional Integrated Water Resources Management project currently under development in the context of the Pacific Partnership.

3.5 UNESCO Participation Programme Grant for Groundwater Monitoring in Niue

Following Niue's attendance at the 12th RSC meeting of the International Hydrological Programme, Niue's Department of Water Works received confirmation of support by UNESCO's Participation Programme for a groundwater monitoring programme.

The objectives of the programme are, besides the establishment of a groundwater resources assessment and monitoring programme, to obtain a clear understanding of the hydrogeology of Niue, determine possible and potential contamination of the groundwater from land-based activities, adopt effective measures to address the vulnerability of the freshwater supply during natural disasters such as droughts, to assist in securing government approval of Water Resources Regulation that legalises and enforces the Water Resources Act of 1996 and to develop effective education & awareness programmes for communities in protecting the islands main water source from contamination and include these in school curricula.

It is expected that the results of the groundwater assessment and monitoring programme can be disseminated to other Pacific Island countries, specifically to benefit other uplifted limestone islands such as Nauru, Kiribati (in particular the island of Banaba) and Tonga.

Drilling in Niue was undertaken in late 2005 accompanied by a geophysical survey, water quality monitoring and the installation of the first borehole loggers. For more information on the groundwater monitoring programme please contact Andre Siohane, Director of the Niue Water Works (**waterworks@mail.gov.nu**).

A follow-up project to continue and extend the activities undertaken in the context of the Participation Programme request is currently under consideration.

3.6 World Water Day

The theme for the 2006 World Water Day was "Water and Culture", supported at the global level by UNESCO as the lead UN agency. The theme encouraged consideration of the many ways of using, conserving and celebrating water, anchored in different cultural traditions across the Pacific and the world.

SOPAC, UNESCO and Live and Learn Environmental Education (LLEE) organized a number of events as part of an overall Pacific World Water Day campaign under the theme of "Water & Culture" with the overarching motto "Plan for Water, Plan for Life, Water for Life".

Awareness materials comprising of posters, photo packs, stickers and water & culture bags were produced and distributed throughout the Pacific region. With support from SOPAC, UNESCO, LLEE and other partners, special World Water Day celebrations, including cultural performances, competitions and other activities under the "Water and Culture" theme were organized in Samoa and Fiji to mark the day.

For the Samoa event, UNESCO worked with the Ministry of Natural Resources, Environment, and Meteorology to organize singing, poetry, dancing and drawing competitions for schools, youth and community groups, all under the theme of "Water & Culture". The event was highly successful, receiving considerable coverage in all local media.

3.7 UNESCO Small Islands Voice

In March 2006, UNESCO's discussion forum Small Islands Voice focused on Wastewater and Sanitation issues in small island countries. In response to a Pacific article on wastewater and sanitation problems in the region many messages were submitted to the forum. The full discussion is available on-line at www.smallislandsvoice.org

4. Publications

- HELP in the Context of the Pacific Regional Action Plan on Sustainable Water Management - a Framework for Action.

A proceedings document containing all presentations and discussions from the November 2005 Pacific HELP Symposium (see above) entitled "HELP in the Context of the Pacific Regional Action Plan on Sustainable Water Management – A Framework for Action" will be published by UNESCO Apia Office in cooperation with Landcare Research, Ltd. (New Zealand) within the coming weeks.

- Hydrology and Water Resources of Small Islands: A practical guide - UNESCO IHP Studies and Reports in Hydrology 49, Editor: A. Falkland

Dr. Falkland's guide was originally prepared in 1994 with the objective of assisting technicians, hydrologists, engineers and managers in the identification, assessment, development, management and protection of water resources of islands. It is intended as a guide to the selection of methods and practices appropriate to the special conditions of small islands.

During the past five years, many requests have been received by UNESCO Apia and SOPAC for this publication, which has long been out of print. In response to these requests, UNESCO Apia Office arranged for and funded a (150 copy) reprinting by UNESCO Publishing. The book was distributed to the attendees of be used at the SOPAC/WMO/UNESCO hydrological training programme in April 2005.

Copies of this publication can be obtained from the SOPAC Secretariat (arieta@sopac.org) or UNESCO Apia Office (hans@unesco.org.ws).

5. Advisory services

During 2006, UNESCO Apia contributed to consultations and preparations for two significant regional training events:

1. **Pacific Water Virtual Learning Centre (WVLC)**. The University of the South Pacific has signed a Memorandum of Understanding with the United Nations University - International Network on Water, Environment and Health (UNU-INWEH) to formalise the establishment of a Regional Centre of the UN Water Virtual Learning Centre (WVLC) in the Pacific. The programme of the WVLC Regional Centre will focus on improving water resource management and water services of developing countries, and to improve training and education in the water sector. In the context hereof, Applications are invited for persons wishing to enrol for study towards a **Postgraduate Diploma in Integrated Water Resources Management (IWRM)**. The course will be offered by the University of the South Pacific (USP) in Distance and Flexible Mode as a pilot project on behalf of the United Nations University (UNU). The course will run on a part-time basis for approximately 18 months, coordinated through the UN Water Virtual Learning Centre (WVLC), newly established at USP. Ten fully funded scholarships or study positions are available for suitably qualified postgraduate students from the 12 member countries of the USP region. Upon successful completion of the course participants will receive a Diploma from UNU.

2. **GPA and UNESCO-IHE Pacific Wastewater Training Course**. A training course for wastewater management has been jointly developed by UNEP's Global Programme for Action for the Protection of the Marine Environment from Land-based Sources of Pollution (GPA/UNEP) with the UNESCO-IHE Institute for Water Education. The wastewater training course addresses one of the Guiding Principles of the Pacific Wastewater Policy and Framework for Action and will be implemented in the Pacific region in 2005-2006 by a consortium of SOPAC, USP-IAS, IOI, in collaboration with SPREP, UNESCO-IHE, GPA/UNEP and UN/DOALOS.

ANNEX 5

SECRETARIAT REPORT
BY
UNESCO BEIJING OFFICE

UNESCO Office Beijing Report of activities 2005-2006

1. Capacity Building activities:

1.1. International Training Workshop on Watershed Eco-environment and Water Resources Management, Sept. 11-19, 2005, IRTCES Beijing, China

Within the framework of UNESCO's International Hydrological Programme (IHP-VI) activities under International Sediment Initiative (ISI), UNESCO Beijing Office in collaboration with International Research and Training Centre on Erosion and Sedimentation (IRTCES) organized International Training Workshop on Watershed Eco-environment and Water Resources Management during September 11-19, 2005 at IRTCES, Beijing, China.

In order to have wider participation, dissemination of knowledge and promote inter-cluster cooperation UNESCO Office Beijing offered equal number of participation to other cluster offices within Asia and Pacific region. By using this opportunity UNESCO Office Tehran and UNESCO Office Almaty sponsored candidates from their cluster countries. These kinds of inter-cluster activity are more welcomed by the member states in terms of sharing knowledge and experience with other cluster countries as well we are using the expertise available with the UNESCO International Centres.

There was 25 experts participated including countries from China, Democratic People's Republic of Korea, Mongolia, Republic of Korea, Islamic Republic of Iran, Pakistan, Kazakhstan, Kyrgyzstan, and Tajikistan. During the training workshop the trainees mastered the fundamental knowledge, modern technology, method and new concept in Sedimentation field and to exchange practical experiences among participants. The topics and contents of the training workshop included:

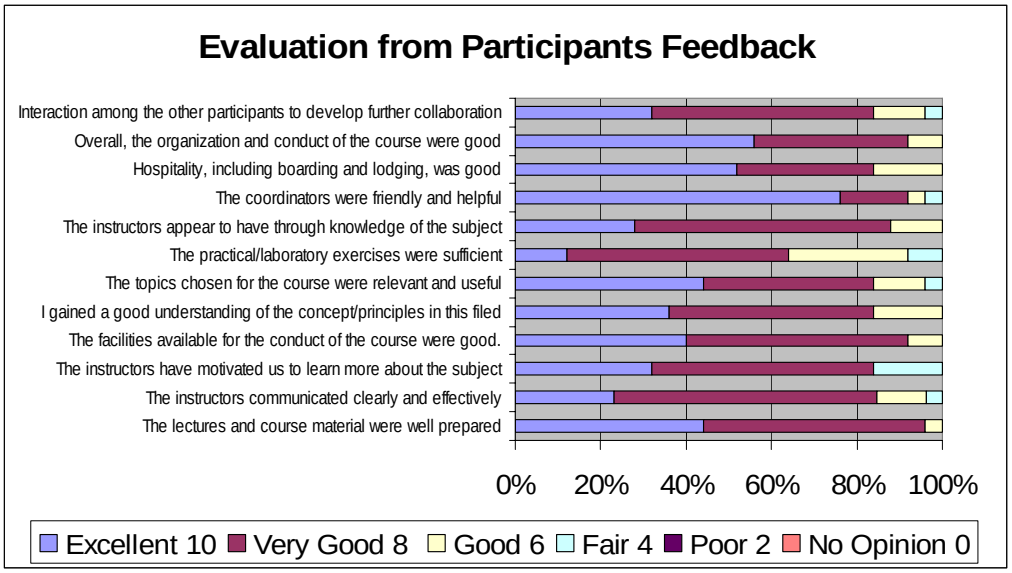
- Basic theories on mechanics of sediment transport
- Fluvial processes
- Watershed eco-environment management
- Water resources management
- Laboratory and field study
- Exchanging information and experiences among participants

The training workshop included lectures in classroom, demonstrations in laboratories of Institute of Water Resources and Hydraulic Research, Beijing, China (lab has one of the world class facility win in China) and Soil and Water Conservation Station of Yanqing County, and participants seminar. The lectures notes are very well prepared and distributed in hard and soft copies. In addition, IRTCES distributed also some interesting monographs published by them and CD ROOM of proceedings of 9th ISRS to participants.

The field inspection dealt with the small watershed management projects. Thus, as recommended by Beijing Water Resources Bureau, the programs were arranged to visit two projects (1) Shang Xin

Zhuang scientific and technical demonstration project on soil and water conservation and (2) Gucheng integrated small watershed management project. Both are located upstream of Guanting Reservoir, in the poor mountain area of Yanqing county, Beijing suburban.

In the internal evaluation done by UNESCO Office Beijing, the results were very much encouraging, which leads to the plan to repeat in the coming years.



1.2. National Workshop on Advanced Sediment Measurement Techniques, IRTCES, China

As China is one of the sediment laden countries in the world and the National Government Proposed to organize a National Training Workshop on Advanced Sediment Measurement Techniques, within the framework of the UNESCO's International Hydrological Programme (IHP-VI), under International Sediment Initiative (ISI). The workshop was cosponsored by Ministry of Water Resources, Government of People's Republic of China. The Workshop was organized by IRTCES in cooperation with UNESCO and the Yellow River Conservancy Commission and Yellow River Institute of Hydraulic Research during November 23-24, 2005 at Zhengzhou, China.

The following topics were dealt in detail (1) Sediment measurement in physical models and in laboratories (2) Sediment measurement in rivers and reservoirs and (3) Sediment measurement in river mouths. Workshop was attended by 35 young engineers and researchers from the National Research Institutions, National Key Laboratories of Universities and Hydrology and Water Resources Institutions around China.

The following recommendations were reached from this workshop:

- There is pressing need for reliable, cost-effective, spatially and temporally consistent sediment data in fields and laboratories. Use of sediment data have expanded from engineering considerations relevant to the design and management of reservoir and in-stream hydraulic structures to contaminated sediment management and ecological environmental quality improvement in rivers and basins.
- The traditional sediment measuring techniques are useful and reliable, but are time-consuming, cumbersome and unable to get continuous data in situ. Recent years several new techniques have been developed for sediment measurement, including nuclear, acoustic, optical, leaser and satellite

techniques etc. Some of them have been employed successfully in practice, for example GPS, Sonar ADCP and 137Cs tracing etc. some are being developed and tested. If sediment-surrogate data can be shown to meet codified accuracy criteria and appropriate sediment-record computation techniques are applied, these technologies have the potential to revolutionize the way in which fluvial sediment data are collected, analyzed and stored.

- Exchange of experience and knowledge on advanced sediment measurement techniques will foster application and improvement of new instruments and methods and benefit acquisition of more reliable and continuous data, which are the foundation of global sediment database.

1.3. National Training Course for Capacity Building on Flood Disaster Prevention Preparedness in Pyongyang, D. P. R. Korea

Upon the request from DPRK National Commission and IHP National Committee, UNESCO Office Beijing supported DPRK in developing a flood forecasting model for Daedong River Basin. The Daedong River is situated in the mountainous area at the middle of the country, and heavy rainfalls and floods are frequent phenomenon caused by typhoon and strong cyclone from July to September every year in tghsi part of the country.

The DPRK authority expressed their desire to disseminate the developed model and its application to young engineers in the country and proposed to organize a National Training workshop on Flood Disaster Prevention and Preparedness based on the model developed by their authorities.

UNESCO jointly organized this National Training Workshop in cooperation with State Hydro Meteorological Administration, DPRK during 2-17 June 2006. The training was attended by more than 20 young engineers/scientists from different provincial meteorological observatory, Hamhung Hydraulic Power University, and Hydrometeorologcial Colleges, State Academy of Sciences and State Hydrometeorological Administration.

The participants felt that in order to forecast the flood disaster it is very much necessary to automate meteorological and hydrological observatories and strengthen communication capacity. The developed flood forecasting model has limited application it is further necessary to develop national wide early warning system to prevent frequent floods, also it is necessary to have nation wide socio-economic data base to estimate the relief works after the disaster. Aother most important aspect figured out was to develop materials to raise public awareness on disaster preparedness.

In addition to this national training upon the request from DPRK, UNESCO also sponsored an International Expert from China to brief the DPRK trainees on the latest developments and International scenario on flood forecasting models. The expert also introduced the latest flood forecasting model developed by Institute of Water Resources and Hydropower Research.

1.4. National Training Course for Capacity Building on Groundwater Hydrology and its Management in Mongolia

Mongolia is a landlocked country located in Central Asia bordered by Russia to the north and the People's Republic of China to the east, west, and south. Water resources of Mongolia are highly vulnerable to climate change and has harsh continental climate with four distinctive seasons, high annual temperature fluctuations, and low rainfall. With limited surface water potential the domestic and industrial water supply of the country mainly depends on groundwater. Unfortunately there is no groundwater monitoring network available in Mongolia. Mongolian Government just started planning to establish ground water and glacier monitoring network within the country. To make the planners and

policymakers aware of critical issue of groundwater data monitoring network, UNESCO Office Beijing in collaboration with Japanese IHP Committee organized training workshop on groundwater issues in Mongolia. Five groundwater experts from Japan were sponsored by Japanese IHP Committee to be part of the resource person.

The training workshop was very well received by Mongolian planners and policy makers and there was interesting discussions between resources persons and Mongolian participants on the necessity of groundwater monitoring network in Mongolia.

There were around 50 experts ranging from policy makers, planners, water supply company executives, officials from Water Authorities took part in the training.

1.5. UNESCO Chair on Groundwater

Mr. Matsuura, the Director General of UNESCO visited Mongolia during July 2006 and held several meetings with President, Prime Minister, and other senior Ministers. During his meeting with Mr. Miyeegombyn Enkhbold, the Prime Minister of Mongolia, the Director-General reported that the partnership between Mongolia and UNESCO in the field of science, notably through UNESCO's support in the establishment of a Master Plan on Science and Technology and Integrated Water Resources Management. Mr Enkbold thanked Mr Matsuura for such support, requesting special assistance in the field of freshwater, access to which is a major concern in Mongolia. Mr Matsuura announced UNESCO's readiness to help Mongolia in this area thorough the creation – with the help of the UNESCO Beijing Office – of a UNESCO Chair on ground water management. Mr Enkhbold welcomed and expressed his appreciation for such support. After this meeting Mr. Matsuura promised to provide special financial support from UNESCO.

1.6. Water Science Education at School level – contribution to Decades on Education for Sustainable Development and Water for Life – Supported jointly by Ministry of Environment, Land and Sea Government of Italy and Ministry of Water Resources, Government of People's Republic of China

Education for Sustainable Development has crystallised as a result of international agreements and the global call to actively pursue sustainable development. Originally perceived as education about sustainability it is being increasingly recognised, through the influence of Agenda 21 and the more recent World Summit on Sustainable Development at Johannesburg (2002), as more than the dissemination of knowledge.

Under the existing bilateral agreement between Government of Italy and Government of People's Republic of China on Sustainable Water Integrated Management (SWIM) project UNESCO Proposed to develop education and learning materials for school children in Chinese language to enhance the future generations understanding on water, with out which we may not be able to achieve sustainable development.

The main objective of this project is to

- Develop a comprehensive teaching and learning material on basic principles of water sciences and water resources condition of China for school children
- Increase teachers, school students and community knowledge on water resources management and conservation within the context of sustainable development, stressing the importance of water.
- Provide support for teachers in the form of programmes, training, teaching materials and a support network to integrate water resources of China, its conservation and management learning into school programmes

- Develop systems and resources to allow schools and communities to monitor and record water resources of the country
- Set up a partnership dialogue in order to fully recognize the principles and values that the ESD promotes: a humane, equitable and caring society

2. Research Projects:

2.1. Development of Flood forecasting simulation model for downstream of Daedong River Basin, Democratic People's Republic of Korea

DPRK National Commission and IHP National Committee requested UNESCO Office Beijing to support in developing a flood forecasting model for Daedong River. Central and local governments and Hydrology Research Institute under State Hydro Meteorological Administration has directed to carry out this project to develop effective flood forecasting and warning system in order to mitigate flood disaster by controlling reservoirs for sustainable economic and ecosystem development in Daedong River.

This project carried out in two phases during Phase I: Data base were constructed for hydrological, meteorological and socio economic variables Various available models for flood forecasting that are based on the comparison of developed indigenous models were also compared. In Phase II the model was calibrated with the past data and prediction models were developed by using real time data. As a follow up and part of the capacity building a national training workshop on flood forecasting was also organized.

2.2. Global Evaluation of Erosion and Sediment Transport (GEST) – Case Study from Yellow River Basin, People's Republic of China under International Sedimentation Initiative (ISI)

In recognition of the increasing importance of erosion and sedimentation processes for water resources management, the IHP Intergovernmental Council adopted a resolution during the 15th session of its International Sedimentation Initiative (ISI). Subsequently the ISI Task Force has formulated a project proposal on the Global Evaluation of Sediment Transport (GEST) to develop representative case studies to verify the socio-economic and environmental risks caused by erosion and sedimentation. One case study identified by the Task Force Group is the Yellow River Basin of China. The Yellow River is well-known as one of the most heavily –sediment- laden rivers in the world. The case study of the Yellow River contributed to the ISI project for increasing awareness of sedimentation and erosion issues. The study promotes sustainable management of soil and sediment resources and advising on policy development and implementation. IRTCES completed the case study in phased manner and come out with final report, this report is expected to publish during 2006 by IHP, UNESCO.

2.3. Integrated Water Resources Management (IWRM) for Tuul River Basin, Mongolia – Joint Initiative with World Water Assessment Programme (WWAP) under World Water Development Report 2

UNESCO Office Beijing in collaboration with World Water Assessment Programme and Mongolian National IHP Committee carried out a Case Study from Mongolia for second world water development report.

Following the fall of the Soviet Union, Mongolia has been going through a profound economic and political transition period. However the consequences are serious: Poverty is on the rise, only a limited

portion of population has access to safe water, sanitation facilities are poor, quality of water resources are decaying, water related diseases are common and health services are out of reach for the poor. These problems are further accentuated by water scarcity, very cold climatic conditions and recent disasters. The Government of Mongolia is committed to implementing reforms in management of water resources and protection of environment. However, due to lack of financial resources and limited number of trained personnel, policies cannot be implemented; laws and regulations cannot be enforced. Agriculture sector, animal husbandry and mining industry are three main pillars of economy and greatly contribute to national GDP. However, sectoral interests have prevented adequate protection of water resources and environment. Decentralization of water tariff setting has promoted economic growth by providing low cost water to business and industry however disregarded the needs of the poor. Mongolia, in its battle against poverty, is considerably disadvantaged by scarcity of water and fertile land resources. The case study report is available at World Water Development Report II "Water a Shared Responsibility".

2.4. Research project on Sediment Management and Wetland Conservation at Yellow River Mouth

Yellow River is well known for its high sediment load in the world. The mean annual sediment load to the mouth is about 1 billion tons, of which 10% deposits in the channels and 50% silts in the delta of Yellow River and 40% can be transported into the sea. As a result, it creates new wetland of 1-2 km^2 per year for extending the river mouth. The flow path in the Yellow River Delta shifts frequently due to deposition. Recently the river channel is shrinking because of serious reduction of discharge, which results in the reduction of discharge capacity of the channels. In addition, with increase of population and rapid development of regional economy, the ecological environment of the Yellow River mouth began to be increadingly concerned by relevant stakeholders. . The study on sediment management and wetland conservation at the mouth shall be conducted with three parts of the sedimentation in the Yellow River Mouth, strategies for stabilizing the Delta Channel, and wetland and nature reserve. The purpose of this case study is to give more emphases on the estuary development of the yellow river.

This research project is jointly sponsored by UNESCO Office Beijing, Ministry of Water Resources, P. R. China and carried out by IRTCES, Beijing.

2.5. Integrated Physical and Ecological Management of Rivers – with Particular Reference to the East River

The East River, 520 km long and with drainage area of 27,040 km^2, is one of the three major rivers of the Pearl River system – the largest river system in South China. The river is a main source of water supply for Hong Kong, Shenzhen, Guangzhou and Dongguan. It currently supplies 0.78 billion m^3 per year to Hong Kong; and this is projected to increase to over 1 billion m^3 in 2010. The integrated management of the East River is of foremost importance in the sustainable development of Hong Kong and the Pearl River Delta yet an integrated understanding is lacking on key water environment issues related to river dynamics, water quality, river ecology, river-coast interaction, and trans-boundary environmental material flows.

The project is carrying out field investigations, basic laboratory studies and numerical modeling on watershed management, river dynamics, river eco-system, and water quality control, with particular reference to the East River. A comprehensive river health index will be developed based on the following 10 indices: (1) flood disaster, (2) watershed vegetation and erosion, (3) mountain tributaries channel morphology, (4) stem river channel stability, (5) sediment transportation, (6) working index (power generation, water supply, navigation, recreation and land creation), (7) water quality, (8) habitat and biodiversity index, (9) human-induced stresses, (10) restoration.

This project is for two year duration 2006-2007 and jointly supported by UNESCO Office Beijing and Ministry of Water Resources, Government of People's Republic of China and executed by IRTCES.

3. Participation in the International Initiative of IHP and cooperation with other cluster offices in the region:

3.1. Cooperation with International Sedimentation Initiative (ISI) a Global Initiative of UNESCO IHP

The **International Sedimentation Initiative (ISI)** has been launched by UNESCO-IHP, as a major activity of the current Sixth Phase (2002–2006) of the International Hydrological Programme (IHP) based on the Resolution XV-8 of the Intergovernmental Council, Paris, 17–22 June 2000. In justifying the resolution, the Intergovernmental Council noted that:

- Erosion and sedimentation processes and management in catchments, river systems and reservoirs are increasingly important in all parts of the world,
- Erosion and sedimentation processes have significant socio-economic and environmental impacts in river basin management,
- Sediment production processes are not sufficiently understood for practical use, while various sediment transport models are available,
- Within the next few decades more than 50% of the world's reservoir storage capacity may be lost due to sedimentation, and realizing that appropriate storage sites of water are limited,
- Sediment management practices should be improved.

The International Sedimentation Initiative is adding a new dimension to ongoing efforts aiming at sustainable sediment management, in the context of sustainable water resources development at global scale.

Refer 2.2. activity report on Global Evaluation of Erosion and Sediment Transport (GEST) – Case Study from Yellow River Basin, People's Republic of China under International Sedimentation Initiative (ISI).

3.2. Cooperation with World Water Assessment Programme (WWAP) for World Water Development Report 2 – Water a Shared Responsibility

World Water Assessment Programme is UN-wide programme seeking to develop the tools and skills needed to achieve a better understanding of those basic processes, management practices and policies that will help improve the supply and quality of global freshwater resources.

The United Nations system is complex and it is not easy to explain which agency and programme does, since each one has its own priorities and procedures. Nevertheless, 24 UN Organization (UN, UN Specialised Agencies, UN Regional Commissions and Secretariats of United Nations Conventions and Decades) have endorsed the goals of the World Water Assessment Programme and the publication of the biennial World Water Development Report. Under this common banner they have agreed to work together - sharing information, knowledge and know-how - to improve our understanding of the policies and practices that encourage sustainable use of water resources.

Refer 2.3 activity report on Integrated Water Resources Management (IWRM) for Tuul River Basin, Mongolia – Joint Initiative with World Water Assessment Programme (WWAP) under World Water Development Report 2.

3.3. Asian G-WADI (UNESCO's Global network for WAter and Development Information for arid lands)

UNESCO recognised the needs of arid areas as a global priority and established G-WADI in 2003 to support networking between centres and individuals across the arid and semi-arid regions of the world. The strategic objective is to strengthen the global capability to manage the water resources of arid and semi-arid regions.

Across Asia, UNESCO Cluster Offices (Almaty, Beijing, New Delhi and Tehran) have joint hands and formulated G-WADI Asia. So far jointly organized three regional training programmes on various aspects of water management in Arid and Semi-arid regions and planning to organize one such event in China during 2007 on groundwater modelling for arid and semi arid regions.

Part of G-WADI Asia published two research reports on Managed Artificial Recharge and Water harvesting for arid and semi arid regions and Asian-GWADI experimental basins report.

The following products of the Global G-WADI are available for every one at www.gwadi.org

- A **news watch feature** highlighting water issues related to arid and semi-arid regions
- Educational and knowledge-based modules related to water resources issues of the dryland regions and tools and techniques e.g. **Isotopic and Chemical Tracers in Hydrology**
- Provision of data sources, e.g. **HyDIS** satellite-based precipitation data
- Educational modules prepared for short course and seminar purposes, e.g. 2005 Roorkee Workshop on **Hydrological Modelling in Arid and Semi-Arid Areas**, and Cairo workshop on **Climate Change in North Africa and the Middle East**.
- Software tools provided through the SAHRA **Hydroarchive**
- Educational information provided through SAHRA's **Globe education and science programme**.

3.4. Transboundary Aquifers in Asia

UNESCO-IHP 14th Intergovenmnetal Council passed resolution XIV-12., by Member States, to promote studies in regard to internationally shared aquifers and subsequently launched the Project on **Internationally Shared Transboundary Aquifer Resources Management (ISARM).** Already there is cooperation in American states, Africa, Europe and Balkan countries in operation.

With a view of starting ISARM-Asia UNESCO office Beijing initiated a pilot project on Heilongjiang-Amur River basin between China and Russian Federation with support from Chinese Geological Survey.

During 34th Congress of International Association of Hydrogeologist (IAH) UNESCO Office Beijing organized a special session on Transboundary Aquifers and adopted Beijing Deceleration??? on ISRAM-Asia with the participation of experts from Asia.

3.5. Regional Workshop on Assessment of Snow-Glacier and Water Resources in Asia

One of the anticipated outcomes of global warming is the reduction of mountain snow cover, glaciation and permafrost now underway in almost all mountain regions. Changes in snowiness and glaciers in the world's largest and highest mountain system may have the most immediate effects on nearly half the world's population. The necessity of glaciological monitoring in Asia is caused by two main

reasons. The first reason is that mountain glaciation is one of the most vivid indicators of climate changes. All changes in the thermal balance of earth surface and total moisture of mountain area are directly reflected in the characteristics of glacier mass balance and its changes. This statement is confirmed by the fact that increase of average annual temperature by less than $1^{o}C$ during the last century was sufficient to cause reduction of glaciation of Central Asian Mountains by more than one third. The second reason is that around 75-80% of river runoff in the region is derived from snow cover, glaciers and permafrost, and with glacier recession the water supply is threatened, which affected socio economic situation in the countries of the region with threat to national security. Glacier and water resources assessment will facilitate climate change detection, planning for adaptation to probable climate change and its extremes.

This workshop will be organized by UNESCO Almaty Cluster Office during 28-30 November 2006 at Almaty with the support from Beijing, New Delhi and Moscow Cluster Offices. Japanese IHP Committee is supporting expert participation in the workshop.

ANNEX 6

COUNTRY REPORTS

NATIONAL REPORT ON IHP RELATED ACTIVITIES
AUSTRALIA

1. ACTIVITIES UNDERTAKEN IN THE PERIOD OCTOBER 2005 – SEPTEMBER 2006

At the 33rd session of the UNESCO General Conference, Australia was elected to the IHP Intergovernmental Council.

1.1 Meetings of the IHP National Committee

IHP activities in Australia are carried out under the guidance of the national UNESCO Science and Technology Network. In order to facilitate the implementation of UNESCO activities in Australia and the region, a national IHP Australian Network was established in 1995 and this network acts as the IHP National Committee for Australia. There are no formal meetings of the IHP Australian Network. Activities are conducted largely between the members by telecommunications (e-mail). The activities of the IHP network are reported on at meetings of the national UNESCO Science and Technology Network. Australia has appointed a new Australian National Commission (NATCOM) for UNESCO. The new NATCOM has 12 members, two parliamentary representatives and four honorary members. The new NATCOM met for the first time in Melbourne on Wednesday 24 August 2005 and again in Canberra from 16-17 March 2006. Mr Bruce Stewart and Professor Ian White represented the IHP National Network at these meetings.

1.1.1 Decisions regarding the composition of the IHP National Committee

The IHP Australian Network includes the following members. Summary details of all current members are listed below.

Name	Expertise	Organization
Bruce Stewart	Water Resources Assessment	Bureau of Meteorology
Tony Falkland	Island Hydrology	ACTEW Corporation
Trevor Daniell	Urban/Flood Hydrology	University of Adelaide
Ross James	Hydrological Data & Networks	Bureau of Meteorology
Peter Martin	Public Relations	CRC for Weed Management
Ian White	Hydrology/Water Quality	Australian National University (and Water Research Foundation of Australia)
Erwin Weinmann	Flood management/water resource management	Monash University
Ian Cordery	Flood/Drought Hydrology	University of New South Wales
Peter Dillon	Groundwater	Centre for Groundwater Studies
Anne Jensen	Ecotones	Wetlands Care Australia
Shahbaz Kahn	Sustainable irrigation systems	CSIRO Land & Water, Griffith

1.1.2 Status of IHP-VI activities

The IHP Australian Network brings together many of the key hydrological research groups within Australia. As such, Australia is able to contribute towards IHP activities through the research programs currently existing in Australia. For example, the eWater Cooperative Research Centre (CRC) and other centres for research undertake activities which are closely aligned to the themes of IHP-VI. A description is provided below of some activities pertinent to IHP-VI.

- *Theme 1 - Global Changes and Water Resources*

A subset of the hydrological data collected by the State and Territory water agencies and the Bureau of Meteorology is regularly contributed to international data centres for use in global and regional studies. The eWater Cooperative Research Centre (http://www.ewatercrc.com.au/) is

embarking on a research program that includes modelling hydroclimatic variability and impact on water resources and aquatic ecosystems and rare events and resilience in hydrological and ecological risk assessment. The Indian Ocean Climate Initiative (IOCI) (http://www.ioci.org.au), a partnership of research organisations, is researching the impact of climate variability and climate change on the water resources of the southwest region of Australia. CSIRO (http://www.csiro.au/), Australia's national research organisation, has research programs addressing global and regional climate change, climate change impacts on natural resources including water and climate change adaptation strategies. Australian National University (ANU) together with Ecowise Environmental have been researching vulnerability and adaptation to global change in small island countries and have contributed to AusAID's Pacific vulnerability and adaptation project. The ANU, Ecowise Environmental and the University of Adelaide have been investigating the vulnerability of water supply catchments in the Australian Capital Territory to global change.

- *Theme 2 – Integrated Watershed and Aquifer Dynamics*

The Centre for Groundwater Studies (http://www.groundwater.com.au) has an extensive research program including research on groundwater/surface water interaction and is investigating how better to manage groundwater resources especially using aquifer storage and recovery. The ANU is researching artesian groundwater processes and modelling of groundwater changes in the lower Great Artesian Basin and in south eastern Australia. ANU, with Ecowise Environmental, are investigating shallow groundwater recharge, socio-cultural aspects of groundwater management and impacts of climate variability in low coral islands as a follow up to of an UNESCO-IHP initiated project. As a result of a National Water Initiative (NWI) agreed by Australian federal and state governments all Australian water agencies are required to develop comprehensive water management plans. The plans are being developed through a process of extensive stakeholder consultation and watershed modelling. The process being employed and the resultant plans provide a valuable resource for similar projects elsewhere in the world.

- *Theme 3 - Land Habitat Hydrology*

The ANU and Ecowise Environmental have ongoing projects in conjunction with UNESCO-IHP investigating shallow groundwater recharge, water quality, impacts of land-use and extraction and socio-cultural aspects of groundwater management and impacts of drought in low coral islands. The ANU together with NSW Department of Primary Industry has been investigating estuary policy and management strategies to improve the health of estuaries. Research into hydrological process in and the sustainable management of wetlands is being undertaken in a number of universities and cooperative research centres in Australia (CRC for Freshwater Ecology, CRC for Catchment Hydrology, CRC for Coastal Zone, Estuary and Waterway Management). The urban environment and water sensitive urban design are also areas of current research.

- *Theme 4 – Water and Society*

The National Land and Water Resources Audit (http://www.nlwra.gov.au/) and http://audit.ea.gov.au/ANRA/atlas_home.cfm) and the Water and the Economy study have produced a considerable body of data and information about the value, use, distribution and quality of water within Australia. Research on property rights of water and the structure, operations and social and economic impacts of water trading markets continues to receive a lot of attention in Australia and is a potential resource for similar projects in other countries. The ANU, the French agency CIRAD and Ecowise Environmental have been undertaking research on the use of multi agent systems and companion modelling to support negotations and reduce conflict over groundwater use in low atolls.

- *Theme 5 Water Education and Training*

Each of the Cooperative Research Centres (CRC) (https://sciencegrants.dest.gov.au/CRC/) is required to undertake an active program of training to ensure their research and technology are transferred into practise as soon as possible. The water related CRCs are:
eWater CRC (http://www.ewatercrc.com.au/)

CRC for Coastal Zone, Estuary and Waterway Management (http://www.coastal.crc.org.au/)
CRC for Tropical Rainforest Ecology and Management (http://www.rainforest-crc.jcu.edu.au/)
CRC for Water Quality and Treatment (http://www.waterquality.crc.org.au/)

These CRCs are a partnership between universities and other research centres that also have educational and training programs. Some of the research centres are listed separately below.

Centre for Groundwater Studies (http://www.groundwater.com.au/)
The purpose of the centre is to provide research, education and specialist services for Australian and International land and water industries with the objective of improving the management of resources affected by groundwater processes.

Centre for Environmental Applied Hydrology (http://www.civag.unimelb.edu.au/ceah)
The Centre for Environmental Applied Hydrology is a research centre within the Departments of Civil and Environmental Engineering and Geography and Environmental Science at the University of Melbourne. Specific expertise covers all aspects of surface and groundwater hydrology, hydraulics and geomorphology.

Centre for Resource and Environmental Studies, Australian National University (http://cres.anu.edu.au) conducts research and postgraduate training in spatial-temporal variability and characterisation of climate, integrated catchment management, groundwater modelling and hydrology, floods and droughts, coastal hydrology and land use, salinity, water and land policy and related socio-economic impacts, ecological economics.

The International Centre of Excellence in Water Resource Management (ICE WaRM) (http://www.icewarm.com.au/) is made up of a consortium of universities and has a strong focus on education and training. It promotes itself to international water resource management students to further their education in Australia and is also developing online courses for delivery in Australia and overseas.

Professor David Waite, Director of the Centre for Water and Waste Technology & Dr Ashish Sharma, from School of Civil & Environmental Engineering at UNSW, are collaborating with Hohai University of Nanjing to develop joint research & a Masters' level training programs in WATER MANAGEMENT through the Australia China Consortium for Water Research (ACCWR)

- *Crosscutting Program Components – FRIEND and HELP*

Collaboration in the Asian Pacific FRIEND project by provision of data, hosting a node of the Internet based Water Archive, and assisting in research activities. The CSIRO Griffith and Charles Sturt University Wagga Wagga is a Regional Coordinating Unit for HELP and the Lower Murrumbidgee Catchment has been included as the only HELP Reference Basin in the Pilot Phase and also in the Demonstration Phase in the lead up to the full implementation of HELP. The Mount Lofty Ranges in South Australia was also proposed as an Operational Help Basin.

1.1.3 Decisions regarding contribution to/participation in IHP-VII

Peter Dillon (CSIRO) attended a meeting to review the draft IHP-VII in Paris from 5-6 June. It is our continuing concern that UNESCO is trying to do too much across a wide range of activities and must focus on where it can best add value and undertake activities which are achievable. It must focus on its mandated areas, establishing key partnerships where necessary. In some areas we believe it is straying outside its areas of responsibility.

Australia is in a strong position to provide input across the range of Focal Areas identified. The research programs of the CRC's, CSIRO and relevant Australian University groups are closely aligned with the activities proposed within the four major theme areas. Some initial contributions include:

Theme I- Global Change, Watersheds and Aquifers

Objective **:** Achieve improved definition of water dependencies in the face of continuing global change, assess particularly stressed areas and develop institutional synergies to mitigate them.

Primary Focal Area:
Focal Area I-1: Large-scale groundwater dependencies related to global change.
- The Great Australian Artesian basin and associated research activities.
- Frameworks for determining sustainable yield of aquifers

Focal Area I-2: Hydrological extremes in sensitive and stressed biomass and hydroclimatic zones e.g. small island developing states.
- Research activities involving the Pacific Island Countries

Focal Area I-3: Global change and feedback mechanisms of hydrological processes in stressed environments.
- The Murray Darling River Basin and GEWEX related research activities

Focal Area I-4: Changing global dynamics in aquatic environments: degrading ecosystems, especially those susceptible to sea level change, coastal sediment balance and pollutant accumulation.
- Research activities involving the Pacific Island Countries
- eWater CRC Research Activities on water quality and catchment processes
- Groundwater dependent ecosystems

Theme II: Governance and Socio-Economics

Objective: Strengthen good governance, wise stewardship of the resources; achieve capacity development and promote assured flow of finances.

Focal Area II-1: Culture, ethics and legislation for wise stewardship of water.
- Indigenous water knowledge and understanding
- Pacific Island countries culture and water issues

Focal Area II-2: Good Governance, capacity development and stakeholder participation. Empowerment of human resources.
- Assisting in training on MAR (management of aquifer recharge) including management policies, codes of practice
- Frameworks for determining sustainable yield of aquifers
- Aquifer storage and recovery

Focal Area II-3: Affordability, poverty alleviation and assured financing, for effective IWRM. Include ‘water’ in national PRSP'
- Implementation of IWRM in the Pacific Island Countries (assistance to SOPAC)
- Australian National Water Initiative

Focal Area II-4: Shared Water resources and conflict
- Water markets and water trading approaches
- International exchange of data

Theme III: Ecohydrology and Environmental Sustainability

Objective: Enhance the designation of water both as an abiotic resource, and as a service, delivered by eco system processes; identify, quantify and improve the critical linkages for environmental sustainability

Focal Area III-1: Water as a landscape agent: erosive capacity, mobile solvent, habitat for aquatic biota - interdependencies and regulation in biogeochemical cycling.
- Developing policy and programs to support ecosystem enhancement through ecosystem service production

Focal Area III-2: Complementing engineering solutions with ecological measures resulting in sustainable carrying capacity of ecosystems
- Developing policy and programs to support ecosystem enhancement through ecosystem service production
- National Approach to Biodiversity Decline

- Groundwater dependent ecosystems

Focal Area III-3: Urbanization pressures, sustainable cities, towns and villages; water and sanitation for mega cities

- Free exchange of information between the Australian Water Conservation Reuse Research Program and UNESCO

Focal Area III-4: Risk based environmental management (under uncertainty), especially climate change threats to ecosystem functions

- Biodiversity and climate change

Theme IV: Water Quality, Human Health and Food Security

Objective: Improved understanding of the distribution of abiotic and biotic pollutants in the water cycle and their impact on human heath; access to water for long term food security

Focal Area IV-1: Methodologies for safeguards against water borne biotic and abiotic pollutants

Focal Area IV-2: Access to safe water, human health and integrated water resource management.

- A major new research project on storing wetland treated stormwater in a brackish aquifer for recovering potable water. This will be an icon project with much on HACCP that will be transferable to developing countries.

Focal Area IV-3: Non-conventional water resources: brackish water use and waste water re-use.

- major new research project on storing wetland treated stormwater in a brackish aquifer for recovering potable water. This will be an icon project with much on HACCP that will be transferable to developing countries.
- Free exchange of info from Australian Water Conservation Reuse Research Program and UNESCO

Focal Area IV-4: Access to water for food security in environmentally stressed zones.

- Climate variability and change and water resources for agriculture

1.2 Activities at a national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

- 17th Australia New Zealand Climate Forum – Climate Variability and Climate Change, 5-7 September 2006, Australian National University, Canberra
- 7th International Conference on Urban Drainage Modelling and the 4th International Conference on Water Sensitive Urban Design was held in Melbourne, 4-6 April 2006
- 3rd Australian Water Summit 2005 was held in Melbourne 28 February to 2 March 2005.
- Australian Water Summit Sydney 2005 was held in Sydney, 30-31 March 2005 with the theme Building a sustainable water industry.
- Water Reuse and Recycling 2005 was held in Sydney 18-20 April 2005.
- The Enviro Conference & Exhibition, a platform for showcasing the Australian environment industry, Melbourne, 9-11 May 2006 (www.enviroaust.net/e6/what_is_enviro_2006.html).
- Catchments to Coast, The Society of Wetland Scientists 27th International Conference and the Australian Marine Sciences Association 44th Annual Meeting, 9 - 14 July, 2006, Cairns.
- 13th Australasian Hydrographic Conference *Interactive Hydrography- Future Directions*, 29th August to 1st September 2006, Darwin, Northern Territory.
- The 8th International Riversymposium was held in Brisbane 6-9 September 2005. The symposium includes the Thiess International Riverprize.
- 4th Victorian Flood Management Conference, Shepparton, Victoria, 11-14 October 2005
- National Water Week – *Water for Life.* 16-22 October 2005
- OECD Workshop on Agriculture and Water, 14-18 November 2005, Adelaide, Australia.
- A number of meetings of the National Committee on Water Engineering, Institution of Engineer's have been held during this period. Some of the key purposes of these meetings are to coordinate and organise hydrology and water resources symposia and conferences, to

coordinate the ongoing revision to the national hydrological design guidelines Australian Rainfall and Runoff, prepare Position Papers on key hydrological issues and to manage the publication of Australian Journal of Water Resources. Position Papers are now all available on the Institution of Engineers, Australia web site: (http://www.eng.newcastle.edu.au/~ncwe/ncwePosPaper/ppHome.htm).

- The National Committee on Water Engineering, Institution of Engineer's has prepared Australian Runoff Quality (ARQ), a design guideline that provides an overview of current best practice in the management of urban stormwater in Australia. It contains: Procedures for the estimation of a range of urban stormwater contaminants; Design guidelines for commonly applied stormwater quantity and quality management practices; Procedures for the estimation of the performance of these practices; and advice with respect to the development/ consideration of integrated urban water cycle management practices. ARQ will be published November/December 2005.
- The Australian Government has undertaken a national land and water resources audit to enable improved decision making in sustainable use of the resources. This audit was completed in early 2002 and a range of publications has resulted. Details of the audit projects and output products are located at www.nlwra.gov.au/archive/archive.html. The results of the audit are available from the web based Australian Natural Resource Atlas at http://audit.ea.gov.au/ANRA/atlas_home.cfm. The National Land and Water Resources Audit has now been established as an ongoing activity with the responsibility of providing data, information and nationwide assessments of Australia's land, water and biological resources to support sustainable development (www.nlwra.gov.au/)

1.2.2 Participation in IHP Steering Committees/Working Groups

Australian experts were nominated for a number of IHP-VI Theme Advisory Boards with Prof. Ian White being appointed as a Regional Representative to the Advisory Board for Theme 4 – Water and Society.

Steve Barnett of South Australia Department of Water Land and Biodiversity Conservation is coordinating Australian input to the UNESCO IHP-VI preparation of the Hydrogeological Map of the World. He has been involved for many years in hydrogeological mapping of the Murray Darling Basin and is Chair of IAH Australian Chapter.

CSIRO is the Australian research organisation linked to the Water and Development Information for Arid Lands (WADI) project being set up by the IHP.

1.2.3 Research/applied projects supported or sponsored

Experience gained as a result of UNESCO/SOPAC sponsored groundwater and sanitation projects undertaken in a number of Pacific Island Countries were presented in a paper titled 'Hydrology of and conflicts over shallow groundwater use and management in low coral atolls.' By WHITE, I., FALKLAND, A., CRENNAN, L., METEUTERA, T., ETUATI, B., METAI, E., PEREZ, P., and DRAY, A. which was presented at the conference *In Low-lying Coastal Areas-Hydrology and Integrated Coastal Zone Management. International Symposium, Bremerhaven Germany, 9-12 September 2002.* Deutches IHP/OHP-National Komittee, Koblenz, Germany.

As a follow-up to the UNESCO/SOPAC research projects in Kiribati and Tonga, Professor Ian White, ANU is Project Manger of an ACIAR (Australian Centre for International Agricultural Research) sponsored project titled: Equitable Groundwater Management for the Development of Atolls and Small Islands. Its overall aim is to provide the basis for the sustainable use and equitable sharing of groundwater resources and their associated catchments between competing sectors, particularly agriculture, combining research on climate, groundwater, cropping and irrigation practices, economics, cultural traditions and social customs, and the aspirations and needs of stakeholders. A start has been made with the first phase of the project in Kiribati focussing on equitable groundwater use in North and South Tarawa. The project is being carried out in conjunction with the French agency CIRAD, the South Pacific Applied Geoscience

Commission and government agencies in Kiribati and Tonga. This work is using Multi Agent Systems and a companion modelling approach to develop Negotiation Support Systems to minimise conflicts over water resource development and use.

White I. and Falkland A. (2004). Effects of Pumping from Infiltration Galleries on Crop Health and Production in Low Coral Islands: Groundwater Impacts. ACIAR Project LWR1/2001/050, Equitable Groundwater Management for the Development of Atolls and Small Islands, prepared for the Australian International Agency for Agricultural Research, November 2004.

White I., Falkland A., Metutera T. and Metai E. (2005). Effects of Landuse on Groundwater Quality in a Low Coral Atoll. Coliforms, Nutrients and Metals. ACIAR Project LWR1/2001/050, Equitable Groundwater Management for the Development of Atolls and Small Islands, prepared for the Australian International Agency for Agricultural Research, May 2005

White I., Falkland A., Perez P., Dray A. , Metutera, T. , Metai E., and Overmars M. (2005). Challenges in freshwater management in low coral atolls. Journal of Cleaner Production, Special Edition Water Management in Coastal Zones Iin press).

White I., Falkland A., Metutera, T. , Metai E., Perez P., Dray A. and Overmars M. (2005). Climatic And Human Influences On Water Resources In Low Atolls. In Proceedings Of The International Seminar On: Climatic And Anthropogenic Impacts On The Variability Of Water Resources Umr Hydrosciences Montpellier / Unesco / Omm Maison des Sciences de L'eau de Montpellier, 22 - 24 November 2005 (in press).

Hydrology for Environment, Life and Policy (HELP)

Australia continues to contribute to the two projects established under the HELP banner. These are the Mount Lofty Ranges (South Australia) and the Lower Murrumbidgee catchment in the Murray Darling River Basin.

Mount Lofty
A case study of the third phase of an exemplar framework (in train for 8 years already as a partnership of Governments, Private sector and community) for integrating expertise of water policy makers, managers and scientists in the further development of an integrated natural resource management investment strategy for the mount lofty ranges, and a case study of the impact of on ground works under phases 1, 2 and 3 of MLRCP on water quality and quantity.

Key issues being addressed:
- creating and sustaining partnerships between stakeholders toward integrated Natural Resource Management including the private sector,
- using these to devise a integrated set of legislative instruments, and
- evaluating the above.

Contact point: Jennifer McKay (University of South Australia)

Lower Murrumbidgee Catchment
Cooperation between researchers, farmers and industry in the Lower Murrumbidgee catchment, and its power to achieve useful and practical on-ground results, is the focus of this HELP initiative. The southern New South Wales catchment has been named as the UNESCO HELP program's first global reference basin. This means that the region's farmers, researchers and irrigation companies will be used as an example to showcase practical solutions for water resources management under competing water uses and economic concerns. The research efforts in the area are addressing problems including rising water tables and salinity, reduced river flows, legislative reforms, competition between water users (including the environment) and falling deep aquifer pressure levels. The catchment is significant; with 2730 farms spread over 560,000

hectares in the Murrumbidgee and Coleambally irrigation areas. Almost a quarter of the water extracted from the Murray-Darling Basin each year is used to produce more than $1 billion worth of crops – almost 16% of Australia's agriculture produce. The lower Murrumbidgee catchment presents an excellent example of community involvement in hydrological research and the development of integrated catchment management policies using a range of tools. In addition, CSIRO Griffith and Charles Sturt University Wagga Wagga have been accepted as a Regional Coordinating Unit for HELP.

Contact Point: Dr Shahbaz Khan (CSIRO) (shahbaz.khan@csiro.au)

A symposium entitled, HELP in Action - Local Solutions to Global Water Problems - Lessons from the South is being planned for 2006. The host country and dates for the symposium have yet to be determined. The proposed symposium themes are:

1. Action on the ground - methods and approaches
2. New integrating science being developed under HELP
3. Connecting environment, economy, social and cultural impacts
4. Institutional and legal lessons for successful HELP implementation
5. Indicators of HELP success
6. Implementing HELP in basins with limited resources and capacity

1.2.4 Collaboration with other national and international organizations and/or programmes

As President of the WMO Commission for Hydrology and also Chair of the Australian IHP Network, Mr Bruce Stewart provides a link between the UNESCO IHP and WMO's Operational Hydrology Programme. Tony Falkland and Ian White are members of the Water Working Group of the Science, Technology and Resources Network of the South Pacific Applied Geoscience Commission. Ian White is a member of the sub-committee on the ethics of freshwater use of UNESCO's COMEST and is a member of the Asian Pacific Association of Hydrology and Water Resources.

1.2.5 Other initiatives

National Water Initiative

Australia has recently embarked on a National Water Initiative. The National Water Initiative (NWI) is a comprehensive strategy driven by the Australian Government to improve water management across the country. Australia's highly variable and often scarce water resources are crucial for our economic, social and environmental wellbeing. We need to continue to improve the productivity and efficiency of our water use, while maintaining healthy river and groundwater systems. The NWI addresses the vital importance of such questions to Australia. It encompasses a wide range of water management issues and encourages the adoption of best-practice approaches to the management of water in Australia.

Reference: http://www.pmc.gov.au/nwi/index.cfm

1.3 Educational and training courses

1.3.1 Contribution to IHP courses

The Bureau of Meteorology provided input to the meteorology and climatology components of the SOPAC/UNESCO/WMO Hydrological Training Programme that has been funded by NZAID and is now in its second year of three years.

1.3.2 Organisation of specific courses

Nil

1.3.3 Participation in IHP courses

A number of international students attended the UNESCO accredited postgraduate courses in hydrology and water resources at the Joint Universities Masters Program (JUMP), Adelaide, South Australia.

1.3.4 Other courses

The Centre for Groundwater Studies (a joint venture between 9 research/educational institutions, government water management organizations and private consultants) organises a wide range of groundwater related training courses. Details of courses can be found at the web site http://www.groundwater.com.au/conf/content.asp. The centre has established strong links with institutions in the region, particularly in Indonesia, Malaysia, Thailand and China.

1.4 Cooperation with the UNESCO-IHE Institute for Water Education and/or international/regional water centres under the auspices of UNESCO

The Australian Bureau of Meteorology produced a document entitled, *Our Future Outlook on Global Water Resources and Water Related Risk Management*, as part of the preparations for the establishment of the International Centre for Water Hazard and Risk management (ICHARM).

1.5 Publications

White, I., Falkland, T., Meteutera, T., and Metai, E. (2003). Impact of Drought on Groundwater Resources in a Low Coral Atoll. *In Managing Water Resources under Climatic Extremes and Natural Disasters*, K. Takara and T. Kojima (eds). IHP-VI, Focal Area 4.4, Technical Documents in Hydrology, No. 2, Regional Steering Committee for South East Asia and the Pacific, UNESCO Jakarta Office, pp 197-212.

White, I., and Wasson, R. (2003). Sources of Stream Salinity in the Eastern Murray-Darling Basin, Australia. . *In Managing Water Resources under Climatic Extremes and Natural Disasters*, K. Takara and T. Kojima (eds). IHP-VI, Focal Area 4.4, Technical Documents in Hydrology, No. 2, Regional Steering Committee for South East Asia and the Pacific, UNESCO Jakarta Office, pp 213-222.

Perez, P., Dray, A., White, I., Le Page, C. and Falkland, T. (2003). Atollscape: A multi-agent system for simulating freshwater management in Pacific atolls. *In Managing Water Resources under Climatic Extremes and Natural Disasters*, K. Takara and T. Kojima (eds). IHP-VI, Focal Area 4.4, Technical Documents in Hydrology, No. 2, Regional Steering Committee for South East Asia and the Pacific, UNESCO Jakarta Office, pp 223-228.

(The three papers above are Australian and Asian Pacific region contributions to IHP VI, Focal Area 4.4).

White I. and Falkland A. (2004). Effects of Pumping from Infiltration Galleries on Crop Health and Production in Low Coral Islands: Groundwater Impacts. ACIAR Project LWR1/2001/050, Equitable Groundwater Management for the Development of Atolls and Small Islands, prepared for the Australian International Agency for Agricultural Research, November 2004.

White I., Falkland A., Metutera T. and Metai E. (2005). Effects of Landuse on Groundwater Quality in a Low Coral Atoll. Coliforms, Nutrients and Metals. ACIAR Project LWR1/2001/050, Equitable

Groundwater Management for the Development of Atolls and Small Islands, prepared for the Australian International Agency for Agricultural Research, May 2005

White I., Falkland A., Perez P., Dray A. , Metutera, T. , Metai E., and Overmars M. (2005). Challenges in freshwater management in low coral atolls. Journal of Cleaner Production, Special Edition Water Management in Coastal Zones Iin press).

White I., Falkland A., Metutera, T. , Metai E., Perez P., Dray A. and Overmars M. (2005). Climatic And Human Influences On Water Resources In Low Atolls. *In Proceedings Of The International Seminar On:* Climatic And Anthropogenic Impacts On The Variability Of Water Resources Umr Hydrosciences Montpellier / Unesco / OMM, Montpellier, 22 - 24 November 2005 (in press).

Daniell T., and White I. (2005) Bushfires and their Implications for Management of Future Water Supplies in the Australian Capital Territory. *In Proceedings Of The International Seminar On:* Climatic And Anthropogenic Impacts On The Variability Of Water Resources Umr Hydrosciences Montpellier / Unesco / OMM, Montpellier, 22 - 24 November 2005 (in press).

IHP papers presented at the International Conference on Water Sensitive Urban Design 'Cities as Catchments', Adelaide, Australia 22-23 November 2004. Edited by R. James, T. Daniell and K. Takara. IHP-VI Technical Documents in Hydrology No. 3. UNESCO Jakarta Office.

1.6 Participation in international scientific meetings

1.6.1 Meetings hosted by Country

The 12th meeting of the UNESCO IHP Regional Steering Committee for Southeast Asia and the Pacific was held in Adelaide 21-24 November in conjunction with the Water Sensitive Urban Design 2004 conference.

See Section 1.2.1 of this report for other international conferences hosted.

1.6.2 Participation in meetings abroad

Bruce Stewart attended the 16th Session of the Intergovernmental Council of the International Hydrological Programme of UNESCO that was held at the UNESCO Headquarters in Paris from 20-24 September 2004.

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 the 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. Mr Bruce Stewart was a representative of WMO on the Joint UNESCO/WMO taskforce that drafted the proposal to establish the Initiative.

Trevor Daniell participated in the Asian Pacific FRIEND meeting on *Design rainfall and design flood determination* held in Kuala Lumpur 6-7 June 2005.

Trevor Daniell and Ian White presented papers at the international seminar on *Climatic and Anthropogenic Impacts on the Variability of Water Resources* held in Montpellier, France 22-24 November 2005. There are 8 regional FRIEND programs in the world: West and Central Africa, Southern Africa, the Nile, Asia-Pacific, Indukush-Himalaya, the Carribbean Islands/Central and

South America, the Alps and the Mediterranean Sea, Europe of the Northwest. The objective of the meeting was to gather at least two scientists by big sub-continental FRIEND region on the subject of the seminar, to address the multiple issues of this theme according to the regions of the world.

Ian White presented an invited paper at the International Conference on Effective Land-Water Interface Management for Solving Agriculture-Fishery-Aquaculture Conflicts in Coastal Zones 1 – 3 March 2005, Bac Lieu, Vietnam.

Ian White attended the UNESCO IHP Groundwater Resources Assessment Under Pressures of Humanity and Climate Change. 4-6 April 2006-Kyoto Japan (Joint paper with Tony Falkland).

Peter Dillon (CSIRO) attended a meeting to review the draft IHP-VII in Paris from 5-6 June 2006.

Shahbaz Khan organised a strategic HELP Regional Coordinating Unit meeting at CSU Wagga, Australia in May 2006. With the courtesy of Charles Sturt University, a number of delegates from New Zealand, Philippines and Pakistan attended this strategic planning meeting.

Shahbaz Khan attended UNESCO's HELP program meeting at the Fourth World Water Forum (March 2006) to develop a program for HELP in the Southern Hemisphere 2007 Conference in South Africa. UNESCO plans to share experience among HELP basins by running a HELP Southern symposium and training workshop 4-9 November 2007 in Pretoria, South Africa, titled "Local Solutions to Global Water Problems - Lessons from the South".

Shahbaz Khan attended the UNESCO Pacific HELP Symposium organised by Landcare Research, in conjunction with UNESCO Apia, UNESCO-NZ, SOPAC, NIWA, Cawthron Institute, and Tasman District Council ran this symposium in Nelson in November 2005 along with a 2-day workshop and field trip on ICM for regional councils and government agencies. The HELP Symposium was also attended by 10 representatives from 6 Pacific Island Countries (Papua New Guinea, Solomon Islands, Vanuatu, Cook Islands, Samoa, and Fiji) and Japan, as well as by a broad range of stakeholders and scientists working in and around the Motueka Catchment.

Shahbaz Khan was an invited speaker with Mike Bonell (UNESCO, France) on the "Progress in the implementation of UNESCO IHP-HELP" at the International Conference "Integrated Assessment of Water Resources and Global Change: A North-South Analysis", Global Water System Project (GWSP) Bonn, Germany, February 22-25, 2005.

1.6 Other activities at a regional level

A project is currently underway titled: Enhanced Application of Climate Predictions in Pacific Island Countries in order to meet the general goals of improving weather and climate services and products. The AusAID funded project is developing a climate prediction capacity in participating countries, and in particular, is providing a framework for incorporating climate prediction information into planning across a broad range of agencies and industries. The climate prediction system being provided under the project is based upon the seasonal climate prediction system of the Australian Bureau of Meteorology, which has successfully issued climate predictions for some years.

The Pacific HYCOS Project proposal developed by WMO in 2001 has received support from the WMO Tropical Cyclone Committee, Pacific Region Global Climate Observing System, Pacific Island Country National Hydrological Services, SOPAC and received a high recommendation as one of the priority Actions identified by the regional consultation meeting in 2002. Efforts are underway to secure funding through the European Union and the Global Environmental Facility (GEF) mechanisms.

WMO held a workshop on Integrated Water Resources Management in Nadi, Fiji on 20-21 October 2005. The workshop was held in conjunction with the 6th Meeting of the WMO Regional Association V Working Group on Hydrology, 17-19 October 2005. Representatives from 15 PICs and attended the meeting and workshop.

1.6.1 Institutional relations/co-operation

No information available at this time.

1.6.2 Completed and ongoing scientific projects

Refer section 1.2.3 re ongoing Pacific Island projects.

2. Future Activities

2.1 Activities foreseen until December 2006

- 5th National Waterwatch Conference (www.waterwatch.org.au) is being planned for end of 2007.
- The biennial convention of the Australian Water Association (AWA) is the Australian water industry's largest and most prestigious event. It is an internationally recognised and well attended occasion, attracting delegates from across Australia and around the globe. The Ozwater 2007 Convention & Exhibition, will be held 4-8 March 2007 in Sydney (http://awaozwater.net/o7/). The convention will cover the national water agenda and include all aspects of management, water and wastewater treatment, water infrastructure, drinking water quality, pollution control, reuse and water resources.
- National Water Week, October 2007
- 9th Australasian Environmental Isotope Conference and 2nd Australasian Hydrogeology Research Conference with the theme *Integrating research and Innovation*, 13-15 December 2006, Adelaide (http://groundwater.com.au/aust-isotope-and-hydro-conferences.html).
- Greenhouse 2005 Action on Climate Change convened by CSIRO will be held 13-17 November 2005 in Melbourne and has the theme Awareness, Abatement, Adaptation, Action..
- MODSIM2005, 12-15 December 2005, Melbourne, Victoria. The 16th in a series with the theme Advances and Applications for Management and Decision Making.
- 4rd Water Sensitive Urban Design conference and 7th Urban Drainage Modelling Conference, Melbourne, 3-7 April 2006.
- The 2nd National WATER EDUCATION CONFERENCE 'From the Waters Edge to the Red Centre' in Alice Springs in April 2006.
- Enviro 06 A conference and exhibition for showcasing the Australian environment industry. 9-11 May 2006, Melbourne. . The 2006 conference will have the theme Building Sustainable Cities. (www.enviroaust.net/e6)
- 30th Hydrology and Water Resources Symposium, 4-7 December 2006 Launceston, Tasmania
- Management of Aquifer Recharge – includes the publication of 'Wise Strategies for Groundwater Recharge Enhancement', further workshops and symposia targeting arid and semi arid areas and possibly also small islands, triple bottom line evaluation of effectiveness of recharge enhancement in developing countries (also with FAO) and development and linkage of web pages on recharge enhancement.
- The UNESCO World Commission on Science and Technology is also pursuing the theme of hydrology through a program with the acronym of COMEST. This program has been largely the initiative of the Australian member of the Commission, Professor Barry Ninham from the ANU. Activities are planned in relation to the COMEST programme.

2.2 Activities Planned for 2007-2008

- Continuation of assistance to Pacific Island Projects.
- Continuation of involvement in Asian Pacific FRIEND.
- Training courses in the Pacific Island Countries.

2.3 Activities envisaged in the long term

NATIONAL REPORT ON IHP RELATED ACTIVITIES. CAMBODIA

1. Introduction

The Royal Government of Cambodia has implemented a policy of promoting economic growth and social development through the introduction on market economy. The development of water resources is deemed to plat the key role in economic growth, as contributes to agricultural and industrial development.

The ministry of Water Resources and Meteorology (MOWRAM) was established in 1999, the main duty is respond for facilitation hydro-meteorological data collection, archiving and exploitation of data and information of water resources development, for the benefit of the people of Cambodia.

Since 1997, the National Committee for IHP was established and head by H.E. Mr. LIM KEAN HOR is Minister of Ministry of Water Resources and Meteorology.

2. Activities at National Level in the Framework of IHP

Activities undertaken in the period of November, 2005 – October, 2006

Today, the main activities in framework of IHP has some limited because of human resources, capacity building in the field of water (Hydrologist) and finance support. However, in National Programs on Water Resources have prepare some legislation, strategy, water profile, etc. Now day under national assembly processing.

- Join Study on Integrated Watershed Management Plan Kbal Chay River Basin.
- Join Study on Comprehensive Agricultural Development of Prek Thnot River Basin.

2.1 National/Local scientific and technical meeting

The technical meeting are generally held in framework national activities cooperate with NGO's, MRC, WB, ADB, etc. to carry out the activities and plan for sort, medium, long terms for sustainable of development of water resources in Cambodia and in Lower Mekong Basin as well.

Participation in IHP Steering Committee / Working group

One representative from Cambodia attended the 13th Regional Steering Committee Meeting for Southeast Asia and the Pacific in conjunction with the International Symposium on Ecohydrology Ramada Bintang Bali Resort, Denpasar,Bali, Indonesia, 21-25 November, 2005.

2.2 Collaboration with other national and international organizations/ programs

The chairman of Cambodia National Committee for IHP(CIHP) is a Permanent Representative of WMO, so he has contact and coordination with WMO' s activities.

The member of CIHP have participated and contributed to many national and international organizations councils in Cambodia related to water resources management and development, environment, natural resources etc. especially flood management and flood forecasting.

World Water Day was celebrated in Phnom Penh as National Level that involve from many ministries, organizations.

2.3 Research/applied projects sponsored

Flood Forecasting and Flood Information for Vulnerable Communities

3. Educational and Training Courses

More then forty representatives attended National Seminar on Flood Forecasting and Flood Information for Vulnerable Communities

Training on Flood Emergency Management Strengthening and Flood Management and Mitigation.

3.1 Contribution to IHP Courses/Organization of Specific Courses.

None

3.2 Participation in IHP Courses.

None.

4.Plan for 2007

-To collaborate IHP activities and meeting as possibility.
-To facilitate the collection, archiving, and exploitation of Hydro-meteorological data and information.
-To build CIHP's capacity to collect, archiving, and exploitation of Hydro-meteorological data and information.
-To standards of quality and timeliness appropriate to the needs of their users.
-Procedures for all stages of data collection.
-Management systems in place to ensure sustainable.
-To celebrate World Water Day 2007.

National Report on IHP Related Activities

Chinese National Committee

1. ACTIVITIES UNDERTAKEN IN THE PERIOD September 2005 — June 2006

1.1 Meetings of the Chinese National Committee for IHP

1.1.1 Decision regarding the composition of the Chinese National Committee

Chairperson Ms. Liu Yaming was shifted to another position in year 2005, Mr. Deng Jian, Director-General of Bureau of Hydrology now will take the chairmanship according to the regulation of Chinese National Committee for IHP. The approval procedure is going on.

1.1.2 Status of IHP-VI activities

Some key activities are provided in the following paragraphs. More activities with more themes and focal areas are going on, thus a series of national and international workshops will be held when projects are finalized.

International Hydrological Methodology Symposium was held on 31 October-2 November 2005 in Nanjing. About 200 participants from China, USA, UK, France, Japan, Germany, Australia, Poland, Korea, Thailand, Nepal and Hong Kong SAR attended the symposium. The symposium exchanged the newest achievements on hydrological research, especially digital hydrological methodology, and look forward hydrology Science. 180 papers were received and will be published by UK IAHS press. China-IHP was one of sponsors and Vice-Chairperson of China-IHP also attended the activities.

Symposium on Water Environment Protection of Yangtze River was held from 18-19 October 2005 in Hefei. 210 participants from 14 provinces and cities in Yangtze River basin participated the symposium. The symposium is a kind of senior officials and experts forum for Yangtze river water protection. Water quality and water pollution control are main themes. Along with economic development, population increasing, water environment has been aggravated. Therefore, to keep a healthy river is common reorganization by the riparian provinces and cities from upper stream and down stream. A proposal of legislation for Yangtze River water Protection to the State Council was approved by Provincial Political Consultancy Committees. China-IHP was invited to present IHP themes and activities.

International workshop of ecosystem rehabilitation and recovery was held from 14-17 November, 2005 in Nanjing, by the state key laboratory of Hydrology, Water Resources and Water Engineering**.** Some international experts, Prof. Smits and Prof. Hans from the Netherlands, Prof. Anderson from Canada and Dr. Sonja Jähnig from Germany, were invited to present new concepts and technologies on urban water pollution control, healthy ecosystem and recovery, as well as bio-rehabilitation technology for water body etc. The Laboratory is one of Chinese National

Committee partners for basic hydrological research.

1.1.3 Decision regarding contribution to/participation in IHP-VII

Secretariat members of Chian-IHP met in Beijing on 12 March 2006 for draft activities arrangement of IHP National Committee. The proposed activities have been discussed and revised. The activities included several workshops, participation of 17th IGC meeting and bilateral cooperation with other countries.

1.2 ACTIVITIES AT NATIONAL LEVEL IN THE FRAMEWORK OF THE IHP

1.2.1 National/local scientific and technical meetings

National technical Standard system workshop was held on 27 April 2006 in Beijing. The system includes some hydrological measurement and monitoring standards which will be issued as the state standard or ministerial standard in the country. Some experts from different ministries joined the discussion on behalf of their ministries.

2nd Young Scientist Forum of China Hydraulic Engineering Society (CHES) was held from 1-3 November 2005 in Xi'an. The forum was organized by Young Scientist Working Committee of CHES and about 300 participants joined the forum. The forum gave a wide field for young scientists and engineers, which included water resources and environment, flood and flood disaster, hydraulic engineering, agricultural water saving, hydro-informatics, rock and soil technology and other water related issues. Some discussions on water-saving orientation society, maintenance of healthy river, and key technologies for important engineering projects were exchanged. A proceeding including 114 papers were distributed in the occasion of the forum.

China-IHP was co-organizer and Vice-Chairperson of China-IHP chaired the opening ceremony.

National Hydro-Informatics Workshop was held from 8-9 November 2005 in Zhengzhou. 120 participants attended the workshop. Mr. Suo Lisheng, Vice Minister of Ministry of Water Resources delivered speech in the opening ceremony. Modernization of water information use and management has been emphasized in past years. It was included in the 11th five-year National Hydro-informatics Management Modernization Planning. Ministry of Water Resource issued a Recommendation for Promoting Hydro-Informatics Modernization. It has been recognized as baseline for advanced technology allocation in hydrology and water resources fields. China-IHP sent members to attend the workshop.

National Symposium on River Ecosystem Rehabilitation Technology was held from 24-25 October 2005 in Hangzhou. Vice Minister of Ministry of Water Resources participated and gave a lecture on Dam and Ecology. Some experiences for river ecosystem rehabilitation were also presented their achievements. TO promote harmony of people and water is one of highlight in Ministry of Water Resources. The rehabilitation of river eco-system pays high attention on natural rehabilitation capacity. Some technologies, standards and criteria from experiences of foreign countries were reviewed and introduced to China since year 2002. 200 participants from river commissions and local organizations attended the symposium. Participants also spend a half day to visit sites at Haining city and Jiashan county in Zhejiang province.

China-IHP briefs the IHP-VII on eco-hydrology and ecosystem rehabilitation in the world.

Workshop of water ecosystem protection and rehabilitation was held on 24 May 2006 in Beijing. Since the Ministry of water resources highlighted ecosystem protection as one of water resources management and protection, the workshop focused on technology standard of ecosystem related to water. It is quite new concept for water experts to deal with integration of society, economy, environment and ecosystem. In the next years, the ecosystem related to water will be put on one of top priorities in this ministry. China National Committee will be involved in some key activities for introducing international development on ecohydrology and related ecosystem protection progressing.

1.2.2 Participation IHP Steering Committees/Working Groups

The 13th Regional Steering Committee Meeting for Southeast Asia and the Pacific and International Symposium on Ecohydrology was held in Bali, Indonesia from 21-26 November 2005. Dr. Liu Heng, on behalf of Chinese National Committee and also as vice Chairperson of Intergovernmental Council Bureau presented country report and 38th IHP bureau meeting achievements. There are about 200 participants, including 3 others from China (Dr. Chen Yuanfang from Hohai University, Dr. Xu Zongxue from Beijing Normal University and Dr. Yu Xiubo from China Science Academy)

As requested by National Committee, Dr. Chen Yuanfang, as a member of FRIEND working group, participated in APFRIEND phase II meeting on the design rainfall and design Flood determination in Kuala Lumpur, Malaysia from the 6th to 7th June 2005. The main activities of the meeting contains : (1) Country reports giving a statement of the techniques that are used in the country, data availability for IFD (intensity—frequency—duration), proposals for the AP FRIEND phase II; (2) Workshop on IFD and Frequency determinations; (3) Discuss on the improvement for RIVER CATALOGUE; (4) A technical visit in the Humid Tropics Hydrology and Water Resources Research Centre of Malaysia.

1.2.3 Research/applied projects supported or sponsored

Chinese Homepage of IHP on Internet has been supported by UNESCO Beijing office and has been updated regularly.

1.2.4 Collaboration with other national and international organization and/or programs

China's delegation including members of IHP national committee members attended 4th World Water Forum in Mexico from 17-22 March, 2006. The participation activities included China, Japan and Korea joint workshop, and also Asian day ceremony, as well as many sessions, especially UNESCO-IHP and WWAP posters. China sends a delegation including 56 experts.

Participation of 33rd General Conference from 9-13 October 2005 in Headquarter of UNESCO. Dr. Liu Heng represented Chinese National Committee participated 3rd committee meeting for Natural Sciences, in where water has been debated and supported by most of member countries.

Participation of The Round Table on Concept and Financial Strategy of UNESCO-IHE

on 9 March, 2006 in Headquarter of UNESCO. Sixty delegations from country members attended the meeting, hosted by the Director General, Mr Koïchiro Matsuura. Dr. Liu Heng, Vice Chairman of Chinese National Committee and alumni of UNESCO-IHE was invited to give a short presentation. he stated that his life changed after studying at IHE, personally and professionally. "I discover my personal potential, my view of things expanded and I got more international oriented", expressed Dr Liu Heng. "I am only an example. Many Chinese professionals playing an important role in Chinese water resources have lived the IHE's experience".

Sino-European Union River Basin Management Seminar was held from 13-14 October 2005 in Beijing. The seminar is a preliminary for starting a Sino-European Union project on river basin management and enhancing cooperation of Sino-European in water resources field. Participants from China Ministry of Water Resources, Ministry of Commerce and State Environment Protection Agency and River Basin Commissions and universities joined the seminar. European Union sent a delegation especially for the seminar. The main topics for two days discussion are water policy development of European Union, EU Water Framework Directive and its implementation, EU integrated river basin management, cases study (Danube river, Spanish water resources management), public participation, ecosystem issues and China River basin management.

Sino-UK water sector cooperation workshop was held on 23 November 2005 in Beijing. UK water sector association organized this workshop with supporting of China Ministry of Water Resources, UK Embassy in Beijing and UK trade association. About 100 participants from water sectors in Beijing attended the workshop. Some high official related to water from two countries delivered their speeches during the ceremony. UK experiences on water sustainable service were introduced by an expert from UK Ministry of Environment, Food and Rural Affairs. Some companies and institutes from UK, including Wallingford, Parsons Brinkerhoff, Costain, ABB, Halcrow, Simon Hartley etc. also bring their management for Chinese counterparts.

19th ICID Congress and 56th International Executive Council was held from 15 to 18 September 2005 in Beijing. Mr. Hui Liangyu, Vice Premier of the State Council, attended the opening ceremony. ICID president, Dr. Abudula Keizeru and many minister level officials attended the congress. Vice Minister, Mr. Ze Haohui from Ministry of Water Resources chaired the opning ceremony.

The Congress combined academic activities with topic of food security and environment sustainability. About 1000 participants from 60 countries joined 4 days seminars, field visiting and executive meetings. There are two themes, i.e., one is improvement of water and land management for increasing irrigation efficiency, another is living harmony with floods. Totally 12 sub-themes are parallel organized.

The 20th Sino-Japan Bilateral Water Resources Meeting was held in 25 October 2005 in Beijing. A delegation from Japanese Ministry of Civil and Transportation and a delegation from Chinese Ministry of Water Resources exchanged opinions on water resources development, management and utilization. Chinese delegation introduced maintenance of healthy Yangtze River, water-saving orientation society, wetland protection. Japanese delegation presented dam construction issues. The meeting is a routine bilateral activity which has been executed for 20 years.

Workshop on online flood simulation and disaster information distribution system was held on 19 April, 2006 in Beijing. Wallingford software company was invited to presented their new products, including remote control platform and online flood forecasting system based on web

technology. It includes information collection system, distributed models. About 50 hydrologists from different level hydrology bureaus attended the workshop. Currently the state flood control system has been developing. Some international famous companies related to water will be invited to introduce their new products.

Integrated transboundary water resource management workshop was held on 14 February, 2006 in Beijing. The workshop is sponsored by Sweden International Development Agency (SIDA). Through the workshop and followed training activities in South Africa and Sweden, the participants understood operational principles, coordination experiences and capacity building for transboundary water management. One participant from IHP National Committee Secretariat was trained.

Community-Based Approaches to Flood Management was held from 3-5 April 2006 in Dakar Bangladesh. About 40 international participants, including one participant from China's Bureau of Hydrology, attended the workshop.

China- Germany joint workshop of hydraulic engineering impact on environment and ecology was held from 1-6 March 2006 in Hubei province. 50 domestic experts from 18 institutions and 17 German experts from 9 German research institutes participated in the workshop. 4 experts from Japan, Italy and USA was also invited to present their newest research outcomes.
The workshop was focusing on large scale hydraulic engineering, especially such as Three-Gorges Project(TGP), impact on environment, ecosystem and social-economy etc. A team including China-Germany experts will continue their research in TGP area. The recent investigation and research will include the field of contribution of rainfall on sedimentation, nutrition and developing some models. Scholar exchange and training plan were also proposed. China National Committee will trace the joint activities, and one of CNC-member from Yangtze River Commission will be involved in the investigation.

Symposium of Water and soil conservancy and sustainable development in small river basins was held from 20-21 November 2005 in Beijing. The symposium focused on sustainable development in small river basins, and covered several themes including technology, concepts, experiences, effects and development progress. Some innovation development ideas and countermeasure were proposed to central authorities. Representatives from Ministry of Water Resources, China Science Academy, World Bank, UK DfID and other 150 participants attended the symposium. CNC representative also participated in the first day discussion, because CNC would like to enhance hydrology roles in small river development, especially in the western part of the country.

International workshop on China water right system initiation was held on 6 December 2005 in Beijing. The workshop was co-organized by China Ministry of Water Resources and Japan International Cooperation Agency (JICA). The main purposes of the workshop are to learn international experiences of water right, water market, to exchange achievements of recent researches in China and to prepare a proposal for authorities to initiate a China water right system. The final results were examined and proved during 8-9 June 2006 in Beijing. The cooperation between China's Ministry of Water Resources and JICA has been sustaining about 20 years since early 1980s. The water right system will be initiated and established in China.

China-Dutch water resources management innovation workshop was held from 18-19 May 2006 in Shanghai. China's Ministry of Water Resources, The Netherlands' Ministry of Transportation Infrastructure and Water Management co-organized the workshop. There are about

210 participants including 90 from Netherlands. The workshop was focused on river training and river basin management. It is one of activities under the framework of China-Dutch cooperation. Some bilateral agreements were signed during the workshop. Several IHP Chinese National Committee members were invited to present their achievements.

1.3 EDUCATION AND TRAINING COURSE

1.3.1 Contribution to IHP courses

International training and research center for hydrology, water resources and water environment (ITRCHWE) continued the training course on River Basin Sustainable Water Resources Management. Vice-Chair Person of China-IHP had a lecture on Integrated Water Resources Management on 16 September, 2005.

UNIDO Hangzhou Regional Center (HRC) for small hydropower, also named as rural small hydropower research institute, enhanced their activities under IHP framework. Two training courses for developing countries are organized in Hangzhou, China annually.

1.3.2 Organization of specific courses

Training course for leaders of hydrological stations was organized from 9-16 November in Nanjing. The course provided advanced technologies for hydrological observation. It is also refreshed for those leaders who working in hydrological stations. China-IHP gave technical support, especially new development of international hydrological programme.

1.3.3 Participation in IHP courses

Each year about 20 participants were sent to UNESCO-IHE with academic recommendation from China-IHP.

1.4 PARTICIPATION IN INTERNATIONAL SCIENTIFIC MEETINGS

1.4.1 Meeting hosted by the country

2nd Yellow River Forum was held from 18 to 21 October 2005 in Zhengzhou. About 800 participants including 300 international participants from 50 countries attended the forum. The His royal highness orange prince William Alexander also attended the forum. 6 themes and 12 sessions were arranged for specific topics. The themes included maintenance of healthy river, hydraulics and non-structure measures, water environment and ecology protection, trans-basin water transfer and water allocation, water right/price and water market as well as specific sessions, such as UNESCO-IHE alumni session. The forum became a well-known action and will take place each two years in cities along Yellow River.

UNESCO-IHE session was chaired by Vice-Chairperson of China-IHP.

Workshop on Dam Safety Monitoring and Management was held from 1-3 November 2005 in Xi'an. The workshop was organized by Ministry of Water Resources with support of World Bank. Mr. Liu Ning, Chief Engineer of Ministry of Water Resources attended the workshop and delivered a speech. About 150 participants, including 20 international participants, participated in the workshop. Participants shared experiences on dam safety monitoring and management in their countries and organizations, as well as discussed dam management technology, legislation and

institution, sedimentation management etc. ice Chairperson of China-IHP attended the workshop.

1.4.2 Participation in meetings abroad

Ms Liu Jingnan from Nanjing Hydraulic Research Institute participated in the "International Training Course on Hydrological Droughts and Low Flows" was organized in Regional Humid Tropics Hydrology and Water Resources Centre (HTC), Kuala Lumpur, Malaysia, 26-30 September 2005.

1.5 OTHER ACTIVITIES AT A REGIONAL LEVEL

1.5.1 Institutional relations / co-operation

To enhance relationship with IAHS at national level, Asian Water Resources Association (AWRA) at regional level, as well as WMO, IAEA, UN-ESCAP at UN system level would be highly concentrated. To cooperate with national committees for hydrological and water resources research in Southeast Asia and the Pacific are key fields.

1.5.2 Completed and ongoing scientific projects

FRIEND projects for flood/low flow forecasting/predictions in Southeast-Asian group work.

2. FUTURE ACTIVITIES

2.1 ACTIVITIES PLANNED TO UNTIL DECEMBER 2007

The National Committee will continue and pay high attention for regional cooperation under IHP framework. WWAP and WWDR are key issues at present, it s supposed that some of China basins will be included in the next versions of WWDR.

2.2 ACTIVITIES FORESEEN FOR 2008-2009

More projects related to IHP-VI themes will be supported by Ministry of Water Resources though IHP national Committee. IHP National will continue to encourage scientific and technical symposia and workshops. Meanwhile, some initiatives for IHP-VII themes will be encouraged and arranged by the National Committee. Cooperation among the Southeast Asia and the Pacific will be top priority.

2.3 ACTIVITIES ENVISAGED FOR THE LONG TERM

China IHP National Committee will make more contributions to IHP, especially, may host RSC meeting/workshops or join co-team fro regional cooperation. In the phase IHP-VII, some working groups will be established for more cooperation activities.

REPORT OF THE
INDONESIAN IHP NATIONAL COMMITTEE
BANGKOK, THAILAND
OCTOBER 2006

1. ACTIVITIES UNDERTAKEN IN THE PERIOD DECEMBER 2005 – SEPTEMBER 2006

1.1 Meetings of the IHP National Committee

1.1.1 Decisions regarding the composition of the IHP National Committee

The organizational structure of the Indonesian National Committee are represented by a Chairman, a Vice chairman, Secretaries, and 14 members from universities and multisectoral-departmental. They are the Indonesian Institute of Sciences (LIPI), Departments of Public Works, Agriculture, Transportation, Forestry, and from Universities. The Indonesian National is on the verge of restructurization for the following two principal considerations: (i) refining the program within the light of IHP Phase VII; (ii) obtaining more participation from the key stakeholders. The persent composition of the National Committee Organization is:

Chairman : Jan Sopaheluwakan[1]
Vice Chairman : Eddy Djajadiredja
Secretary I : Gadis Sri Haryani
Secretary II : Nenny Sintawardani

Members:

1. P.E. Hehanussa	LIPI
2. M. Rahman Djuwansyah	LIPI
3. Hadikusumah	LIPI
4. Sudaryati Cahyaningsih	LIPI
5. Bogie Soedjatmiko	LIPI
6. Indreswari Guritno	University of Indonesia (UI)
7. Hidayat Pawitan	Bogor Agriculture Institute (IPB)
8. Istiqlal Amien	Dept. of Agriculture
9. Sutardi	Dept of Public Works
10. Joesron Loebis	Dept of Public Works
11.Willem Putuhena	Dept. of Public Works
12. Eulis Retnowati	Dept. of Forestry
13. Hery Harjanto	Agency for Meteorology and Geophysics
14. Jusman Sihombing	Dept. of National Education

The committee normally hold a bimonthly coordination meeting and additional technical meetings as needed for the planning and implementation of seminars and workshops organized by the committee. The

[1] Prof. Dr. Jan Sopaheluwakan's Chairmanship will be succeeded by Dr. Hery Harjono soon. The latter has taken the office of the Earth Science Deputyship in LIPI since September 19, 2006, whose position is assumed to be the ex-officio responsibility for the IHP-UNESCO. Prof. Sopaheluwakan will give his time as the present Deputy Chairman for Scientific Services in LIPI for the future strengthening of the Regional Center for Ecohydrology in Cibinong.

committee routine meetings are also attended by the chairman of the Indonesian Committee for UNESCO and Program Specialist of the UNESCO Jakarta Office. Members of the national committee through regular meetings distribute and report information related to these activities and bridge closer contacts between them. The mailing address are as follows :

Dr. Gadis Sri Haryani
Indonesian National Committee for IHP
Research Centre for Limnology LIPI
Indonesian Institute of Sciences
Kompleks LIPI
Cibinong, 16911, INDONESIA
e-mail: gadissh@indo.net.id or limno@indo.net.id

Or

c.o. Bureau of Science and Technology Cooperation and and Promotion, Indonesian Institute of Sciences (LIPI)
Jln. Gatot Subroto No. 10, Jakarta, 12710, INDONESIA
Telp.: 62-21-52257111/5207226,
e-mail: bkpi@lipi.go.id

1.2 **Status of IHP-VI activities**:

Activities related to IHP-VI programme are implemented by and in various departments, universities, and research institutions members of IHP National Committee. A bi-monthly committee meeting received reports from each group activities, delivered and of use to other national members and for other related IHP-VI activities.

National Workshop on the Preparation of The Formulation of Indonesia's IWRM and Water Efficiency Plan was held in February 2005: It is a contribution for IHP VI Theme 2: Integrated Watershed and Aquifer Dynamics.

A contribution for IHP VI Theme 5 *Water Education and Training*: Under the flagship of Indonesia Water Partnership, the water stakeholders have been making use of the World Water Day since year 2000 until now. Its main objective is to conduct campaign through training, educating and dialogues and seminars program to augment public participation. The annual themes were changed according to the prevailing local needs. Three strategic target groups have been chosen, namely the school children and teachers, the decision makers cum academics, as well as the farmers.

1.3 Activities at national level in the framework of the IHP

1.3.1 National/local scientific and technical meetings:

Scientific and technical meetings are held within the context of APCE program, organized by National Committee.

On 29 November 2005, RIWR (Research Institute for Water Resources) arranged a colloquium on hydrological researches and a technology exhibition on hydrological equipments which were attended by representatives of other governmental institutions, universities, private sectors and students.

1.3.2 Participation in IHP Steering Committees/Working Groups:

- Chairman and committee members attended UNESCO IHP 13th Regional Steering Committee Meeting for Southeast Asia & the Pacific, Denpasar, Bali, Indonesia, 21 – 25 November 2005

1.3.3 Research/applied projects supported or sponsored:

-

1.2.4 Collaboration with other national and international organizations and/or programmes:

- -.

1.2.5 Other activities:

Several events related to the World Water Day 2006:

- in Bogor by organizing an International Symposium on The Ecology and Limnology of the Malili Lakes, 20-22 March 2006.
- In Jakarta The Multistakeholders Dialogues on Water and Disaster; Water and Food; Water Availability and its mechanism of provisioning.
- In Cibinong, organized by Drinking Water Company in District of Bogor: water education for children, exibitions, etc.

1.3 Educational and training courses

1.3.1 Contribution to IHP courses:

- 3rd Ecohydrology Training Workshop was held in Bali, 21-26 November 2005.

1.3.2 Organization of specific courses:

Organized the 3rd Ecohydrology Training Workshop in November 2005, attended by 35 participants from Asia Pacific nations

1.3.3 Participation in IHP courses:

- Mrs. Yustiawati, M.Sc, participated in IHP Training Course Water and Carbon Cycles in Terrestrial Ecosystems, 26 February – 11 March 2006, Nagoya & Chiba, Japan.

1.4 Publications

Proceedings on International Symposium on Ecohydrology, Bali, 2005.

1.5 Participation in international scientific meetings

1.5.1 Meetings hosted by the country:

- International Symposium on Ecohydrology, Bali, 21 – 22 November 2005
- The 13th Regional Steering Committe for Southeast Asia and the Pacific UNESCOmeeting in Bali, 24-25 November 2005
- The 3rd Training Workshop on Ecohydrology, Bali, 24 -25 November 2005
- Scientific Advisory Committee for Ecohydrology Meeting, Bali, 25-26 November 2005.

1.5.2 Participation in meetings abroad:

- Prof. Jan Sopaheluwakan and Prof. Peter Hehanussa represented Indonesia in the 16th IGC Meeting in Paris, 20-24 September 2005 in Paris, during which

Indonesian Proposal on the establishment of Category 2 water related center (Asia Pacific Center for Ecohydrology) was presented.

- Mr. Joesron Loebis attended the "6th Session of Regional Association V (RA V) Working Group on Hydrology (WGH) of World Meteorological Organization (WMO)" in Nadi, Fiji from 17 to 25 October 2005. In the meeting, Indonesia gained support for the establishment of Regional Hydrological Training Center (RHTC) for South-West Pacific in Indonesia. The plan was then endorsed in "The 14th Session of RA V (South-West Pacific) Meeting" held in Adelaide, Australia from 9 to 16 May 2006. At this moment, RIWR is arranging next steps in preparing the developing role of Indonesian Hydrological Training Center to become the RHTC for South-West Pacific under the auspices of WMO.
- T. Firdaus Larosa, MT attended "Flood Hazard Mapping" course in Japan from 27 October to 3 December 2005.
- Prof. Hehanussa attended Scientific Advisory Committee (SAC) on Ecohydrology meeting, in Poland, 17-19th November 2005
- Mr. Hehanussa attended the Opening Ceremony of the European Regional Centre for Ecohydrology, under the auspices of UNESCO, 8th March 2006.
- Attended the 4th World Water Forum in Mexico City, March 2006
- Prof. Jan Sopaheluwakan, Dr. Gadis Sri Haryani, Mr. Eddy Djajadiredja, Mr. Hery Haryanto, Participated in 17th session of IHP Intergovernmental Council UNESCO, 3-7 July 2006

1.6 Other activities at regional level

1.6.1. Institutional relations/co-operation:

1.6.2 Completed and ongoing scientific projects:

International Symposium on Ecohydrology in conjunction with the 13th Asia Pacific RSC meeting was held in 21-25 November 2005 in Bali Island attended by 126 participants from 21 countries (Argentina, Australia, Bangladesh, Cambodia, Canada, China, Egypt, Fiji, France, India, Indonesia, Iran, Japan, Korea (PDR), Korea (Rep. of), Lao PDR, Malaysia, Micronesia (Fed. St. of), Mongolia, Myanmar, Nepal, New Zealand, Papua new Guinea, Philippines, Poland, Portugal, Samoa, South Africa, Srilanka, Sudan, Thailand, Vietnam). Two other meetings was adjoined during the period November 2005 are the 3rd International Training Workshop on Ecohydrology and Annual Scientific Advisory Committee on Ecohidrology meeting.

The opening remarks of the International Symposium and Training Workshop were given by Dr. Ir. Jan Sopaheluwakan, M. Sc., APU (representative of the Chairman of LIPI), Dr. Han Qunli (Representative of UNESCO Jakarta Office), Professor Arif Rahman (Executive Chairman of Indonesian National Commission for UNESCO), and Dr. Eddy Djajadiredja (representative of Indonesian IHP Chairman). The closing remark was given by Dr. Ir. Gadis Sri Haryani (chairperson of Organizing Committee).

The International Symposium presented and discussed 44 papers that covered wide spectrum of ecohydrology and hydrology. Two keynote speeches were given by Prof.

Maciej Zalewski from Poland Academic of Sciences, and Dr. Basuki Hadimulyono from Department of Public Works.

The Training Workshop were given by:

1. Prof. Maciej Zalewski: Ecohydrology – System Approach for Sustainable water Ecosystem and Society.
2. Prof. P.E. Hehanussa: Background Informations (related to setting up the new) on the Indonesian Water Resources Law
3. Prof. Hidayat Pawitan: The Needs of Criteria and Indicators in the Development and Management of Water Resources.

2. FUTURE ACTIVITIES

2.1 Activities planned until December 2007

- The Asia Pacific Center for Ecohydrology (APCE) under the Indonesian Institute of Sciences is going to be operational and host activities in the region[2]
- The 15th IHP-RSC meeting is planned to be held Philippines, 2007
- 12th World Lake Conference, India November 2007
- Research Institute for Water Resources will contribute more activities through participation in short term courses or joint research in cooperation with the Indonesian National Committee of UNESCO-IHP in several issues, including:
    - Flood
    - Sediment and erosion
    - Ecohydrology
    - Water management
    - Real-time forecasting
    - Modeling
    - Urban hydrology

  The RIWR will support the Regional Center for Ecohydrology initiative, which will be integrated in the Regional Hydrological Training Program for Southeast Asia and The Pacific region.

2.2 Activities foreseen for 2007-2008

- Various activities related to implementation and starting of activities by the APCE centre
- 12th World Lake Conference, India November 2007

2.3 Activities envisaged in the long term

- Indonesian National committee for IHP will promote activities to public coordinate participations at national level to augment people's awareness through, educations and trainings on hazards caused by global warming, as well as hazards caused by geological and volcanological events, in which Indonesia is one of the most prone areas. These include sea level rise, flood and drought hazard, volcanic debris control, earthquakes, tsunamis, water and food security, and access to save water. Area of priorities is mega cities, and coastal areas. Considering that Indonesia is an archipelago (more than 17.508 islands), inhabited by more than 220 million people, this is a large task. The objective is

[2] See Appendix 1

to promote people's preparedness, by the communities as well as governments institutions, in facing the oncoming hazards.

- Asia Pacific Center for ecohydrology (APCE) has been set up in Cibinong Science Center in close cooperation with Research Center for Limnology, Indonesian Institute of Sciences. It has prepared a demo-site which is located at the upper Citarum Basin. The reservoirs collect water that drains the Bandung Basin where urban and industrial wastes are still a major problem. Eutrophication of the reservoir is being studied to promote alternatives to reduce the pollutants. Water cycle related to erosion and sedimentation is also being studied in a small Cililin Basin. Results of studies will be shared as study cases with other Asia – Pacific scientists interested in ecohydrology implementation.

Appendix 1

Report of Asia Pacific Center for Ecohydrology

This Category II Center will continue its service to foster future regional cooperation in the field of ecohydrology. The success of three consecutively execution of the Training-Workshop on ecohydrology for the Asia Pacific Region in 2001, 2003 and 2005 has given a sound base for the establishment of the center. Its on-going core activity in training workshop will be complemented in the future with some public outreach and advocacy and, when deemed necessary, some consulting activities. The Center's action program within the foreseeable future will be:

1. Finalizing "the last mile" of legal administrative requirements with the support of UNESCO Jakarta Office to be submitted to the next 2007 UNESCO Board of Executive Meeting in Paris.
2. Refine and complement the on-going ecohydrological research in the Upper Citarum River Basin as a plausible candidate for the demo site of the Center. This will be accompanied also with the effort of finding another alternative or complementary demo site elsewhere in Indonesia that may represent a typical basin of the region's interest.
3. Incremental improvement of the program, supporting facilities, networks and partnership.
4. Carry out a series of stakeholders consultation and fostering the domestic and overseas partnership, including among and between the Category II Centers under UNESCO, as it was agreed by the Director's meeting during the 17th IGC-IHP in Paris, July 4, 2006.
5. Design and production of a set of campaign materials for the partnership and public outreach program.

NATIONAL REPORT ON IHP RELATED ACTIVITIES
JAPAN

Various activities of UNESCO have been implemented under the support of the Japanese National Commission for UNESCO with financial contribution in the form of Fund-in-Trust (JFIT) for the Promotion of Science for the Sustainable Development. The following summary includes the activities of Japanese National Committee for the International Hydrological Programme (IHP) of UNESCO undertaken during September 2004 to September 2006.

1. ACTIVITIES UNDERTAKEN IN THE PERIOD SEPTEMBER 2004 – SEPTEMBER 2006

1.1 Meetings of the IHP National Committee

1.1.1 Decisions regarding the composition of the IHP National Committee

New members of the IHP National Committee have just been appointed in June 2006 as follows.

Chairman: TAKEUCHI Kuniyoshi, Prof., Univ. of Yamanashi

NAKANISHI Hisae, Prof., Nagoya Univ.

KOIKE Toshio, Prof., Univ. of Tokyo

UEDA Hiroshi, Prof., HyARC, Nagoya Univ.

SHIMIZU Yoshihisa, Assoc. Prof., Kyoto Univ.

JINNO Kenji, Prof., Kyushu Univ.

TAKARA Kaoru, Prof., DPRI, Kyoto Univ.

TAKEMON Yasuhiro, Assoc. Prof., DPRI, Kyoto Univ.

TANAKA Tadashi, Prof., Univ. of Tsukuba

NAKAYAMA Mikiyasu, Prof., Univ. of Tokyo

WATANABE Tsugihiro, Prof., Research Institute for Humanity and Nature (RIHN)

TERAKAWA Akira, Mr., ICHARM, Public Works Research Institute (PWRI)

KURAJI Koichiro, Dr., Univ. of Tokyo

1.1.2 Status of IHP-VI activities

(1) Catalogue of Rivers: The Catalogue of Rivers for Southeast Asia and the Pacific, Vols. 1 and 2, published in book form in 1995 and 1997 respectively, were compiled in a CD-ROM with the aid of Special Coordination Funds for Promoting Science and Technology (Prof. Takara, DPRI, Kyoto University). The CD-ROMs for Vols. 1 and 2 were distributed at the Asian-Pacific FRIEND (Flow Regimes from International Experimental Network Datasets) Workshop and Kuala Lumpur on 6-7 June 2005, as well as at the 13th Session of IHP Regional Steering Committee (RSC) for Southeast Asia and the Pacific (SEAP) in Kuta, Bali, Indonesia on 24-25 November 2005.

(2) Asian Pacific FRIEND: Prof. Takara attended the Asian Pacific FRIEND Workshop, Kuala Lumpur on 6-7 June 2005 and reported the current status of IDF analysis and practice in Japan. Based on an action item decided at the Workshop, he collected rainfall data at five rain gauges in Aichi Prefecture

and distributed them to AP FRIEND members. He also analyzed the rainfall data provided by the members and reported the preliminary results at the APF Technical Sub-Committee (TSC) on 21 November 2005 at the occasion of the 13th Session of RSC in Bali, Indonesia.

(3) Hydrology for Environment, Life and Policy (HELP): Dr Tachikawa submitted the second report of the Yasu River basin, a HELP candidate basin in Japan, to HELP Secretariat for their review.

1.1.3 Decisions regarding contribution to/participation in IHP-VII

Dr. Kuraji has joined in preparation of the IHP-VII as an expert from Japan. The Japanese National Committee for IHP sent comments on IHP-VII Draft Plan to the UNESCO-IHP Secretariat, taking into account the importance and necessity of prevention of water-related disaster.

1.2 Activities at national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

(1) IHP Training Course Working Group Meeting was held at Shin-Kokusai Building, Tokyo on 24 May 2005. The courses for FY 2005 and 2006 were decided to name as “Water and Carbon Cycles in Terrestrial Ecosystems” and “Oceanography Basics”. The composition of Training Course Working Group was determined as well. Prof. Ueda, HyARC, Nagoya University is the head of the Working Group since 2005.

(2) An IHP-VII proposal was presented by a group of Univ. of Tsukuba on the basis of discussions on IHP-VII at the IHP National Committee meeting on 3 August 2004. The proposal title was “Capacity Building and Education for Observers for Continuous Monitoring of Terrestrial Environments in Asia: An Integrated program of Flux Observation, Tracer Analysis and Numerical Modeling”, which is appeared in Newsletter “IHP” No. 18 (June 2005).

(3) ICHARM Inauguration Symposia:

- “Towards Global Water Disaster Reduction - Cooperating through ICHARM (International Centre for Water Hazard and Risk Management) -” was held at the United Nations University (UNU), Tokyo, Japan on 10 May 2006.
- “Alliance for Localism” was held at the United Nations University (UNU), Tokyo, Japan on 14 September 2006. Mr. Kazuo Kitagawa, the Minister of Land, Infrastructure and Transport of Japanese Government gave a message. Several representatives gave keynote speeches such as from US Army Corp of Engineers, UN-ISDR, WMO, UNESCO, Brazil, and DPRI of Kyoto University.

(4) IHP Training Course Working Group Meeting was held at the MEXT, Tokyo on 24 May 2006. The courses for FY 2006 were discussed. A short course for participants from the Asia-Pacific region is going to be conducted with a theme *Oceanography Basics*, from 26 November to 9 December 2006 (See 1.3.1 (2) c) below).

1.2.2 Participation in IHP Steering Committees/Working Groups

The Japanese National Commission for UNESCO provides UNESCO with financial contribution in the form of Fund-in-Trust (JFIT) for the Promotion of Science for the Sustainable Development. Using

JFIT, the UNESCO Jakarta Office organizes the UNESCO-IHP Regional Steering Committee (RSC) for Southeast Asia and the Pacific and IHP Training Courses in collaboration with the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT), Japanese Universities and Research Institutes.

(1) Regional Steering Committee (RSC)

a) The 12th RSC was held in November 2004 in Adelaide, Australia. The cost for participants from Asia and Pacific (Cambodia, Indonesia, Rep. of Korea, Lao PDR, Myanmar, NZ, Niue Island, the Philippines, Thailand and Vietnam) was financially supported by JFIT. The Review of the Catalogue of Rivers and maintenance of the current system of RSC were decided in the RSC. Prof. Takara was re-elected as the Secretary of RSC.

b) The 13th RSC was held in November 2005 in Kuta, Bali, Indonesia. Prof. Tanaka (Univ. of Tsukuba), Prof. Takara and others participated in the meeting. The policy of IHP governance in the region was discussed and confirmed. The RSC adopted a resolution for encouraging Lao PDR, Myanmar and Mongolia to officially participate in the RSC in the near future.

1.2.3 Research/applied projects supported or sponsored

The MEXT bestowed Prof. Takara, Kyoto University on a Grant-in-Aid for Scientific Research for FY 2004-2006 in order to promote a climate- and disaster-related international cooperative research in East Asia. For FY 2002-2004, Special Coordination Fund for Promoting Science and Technology for coordination of international meetings on monitoring, forecasting and mitigation of water-related disasters was allocated by the MEXT to Prof. Takara, Kyoto University. These funds are used in part for meetings related to UNESCO-IHP such as RSC meetings.

The MEXT Grant-in-Aid for Scientific Research was awarded to “Downscaling of Global Earth Observation Products to Locally Useful Information” led by Prof. Kuniyoshi Takeuchi, University of Yamanashi for FY2004-2006 to promote the research on PUB, Predictions in Ungauged Basins, an IHAS-initiated science program supported by IHP IGC Resolution XV-7.

The MEXT Special Coordination Funds for Promoting Science and Technology (Leadership for international scientific cooperation) was awarded to “Leadership on the Hydrological Science for Mitigating World Water Issues” led by Assoc. Prof. Taikan Oki,University of Tokyo for FY2004-2006. The fund was used to promote international activities including PUB and other IHP-related initiatives.

1.2.4 Collaboration with other national and international organizations and/or programmes

The Japanese IHP National Committee has been closely collaborating with:

(1) The Liaison Committee on Hydrological Science, Science Council of Japan.

(2) The GAME Sub-Committee of the Special Committee on WCRP, Science Council of Japan.

Recognized by Science Council of Japan, (1) and (2) will be reformed in 2006. The GEWEX Asian

Monsoon Experiments (GAME) was reformed into Monsoon Asian Hydro-Atmosphere Scientific Research and Prediction Initiative (MAHASRI) last year led by Prof. Matsumoto, University of Tokyo, and so as in SCJ.

(3) The national government and its branches relating to hydrology and water resources administration.

(4) Nagoya University for IHP Training Courses and graduate school. Other universities and research institutes.

(5) The Japan Water Forum (JWF).

(6) World Meteorological Organization (WMO).

(7) International NGOs/NPOs such as the International Association of Hydrological Sciences (IAHS), the International Water Resources Association (IWRA) and the International Consortium on Landslides (ICL).

1.2.5 Other initiatives

N/A

1.3 Educational and training courses

1.3.1 Contribution to IHP courses

(1) Doctor of Science degree on atmospheric and hydrospheric science:

The Graduate School of Science and the Graduate School of Environmental Studies of Nagoya University accepts students from Asia and the Pacific region, with the financial support from the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT).

(2) IHP Training Courses:

The Hydroshperic Atmospheric Research Center (HyARC) of Nagoya University offers IHP Training Courses for both foreign students of Graduate School of Science, Nagoya University and trainees chosen by UNESCO Regional Science Bureau for Asia and the Pacific in Jakarta. The training courses are financed by the Japanese Fund-in-Trust (JFIT) for IHP.

a) The 14th IHP Training Course on “Hydrology in Asia” was carried out in Kuala Lumpur, Malaysia in October 2004, gathering many participants (11 lecturers from Japan and 29 trainees from 14 countries in Asia and Pacific regions including 16 trainees from Malaysia). The Humid Tropics Centre, Kuala Lumpur (HTC KL) kindly hosted the training course. This was the first attempt for Japan to organize the IHP Training Course in abroad. The past 13 courses were reviewed at this occasion. The cost of participants from Indonesia, PNG, Philippines, Thailand, Vietnam, China, India, Lao PDR, Sri Lanka and NZ was financially supported by JFIT. Prof. Nakamura (HyARC, Nagoya Univ.), Prof. Takara and others participated in the course.

b) The 15th Training Course was organized in Nagoya and Chiba in February-March 2006 under the theme of “Water and Carbon Cycles on Terrestrial Ecosystems“. JFIT financially supported 7 participants.

c) The 16th Training Course is going to be conducted with a theme *Oceanography Basics*, from 26 November to 9 December 2006, at the Hydrospheric Atmospheric Research Center (HyARC), Nagoya University, Nagoya, Japan. The course comprises a series of lectures and practice sessions in English. It also includes an overnight field observation cruise in Ise Bay on a training vessel Sei-Sui Maru of Mie University, and a technical tour to the Center for Marine Environmental Studies, Ehime University.

1.3.2 Organization of specific courses

In cooperation with the Mongolian National Committee for UNESCO-IHP and the UNESCO Beijing Office, the Japanese National Committee for UNESCO-IHP co-organized the Mongolian National Training Workshop "Groundwater Hydrology and Management" in Mongolia on 14 and 15 June 2006. Five Japanese experts participated in the Training Workshop at their own expense as lecturers. The Japanese experts are: Prof. Dr. Kaihotsu (Hiroshima Univ.), Prof. Dr. Takara (Kyoto Univ.), Prof. Dr. Jinno (Kyushu Univ.), Dr. Tsujimura (Univ. of Tsukuba) and Dr. Hamaguchi (Kyoto Univ.). The Mongolian National Committee for IHP, the organizer of the workshop, supported staying expenses for the lecturers.

1.3.3 Participation in IHP courses

N/A

1.4 Cooperation with the UNESCO-IHE Institute for Water Education and/or international/regional water centers under the auspices of UNESCO

ICHARM: **I**nternational **C**entre for Water **Ha**zard and **R**isk **M**anagement under the auspices of UNESCO was established in Tsukuba, Japan in March 2006, after getting accreditation by the member states of UNESCO at the 33rd General Conference of UNESCO. Dr. Kuniyoshi Takeuchi, the chairman of the Japanese National Committee for UNESCO-IHP, was assigned as the founding Director of ICHARM. ICHARM was established as the core of research, training, and information networking activities on water-related disasters at global levels. The activities are expected to contribute in the prevention and reduction of water-related disasters, such as floods. It is important to cooperate with existing UNESCO Centers such as IHE in the Netherlands, IRTCES in China, CATHALAC in Panama and HTC in Malaysia, etc. The outline of ICHARM is as follows.

1) Objectives: The objective of the Centre is to be the world centre of excellence to provide and assist implementation of best practicable strategies to localities, nations, regions and the globe to manage the risk of water related disasters including flood, drought, landslide, debris flow, storm surge, tsunami and water contamination. The Centre conducts research, capacity building and information networking activities in an integrated manner for preventing and mitigating the impacts of water

related disasters and thus to achieve sustainable and integrated river basin management.

2) Functions:

(i) to promote scientific research and to undertake effective capacity-building activities at the institutional and professional levels;

(ii) to create and reinforce networks for the exchange of scientific, technical and policy information among institutions and individuals;

(iii) to develop and coordinate cooperative research activities, taking advantage particularly of the installed scientific and professional capacity of the IHP networks, WWAP, the IFI/P and relevant programmes of non-governmental organizations, international institutions and networks;

(iv) to conduct international training courses for practitioners and researchers on the global level; and

(v) to organize knowledge and information transfer activities including international symposia or workshops, and to engage in appropriate awareness-raising activities;

3) Structure: The center is established as a part of the Public Works Research Institute (PWRI) and be operated under the responsibility of its Chief Executive, with the advice from the Advisory Board.

1.5 Publications

1. « IHP Papers presented at the International Conference on Water Sensitive Urban Design 'Cities as Catchment' », IHP-VI Technical Documents in Hydrology No. 3, UNESCO Jakarta Office, (Eds.) R. James, T. Daniell and K. Takara, November 2004.
2. « MPMD-2005: Monitoring, Prediction and Mitigation of Water-Related Disasters », Proceedings of International Conference on Monitoring, Prediction and Mitigation of Water-Related Disasters, (Eds.) K. Takara, K. Tachikawa and NMNS B. Nawarathna, January 2005.
3. Catalogue of Rivers for Southeast Asia and the Pacific Vol. 1 (1995) and Vol. 2 (1997) CD-ROM version (March 2005).
4. « IHP », Newsletter on IHP activities of Japan, No.18, June 2005 (in Japanese).
5. The booklet of the Portfolio of Water Actions (PWA) was published in March 2005 to show the current progress of the PWA created by Japanese Government. 98 plans of action or commitments are listed in the PWA. The booklet was used for facilitating efforts to initiate concrete actions, and bring desirable results.
6. T. Oki, C. Valeo and K. Heal (Eds.), Hydrology 2020: An Integrating Science to Meet World Water Challenges, IAHS Publication 300, 190 +xxxii pp, 2006.

1.6 Participation in international scientific meetings

1.6.1 Meetings hosted by the country

(1) MPMD-2005 (Kyoto Univ., 12-15 Jan. 2005): The International Conference on Monitoring, Prediction and Mitigation of Water-Related Disasters, Kyoto University, Kyoto, Japan, 12-15 January 2005, was co-organized by UNESCO-IHP with a sponsorship by a three-year (2002-2004) research

programme “Contribution to International Cooperation for Monitoring, Prediction and Mitigation of Water-Related Disasters” (PI: Prof. Takara, DPRI, Kyoto University) under the framework of the Special Coordination Funds for Promotion of Science and Technology, MEXT. The discussion outcomes at this conference were brought to the World Conference on Disaster Reduction (WCDR), Kobe, Japan, 18-21 January 2005.

(2) WCDR Session (Kobe, 19 Jan. 2005): A proposed session “New International Initiatives for Research and Risk Mitigation of Floods (IFI/P) and Landslides (IPL)” was held. Numerous scientists and representatives of NGOs, GO and the UN grouped around the “International Consortium of Landslides” (ICL) and the “Joint UNESCO/WMO Flood Initiative” (JUWFI) propose, in order to overcome years of under-investment in and poor coordination of the scientific and technical infrastructure activities needed to reduce the vulnerability notably of developing countries to natural hazards, to sign a joint ‘Memorandum of Understanding’ (MoU) between major stakeholders concerning “Strengthening Cooperation in Research for Earth System Risk Analysis and Sustainable Disaster Management within the Framework of the UN-ISDR”. Based on existing networks and institutional, national and international expertise the new MoU shall contribute to the overall strategy of disaster reduction of the UN, including the objectives of the UN-WCDR, and is intended to provide a better and formal platform to promote research and preventive activities for an integrated Earth system risk analysis and sustainable development targeting landslides, floods, and other disasters like earthquakes, tsunamis, or volcanic eruptions. The session shall be completed by presenting a ‘letter of intent’ to finalize in due course the above-mentioned MoU to be signed by the representatives of UNESCO, WMO, FAO, UN/ISDR, UNU and ICSU

(3) Asian Water Cycle Symposium (Univ. of Tokyo, 2-4 Nov. 2005) was held for Asian GEOSS kick off convened by Prof. Toshio Koike. Dr. Andras Szollosi-Nagy (UNESCO) and a number of Asian national representatives came including from non-signed members of GEOSS (Global Earth Observation System of Systems). It was stressed that Asian FRIEND especially Catalogue of Rivers and its Water Archive can contribute GEOSS. It is an agenda how APF can contribute GEOSS and what kind of resources we need to do so. It is suggested by Szollosi-Nagy that we consider the submission of GEOSS support resolution to the next Council. What kind of resolution do we submitted.

(4) Asian PUB is developing quite well under Dr. Yasuto Tachikawa's initiative. Quite a few national representatives came to Nanjing and had Asian PUB national working group meeting (Hohai Univ., 31 Oct.-2 Nov. 2005). The attended were Korea, Nepal, Thai, China and Japan. Sri Lanka PUB did not attend. Strong national interests were demonstrated towards hydrological sciences for improving prediction.

(5) Post-GAME MAHASRI led by Dr. Jun Matsumoto (Univ. of Tokyo) is now official with many participants from Asian countries. A meeting was held in Univ. of Tokyo on 1 Nov. They requested the collaboration with IHP FRIEND as well as with PUB.

(6) Round Table Discussion: Strengthening Research and Learning on Earth System Risk Analysis and Sustainable Disaster Management within UN-ISDR as Regards “Landslides” : Towards a dynamic

global network of International Programme on Landslides (IPL), Elizabeth Rose Hall, United Nations university, Tokyo, Japan, 18-20 January 2006, organized by International Consortium on Landslides (ICL), UNESCO, WMO, FAO, UN-ISDR, UNEP, UNU and Kyoto University.

(7) International Workshop on Flood Risk Management, Tsukuba International Congress Center EPOCHAL TSUKUBA on 24-26 January 2006, organized by the Public Works Research Institute (PWRI), UNESCO and WMO.

(8) UK-Japan Flooding and Coastal Defense Workshop, British Embassy, Tokyo, Japan, 31 January to 4 February 2006. From UK, Prof. Ian Cluckie, Prof. Brian Golding and six others and from Japan, Prof. Takeuchi, Prof. Takara, Mr. Terakawa and others attended.

(9) UNESCO-GRAPHIC (Groundwater Resources Assessment under the Pressures of Humanity and Climate Changes) International Symposium was held at the new facility of the Research Institute for Humanity and Nature (RIHN), Kamigamo, Kyoto, Japan, 4-6 April 2006 with supports by GWSP (Global Water System Project), IAH (International Association of Hydro geologist), IGRAC (International Groundwater Resources Assessment Center), etc. Dr. Makoto Taniguchi (RIHN) organized this symposium.

(10) ICHARM meetings stated above and ICHARM First Advisory Board meeting in Tsukuba on 15 September 2006.

1.6.2 Participation in meetings abroad

Japan has played important role in the IHP Intergovernmental Council as a member. In particular, Prof. TAKEUCHI had been the Chairperson of the Council and Bureau of IHP from 1998 to 2000. Japan participated in the establishment of the Regional Steering Committee (RSC) for Southeast Asia and the Pacific in 1993. The first RSC chairperson was Prof. Yutaka Takahashi (Univ. of Tokyo). Since then at least a couple of National Committee members have attended and participated actively in all of the annual meetings of the RSC. The Chairman of the Japanese National Committee for the IHP, Prof. Takeuchi, had served as the RSC Secretary (1993-1999) and the Chairman of the Technical Sub-Committee (TSC) for Asian Pacific FRIEND (APF) Phase 1 (1997-2001) in the framework of the RSC, while Prof. Takara is playing a role of the RSC Secretary (1999-2006) and a member of TSC-APF Phases I and II (2002-2007).

(1) The 7th IHP/IAHS George Kovacs Colloquium, Paris, 17-18 September 2004 (Prof. Takeuchi and Prof. Takara)

(2) The 16th Session of Intergovernmental Council (IGC), UNESCO, Paris, 20-24 September 2004 (Prof. Kuniyoshi Takeuchi, Prof. Kaoru Takara, Mr. Kazuo Akiyama (MEXT), Mr. Masaru Kunitomo (MLIT), Mr. Kiyofumi Yoshino (MLIT), Ms Mariko Kobayashi (Permanent Delegation to UNESCO), Dr Tadahiko Sakamoto (PWRI), Mr. Akira Terakawa (PWRI), Mr. Daisuke Kuribayashi (PWRI), Mr. Shigenobu Tazou (PWRI), Mr. Kenji Suzuki (MLIT) and Mr Seiji Ito (MLIT)).

(3) The 2nd GRAPHIC meeting (Univ. of East Anglia, UAE, 3 April 2005): Dr Makoto Taniguchi (RIHN) attended and had discussions on database management system for GRAPHIC (Groundwater

Resources Assessment under the Pressure of Humanity and Climate Change) project and review of the past research themes. The 3rd meeting was held at the Research Institute for Humanity and Nature (RIHN) in Kyoto, Japan in April 2006.

(4) The 4th World Water Forum (Mexico City, Mexico, 16-23 March 2006): Water-related ministries or agencies, various sectors, and stakeholders participated in the Forum. (ICHARM, Prof. Takeuchi, Prof. Watanabe, Prof. Takara and others).

(5) The 8th IHP/IAHS George Kovacs Colloquium, Paris, 30 June-1 July 2006 (Prof. Takeuchi)

(6) The 17th Session of Intergovernmental Council (IGC), UNESCO, Paris, 3-7 July 2004 (Prof. Kuniyoshi Takeuchi, Prof. Kaoru Takara, Mr. Akira Terakawa, Mr. Kazuo Akiyama (MEXT), Ms Mariko Kobayashi (Permanent Delegation to UNESCO)).

1.7 Other activities at regional level

1.7.1 Institutional relations/cooperation

Japanese National Committee supported the proposals for the UNESCO Participation Programme 2006-2007 for the "Regional Conference on Regional Conference on Hydrology and Water Recourses Management for Hazard Reduction and Sustainable Development," based on a request from the Philippines National Committee for IHP.

1.7.2 Completed and ongoing scientific projects

N/A

2. FUTURE ACTIVITIES

2.1 Activities planned until December 2007

1) The 14th Session of the IHP Regional Steering Committee (RSC) for Southeast Asia and the Pacific will be held in Bangkok, Thailand, in conjunction with the 3rd Asia Pacific Association of Hydrology and Water Resources Conference (APHW2006), in October 2006.

2) The 16th IHP Training Course with the theme "Oceanography Basics" will be held in Nagoya, Japan, in Novemeber-December 2006.

2.2 Activities foreseen for 2008-2009

(1) Participation in RSC activities including Asian Pacific FRIEND and the Catalogue of Rivers.

(2) Nagoya University IHP Training Courses in 2008 and 2009.

(3) Implementation of projects related to IHP-VII.

(4) Activities related to the International Center for Water-related Hazards and Risk Management (ICHARM).

(5) Research on HELP basins.

(6) Collaboration with UNESCO-MAB activities.

2.3 Activities envisaged in the long term

(1) Participation in IHP-VII projects and RSC activities.

(2) Nagoya University IHP Training Courses.

(3) Information dissemination through a web page of the National Committee.

NATIONAL REPORT ON IHP RELATED ACTIVITIES
IN
REPUBLIC OF KOREA

October, 2006

Korean National Committee
for
The International Hydrological Programme
Republic of Korea

1. ACTIVITIES UNDERTAKEN IN THE PERIOD SEPTEMBER 2004-OCTOBER 2006

1.1 Meetings of the IHP National Committee

1.1.1 Decisions regarding the composition of the IHP National Committee

For the solution of water problems and the protection of mans welfare and the quality of human life, a UNESCO Resolution in 1964 created the International Hydrological Decade(IHD). Korea as a participant in the program, then appointed within its Ministry of Construction a IHD National Committee(later, IHP National committee), which undertook pioneer hydrologic surveys of selected representative basins in three major river systems during the program period, and embarked in 1975 on a 6-year International Hydrological Programme (IHP) project as the first step toward an extension of surveys of domestic river basins in order to fulfill its responsibilities in the world's consolidated efforts to cope with the water problem. After the completion of the first phase of IHP in 1980, the second phase of IHP project(1981~1983), the third phase of IHP project(1984~1989), the fourth phase of IHP project(1990~1995), the fifth phase of IHP project(1996~2001) and the sixth phase of IHP project(2002~2007) followed for the continuation of representative basin studies, the adoption of new techniques of water resources development and water quality control, the hydrological evaluation of urbanization and variations of watershed including sustainable development in a changing environment, hydrology and water resources development in a vulnerable environment, and education and training in hydrology and water resources.

In the beginning of the New Millennium and this year (2006), Korean National Committee for the IHP was reorganized and strengthened to fulfill the IHP activities more effectively and actively. All members of the Committee were from every part of water related organizations in the country and executive functions are carried out within the Water Resources Bureau, Ministry of Construction and Transportation.

Decisions regarding most of IHP related activities are made by this committee which is held regularly and on request in special occasion.

1.1.2 Status of IHP- activities

During the sixth phase(2002~2007) of IHP, the Korean National Committee for the IHP is paying its efforts to achieve the objectives set by UNESCO for this phase of IHP and the following projects are being and be executed in Korean river basins and in the field of hydrology and water resources in Korea.

(1) Global changes and water resources

(2) Integrated watershed and aquifer dynamics

(3) Land habitat hydrology

(4) Water and society

(5) Water education and training

Based on these projects (themes), more practically-oriented-projects for Korean hydrologic and water resources conditions have been and will be executed and their detailed information are listed in Table-1.

Table-1 IHP National Events in IHP-

Projects/Activities	Brief Description	IHP-Subprogram	Location and Duration	Supporting Body	Gov. Input	Output
1. 2004 IHP Representative Basin Studies	·Distribution of hydrological data by electronic publication( ) ·Study on flash flood forecasting and management for mountainous region( ) ·Study of urbanization effect on river water and sewage quality ·Water conflict factors and solution in Korean river basins ·Development of image education system for water resources education and training ·Collection and fundamental analysis of hydrological data of the Representative basins ·Preparations of River Catalogue - Vol. 11	Theme 1, 2, 4 and 5	Korean rivers	MOCT	Major Gov. input	Report and Papers
2. 2005 IHP Representative Basin Studies	·Comprehensive analyses on climate change and its effect on water resources ·Evaluation of drought and its measures ·Distribution of hydrological data by electronic publication(IV) ·Study of urbanization effect on river water and sewage quality(II) ·Water conflict factors and solution in Korean river basins(II) ·Development of image education system for water resources education and training(II) ·Collection and fundamental analysis of hydrological data of the Representative basins ·Preparations of River Catalogue-Vol.12	Theme 1, 2, 4 and 5	Korean rivers	MOCT	Major Gov. input	Report and Papers
3. 2006 IHP Representative Basin Studies	·Water demand management planning and its studies ·Runoff characteristics change and runoff reduction studies according to large-scale housing area development ·Runoff analyses by future landuse and climate change ·Int'l river management examples investigation and development of management strategy of South-North Korean co-boundary river basins ·River basin management manual for Integrated River Basin management(IRBM) ·Optimal water resources use and its management technique development in island and coastal region ·Groundwater variation characteristics in urban areas ·River and culture/civilization studies in river basin ·Selection and design of new Representative basins for hydrological data collection ·Review of study results and future direction of present Representative basins	Theme 1, 2, 4 and 5	Korean rivers	MOCT	Major Gov. input	Report and Papers
4. Asian/Pacific FRIEND Studies	·Basic hydrologic analyses in AP FRIEND river basins ·Comparative regional analyses of hydrology and water resources in AP FRIEND regions	Theme 1 Area 1.1	Korean rivers	MOCT		Report and Papers
5. Special program on the low-flow management	·Low-flow management system simulation ·River water quality variation ·Changing climate and runoff conditions	Theme 1 and 2	Korean rivers	MOCT MOE MOA		Report and Papers
6. Water resources management during extreme flood and drought	·Extreme flood and drought modeling ·Water resources management techniques during extreme hydrologic periods	Theme 1, 2 and 3	Korean rivers	MOCT MOA		Report and Papers
7. Special program of regional hydrology	·FRIEND basin studies ·HELP studies ·PUB studies			MOCT MOE		

MOCT : Ministry of Construction and Transportation
MOE : Ministry of Environment
MOA : Ministry of Agriculture

In the beginning of the sixth phase of IHP (2002~2007), the Korean National Committee for the IHP has prepared the research programme of IHP-□ phase as given in Table-2 to achieve the objectives set by UNESCO for this phase of IHP.

Table-2 Planned Research Programme of IHP- Phase

Theme	Title	Potential Contribution and Research Activities	Executing Milestone						Remark
			2002	2003	2004	2005	2006	2007	
Theme 1	**Global Changes and Water Resources**								
Focal Area 1.1	Global estimation of resources : water supply and water quality	·Low-flow management in consideration of water quality improvement and changing environment in river systems ·Developing environmentally sound – sustainable development and management strategies of water resources ·Development of water archive and contribution of Korean hydrological data and water quality data to global and regional studies ·Comparative global and regional analyses of water resources ·Developing national water quality management strategies							
Focal Area 1.2	Global estimation of water withdrawals and consumption	·Comprehensive studies of alternative means to save and conserve water resources for future demand ·Evaluation of national water use and demand ·Evaluation of groundwater resources and developing suitable management strategies for their withdrawals and consumption							
Focal Area 1.3	Integrated assessment of water resources in the context of global land based activities and climate change	·Integrated studies of water resources changes due to man-made activities ·Comprehensive analyses of climate change and its effect to water resources ·Assessment of water resources due to land use change							
Theme 2	**Integrated Watershed and Aquifer Dynamics**								
Focal Area 2.1	Extreme events in land and water resources management	·Hydrological studies of extreme events in Korean river basins ·Developing the best flood warning systems and the use of radar-based rainfall information ·Evaluation of national drought characteristics and their alternative measures ·Water resources management during extreme flood and drought							
Focal Area 2.2	International River Basins and Aquifers	·Developing strategies of international river basin management							
Focal Area 2.3	Endorheic Basins								
Focal Area 2.4	Methodologies for integrated river basin management	·Development of integrated river basin management systems in Korean river basins ·Integrated urban water management ·Assessment of surface water and groundwater resources in watershed and aquifers							
Theme 3	**Land Habitat Hydrology**								
Focal Area 3.1	Drylands								
Focal Area 3.2	Wetlands								
Focal Area 3.3	Mountains	·Studies of hydrological processes in mountain watershed ·Flash flood and runoff characteristics in mountain hillslope basins							
Focal Area 3.4	Small islands and coastal zones	·Studies of hydrology and water management in small islands and coastal zones ·Assessment of groundwater resources in small and volcanic islands ·Studies of water supply and alternate water resource systems in small islands and coastal zones							
Focal Area 3.5	Urban areas and rural Settlements	·Development of stormwater management model in urban areas ·Studies of change of urban rivers to environmentally sound – natural rivers ·Studies of decreasing methods of urban runoff ·Assessment of urban stormwater quality systems							
Theme 4	**Water and Society**								
Focal Area 4.1	Water, civilization and ethics	·Studies of relationship of water with culture and civilization in Korean river basins - - - characteristics of water culture							

Focal Area 4.2	Value of water	·Assessment of water price for effective consumption ·Studies of water consumptive habit in the society							
Focal Area 4.3	Water conflicts – prevention and resolution	·Evaluation of water conflict problems in Korean river basins : case studies							
Focal Area 4.4	Human security in water – related disasters and degrading environments	·Review and assessment of prevention activities in water – related disasters ·Studies of environmental impacts by water – related disasters							
Focal Area 4.5	Public awareness raising on water interactions	·Development of public awareness and participation programs in water resources project ·Studies of public awareness in water resources							
Theme 5	**Water Education and Training**								
Focal Area 5.1	Teaching techniques and material development	·Evaluation and development of teaching and training techniques in water – related education ·Development of internet-based teaching materials for water resources education							
Focal Area 5.2	Continuing education and training for selected target groups	·Development of continuing education and training programs for practicing hydrogists and water – related engineers							
Focal Area 5.3	Crossing the digital divide	·Development of the internet program of water education & information							
Focal Area 5.4	Institutional development and networking for WET	·Access to hydrological and water resources educational expertise within Korea							

1.1.3 Decisions regarding contribution to / participation in IHP-

Upon having received the progress report on the seventh phase of the international hydrological programme(IHP-□, 2008-2013), the Korean National Committee for the IHP decided to prepare the potential contribution and research programme of IHP-□ during the IHP-□ period(2002-2007) based on the proposed concept and structure of IHP-□ as the followings ;

Water Dependencies : Systems under Stress and Societal Responses

Theme : Global Changes, Watersheds and Aquifers

Theme : Governance and Socio-Economics

Theme : Ecohydrology and Environmental Sustainability

Theme : Water Quality, Human Health and Flood Security

Cross Cutting Programmes : HELP and FRIEND

Education and Capacity Building

1.2 Activities at a national level in the framework of the IHP

1.2.1 National / local scientific and technical meetings

Annual regular or many special scientific and technical meetings in the framework of the IHP were held in collaboration with International Hydrologic Environmental Society(IHES), Korea Water Resources Association(KWRA), Korean Society of Civil Engineers (KSCE), ICOLD Korean National Committee (KNCOLD), IWRA Korea Geographic Committee(IWRA-KGC), Korea Federation of Water Science and

Engineering Societies(KFWSES), Korea Water Resources Corporation, and other water-related organizations in Korea. In those meetings, national/local hydrologic issues and water resources problems were dealt with special solution measures and their results were published in the form of scientific or technical reports and papers.

1.2.2 Participation in IHP Steering Committees / Working Groups

Republic of Korea was one of most active member countries in IHP Regional Steering Committee's activities for Southeast Asia and the Pacific. Republic of Korean delegates actively participated in the IHP Regional Steering Committee and Working Group meetings held in the period of 2004~2006.

1.2.3 Research / applied projects supported or sponsored

Research projects supported by the Government in the framework of the IHP in the period of 2004~2006 are listed in Table-1. Some other research or applied projects were also supported or sponsored by the Government and other water-related organizations such as Korea Water Resources Corporation during this period.

The following projects have been and are being implemented for the Asian Pacific FRIEND in the three representative river basins chosen as the Korean Asian Pacific FRIEND basins(Pyungchang-gang, Wichun, Bochungchun river basins).

· Basic hydrologic analyses and data collection

· Comparative regional flow regimes analyses

  - Rainfall models and design storm

  - Flood models and design flood

· FRIEND river basin review and selection

· HELP river basin selection and studies

1.2.4 Collaboration with other national and international organizations / or programmes

The Korean National Committee for the IHP is functioning in the execution of IHP activities in collaboration with the following national and international organizations/or programmes; Korea Water Resources Corporation; Korea Water Resources Association; Korean Society of Civil Engineers; Korean Society of Agricultural Engineers; Korean Meteorological Society; ICOLD Korean National Committee; IWRA Korean Geographic Committee; International Hydrologic Environmental Society(IHES); Korea Federation of Water Science and Engineering Societies; Korea Institute of Construction Technology; Korean Universities Hydrology and Water Resources Programmes.

1.3 Educational and training courses

1.3.1 Contribution to IHP courses

The Korean National Committee for the IHP is contributing to the Korean Universities hydrology and water resources courses in the framework of the IHP in which graduate students and engineers are mostly involved with IHP projects and also educated or trained through the formal courses.

1.3.2 Organization of specific courses

Special workshops and seminars in the field of hydrology and water resources are annually organized by the Korean National Committee for the IHP in collaboration with above mentioned organizations in 1.2.4. In these specific courses, special topics are dealt with practical application in river basins.

1.3.3 Participation in IHP courses

The Korean National Committee for the IHP has actively been participating in IHP courses which were held in Asia-Pacific regions such as Japan, China and Malaysia by sending highly qualified hydrologists or proper candidates.

1.4 Cooperation with the UNESCO-IHE Institute for Water Education and/or international /regional water centres under the auspices of UNESCO

The Korean National Committee for the IHP had particularly close cooperation with International Center for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO in its preparatory activities for the establishment during last two years through the participation in workshops and strong support at the UNESCO Council and regional meetings.

1.5 Publications

The Korean National Committee for the IHP is publishing IHP Annual Research Report and the Catalogue of Rivers in Korea every year in the form of Government Publication since 1975. These reports are distributed to all water-related organizations and IHP-KNC members and research results are published on the journals of academic societies or organizations.

Some other technical reports, proceedings of scientific meetings and specific course's materials are also published by the IHP-KNC.

1.6 Participation in international scientific meetings

1.6.1 Meetings hosted by the country

The following IHP meetings were hosted and organized by the IHP-KNC, IHES and Yeungnam University.

·2004 International Symposium on Hydrological Environment

·2005 International Symposium on Hydrological Environment

These meetings were held at the Yeungnam University and Inter-Burgo Hotel, Taegu, Republic of Korea in 2004 and 2005.

1.6.2 Participation in meetings abroad

The Korean National Committee for the IHP actively participated in the IHP Inter-Governmental Council meeting as well as the regional IHP meetings such as Meetings of IHP Regional Steering Committee for Southeast Asia and the Pacific, Asian Pacific FRIEND Project and its workshops, working Group meetings and etc.

2. FUTURE ACTIVITIES

2.1 Activities planned until December 2007, foreseen for 2008-2009 and envisaged in the long term

From the beginning of 2002, IHP-KNC prepared concrete national plan for the sixth phase of IHP and began to implement this plan in Korean river basins. IHP-KNC will also actively continue and participate in the Asian Pacific FRIEND project to complete with successful results for the Southeast Asia and the Pacific.

IHP-KNC will also prepare the potential contribution and research programme of IHP-□ by the end of IHP-□ period (2007) and organize some international and regional activities within this period.

The following international symposium and workshop will be organized until December 2007 as the IHP-□ activities of IHP-KNC.

·2006 International Symposium on Hydrological Environment

·2007 International Symposium on Hydrological Environment

·Korean Workshops of FRIEND, HELP and PUB

MINISTRY OF AGRICULTURE AND FORESTRY
DEPARTMENT OF METEOROLOGY AND HYDROLOGY

COUNTRY REPORT

OF

LAO P.D.R.

PREPARED BY

MR. MANOLOTH SOUKHANOUVONG

DEPUTY CHIEF OF HYDROLOGY DIVISION

UNESCO-IHP

14 TH REGIONAL STEERING COMMITTEE MEETING

FOR SOUTHEAST ASIA AND THE PACIFIC

GRAND HOTEL, BANGKOK,

THAILAND,

19-20 OCTOBER 2006.

STATUS AND ACTIVITIES OF DMH LAO P.D.R.

I. Role of meteorology and hydrology in national development.

The Government of Lao PDR is committed to national growth and poverty eradication. It has set a goal of poverty eradication and graduation from Least Developed Country (LDC) status by 2020. This depends on a more productive agriculture and forestry sector.

Meteorology and hydrology have an important role to play in the national strategy, as virtually all-human activities are influenced by weather, climate and water. The services provided by the Department of Meteorology and Hydrology (DMH) can contribute to the protection of life and property, mitigation of natural disasters, and the development of different sectors of the economy such as agriculture, forestry, civil aviation, urban development, water management, energy production, tourism, and others. Observations and predictions of the weather and climate with higher level of accuracy and lead-time can radically improve people's chances of living in relative safety, building more comfortable lives and protecting precious natural resources more effectively.

Human resource development is the key to the future of the department. Notably, DMH lacks capacity in information and communication technology and electronic engineering, which are essential for maintenance and development of meteorological and hydrological facilities and applications. Capacity in these critical areas should be built up through recruitment, education or training. Capacity building in meteorology, hydrology and climatology should also continue, but with greater specialization.

DMH has greatly benefited from international, regional and bilateral cooperation, and should continue and expand such cooperation.

II. Functions and Profile of the Department of Meteorology and Hydrology

DMH, established in 1956, is a technical department under the Ministry of Agriculture and Forestry (MAF). Its basic functions are:

- Collection of meteorological and hydrological data
- Data processing and analysis
- Weather forecasting
- Flood forecasting
- Training.

The department is organized into six divisions plus a number of provincial Hydro-meteorological stations:

- Administration Division
- Technical Division
- Weather forecasting and Aeronautical Division
- Meteorological Network and Agro-Meteorological Division
- Hydrological Division
- Climatological Division
- Provincial Services of Meteorological and Hydrology.

The department has an establishment of 206 staff, of which 72 are at the headquarters in Vientiane. There is a provincial hydro-meteorological station at each of the provinces which is responsible for collecting meteorological and hydrological data and sending them to the headquarters. The provincial hydro-meteorological station is also responsible for relaying weather forecasts and warnings from the headquarters to relevant provincial authorities. There are also a number of district hydro-meteorological stations which are primarily responsible for collecting meteorological and hydrological data.

III. Resources and external assistance

The DMH, like many other National Meteorological and Hydrological Services (NMHS) in developing countries, is poorly resourced, with very limited funding from the national budget to meet operational and development costs. DMH thus lacks the very basic infrastructure to sustain even a minimum level of meteorological and hydrological services to meet national needs let alone, as a Member of the World Meteorological Organization (WMO), to fulfil regional and international obligations.

DMH depends substantially on extra-budgetary resources to meet urgent operational requirements. Through bilateral arrangements, France and Viet Nam had provided equipment and related training in the 1990s. Through the Voluntary Co-operation Programme (VCP) of WMO, China, France, Japan and the United Kingdom had contributed meteorological and telecommunication equipment. Japan is currently assisting DMH to strengthen its meteorological and hydrological services by establishing Doppler weather radar, a satellite ground reception station and associated data processing and display facilities.

IV. Vision

DMH's vision for itself is that the department should be:

(a) professional in providing meteorological, hydrological and environmental services in support of safety and sustainable development of the Lao community, contributing to commitment to national economy growth and poverty eradication and graduation from Least Developed Country Status by the year 2020.

(b) highly competent in issuing meteorological and hydrological warnings to reduce the loss of life and property during severe weather; and

(c) able to play an effective role in international and regional cooperation in the fields of meteorology , hydrology and seismology.

Mission

(a) collect and exchange meteorological and hydrological data in accordance with WMO regulations for weather analysis, and issue warnings to the public on hazardous weather;

(b) provide meteorological and hydrological data, information, forecasts and warnings to support activities of various sectors of the community such as agriculture, aviation, industry, tourism, trade and commerce, etc.;

(c) strengthen meteorological research for the advancement of meteorological and hydrological sciences for the tropical area and the understanding of the country's weather, climate and hydrological situation; and

(d) engage in international and regional cooperation in the fields of meteorology, including climatology , hydrology and seismology for the benefit of the nation.

V. Strategic Plan for Enhancement of DMH in 2005-2008

5.1 The development of the Strategic Plan

The Strategic Plan for Enhancement of DMH in 2005-2008 was developed at the request of DMH and was given to the Secretary-General of WMO in January 2005 for consideration of assistance. For that purpose, a WMO mission was undertaken on 26-28 April 2005 to assess the existing meteorological facilities within Lao PDR, the range of services provided by DMH, and the requirements of the major users of these services. From that assessment, challenges and opportunities facing DMH were identified, and strategies to enhance the department were drawn up.

Account was taken of DMH's Development Plan for 2000-2010, which was drawn up by the department at the end of 1999, and the WMO Strategic Plan for the Enhancement of

NMSs in Regional Association II (Asia) (2005-2008) which was endorsed by the 13th session of Regional Association II (RA II) at Hong Kong, China in December 2004.

Apart from some, which had been completed, many of the programmes and projects in that plan are still on-going. They should be pursued with vigour as they are in line with the strategies identified in this plan. Furthermore, new programmes and new projects have to be developed according to these strategies to take account of the changes in circumstances and technologies in the past several years. Although the development of programmes and projects from the strategies is beyond the scope of this plan, a list of new programmes and projects together with a time table of implementation has been drawn up and included in this plan to facilitate further planning.

5.2 The purpose of the Strategic Plan

The purpose of having a Strategic Plan for enhancement of DMH is:

(a) to develop an understanding of the objectives and priorities for the development of the department, and to guide the planning and implementation of programmes and projects for achieving these objectives;
(b) to ensure coherence and encourage synergy among different programmes and projects of the department;
(c) to raise general awareness of the status of work of the department and to have a framework under which government funding and development assistance could be sought and coordinated among the department, the government and contributing agencies; and
(d) to develop a framework for training staff, transferring technology and exchanging experience in weather, climate and hydrological monitoring and observation, data processing, data management, forecasting, climate monitoring and provision of services, and taking advantage of advances in science and technology.

5.3 Challenges, opportunities and strategies

In this Strategic Plan, challenges and opportunities facing DMH in the areas of observation, telecommunications, data processing, forecasting, provision of services, transfer of technology, development of human resources and international and regional co-operation are identified, and strategies to enhance the capability of the department in these areas designed.

5.4 Programmes, projects and work plan

To implement this Strategic Plan, programmes and projects would have to be developed in line with the strategies. Although they are outside the main scope of this plan, an outline of such programmes and projects, and the time scale of their implementation, has been drawn up as an appendix to give substance to the strategies and to facilitate further planning.

VI. Current Facilities.

6.1. Meteorological surface Observation Network.

The meteorological network of DMH is composed of 17 synoptic stations, 33 climatological stations and 113 rain gauges, all of which are manual stations. Ten of the synoptic stations are located at or near airports. Due to staff constraint, observations at the synoptic stations are carried out only four times a day during day time (at 00, 03, 06 and 09 UTC), with the exception of four stations that make three-hourly observations for SYNOP issuing and half-hourly observations for METAR issuing around the clock. Observations are reported to DMH headquarters by single side band (SSB) radio-telephone or public telephone. At the rain-gauge stations, observations are normally taken once a day, entered into log books and sent to DMH headquarters once a month. For selected rain-gauge

stations, data are also reported daily to provincial hydro-meteorological stations and then to DMH headquarters through SSB radio-telephone or public telephone, and the frequency of observations can be increased to once an hour during rainy situations. Encoding of observations into SYNOP or CLIMAT messages for international exchange is done manually at the DMH headquarters.

6.2. Weather Radar and Satellite ground receiving equipment

Based on a master plan study on integrated agricultural development in Lao PDR, the Japanese Government through JICA is assisting the Lao PDR Government to set up a C-band Doppler weather radar and SDUS HRIT satellite receiving equipment at DMH headquarters. The project commenced in 2004 and was completed in early 2006. Staff of JICA and the Japan Weather Association (JWA) has been on-site to supervise the project. The equipment has been housed in a radar tower in which there is provision for a weather forecasting office and a maintenance room. The radar and satellite data will also be transmitted from DMH headquarters via radio to the international airport at Vientiane for display at the Area Control, VFR Room and the airport meteorological office. Training is being provided to DMH staff on radar meteorology, radar operation and maintenance, weather forecasting and aviation weather.

The new Doppler radar and HRIT receiving satellite stations are regarded as the single most important enhancement of meteorological observation in the next several years. It enables round-the-clock observation of rain-bearing weather systems and provides useful data to analyze and forecast the movement and development of such systems. It is a set of highly sophisticated and complex equipment with heavy moving parts, electrical and electronic modules, computers and application software. Its maintenance requires knowledge and skill in microwave, electrical and electronic engineering, computer hardware and software, which have been lacking in DMH hitherto.

6.3. Data Collection and Dissemination facilities.

Between Headquarters and remote domestic stations data are collected and disseminated by means of HF Single Side Band Transceiver radio, public telephone and Fax. For regional and global data exchange, DMH is connected to GTS Bangkok RTH with 64 kbps dedicated line, FTP (TCP/IP). A point to point link to NHMs of Vietnam has been established to download data from the Central Hydro-Meteorological Forecasting Centre. Internet connection via dial-up through local ISP is another important means to get data, NWP products from web sites of various regional and global centres.

6.3.1. Surface observations

The meteorological network of DMH is composed of 17 synoptic stations, 32 climatological stations and 110 rainfall stations, all of which are manual stations. Ten of the synoptic stations are located at or near airports. Due to staff constraint, observations at the synoptic stations are carried out only four times a day during day time (at 00, 03, 06 and 09 UTC), with the exception of four stations that make three-hourly observations around the clock. Observations are reported to DMH headquarters by single side band (SSB) radio-telephone or public telephone. At the climatological stations and rain-gauge stations, observations are normally taken once a day, entered into log books and sent to DMH headquarters once a month. For selected rain-gauge stations, data are also reported daily to provincial hydro-meteorological stations and then to DMH headquarters through SSB radio-telephone or public telephone, and the frequency of observations can be increased to once an hour during rainy situations. Encoding of observations into SYNOP or CLIMAT messages for international exchange is done manually at the DMH headquarters.

Most of the stations are not fully equipped with basic instruments and are poorly manned by staff or volunteers who, in most cases, lack proper training. The meteorological surface network is also in a poor state of maintenance. Most instruments are worn out and

obsolete, and many have become unserviceable. There are also no national standard instruments or travelling standard instruments for calibrating station equipment.

The inadequacy of national resources available to DMH is probably one of the reasons for the present state of the surface observation programme. Although there has been bilateral support to help overcome the deficiencies, the need far exceeds the assistance given. The requirement to operate and maintain a large number of manned stations over the entire country by a relatively small meteorological service is likely to be another reason for the poor state of the surface observation programme. The long-term solution is remote sensing and automation but it needs careful consideration of the equipment requirements and sustainable funding and human resources.

There are also four solar-powered automatic weather stations donated by France. All of them have failed and are not in operation due to the lack of spare parts and consumables.

The hydrological network consists of 22 water-level recording stations and 75 staff gauges whose establishment and operation have been supported by the Japan International Cooperation Agency (JICA) since 1996. The water-level recorders and rain-gauges of DMH collect data from tributaries of the Mekong River in the central province and other provinces in the southern region. Readings are normally taken once a day, but could be up to once an hour for selected locations in rainy situations. For the main course of the Mekong River and the northern region, the responsibility of data collection belongs to the Waterway Administration Division (WAD), Department of Communication, Ministry of Communication, Transport, Post and Construction (MCTPC). Data are exchanged between the two departments according to an agreement.

6.3.2. Telecommunications

a) International and regional

Since 2002, DMH has been connected to the Regional Telecommunication Hub (RTH) in Bangkok under the Global Telecommunication System (GTS) by a 64 kbps link. The link was established within a VCP project which was completed in October 2005 with the financial support by France, Japan and the United Kingdom.

DMH was also connected to Hanoi in Viet Nam by a 9,600 bps satellite link (receive only) through which GTS data could be downloaded and plotted on charts. The link and associated computing facilities were set up in 1998 with the support of Viet Nam, but ceased operation in 2003 after the plotters failed beyond repair. There is on-going discussion between Lao PDR and Viet Nam to restore operation by replacement of equipment but no decision has yet been made.

France provided a SADIS reception system for receiving World Area Forecast System (WAFS) products from World Area Forecast Centre (WAFC) London, but the system has failed and been out of operation since 2003.

DMH headquarters has a dial-up link to the Internet, which is used to access meteorological products from the NMSs in Hong Kong, China; Japan; Republic of Korea; the United Kingdom and Viet Nam. However, the speed of the link is slow, and the connection often drops during downloading of larger files (such as grid-point value files) because of competition for connection with other subscribers.

b) National

Communication with provincial hydro-meteorological stations for the reporting of observations and dissemination of forecasts is either through SSB radiotelephone or public telephone. Communication by radiotelephone is unreliable due to signal fading in the morning. The radio equipment is also worn-out and in a poor state of maintenance because of lack of spare parts. There is also lack of petrol for the electric generators. The public telephone network, with overhead lines, often fails in high winds and thunderstorms.

For dissemination of weather forecasts, climate outlooks and flood forecasts to other organizations such as the radio station, the television station, various Ministries and the National Disaster Management Organization (NDMO), telephone or fax is used. Interruption occurs occasionally during high winds and thunderstorms.

Mobile phone as an alternative is becoming more popular and affordable, but there are still many blind spots especially in provinces. The situation is however improving.

6.3.3. Data processing

CLICOM version 3.1 is used for archiving meteorological data. The software version in use is out of date.

HYMOS version 4.01 is used for analyzing rainfall, water-level, discharge and other hydrological data. The software version in use is out of date.

A Synergie system provided by France is used for receiving, processing and displaying surface and upper-air data from the GTS link with RTH Bangkok.

All data processing computers are standalone, with no sharing of data.

6.3.4. Forecasting

Twenty-four-hour weather forecasts for 17 cities are made at the National Meteorological Centre (NMC) at DMH headquarters daily at around 10:30 a.m. after collecting 00 UTC observations from the synoptic stations. In the wet season, additional forecasts are made in the late afternoon with reference to the 06 UTC observations.

A weekly weather outlook, that is daily forecasts for the seven days of the week, are prepared once a week. For the 24-hour and weekly forecasts, synoptic reasoning based on surface and upper-air charts produced by other centres and accessible from the GTS or the Internet is the primary method of forecasting. The forecasting of the remnants of tropical cyclones which might enter the country is additionally based on tropical cyclone warnings and marine forecasts issued by the Regional Specialized Meteorological Centre (RSMC) in Tokyo and by the Hong Kong Observatory.

Monthly and three-monthly climate outlooks (rainfall only) are prepared once a month, and that for the annual rainfall once a year using statistical empirical relationships between local rainfall climatology and ENSO forecasts.

The NMC also provide prognostic guidance to the meteorological offices at the airports for the preparation of Terminal Aerodrome Forecasts (TAFs). The NMC is manned by a total of five forecasters, with normally one, at most two, on duty at any time. It is operational during office hours from 8:00 a.m. to 4:00 p.m.

Flood forecasts are made for low-lying areas of the Mekong River basin on the Lao side, using a mix of empirical methods and tropical cyclone tracking information contained in warning messages from Hong Kong, China and Japan. Twenty-four-hour water-level forecasts for six key stations are made using time-lag stage correlation between upstream and downstream, and flow forecasts for the Nam Ngum Reservoir are made using flow correlation between upstream and real inflow, which is computed from the storage capacity curve of the Nam Ngum Dam.

In general, the difficulties experienced in forecasting include inadequate meteorological coverage by reporting stations (notably rain-gauge stations to pick up all upstream rainfall), the lack of radar and satellite images, advanced techniques and computing facilities for forecasting, and the lack of manpower for round-the-clock weather monitoring and forecasting. Those related to observations and manpower are dealt with in other sections of this document

6.3.5. Public weather services

DMH issues weather forecasts and outlooks to the public through television, radio, and newspapers.

Newspaper carries the seven-day weather outlook. However, with one outlook issued per week, it becomes out of date as the week progresses.

Twenty-four-hour weather forecasts are sent to the Lao National Television by fax at around 11:30 a.m. for the noon news. There is no updated forecast for the evening news and the morning news on the following day, or when the weather changes unexpectedly. The TV stations are well aware of the importance of weather to viewer.

The forecaster in NMC presents the 24-hour forecast over the phone to the Lao National Radio for direct broadcast around 11:00 a.m. The forecast is also sent by fax to the radio station for the English service broadcast. There is no updated forecast for the evening or the next morning, or when the weather changes unexpectedly. Announcers sometimes have to call DMH for interviews when the weather changes or when weather extremes occur.

The interest of listeners, especially the farmers, is the rainfall. Radio is the most popular channel for the people to receive weather information, followed by TV. Coverage of radio in the rural area is good, and the people usually have one or more radio sets per household. Lao National Radio also makes Internet broadcast at www.lnr.org.la.

6.3.6. Hydrological services

The situation with respect to hydrological observation and forecasting is discussed in earlier sections.

The Mekong River Commission (MRC) issues flood forecasts but these are only used as a reference by DMH which prepares its own forecasts using a statistical (2-stage) method. DMH headquarters issues flood warnings to the public via the media, and to NDMO, relevant Ministries, and hydropower companies. DMH also sends flood warnings to provincial hydro-meteorological stations, which relay the warnings to other provincial authorities. Timely dissemination of flood warnings to provincial authorities is sometimes not possible due to telecommunication problems.

National Disaster Management Organization (NDMO) has persuaded TV and radio stations to give more airtime for flood warnings, and wishes DMH to provide more detailed information. NDMO also would like DMH to talk more to the public about how people should respond to flood warnings.

The hydrological programme of DMH is supported by JICA on a continuous basis, with an expert from Japan stationed in DMH headquarters

6.3.7. Climatological services

Climatological data have wide application in the planning of socio-economic development. DMH prepares annual summaries of climatological data. It also issues monthly and three-monthly climate outlooks of the rainfall once a month, and of the annual rainfall once a year to users in the agricultural, hydropower, construction and other sectors.

The management of climatological data is poor, due to the lack of resources. Over 40 years of data are not stored in electronic media rendering data retrieval difficult. Data quality is dubious, as measuring equipment is not calibrated, and there are often large gaps in data due to equipment failure. As such, the data are not suitable for more sophisticated applications such as detection of climate variability and climate change.

CLICOM and HYMOS are used for management of climatological data. The software versions used are out of date.

VII. Human resources, education and training

DMH has an establishment of 206 staff, of which 72 are at the headquarters. The Weather Forecasting and Aeronautical Division is the biggest division with 40 staff, but only five forecasters. There are five to 15 staff at each provincial hydro-meteorological station. At the district level, a hydro-meteorological station typically has two to four staff.

Out of the total establishment of 206, about one-fifth is engineers, one-fifth technicians, and the rest observers. The engineers are professional staff with tertiary

education while the technicians are non-graduates, and observers are recruits from secondary school leavers.

Engineers and some technicians obtained their education and specialized training abroad such as in France, Hungary, India, Viet Nam and the former USSR. Observers and most technicians receive training locally.

Most of the professional and technical staff are based at the headquarters and provincial hydro-meteorological stations. At the district level, there are only observers whose duty is making meteorological and hydrological observations.

The present number of observers is inadequate to maintain a satisfactory observing programme. On the other hand, there is a need to review the current deployment of professional and technical staff to ensure they are assigned productive tasks that commensurate with their expertise.

DMH has a Meteorological Training Centre that provides basic training to observers and technicians. New observer recruits are given six-month training in basic meteorology and hydrology. On promotion to technician, they are given two-year training on medium-level meteorology and hydrology. The number of meteorologists and hydrologists in DMH as well as their qualifications remain inadequate. There is shortage therefore in both manpower and know-how.

There is a wide gap in technological capability between senior and junior staff. Often, senior staff has to engage in technical work themselves instead of supervising the junior staff.

VIII. International and regional cooperation

Lao PDR is a Member of WMO, UNESCAP/WMO Typhoon Committee, ASEAN Sub-committee on meteorology and geophysics, the Mekong River Commission and UNESCO supported for DMH to participate many workshop, training and RSCM-IHP. And DMH participates in their activities.

DMH has benefited substantially in recent years from assistance rendered by China, France, Japan and the UK through VCP of WMO, and from assistance rendered by Australia, France, Japan and Viet Nam through bilateral cooperation.

DMH participates in the WMO World Weather Information Service, a website of official city forecasts around the world. Three-day weather forecasts of four cities of Lao PDR provided by DMH are displayed on the website for access by people around the world.

Under the framework of the World Hydrological Cycle Observing System (WHYCOS), a regional project Mekong-HYCOS is being developed by WMO, the Mekong River Commission Secretariat and Member countries of the Mekong River Commission including Lao PDR. The project proposal has been drawn up and the parties involved are working towards the advanced development stage prior to implementation. The project will contribute towards management and mitigation of flooding alongside the Mekong River.

IX. Future Works

- To improve transferable hydrologic models and methods across scales and regions for the prediction of less/engaged basins.
- Developments of tools to diagnose the prediction uncertainty derived from data, model structure and parameter identification are highly desirable.
- To establish dense hydrologic observation network is essential.

X. Conclusion

- Lao PDR is vulnerable to severe natural disasters, which have significant social-economical impact on the society in terms of loss of lives, damage to properties, infrastructure, transportation, and so on.

- DMH contributes weather forecast, flood forecast and warning these hazards to public safety and national economic development.
- DMH has been successful in obtaining assistance through bilateral arrangements, and through WMO VCP as well.
- Meteorological, climatological and hydrological services contribute to protect of public safety and sustainable development of the nation.
- The demand for hydro-meteorological services would continue to grow as the nation develops and advances.
- The Extra-budgetary resources should only complement national resources when necessary and justified, and for that bilateral arrangements and WMO VCP remain the most promising.

14th REGIONAL STEERING COMMITTEE MEETING FOR UNESCO-IHP SOUTHEAST ASIA AND THE PACIFIC

16 - 20 OCTOBER 2006
BANGKOK , THAILAND

COUNTRY REPORT OF MALAYSIAN NATIONAL COMMITTEE FOR IHP

(NOVEMBER 2005 – OCTOBER 2006)

BY
DATUK Ir. HAJI KEIZRUL BIN ABDULLAH
CHAIRMAN
MALAYSIAN NATIONAL COMMITTEE FOR IHP

COUNTRY REPORT 2006
OF
MALAYSIAN NATIONAL COMMITTEE FOR IHP

CONTENTS

1. ACTIVITIES UNDERTAKEN IN THE PERIOD NOVEMBER 2005 – OCTOBER 2006

The Malaysian National Committee for IHP was formed in 1975, and comprises 29 governmental agencies and institutions of Higher Learning as listed in Appendix A.

1.1 Meetings of the IHP National Committee

a) The EXCO meetings were held as follows:-

Year 2006 in Kuala Lumpur 3 October 2006

b) The Annual General Meeting will be held as follows:-

Year 2006 36th AGM on 6 November 2006
in DID Kuala Lumpur

1.1.1 Decisions regarding the composition of the IHP National Committee

The National Committee of IHP Malaysia (MIHP) consists of 8 Executive Committee (EXCO) members, of which 4 are permanent and the other 4 are elected during the Annual General Meeting for a two (2) years term. The Chairman of the National Committee is Datuk Ir. Keizrul Abdullah, the Director General of Drainage and Irrigation Department (DID) Malaysia. The Secretary of the National Committee is Mr. Lee Bea Leang (from January 2006) who succeeds Ir. Abdul Rahim Kaparawi (from January 2004 to March 2005), and he is the Director of Hydrology and Water Resources Division of DID, the Secretariat for IHP Malysia.

The 35th Annual Meeting held on 15th July 2005 reelected members of EXCO to serve for another two (2) year term from the same agencies as follows :-

1. The Universiti Sains Malaysia, (USM)
2. Forest Research Institute of Malaysia (FRIM)
3. Malaysian Institute for Nuclear Technology (MINT)
4. Department of Environment (DOE)

The permanent EXCO members are:-

1. Department of Irrigation and Drainage Malaysia (DID)
2. Malaysian Meteorological Service (MMS)
3. Department of Minerals and Geosciences (DMG)
4. Malaysian National Commission for UNESCO (MNCU)

MIHP plans its activities through its Executive Committee, and they are carried out by the three standing committees and their working groups. The three standing committees comprise:

(a) Committee on Research (JKP) under the chairmanship of the Director of Humid Tropics Center, Kuala Lumpur (HTC KL).

(b) Committee on Education, Training and Public Information (JKPLPA), headed by the University of Technology Malaysia (UTM).

(c) Committee on Standardization of Hydrological Practices (JKPAH), headed by the Department of Irrigation and Drainage (DID) Malaysia.

The Chairmen of these standing committees report their activities during the quarterly MIHP EXCO meeting.

1.1.2 Status of IHP-V and IHP-VI activities

MIHP through its Standing Committee on Research plays an important role in coordinating and formulating proposals for research projects. The members of this Standing Committee consist of engineers and researchers from various government departments, universities and research institutions. Meetings were periodically held to discuss and implement research projects in line with the IHP-VI UNESCO project plan (2002 – 2007).

MIHP Standing Committee on Research has carried out several research projects through the respective lead agencies (*see Table 1*).

1.1.3 Decisions regarding contribution to/participation in IHP-VI

MIHP is co-organising the National Conference on Water for Sustainable Development, which was held on 13 – 14 July 2006 at Port Dickson of the Negeri Sembilan state. There were 34 papers presented and attended by 103 participants.

1.2 Activities at national level in the framework of IHP

1.2.1 National/local scientific and technical meetings

Several scientific and technical meetings were organized in association with the Malaysian Hydrological Society, the Water Resources Division of the Institution of Engineers Malaysia (IEM), the International Commission on Irrigation & Drainage (ICID), and the Malaysian National Committee on Irrigation & Drainage (MANCID).

1.2.2 Participation in Regional IHP Steering Committee

The 13th RSC Meeting for IHP UNESCO for South East Asia and the Pacific at Bali, Indonesia from 21 November – 26 November 2005 was attended by Ir. Keizrul Abdullah, the Chairman of MIHP and Dr. Mohd Nor Desa, the Director of HTC Kuala Lumpur.

1.2.3 Research projects sponsored

See Table 2 and Table 3.

1.2.4 Collaboration with other national and international organizations/programmes

Dr. Mohd. Tadza b. Abdul Rahman of Malaysian Institute for Nuclear Technology Research (MINT) has been nominated as the expert by the MIHP. He acts as focal point for the UNESCO – IAEA Joint International Isotopes in Hydrology Programme (JIIHP).

The Chairman and Secretary of the MIHP are in frequent contact with the Regional Hydrological Advisor to the President of the WMO Regional Association. This contact enables coordination of activities under the aegis of IHP and the WMO in Malaysia to be executed successfully.

1.2.5 Other initiatives

MIHP has been organising several activities such as workshops, seminars, basic courses in Hydrology etc. at National Level through out the year.

The MIHP has sucessfully organised The 2006 World Water Day Celebration in collaboration with government agencies, NGOs and private sectors. The celebration was launched by His Royal Highness the Acting Raja (Ruler) of Perlis at 9.30 pm on 23 April 2006 at the Esplanade Sungai Perlis, Kangar. Guests of honor include Her Royal Highness the Princess of Perlis, Chief Minister of Perlis, Minister of Natural Resources and Environment, Deputy Minister of Arts, Culture and Heritage, Parliamentary Secretary to The Ministry of Natural Resources and Environment, Chief Secretary to the Ministry of Natural Resources and Environment, State Secretary of Perlis, Director General of DID, Federal and State officials.

The activities carried out include the national seminar, the national exhibition, drawing and coloring contest, articles and feature writings in the electronic and mass media (see Table 4).

1.3 Educational and training courses

In the year 2005, talks on hydrology and environment to secondary schools were organised with participation of over 1,000 students.

Several other educational programmes were organized for student as follows:

a) **Sustainable Water Resources Management Seminar and Camp –** was jointly organised by JKPLPA and Ministry of Education in conjunction with 2006 World Water Day Celebration from 22 – 23 April 2006 in Kangar, Perlis. The program of the Camp comprises of practical activities in hydrology on the first day and seminar on the second day. 100 secondary students and 25 teachers from the state of Perlis participated in this program.

b) **National Exhibition on Education**
The National Exhibition on Education was held from 21 until 24 August 2006 in Seremban, Negeri Sembilan organised by the Ministry of Education Malaysia with participations from MIHP, government agencies, private firms and NGOs. The exhibition was opened for all students, teachers and the public.

c) **Workshop on Preparation of Programme and Activity for Malaysian National Commission for UNESCO (NATCOM) and Permanent Sub-Committees**

The worshop was organised by Malaysian National Commission for UNESCO from 6 until 9 August 2006 in Port Dickson, Negeri Sembilan. The workshop was aimed to prepare and plan the upcoming programmes and activities for NATCOM for the next two years. Among the topics covered were ASPnet, IHP, Disaster Management and others.

1.3.1 Contribution to IHP courses

None

1.3.2 Organisation of specific courses

None

1.3.3 Participation in IHP courses / seminars

None

1.4 Publications

Publications contributed by MIHP are as follows:

1) The Proceedings of The International Conference on Urban Hydrology for 21st Century edited by Dr. Mohd. Nor Desa. The proceedings become IHP – VI – Technical Document in Hydrology No. 1 UNESCO Jakarta Office, 2002 .

2) The Proceedings of The International Symposium on Comparative Regional Hydrology Mission for IHP - VI of UNESCO edited by Dr. Mohd. Nor Desa and became IHP – VI Technical Document in Hydrology No. 1 UNESCO Jakarta Office, 2002.

3) Standardization of Practices and Techniques of Water Quality Sampling in Malaysia (manual) by JKPAH.

1.5 Participation in international scientific meetings

1.5.1 Meetings hosted by the country

None

1.5.2 Participation in meetings abroad

1) MIHP Chairman Datuk Ir. Keizrul bin Abdullah attended the International World Water Day Celebration in Mexico City from 16 – 22 March 2006 accompanying The Honorable Minister of Natural Resources and Environment who delivered a keynote speech.

2) The Chairman of IHP Malaysia Ir. Keizrul Abdullah has been elected as the Vice Chairperson for Asia Pacific Region (Group IV) of the InterGovernmental Council and Bureau of IHP-UNESCO during the 17th Session of the IGC-IHP in Paris, July 2006.

1.6 Other activities at a regional level

Application for a participation programme grant 2006-2007 to carry out a project on "River Eco– Expedition" for S.E.A. regional student exchange programme on Hydrological and Environmental Expedition has been re-submitted to the Malaysian National Commission for UNESCO for consideration.

1.6.1 Institutional relations/co-operation

None

1.6.2 Completed and on-going scientific projects

Refer to Table 2.

2. FUTURE ACTIVITIES

2.1 Activities planned for 2007 and beyond

1) The implementation of the proposed project on "River Eco-Hydrology Expedition for S.E.A. Regional Student Exchange Programme" to be held at the end of 2006 is very much dependent on the availability of financial sponsorship from UNESCO.

2) The second "National River Expedition" is planned to be held in 2007 under the sponsorship of MNCU and that other local agencies who are members of the standing committee (JKPLPA) will be participating in this event.

3) International Conference on Flood Hazard Mapping (International Centre for Water Hazard and Risk Management, ICHARM 2007) for which the proposal has been made by ICHARM Japan to collaborate with Malaysia to jointly host the event. It is scheduled to be held in April 2007.

Other proposed activities are listed in Table 5.

2.2 Activities envisaged in the long term

Being planned.

Table 1. Research projects by MIHP/DID under Experimental Applied Research (EAR), IRPA in conjunction with IHP phase VI

Theme / Focal Area	Title	Status	Agencies Involved	Impl. period	Funding Agency Project Cost
Theme 2	**Integrated Watershed Dynamics**				
Focal Area 2.2	a) Development of Runoff Generation and Catchment responses in Forest and Agricultural sites	Literature review - Phase I completed. Purchasing of equipment and installation.	UTM,MINT,USM,FRIM, JMG	2004 - 2007	IRPA RM 298,000
	b) Modelling of Convective Rain for Predicting Flash Flood	The modelling is already 60% completion and the collection of data is still in progress.	UTM		IRPA 186,000
Theme 3	**Regional Perspective**				
Focal Area 3.1	a) Development of Temporal Pattern for Urban Areas and PMP Derivation for Peninsular Malaysia	Preparation of max. persisting Dew Point is 90% completed. Analysis of Temporal Characteristics of short term rainfall in Kerayong River now completed.	HTC,MMS	2004 - 2006	IRPA RM 166,000
Focal Area 3.5	a) Detailed Hydrological Balance Study of Paya Indah Wetlands, Selangor	Literature review - Phase I partially completed. Phase II – Study of historical data on rainfall, geological, hydrological, meteorological and topographic maps and flow path between the lakes in the Wetlands is on-going.	HTC,DID,UTM,FRIM, MINT,MMS,JMG	2004 - 2007	IRPA RM 277,00
Focal Area 3.7	a). Development of runoff characteristics to validate Manual Saliran Mesra Alam (MASMA)	Literature review completed. i) Checking data reliability for Kerayong River. ii)Separation of rainfall volume and runoff volume. iii) Determination of hydrograph separation.	USM,DID,MINT KUiTTHO,HTC	2004 - 2007	IRPA RM 241,000
	b) Development of Urban Stormwater Management Model (SWMM) and GIS for Decision Support System	i) Development of USM SWMM Main Engine. ii) Redevelopment of USM tools.	USM,JPS	2004 - 2007	IRPA RM 163,000

Table 2: Malaysian IHP Research Activities Under IHP Phase VI

No .*	Title	Status	Agencies Involved	Completion Date	Funding Agency
1. (6.1/6. 2)	Effects of Logging on the Muda/Pedu Reservoirs.	Late start of logging activity of modified logging compartment. Continue with hydrological data collection including sediment transport for post-logging assesment.	DID/UPM/UTM/JPSM/MINT/ MADA/ FRIM/ LESTARI/ UKM/JPNK/DOA	Dec 2006	DID and MADA

* - Numbers in bracket refers to IHP-V theme and project number

Table 3: Asian Pacific FRIEND research project

No .	Title	Status	Agencies Involved	Completion Date	Funding Agency
1.	Water Archive	On going	DID	2006	M'sian Govt.
2.	Catalogue of Rivers for South East Asia & the Pacific.	Volume VI . Planning in progress	DID	2007	M'sian Govt.
3.	AP FRIEND – IDF Project and Design Flood Project	Preliminary analyses of rainfall data from countries	DID / NAHRIM / UNITEN / HTC / UTM	2007	M'sian Govt.

Table 4. Activities Carried Out by Malaysian IHP for 2005/2006 (from November 2005 - October 2006)

Item	Activity	Period and Venue	Lead Agency
1.	**World Water Day 2006**		
i.	Launching by His Royal Highness The Acting Raja (Ruler) of Perlis	23 April 2006 Kangar, Perlis	MIHP
ii.	National Exhibition	22 – 23 April 2006 Kangar, Perlis	DID Perlis
iii	Drawing and Colouring Contest	23 April 2006 Kangar, Perlis	MOE
iv	Publicity	During the World Water Day Celebration	Radio & TV Malaysia, local newspapers and bulletin
v	Open Day of Water Treatment Plant	21 March – 12 April 2006	JBA
vi	National Seminar on Nuclear Technology for Water Resources Management	2 - 3 April 2006 Bukit Merah Resort	DID
vii.	Sustainable Water Resources Management Camp	22 - 23 April 2006 Kangar Perlis	JKPLPA
2.	**Courses**		
i.	Water Resources Management for 21st Century	Port Dickson, Negeri Sembilan 13-14 July 2006	HTC / MIHP
3.	**Talks to Secondary school students on Hydrology and Environment Issues.**	Through out the year 2005 and 2006	MIHP Members

Table 5: Future Activities by Malaysian IHP for 2006 - 2008

A) Research

Item	Activity	Proposed Agency Involved	Lead Agency	Funding Agency
1.	Effects of Logging on the Muda/ Pedu Reservoirs Phase II.	DID/UPM/UTM/JPSM/MINT/MADA/FRIM/ LESTARI/UKM/ JPNK/DOA	DID	Government of M'sia
2.	Establishment of Landside Hazard Assessment Map for North-South Expressway and Cameron Highlands	UiTM,MINT,KUiTTHO, DID JMG	UiTM	Government of M'sia
3.	Determination of Event Mean Concentration (EMC) Values of Suspended Sediments and Nutrients in Urban Discharge Monitoring at Stations of Sg. Kerayong and Taman Mayang WP. Kuala Lumpur	UiTM, MINT,KUiTTHO,DID, MMS,UPM	UiTM	Government of M'sia
4.	Establishment of a Rainfall Erosivity Profile along North-South Expressway	UiTM,MINT,KUiTTHO, DID, MMS,UPM	UiTM	Government of M'sia
5.	Heat Island Effects in Urban Areas and Correlation with Rainfall Runoff Pattern	MINT,USM,UiTM	MINT	Government of M'sia
6.	Performance Indicator of Stormwater Gross Pollutant Trap for Urban Drainage System	DID,USM,UTM,HTC	DID	Government of M'sia
7.	Modelling of Convective rains for Predicting Flash Floods	UTM	UTM	Government of M'sia

B) Meeting / Seminar / Conference / Workshop / Talks

Item	Activity	Period and Venue	Lead Agency	Funding Agency
1.	Water Resources Management	2006 UTM Skudai	JKPLPA	Government of M'sia
2.	World Water Day 2007.	March 2007	MIHP	Government of M'sia
3.	World Water Day 2008.	March 2008	MIHP	Government of M'sia
4.	Talks on Hydrology to Schools.	2006 - 2008	JKPLPA	Government of M'sia
5.	Seminars and Workshops on MIHP research projects.	2006 - 2008 K. Lumpur	HTC/DID	Government of M'sia
6.	River Expedition for Selangor Secondary School Students	2006 DID Gombak	JKPLPA	Government of M'sia
7.	Talks on Environment to Schools	2006 - 2008	JKPLPA	
8.	Environmental Camp (Mangrove Eco System)	2007 Tg. Piai, Johor	JKPLPA	Government of M'sia
9.	Meeting and Technical Visit	2006 Perak	JKPLPA	Government of M'sia
10.	ICHARM (International Conference on Flood Hazard Mapping)	April 2007 K. Lumpur	MIHP	MNCU
11.	River Eco – Hydrology Expedition for S. E. A. Regional Students Exchange	2007 Johor	JKPLPA	Government of M'sia
12.	Workshop on Wetland Hydrology	2008 K. Lumpur	JKPAH	Government of Japan
13.	IRPA Seminar on Urban Hydrological Characteristics of Sg. Kerayong	2008 K. Lumpur	JKPAH	UNESCO
				Government of M'sia
				Government of M'sia

Appendix A

CURRENT MEMBERS OF THE MIHP

1.	DID *[1]	-	Department of Irrigation and Drainage (Secretariat)
2.	DOA	-	Department of Agriculture
3.	DOE *[2]	-	Department of Environment
4.	DOF	-	Department of Forestry
5.	EPU	-	Economic Planning Unit
6.	FELDA	-	Federal Land Development Authority
7.	FRIM *[2]	-	Forest Research Institute of Malaysia
8.	DMG *[1]	-	Department of Minerals and Geosciences
9.	MACRES	-	Malaysian Center for Remote Sensing
10.	MMS *[1]	-	Malaysian Meteorological Service
11.	MNCU *[1]	-	Malaysian National Commission for UNESCO
12.	MOA	-	Ministry of Agriculture
13.	MOE	-	Ministry of Education
14.	MOF	-	Ministry of Finance
15.	MOH	-	Ministry of Health
16.	MINT *[2]	-	Malaysian Institute of Nuclear Technology
17.	PWD	-	Public Works Department
18.	TNB	-	Tenaga Nasional Berhad
19.	UKM	-	Universiti Kebangsaan Malaysia
20.	UM	-	University of Malaya
21.	UPM	-	Universiti Putra Malaysia
22.	USM *[2]	-	Universiti Sains Malaysia
23.	UTM	-	Universiti Teknologi Malaysia
24.	KUiTTHO	-	Kolej Universiti Technologi Tun Hussein Onn
25.	UiTM	-	University of Technology MARA
26.	NAHRIM	-	National Hydraulics Research Institute of Malaysia
27.	HTC	-	The Regional Humid Tropics Hydrology and Water Resources Center for Southeast Asia and the Pacific
28.	MHLG	-	Ministry of Housing and Local Government
29.	JBA	-	Department of Water supply , Ministry of Energy, Water and Communication

Note: *[1] - Permanent EXCO Member

*[2] - Elected EXCO Member

IHP country report, Mongolia, 2006

Mongolian National Committee for the IHP, Ulaanbaatar 2006

IHP country report, Mongolia, 2006

As in other arid and semi-arid regions of the world, water resources in Mongolia are limited, and under severe and increasing pressure due to expanding populations, point and diffuse pollution, increasing volumes of industrial and domestic waste, and over-development of groundwater. These factors provide a major threat to the scarce water resources in Mongolia.

The impact of the above combined with that of climate change (e.g. melting of glaciers) on river discharges becomes more and more manifest. Drinking water resources are largely unprotected and some 30% of the total drinking water supply does meet the prevailing health standards resulting in increased incidence of diseases. The overall efficiency of water use by municipalities and industry is low. Enforcement of legislation with regard to use and protection of water resources is weak if non-existent and pollution by industry (notably mining) is rife. Adding to this the impact on the fragility of an extensive system of fresh water ecosystems, these developments call for concerted action in Mongolia in order to manage, use and develop its water resources in a sustainable manner i.e. now and in the future.

Steps and Indicators for water sector development:

- Updated Water law of Mongolia since July 2004, implementation this water law not too slowly comparing previous Water law (1995)

- Implementation National Water program (III phase 2006-2010), every year taking report to the National Government

- Established new water agency – WAA (2005), which is mostly managing and protection of water sources

- Increasing investment in water sector (has been implemented World bank project improvement water supply and sanitation condition in Ger (household) area Ulaanbaatar city, managing water supply and sewerage system some provinces in Western and Eastern Mongolia, JICA project management water supply capital city of Ulaanbaatar and increased national budget for reconstruction pumping system, building water tanks)

- Developed number of projects (development IWRM in Mongolia, National Water database, Groundwater monitoring, Improvement capacity building in water sector est.)

- Strengthen capacity building in water sector, every year organized not less than 2-3 national training courses in different subject

- Increased public participation, more cooperation within water institutions and also has been more developed public awareness in water sector

II. Main activities and outputs in 2006:

A. In national level:

- Organized national training course in “Groundwater Hydrology and Management” supporting Japanese IHP and UNESCO Beijing Office and trained more than 40 specialists in water sector of Mongolia.

- For sharing and learning from foreign experiences Prof. Kenji Jinno from Kyushu University of Japan sent “Groundwater dams” DVD, Minister of Nature and Environment of Mongolia and other officials had meeting and discussion about how can develop groundwater management and dams in Mongolia.
- Prepared and delivered country report to the Intergovernmental meeting, UNESCO Beijing office and NatCom Mongolia and also sent suggestions for the development IHP phase YII
- Conducted a case study water loss in Erdenet city and delivered report to Ministry Construction and Urban Planning of Mongolia
- Established and has been developed Research and Training Center for IWRM, which will focusing to improve capacity building and to contribute development IRBM in Mongolia.
- Has been provided with scientific consulting service for new Water agency, which was established in June 2005, under Ministry Nature and Environment of Mongolia.
- Participated formulation and development projects “Kharaa River basin” in Darkhan city and organized workshop with Kassel University of Germany
- Prepared project proposal “Development IWRM plans in Mongolia” with Dutch professors and other water institutions

B. Regional and International activities:
- Participation and presentation on “ Groundwater management in Mongolia” to the International Symposium on Groundwater Sustainability in Alicante, Spain, February 2006.
- Participation International Water exhibition EKBATEK-2006, Moscow, Russia.
- Developed cooperation studying water quality and improvement laboratory condition with Lille University of Northern France, May 2006.
- Presentation National water policy issues in Rosenburg International Conference on Water Policy, Galgary, Canada, September 2006.
- Participation International Symposium on Managing Water Supply for Growing Demand and 14th Regional Steering Committee Meeting for UNESCO-IHP Southeast Asia-Pacific. Bangkok, Tailand16-20 October 2006.

C. Developed project proposals
- Improvement capacity building in Water sector of Mongolia;

- Strengthening groundwater management in Mongolia **(**Development of groundwater database of Mongolia, its connection to the digital GIS in pilot area);

- “Development of a modular modeling framework to support integrated river basin management in Mongolia”;
- With the consultants from World Bank was developed draft National wastewater strategy in Mongolia
- Development GIS based water database and establishment water data network in national level in Mongolia

D. Participation and involvement on going projects:

- Since September 2006 international project “Integrated Water Resources Management in Central Asia”: Model region Mongolia (MoMo) funded by Federal Ministry of Education and Research, Germany
- Since August 2006 international project “Development IWRM plans in Mongolia”, funded by Dutch Government
- since July 2006 “Establishment Geo-information center in Mongolia” project

E. General objectives and Conclusions

- Development main principles IRBM in Mongolia;
- Strengthening groundwater management in Mongolia **(**Development groundwater database and monitoring network of Mongolia);
- Development of a modular modeling framework to support integrated river basin management in Mongolia;
- Improvement capacity building and legal mandate in water sector of Mongolia;
- Conduct pilot case studies focused to reveal reasons of changes in hydrological regimes river, lake and glacier systems;
- Conduct international publication, joint and co-research, technology transferring activity, develop consulting service and learning from others
- Improve cooperation in regional and international level, especially for implementation IHP phases, involvement regional programs, activities and ongoing projects in water management;

National Committee for IHP, Mongolia
Address:C.P.O.Box-1650, Ulaanbaatar-13, Mongolia email :b_green@mongol.net

Supply and Demand on Water Resources in Myanmar

Mr. Htay Oo Kyi

Myanmar

1. INTRODUCTION

Myanmar is generally blessed with abundance of water which, however, is poorly distributed both in space and time. During the wet season when the available water for exceeds the demand in almost all parts of the country, most of it is lost into the sea, while during the dry season scarcity of water becomes a problem for most parts of the country. The dry zone suffers annually acute shortage of water which sometimes occurs even during the wet season.

To solve the water deficit problems, Water management practice was started since the days of Myanmar Kings. According to the growth rate of population the old dams, weirs and ponds are not sufficient in these days. Therefore the government of Myanmar is launching a national programme for availability of water aimed at bringing about higher level of agricultural productivity whilst ensuring sustainability.

2. CLIMATE AND RAINFALL

Myanmar has three distinct seasons. The cold season emerges from November to January dry season starts from February to April followed by wet season. Myanmar receives its annual rain mainly from the south-west monsoon from mid May to mid October. Ninety percent of the annual rainfalls in different region of Myanmar are monsoonal. The rainfall varies depending on the locality and elevation. The annual rainfall of the country ranges from about 600 mm in the central plain and increasing out ward to 1800 mm in the East, 2300 mm in the North and 4000 mm in the West and South as shown in Figure (1). Maximum annual rainfall, which mounted up is 4800 mm are observed along coastal areas. In table (1) seasonal rainfall distribution is classified by regions. In Eastern part of the country, rainfall distribution is observed as 12 % of annual rainfall, even in cool season. This percentage, which is double or triple compare to other parts of the country is significant. Rains producing major features are differ not only season by season but also region by region.

Besides, the average highest temperature in Central Myanmar during the summer months and April is above 110ºF (43.3ºC) while in Northern Myanmar, it is about 79ºF (36.1ºC) and on the Shan Plateau between 85ºF and 95ºF (29º C and 35ºC). Temperature of towns vary according to their location and elevation.

3. EXTREME PHENOMENA OF WATER RESOURCES

Floods

Observation shows that the percentage of occurrence of floods (exceeding danger level) in medium and large rivers of Myanmar is 6% in June, 23% in July, 49% in August, 14% in September and 8% in October. Normally flood use to occur in each and every year at one river system or another as indicated in figure (2). According to that figure the flood frequencies of Sittoung and Thanlwin exceeded Chindwin, and Chindwin exceeded Ayeyarwady's flood frequency. The figure shows that the severe floods had occurred in 1973,1974, 1976,1979,1988, 1991, 1997, 2002 and 2004.

The peculiar feature of 2004 floods is the occurrences of severe flood twice along almost all Myanmar rivers. Along Ayeyarwady river, the observed peaks at Bhamo, Mandalay, Sagaing, NyaungU and Magwe were noted as the highest ever recorded and peaks occurred at Myitkyina, Katha, Minbu, Pyay and Henzada were recorded as second highest since 1965.

Drought

In Myanmar, identification of drought is done by using rainfall for meteorological drought and using rainfall as well as runoff data for hydrological drought. The rainfall deficiency is usually defined as the deviation of the rainfall values from the normal rainfall during the specified time period. Rainfall deficiency forecasting may provide useful information for predicting the drought condition. Likewise information on hydrological data such as rainfall, low flow, ground water table, and reservoir level are the key inputs in assessing the hydrologic problems, their impact and taking remedial decisions.

The state of approaching hydrological drought is tried to analyze by low flow period water level of Nyuang U, centre of dry zone. Comparison of daily mean water levels for nearest 10-years backward from 2004 and comparison of 10-years average recession curves from 1966 to 2004 are shown in figure (2) and figure (3). Both of the plots indicate the water levels fall lower and lower year after year. The formation of sand dune with changing of water course along major navigation rivers seem more frequent events nowadays. With the purpose to enforce the upgrade of proper water management to overcome the scarcity of water, DMH is going to issue Minimum Alert Level for Central Myanmar areas: Mandalay, Sagaing, Nyaung U, Chauk, Minbu and Magwe of Ayeyarwady river and Monywa of Chindwin river. Aiming to assist the effective water management by responsible sectors, the coarse approximation of water cycle in Myanmar is presented in figure (4). Annually Myanmar received rain water 1484.6 Km^3 and ground recharge

is 287.2 Km^3.However in dry season (January - April), there is no rain water and the water has to be extracted from ground by 45 Km3. The approximation needs further refinements and justification.

4. WATER RESOURCES POTENTIAL

Surface Water Resources

In Myanmar, there are four major river systems. The largest, longest and most useful Ayeyarwady river runs for about 1786 km from the for North, While Chindwin, the most important tributary to Ayeyarwady runs 901 km from the extremes Northwest of Myanmar. The ThanLwin rivers, which originates in China, flowing for 1223 km through Myanmar territory, and Sittaung which originates from the lower part of central Myanmar runs for 407 km and flowing out is Andaman Sea. Besides these four main rivers, there are coastal streams in Rakhine State and Tninthari Division.

Table (2). Potential Water Resources in Myanmar

River Basin Number	Name of Principal Rivers Basin	Catchment Area 1000*km^2	Surface Water km^3	Ground Water km^3
1	Chindwin	115.3	141.293	57.578
2	Upper Ayeyarwady	193.3	227.920	92.599
3	Lower Ayeyarwady	95.6	85.800	153.249
4	Sittaung	48.1	81.148	28.402
5	Rakhine State	58.3	139.245	41.779
6	Taninthari State	40.6	130.927	39.278
7	ThanLwin	1580	257.918	74.779
8	Mekong	28.6	17.634	7.054
	Total	737.8	1081.885	494.713

5. GROUND WATER RESOURCES

Ground water is being exploited not only for domestic water supply but also for irrigation purpose in areas where conditions are favourable. Deep tube wells are drilling in the dry zone and there are also many wells in the delta, coastal, northern and eastern hilly regions. The total estimated ground water potential is about 494.713 km3 per annum. Potential surface water resources and ground water resources according to major river basins are shown in Table (2).

6. WATER RESOURCES AND ITS UTILIZATION

Agriculture is the main sectors of the utilization of water in Myanmar as water is very important for cultivation of Crops. Irrigation department (1D) plays a major role as the prime water user mainly for the purpose of supplying water to the farmland. Since 1988 (1.D) is accelerated developing irrigation facilities at the feasible places with in the country. Altogether 184 numbers of irrigation facilities have successfully been implemented with the benifited area of about 2.6 million acres (1.1 million ha). As a result of the extension of the irrigated land, the percentage of the irrigated area and agricultural production are increased.

The viable land, land man ratio and other indicators are shown in the following table.

Water Resources and its utilization

Sr. No	Statement	FPS System	CGS System
1.	Land area of Myanmar	167.0 million acres	67.7 million ha
2.	Culturable land	44.0	17.8
3.	Population	54.3 million	-
4.	Culturable land availability per person	0.81 acres / person	0.32 ha / person
5.	Annual water resources potential	1276 million Acft / yr	1576 km3/ yr
6.	Annual estimated utilization of irrigation water for cultivation	33.6 million Acft	41.5 km^3
7.	Water availability per acre / ha	7.6 ft	5.7 m
8.	Water availability for one acre / ha of culturable land	29.0 ft	21.8 m
9.	Current percentage of annual usage of water for cultivation	less than 10 %	-

Present Water use by different sectors

Water withdrawal in Myanmar, have been in the increase particularly in the agriculture sector. The following table shows the total water use in different sectors for the year 2004–2005.

Sr. No	Sectors	Water use		Percentage
1.	Irrigation	33.6	41.5	91
2.	Domestic	3.0	3.7	8
3.	Industry	0.3	0.4	1
	Total	36.9	45.6	100

Table. Water use different sector and percentage of contribution.

It was found out that as much as 91 percent of the water is tapped for irrigation purpose and about 8 percent is for domestic consumption and 1 percent is for Industry.

Demand Projection by the year 2015

Although the increase of population in 1983-1984 was 2.02 percent, it decreased down to 1.84 percent in 1997-98. Assuming the same 1.84 percent, the population in 2015 will become 63.4 million. By keeping in phase with the established future work plan of irrigation Department, projection of assessment for the year 2015 has been tried (win, zaw.I.D). Additional 1.8 and 0.4 million acres of farmland have been added under irrigation Department (I.D) and water Resources Utilization Department (WRUD) respectively from 2004-2005 data mainly for paddy. The following table shows the water use of different sector and the percentage of distribution by the year 2015. (Table 4)

Sr. No	**Sectors**	**Water use**		**Percentage**
1.	Irrigation	43.6	53.8	90
2.	Domestic	3.9	4.8	8
3.	Industry	0.6	0.7	2
	Total	48.1	59.3	100

It can be noticed that although the water use for agriculture is reduce by 1 % after comparing with 2005 data, the percentage of contributing of domestic sector remain unchanged but in industrial sector is increased 1 % by the year 2015.

7. WATER MANGANMENT ACTIVITIES

At present, only about 6 % of the total water resources of 870 million acre feet per annum are being utilized annually. Numerous irrigation facilities have been implemented and inaugurated during the present decade for irrigation and water supply to develop rural and urban areas.

Construction of irrigation works for crop cultivation historically started since the days of Myanmar Kings. Various irrigation projects were implemented after the independence. After 1988, the government put forward continuous efforts in the construction of dams and reservoirs throughout the country by utilizing large capital investment, man power and machineries making use of the available domestic resources and expertise. As the result, irrigation facilities now exist in groups in localized zones throughout the country. After 1988 – 89 , total irrigated area has increased to 4.32 million acres. The irrigation projects completed between 1988 – 89 to 2006 (end

of March 2006) numbered 184. Irrigation coverage increased from 12.5% of the sown area in 1987-88 to 19.1 on 2003-2004(Table). Rural water supply is effective to 14.9 million out of 32.5 million rural populace. Apart from the construction of dams and weirs, establishment of 271 river pump stations and 7478 of tube wells were made for rural water supply and agricultural use (Table)

8. DISCUSSION

At present, Myanmar can be identified as a low water stress country and a certain percentage of fresh water potential is used for agriculture purpose. Although Myanmar has aboundant water resources, it is necessary to utilize in a sustainable manner in the country. The most water scared region in Myanmar is central Dry Zone. Previously, farmers in which often affected by droughts, causing crop failure. Those situations prompted initiation of river pumping projects, dams and reservoirs with priority being given to central dry zone, to make the best of existing perennial river and stream water sources and also to created and enabling environments of outlets for the farmers for securing water availability at all seasons.

Climate change is already occurring in Myanmar. The most remarkable facts are; warmer temperatures, lesser rainfalls, later onset of southwest monsoon shorter duration of southwest monsoon, lesser storms in the Bay of Bengal. But in lanina year Myanmar received large amount of rainfall and floods were occurred in Myanmar rivers. The delta region where the population density is the highest and rice is a major crop. In this region, about 40 % of the area are still affected by flood damage and sea water intrusion. Flood control improvement through of sluice gates and drainage canals serve as irrigation canals, can remedy these problems.

Several government agencies and departments under different ministries are engaged independently both in surface and ground water use but the extent and type of water use are different from one another. Irrigation Department (ID) plays a major role as the prime water user mainly for the purpose of supplying water to the farmland. Water Resources Utilization Department (WRUD) also plays major role in pump irrigation, construction of dams, and sanitation service through the township development committees. Therefore cooperation and coordination among water related agencies is main issues for the proper management of water resources.

9. CONCLUSION

It was concluded that about 90 percent of the water use is for agriculture purpose and the remaining 10 % goes to domestic and industrial purpose both for present and by the year 2015. As water is the most fundamental requirement for agriculture, steps are being taken to ensure that

there is sufficient water for the cultivation of crops at the required time. The construction of irrigation facilities meant not only for the agriculture purpose also for greening the environment, for supplying drinking water to local people and for generating electricity where possible. In this case proper water resources management is important to ensure the long term benefit and improved socio-economic life for farmers, the majority of the population.

Given priority for the importance of water use in irrigation sector, it is required to address water management issues at various levels. It is believed that the improvement of downstream development, reuse of return flow, application of effective water management practices etc. could significantly save the use of irrigation water in future. Last, but not least weather forecast, long-term forecast, seasonal forecast and flood warnings issued from the department of meteorology and hydrology is a major key for the water management activities.

Land Utilization in Myanmar and Neighbouring Countries (2002)

Country	Total Land Area	Total Sown Area	Percent
World	32291	3786	11.72
Asia	9230	1397	16.97
Myanmar	167	25	16.17
Thailand	126	45	35.71
Vietnum	80	21	26.25
Indonesia	448	83	18.53
Malaysia	81	19	23.46
Philippines	74	26	35.14
Lao PDR	57	2	3.51
Cambodia	44	9	20.45
China	2305	385	16.70
Bangladesh	32	21	65.63
India	735	420	57.14

Source: Selected Indicators of Food and Agriculture Development in Asia Pacific Region, 1992 – 2002, RAP Publication 2003.

LAND UTILIZATION IN MYANMAR (2003-2004)

Net Sown Area	25.39
Fallow Land	1.26
Culturable Waste Land	16.24
Reserved Forests	37.77
Other Forests	44.87
Others	41.65
Total	167.18

Irrigated Area of Myanmar and Neighbouring Countries (2002)

Country	Total Sown Area (mil.ac)	Irrigated Area (mil.ac)	Percent
World	3786	674.7	17.82
Asia	1397	428.9	30.70
Myanmar	42	52	12.38
Thailand	45	122	27.11
Vietnum	21	7.4	35.24
Indonesia	83	11.9	14.34
Malaysia	19	0.9	4.74
Philippines	26	3.8	14.62
Lao PDR	2	0.4	20.00
Cambodia	9	0.7	7.78
China	385	135.5	35.19
Bangladesh	21	10.9	51.90
India	420	35.4	32.24

Source: Selected Indicators of Food and Agriculture Development in Asia Pacific Region, 1992 – 2002, RAP Publication 2003.

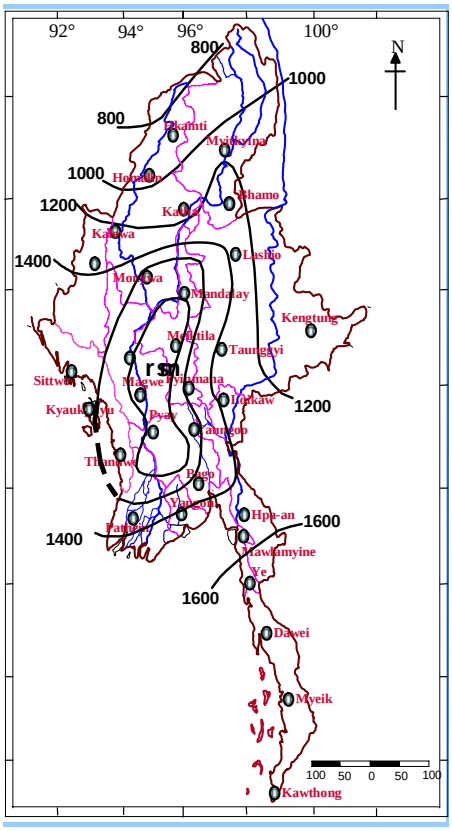
Table (5) Progress of Irrigated Area in Myanmar

Year	Net Sown Area (mil.ac)	Irrigated Area (mil.ac)	Percent
1987 – 88 *	19.73	2.46	12.5
1996 – 97	22.92	3.85	16.8
1997 – 98	22.93	3.93	17.2
1998 – 99	23.90	4.18	17.5
1999 – 2000	25.04	4.55	18.2
2000 – 2001	25.89	4.71	18.2
2001 – 2002	26.33	4.91	18.6
2002 – 2003	26.73	4.62	17.3
2003 – 2004	27.27	5.22	19.1

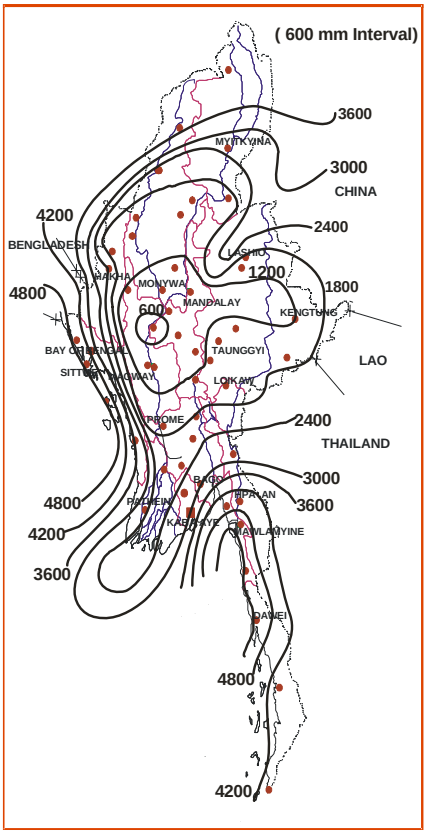
Table (6) Other Irrigation Projects

Project	Number	Beneficial Area (ac)
Pump Irrigation from rivers	27	303036
- Electric pumping	90	190330
- Diesel pumping	181	112706
Underground water for agriculture	7478	9002
- Tube wells	6920	62395
- 99 ponds (Natural flow)	447	8181
- Group Electric pumping	141	19726

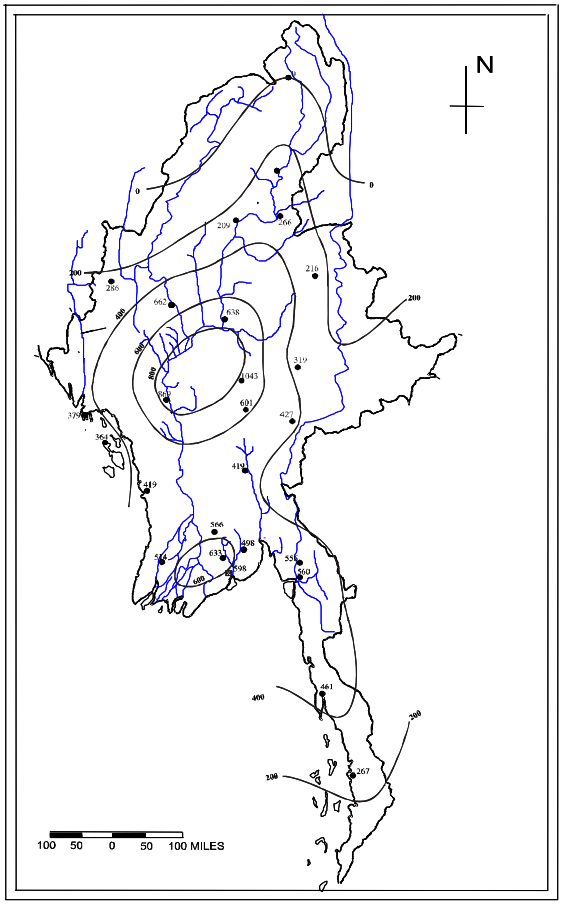
Mean Annual Evaporation (mm)

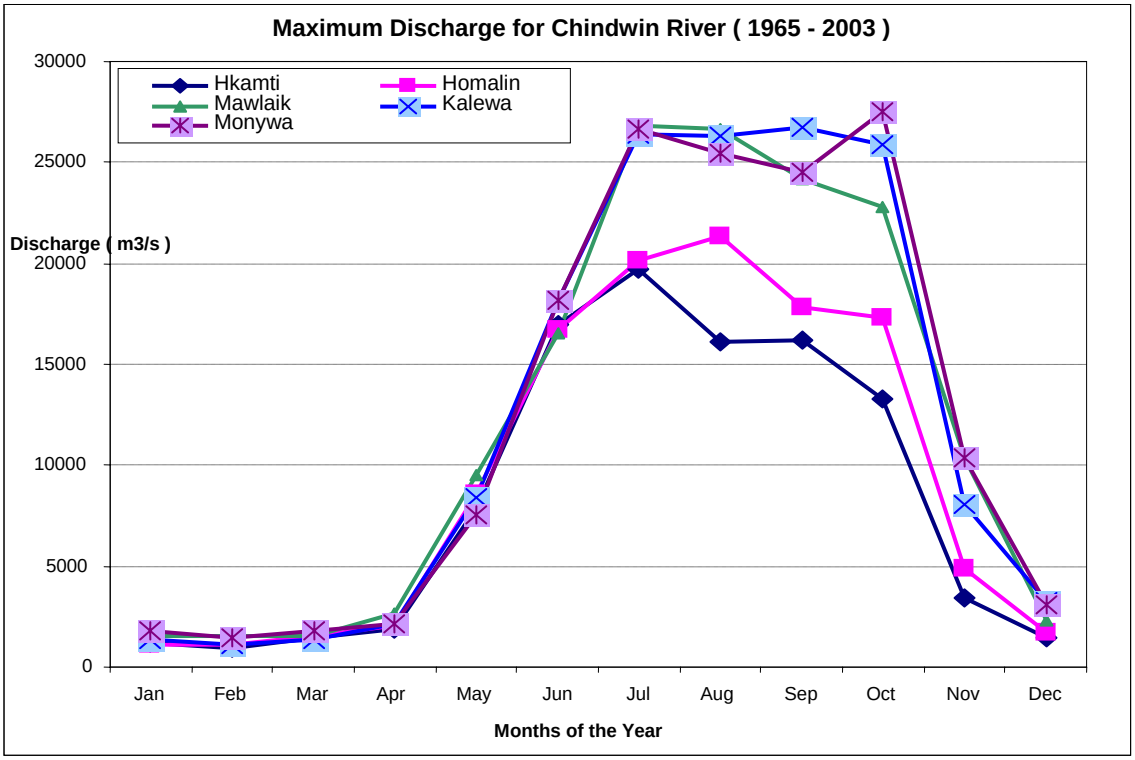


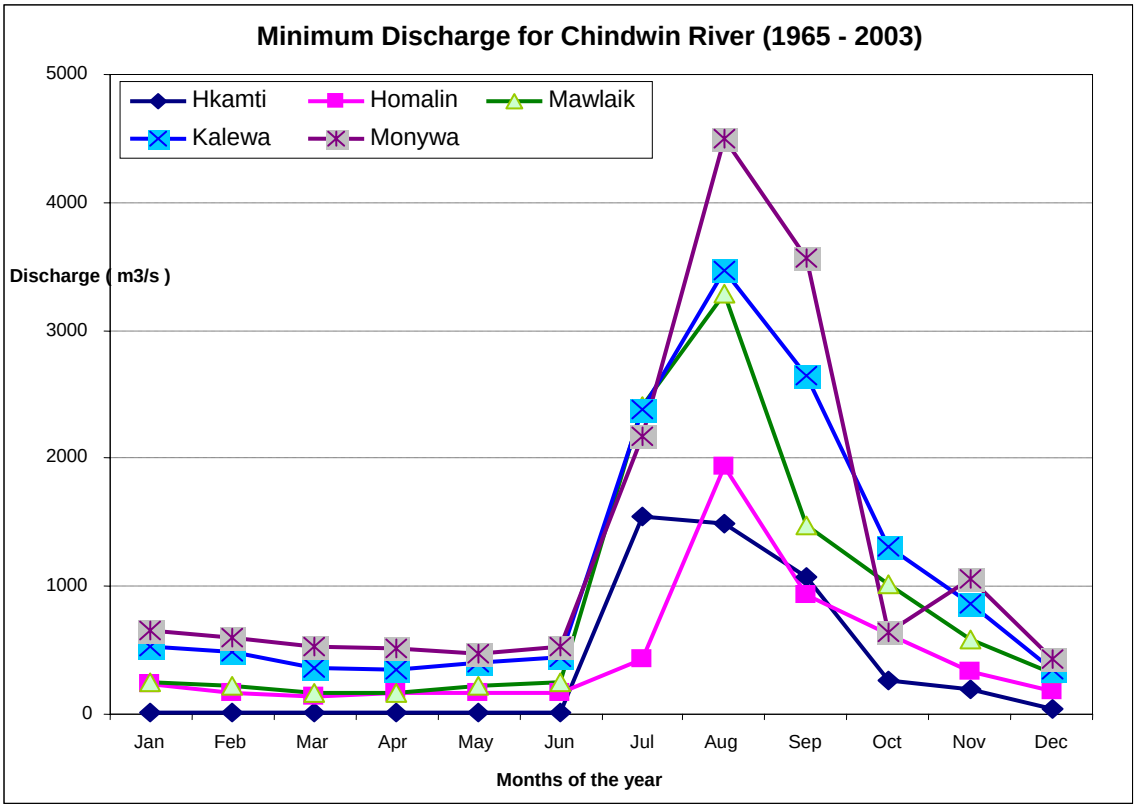
Mean Annual Rainfall (mm)

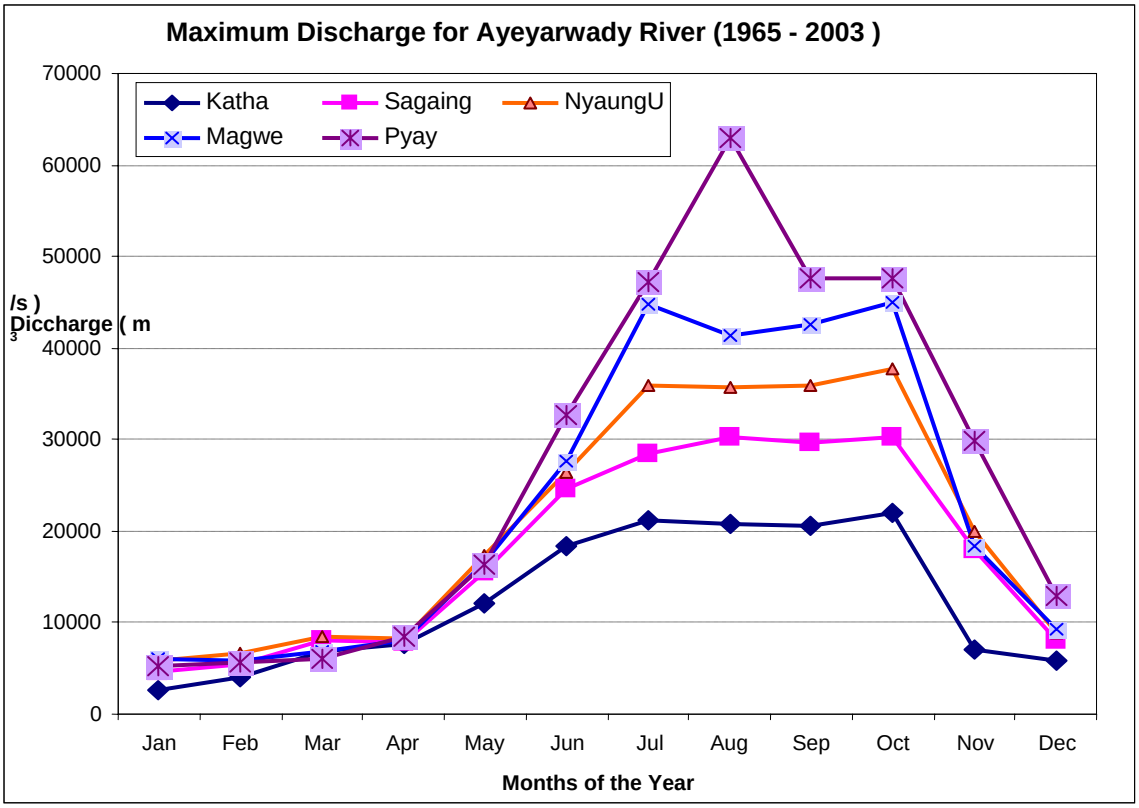


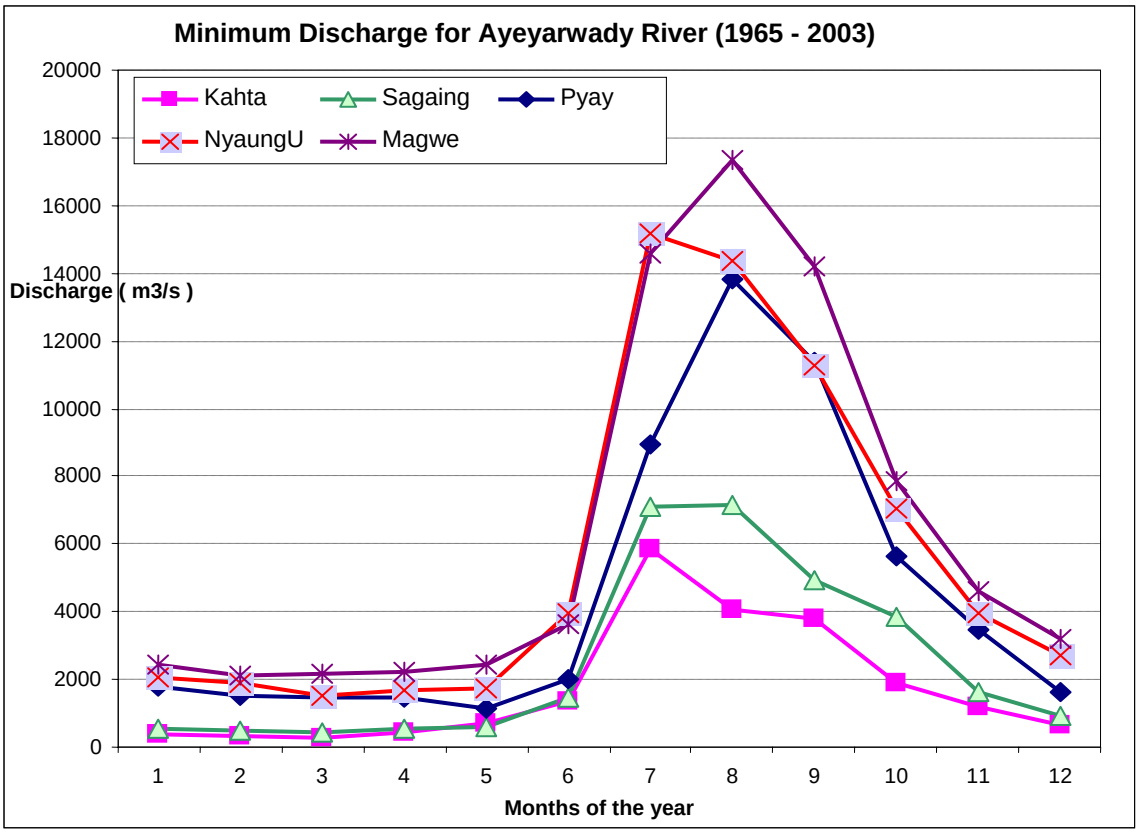
Total Soil Water Deficit

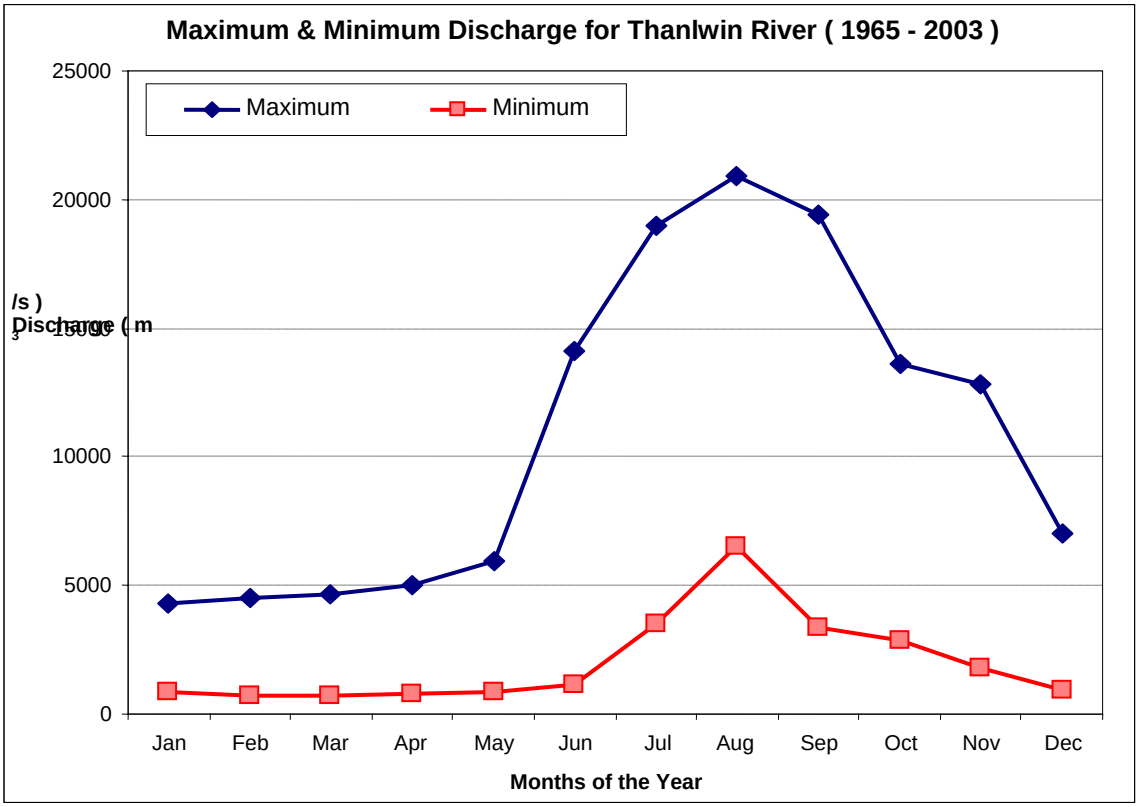


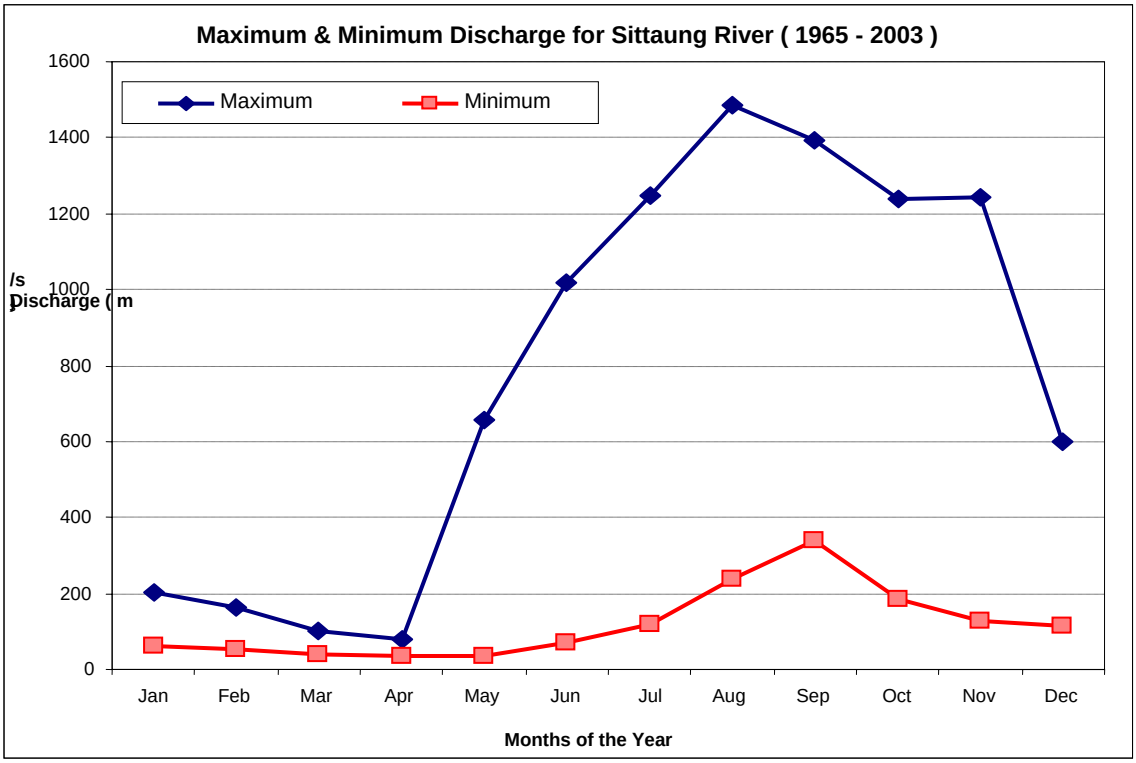

Maximum Discharge for Chindwin River (1965 - 2003)
Hkamti
Homalin
Mawlaik
Kalewa
Monywa
Discharge (m3/s)
30000
25000
20000
15000
10000
5000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Months of the Year


Minimum Discharge for Chindwin River (1965 - 2003)
Hkamti
Homalin
Mawlaik
Kalewa
Monywa
Discharge (m3/s)
5000
4000
3000
2000
1000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Months of the year


Maximum Discharge for Ayeyarwady River (1965 - 2003)
Katha
Sagaing
NyaungU
Magwe
Pyay
70000
60000
50000
40000
30000
20000
10000
0
/s)
Diccharge (m
3
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Months of the Year


Minimum Discharge for Ayeyarwady River (1965 - 2003)
Kahta
Sagaing
Pyay
NyaungU
Magwe
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Discharge (m3/s)
1
2
3
4
5
6
7
8
9
10
11
12
Months of the year

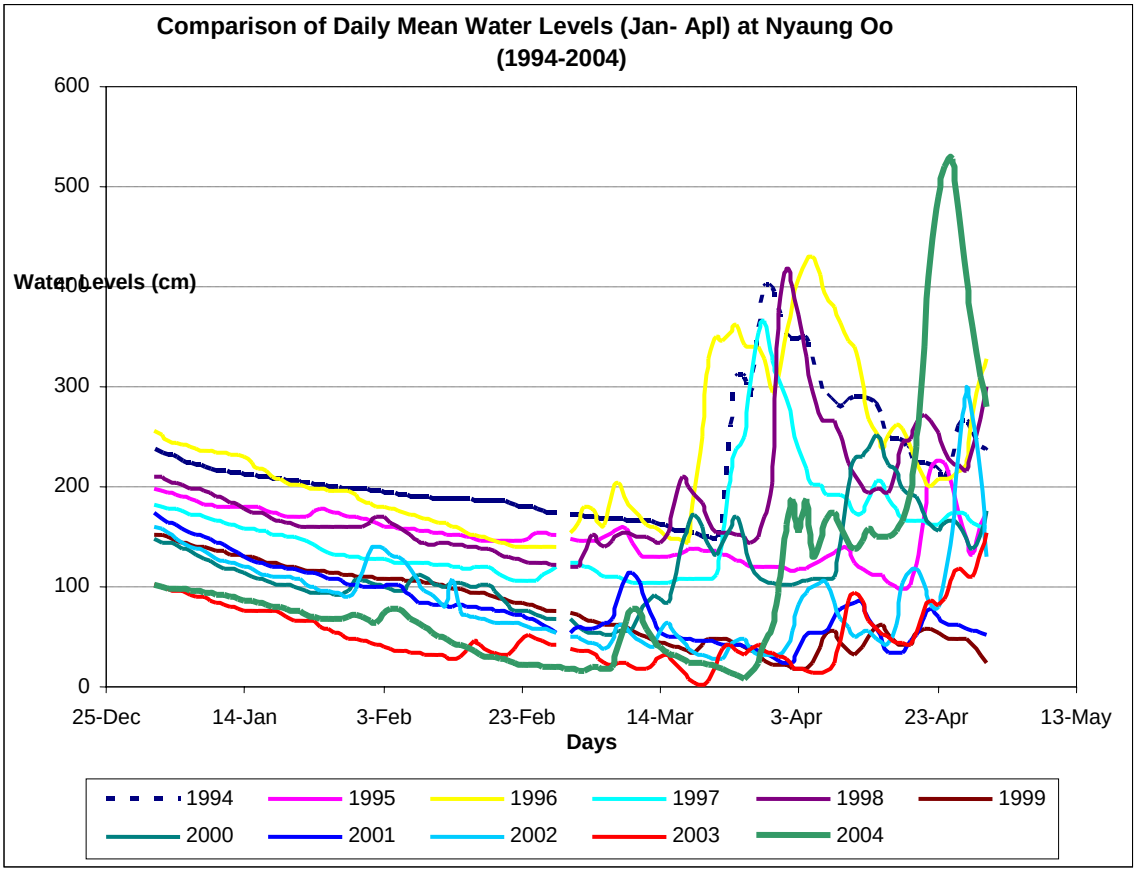

Maximum & Minimum Discharge for Thanlwin River (1965 - 2003)
Maximum
Minimum
25000
20000
10000
5000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Months of the Year

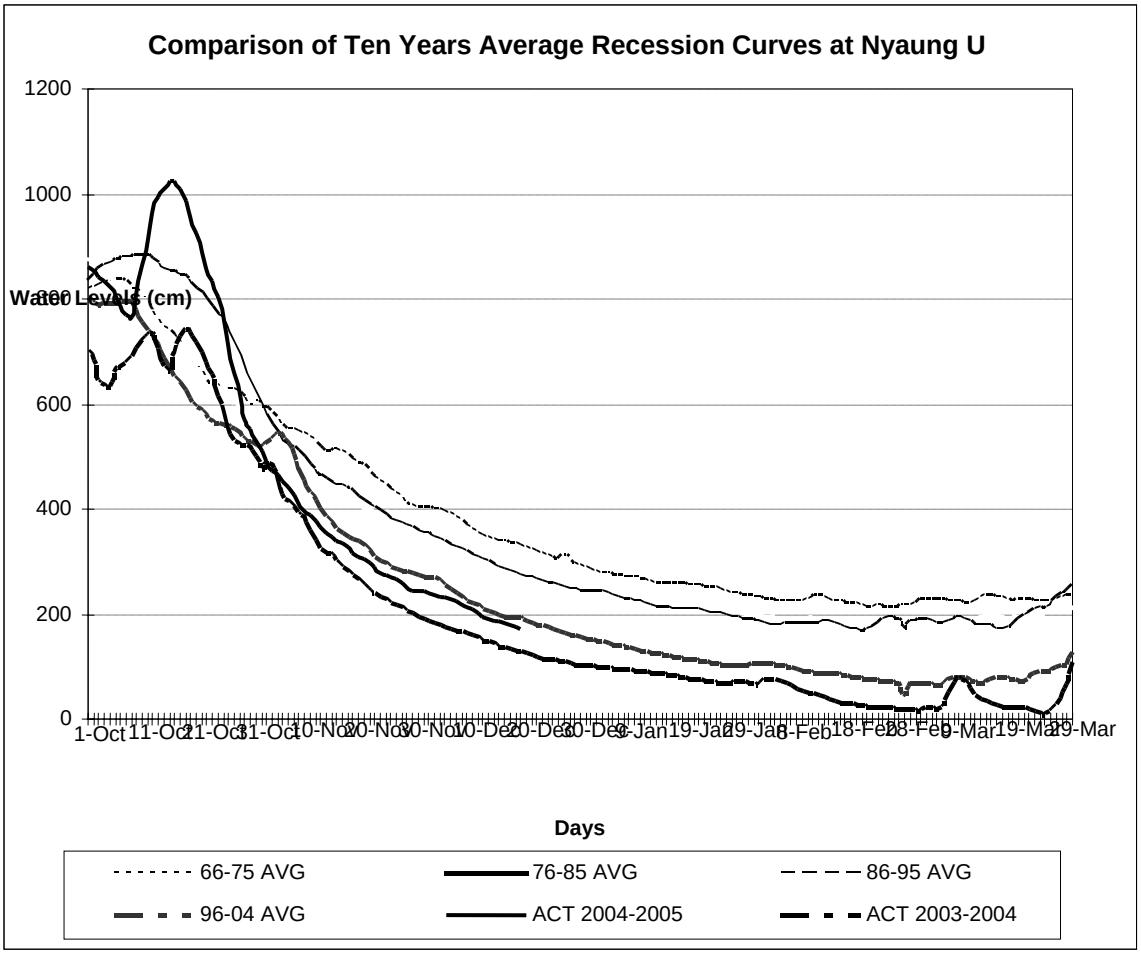

Maximum & Minimum Discharge for Sittaung River (1965 - 2003)
Maximum
Minimum
1600
1400
1200
1000
800
600
400
200
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Months of the Year

Annual Maximum Water level for Major Rivers at Different Stations in Myanmar From 1966 to 2004

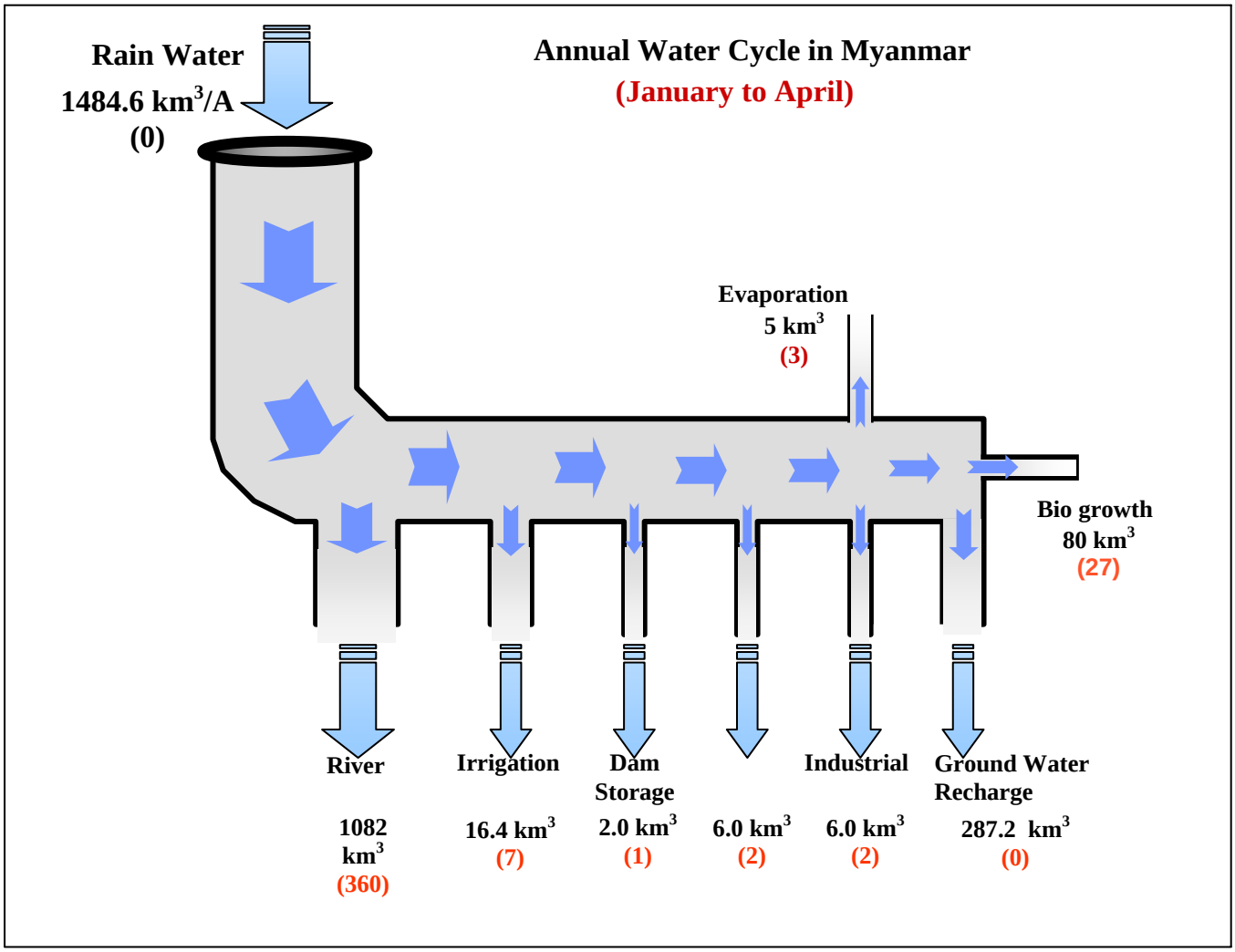
Rivers and Stations	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Frequency of Flood: Above D/L	Frequency of Flood: 1m above D/L
Ayeyarwady																																									
1. Myitkyina					⇧	⇧			⇧													⇧										⇧							9	4
2. Bhamo						♦			⇧		⇧		⇧									⇧			⇧			⇧		⇧			⇧	⇧					12	4
3. Katha	⇧		⇧				⇧	⇧	⇧		⇧		⇧					⇧	⇧			⇧			⇧	⇧		⇧		⇧	⇧	⇧	⇧			⇧		21	4
4. Sagaing	⇧				⇧			⇧			⇧	⇧		⇧				⇧		⇧	⇧	⇧	⇧		⇧						⇧		⇧			⇧		19	4
5. Nyaung-U			⇧		⇧	⇧		⇧				⇧		⇧	⇧		⇧	⇧	⇧	⇧		⇧	⇧	⇧	⇧	⇧				⇧			⇧	⇧			⇧	⇧		26	5
6. Chauk	♦	♦				⇧		⇧											⇧				⇧			⇧												⇧	9	3
7. Minbu			⇧		⇧									⇧	⇧			⇧	⇧			⇧		⇧	⇧			⇧		⇧			⇧	⇧			⇧		25	11
8. Aunglan	⇧	♦	♦			⇧						⇧											⇧																8	4
9. Pyay			⇧		⇧	⇧		⇧			⇧	⇧											⇧		⇧	⇧							⇧						14	4
10. Henzada			⇧	⇧	⇧	⇧		⇧				⇧							⇧	⇧		⇧	⇧	⇧	⇧	⇧		⇧		⇧	⇧		⇧	⇧			⇧		24	5
Chindwin																																								
1. Hkamti			⇧							⇧				⇧	⇧					⇧		⇧			⇧				⇧			⇧	⇧					23	13
2. Homalin	♦	♦		⇧	⇧		⇧			⇧		⇧	⇧		⇧	⇧	⇧	⇧		⇧		⇧	⇧		⇧			⇧		⇧			⇧	⇧			⇧		30	11
3. Mawlaik				⇧	⇧					⇧			⇧			♦						⇧											⇧		⇧				29	22
4. Kalewa		⇧		⇧	⇧	⇧							⇧							⇧		⇧											⇧		⇧				31	22
5. Monywa	⇧			⇧	⇧	⇧		⇧				⇧					⇧		⇧	⇧		⇧		⇧	⇧			⇧		⇧			⇧	⇧			⇧		27	10
Dokehtawady																																								
1. Hsipaw	♦	♦																																					3	3
2. Myitnge	♦	♦	♦	♦	♦	♦		⇧			⇧		⇧	⇧	⇧	⇧		⇧		⇧		⇧	⇧	⇧	⇧	⇧			⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧		28	7
Bago																																								
1. Bago																⇧				⇧	⇧									⇧								⇧	10	5
Sittoung																																								
1. Toungoo	♦		⇧	⇧	⇧	⇧	⇧		⇧	⇧	⇧				⇧	⇧	⇧			⇧		⇧	⇧		⇧		⇧	⇧	⇧	⇧		⇧			⇧	⇧	⇧		⇧	27	3
2. Madauk	♦	⇧			⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧		⇧	⇧	⇧	⇧	⇧	⇧						⇧	⇧			⇧			⇧		36	12
Thanlwin																																								
1. Hpa-an		⇧	⇧		⇧						⇧	⇧		⇧	⇧				⇧				⇧	⇧									⇧					⇧	34	22
Shwegyin																																								
Shwegyin			⇧	⇧		⇧	⇧	♦	⇧					⇧						⇧					⇧	⇧	⇧	⇧						⇧	⇧	⇧		⇧	20	5
Frequency of Flood above D/L	11	4	13	9	16	15	5	18	20	5	18	14	10	14	11	7	9	9	14	15	4	16	18	11	15	16	6	13	5	13	8	19	15	13	8	5	15	7	21	465	
Freq. of Flood 1m and more above D/L	7	1	4	2	3	4	-	9	14	-	10	5	3	6	3	2	4	3	6	3	1	1	7	4	4	8	4	5	4	3	2	15	-	7	1	2	7	3	16		183

Highest Water Level
Second Highest Water Level
Third Highest Water Level
1m and more above Danger Level for all stations and 0.5 m for Monywa station
⇧ Above Danger Level
Below Danger Level
♦ Data not Received


Comparison of Daily Mean Water Levels (Jan- Apl) at Nyaung Oo
(1994-2004)
Water Levels (cm)
600
500
400
300
200
100
0
25-Dec
14-Jan
3-Feb
23-Feb
14-Mar
3-Apr
23-Apr
13-May
Days
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004


Comparison of Ten Years Average Recession Curves at Nyaung U
Water Levels (cm)
1200
1000
800
600
400
200
0
1-Oct
11-Oct
21-Oct
31-Oct
10-Nov
20-Nov
30-Nov
10-Dec
20-Dec
30-Dec
9-Jan
19-Jan
29-Jan
8-Feb
18-Feb
28-Feb
9-Mar
19-Mar
29-Mar
Days
66-75 AVG
76-85 AVG
86-95 AVG
96-04 AVG
ACT 2004-2005
ACT 2003-2004

Coarse Approximation of Water Cycle in Myanmar



14th IHP REGIONAL STEERING COMMITTEE MEEETING
FOR
SOUTH EAST ASIA AND THE PACIFIC
BANGKOK, THAILAND
(19 – 20 November 2006)

NATIONAL REPORT OF NEW ZEALAND

1. ACTIVITIES UNDERTAKEN IN THE PERIOD OCTOBER 2005 – SEPTEMBER 2006

1.1 Meetings of the IHP National Committee

1.1.1 Decisions regarding the composition of the IHP National Committee

Dr R P Ibbitt and Mr R J Curry continued as Chairman and Secretary respectively on the IHP National Committee.

1.1.2 Status of IHP-V activities

The following projects continue to be funded:

- WG 1.1 (Information on New Zealand's Freshwaters: Water Resources Archive);
- WG 2.7 (Land Use Intensification: Sustainable Management of Water Quality and Quantity); and
- WG 2.8 (Reducing the Impacts of Weather Related Hazards)

(refer IHP-V Technical Documents in Hydrology No.2 UNESCO Jakarta Office 1999 for details).

While WG 1.1 is an on-going long-term project, projects WG 2.7 and 2.8 have undergone name changes to reflect changes in research direction and the way research projects are now organized in New Zealand. Funding for WG 2.7 now extends to the end of June 2009, while that for WG 2.8 extends to the end of 2008. However, both projects will be subject to periodic review.

WG 1.1 – "Information on New Zealand's Freshwaters: Climate and Water Resources Archives" was reclassified some years ago as "Nationally Significant Databases" with guaranteed long-term funding. Since reclassification funding levels have been static, and have been eroded by inflation. Although advances in technology and operating efficiencies have offset much of this, both the climate and hydrometric network were operating in a maintenance mode with only essential upkeep, site visits and data downloads being done. This year saw the second year of a 30% increase in the NZ Government's long-term annual funding of the collection and data archiving programme for the national climate and hydrometric databases. This has offset inflation losses over the past ten years of static funding and has been the second year with considerable activity associated with the upgrading of recording stations and instrumentation, and the general lifting of standards, particularly those associated with the maintenance of stage / flow ratings at the less stable flow recording stations.

In 2000 New Zealand started to build a national soil moisture monitoring network. These sites take time to stabilize. The network, including some local government sites, has now reached 60 in total and is increasing, as appreciation of the value of the network is gained.

The year has also seen the completion of a number of trials with various data loggers combined with radio/cellular-phone/satellite communications options as part of NIWA's nation-wide telemetry upgrade project. This project replaces an ageing Aquitel (1980's) telemetry system and the upgrading of about 180 hydrometric stations has commenced. In addition the automation / telemetry of a number of key climate stations has, and is being implemented. These and other initiatives have enabled a significant increase in the numbers of telemetering climate and

hydrometric stations, and this has enabled the provision of expanded near real time data services, while the ease of data input has facilitated the publication of regular bulletins such as “The Climate Update” and “Water Resources Update”.

From operational and health and safety points of view satellite phones have been introduced as standard equipment with NIWA field teams and are now being carried by staff on field campaigns into remote areas. Extremely positive feed-back has been received from most teams on the assurance and comfort of having these phones available when working solo and remotely. Apart from the health and safety considerations, the phones have proved extremely useful for logistical purposes where no other forms of communication are available.

1.1.3 Decisions regarding contribution to/participation in IHP-V

Some components of the New Zealand hydrological research programme are aligned with IHP-VI themes in eco-hydrology and sustainable water management. It should be noted that the bulk of hydrological research in New Zealand is funded through the Foundation for Research Science and Technology (FRST), whose mandate is to fund research that is in the national interest. All proposals submitted to the Foundation must therefore demonstrate that results will address national needs, and alignment with IHP themes is possible only to the extent that these themes are relevant to resource management requirements in New Zealand.

1.2 Activities at national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

Scientific and technical meetings are generally held within the context of professional societies (particularly the New Zealand Hydrological Society) and resource management affairs (e.g. workshops organized by the Ministry for the Environment under the aegis of its National Agenda for Sustainable Water Management).

The Secretary and Chairman of the IHP National Committee have met regularly to discuss IHP matters.

1.2.2 Participation in IHP Steering Committees Working Groups

The Chairman is a member of New Zealand’s UNESCO Science Sub-Commission where he is able to promote hydrological matters at a national level.

Dr Ibbitt and Mr Curry attended the 13th RSC meeting held in Bali, Indonesia and attended the 11th Technical Sub-Committee meeting associated with the 13th RSC meeting.

1.2.3 Research/applied projects supported or sponsored

None

1.2.4 Collaboration with other national and international organizations and/or programmes

- The Chairman and Secretary of the National Committee are in frequent contact with the Regional Hydrological Advisor to the President of the WMO Regional Association V, and with the Hydrological Adviser to New Zealand’s Permanent Representative to the WMO. This contact enables coordination of activities under the aegis of IHP and the WMO OHP in New Zealand. Frequent contact is also maintained with SOPAC’s Suva based Water & Sanitation Unit, through its role of representing the SW Pacific Island states on water related issues.

- SHMAK Validation in Fiji
  Validation of the NIWA NZAID project "Development of a **S**tream **H**ealth **M**onitoring **A**ssessment **K**it; Education leading to action" for Pacific Islands, (PAC-SHMAK), is well underway. This project commenced in 2004 with NIWA developing its New Zealand SHMAK for use by schools and community groups in Fiji, and collaboration with the Fiji based NGO "Live & Learn" is being undertaken in conjunction with the Fijian Institute of Technology, where six students have been taught the necessary skills to collect biological samples and measure habitat parameters from a variety of streams throughout Fiji. An identification guide is currently being prepared to allow people to identify the different types of animals that they collect from streams. This guide will be illustrated with a combination of both line drawings, and photographs of the various animals.

  Freshwater invertebrates are widely used in many countries to indicate stream health. This is commonly done by calculating various biotic indices based on tolerance scores calculated for individual animals. Low tolerance scores are assigned to animals tolerant of degraded conditions, while high tolerance scores are assigned to animals found in pristine streams. NIWA has successfully developed tolerance scores for the freshwater animals collected during this survey, and had subsequently created a Fijian Biotic Index (FBI) that can be used to calculate the biological health of streams, based on their invertebrate communities. NIWA has also examined the relationship between invertebrate communities and the physical condition of streams. This work has allowed the development of a Habitat Condition Index (HCI) score that can be used to assess the habitat condition of a particular stream. A strong relationship exists between the FBI and HCI, highlighting the fact that streams with degraded habitats support poorer invertebrate communities than streams with good habitats. Both the FBI and the HCI will be central to the SHMAK kit. Work is currently underway producing a manual that teaches people how to assess both biological health and habitat quality of Fijian streams. This will be presented to potential end-users upon completion.

  The final outcome will be a mixture of scientific reports summarizing the state of Fijian freshwaters and the pressures they are facing, as well as the development of a kit to measure stream health. The major end user of the kit is expected to be the NGO "Live and Learn", who have a River Care program operating throughout Fiji, and other South Pacific countries. This will enable villagers to monitor the effects of land use activities and seek to develop ways to mitigate any adverse effects of unsustainable industrial and land use practices. Once application of the kit has been validated for Fiji streams, the technique is considered to be relatively easily applied in other South-west Pacific Island countries with minimal validation testing.

- The Chairman attended the Western Pacific Geophysics meeting where he made a presentation on uncertainties in flood forecasting, and, on behalf of a colleague, a presentation on the flow uncertainties arising from structural differences between rainfall-runoff models.

- In August the National Institute of Water and Atmospheric Research (NIWA) was pleased to host a three day visit from the Malaysian Drainage and Irrigation Department (JPS). JPS are looking into improving data collection for multiple purposes, including flood forecasting, and are investigating innovative techniques for flood forecasting in medium sized tropical catchments.

1.2.5 Other initiatives

HELP – Motueka catchment

Work on the Hydrology for the Environment, Life and Policy (HELP) basin at Motueka continues. This basin was New Zealand's contribution to Volume 5 of the Catalogue of Rivers. Details of the Motueka HELP project are available at http://icm.landcareresearch.co.nz/. Each year the group

which is responsible for running the HELP basin project organise a stakeholder meeting. This years meeting was expanded to include participants from the Pacific Island Countries – see section 1.5.1 of this report for more information.

Diatom invasion - *Didymosphenia geminata*

Concern by the Ministry of Agriculture and Forestry (MAF), Department of Conservation, Environment Southland and Fish & Game continues to grow over the invasion of the Waiau & Mararoa Rivers in Southland by the northern hemisphere, diatom *Didymosphenia geminata* which forms massive slimes over riverbeds. It appears to have been introduced by tourist fisherman and MAF has now declared the alga to be an 'unwanted species' in New Zealand because of the way it will severely compromise the quality and pristine status of our key trout fishing rivers. MAF is in the process of implementing a wide-scale containment strategy and NIWA staff are playing a very active role in this process. Actions include preparing fact sheets, helping MAF and Environment Southland staff with information on the alga's biology, and designing future work to assess rates of dispersal, potential risks, habitat requirements, and border control / disinfection measures.

Trials to test biocides that might be used to control didymo have advanced with the completion of a month-long bioassay at the specially constructed didymo research facility at the Monowai Power station. Of the four compounds tested, three showed potential as useful control agents. However, at the concentrations used, only one compound (Organic Inteceptor) resulted in 100% kill of didymo. An unfortunate side-effect was that it also killed all the non-target test organisms. Various options for other compounds and application rates are now being assessed.

As an example of its invasive nature a recent high flow gauging on the Mararoa River was interrupted several times in order to clear didymo growth from the propeller type current meter. Didymo presence is becoming a serious impediment to successfully undertaking current meter gaugings.

Figure 1
Shows didymo mat around spindle of Gurley type current meter and hanger bar following an attempted river flow gauging of the Mararoa River.

Figure 2.
A long period of low flows in the Mararoa saw a rapid increase in didymo infestation to the extent shown

This particular meter was found to have a degraded spin test, apparently due to abrasion of the pivot and cup bearing by either the mass of the Didymo skeleton (which is really small, around 0.1 mm and consists of silica-based material) or the sand/silt that builds up in the Didymo mat.

EcoConnect

Eco-Connect is a system aimed at making accurate weather forecasts for environmental forecasting. It uses a meso-scale weather model (NZLAM) run on a super-computer to downscale global weather forecasts with assimilation of satellite data. Forty-eight hour forecasts are produced on a 12 km grid covering New Zealand. The system became operational on the 1st of July 2006 and output from it was almost immediately used to help with flood forecasting in the lower North Island of New Zealand.

1.3 Educational and training courses

1.3.1 Contribution to IHP courses

None.

1.3.2 Organisation of specific courses

Courses and workshops are generally organized in New Zealand to meet national needs. Because of the country's relative remoteness and distinctive resource management requirements, courses are not always suitable for participation by people from overseas.

Workshop on Water Availability

The New Zealand Hydrological Society, in conjunction with the Local Authority Monitoring Environment Group (LAEMG), hosted a Workshop on Water Availability in Hamilton on 3 May 2006 to promote the interchange of ideas and techniques associated with the use of the latest technology to assess water resources - quantity, quality and variability. Thirteen papers were presented and attendance was by representatives of most water resource monitoring agencies in New Zealand.

NIWA Courses

Courses were provided by NIWA for regional council and NIWA staff on:

- General environmental data logging
- General Hydrology and Data Collection Operations
- Flosys real time telemetry operations
- Hydrological statistics
- Managing extreme weather and flooding
- Electric Fishing Machine Operator
- Targeted Riparian Management
- Introduction to Freshwater Pests (Biosecurity)
- Introduction to Stream Invertebrates
- Taxonomy and Monitoring of Estuarine Invertebrates
- Identification of Algae in Rivers and Lakes

In addition NIWA sponsored Kevin Oberg from the US Geological Survey (next item)

Cook Islands – hydrometric training

Wilson Rani, from the Ministry of Works, Rarotonga, completed the NIWA General Hydrology and Data collection course held in Christchurch from 31 October to 4 November. Wilson also spent a week attached to the NIWA Greymouth branch, and a further two weeks attached to the NIWA Christchurch field team, for practical applications on field hydrology and data processing.

NIWA / USGS – ADCP Course

Most NIWA branch/field team staff attended four-day courses in Rotorua and Christchurch during March. These courses were run by by USGS expert in acoustic flow, Kevin Oberg (Hydrologist and head of ADCP training and development). The course covered a mixture of theory, data collection procedures, and data review to identify common problems plus other information that can be gained from the data. (Examples of this include salt-water wedges, turbulence, suspended sediment, bi-directional flow, etc). There was a lot of very positive feed-back from those attending, and several ADCP items have since been been purchased, thus increasing the number of ADCP units in use. Although the technology is still advancing, the USGS have ADCPs in virtually all offices and some 60% of their gaugings are done by acoustic methods.

Pacific Islands Hydrological Training Programme

As a contribution to the implementation of the Regional Action Plan on Sustainable Water Management and the associated Type II Partnership Initiative, NZAID funded a three year Hydrological Training Course developed for hydrological technicians from the Pacific region. The third and final course, comprising 3 weeks on a combination of surface and ground water was held at the SOPAC Secretariat in Suva, Fiji, from 12-30 June. All three courses comprised surface water training provided by experienced field hydrologists from the NIWA (John Fenwick, Pete Mason & Martin Robertson) whilst the groundwater component in the second and third courses was provided by Tony Falkland (Ecowise - Australia) & David Scott (Environment Canterbury). In addition to the surface water trainees from the Cook Islands, Fiji, Federated States of Micronesia, Papua New Guinea, Samoa, Solomon Islands and Vanuatu, groundwater trainees at the 2nd and 3rd course were from Kiribati, Marshall Islands, Palau, Nauru, Niue, Guam, Tonga and Tuvalu. NZAID also funded the TIDEDA hydrological archiving software, together with some limited on-site support for member countries.

Solomon Islands training attachment – watershed modelling (UNESCO)

A request has been received from Isaac Lekelalu (Deputy Director of the Water Resources Division of the Solomon Islands Department of Mines, Geology and Water Resources) for an up to six-month training attachment to be funded by UNESCO under its Fellowship Program 2006-07; Priority Program Areas, one of which is water and associated ecosystems. The proposed training attachment is to focus on catchment modelling of ground and surface water.

1.3.3 Participation in IHP courses

See 1.3.1.

1.4 Publications

Contributions to IHP publications have been principally through the Regional Steering Committee and the Asia-Pacific FRIEND. Other publications related to IHP activities include:

- Mean Annual Low Flow Model
  New Zealand now has a draft national model for estimating 7-day mean annual low flows. The model is currently being evaluated by the regional councils of New Zealand. The work leading to the model was presented to the International Training Course on Hydrological Droughts and Low Flows, see section 1.3.3, and will be written up this year.

- The “Climate Update” monthly bulletin
  The National Climate Centre (NCC) has published a further 12 issues (76 to 87) of the monthly circular entitled “The Climate Update”. (http://www.niwa.co.nz/ncc/cu/archive) This publication summarises each month of New Zealand’s climate, including soil moisture and river flows. It also predicts the following months climate, soil moisture and river flows, and states how good was the previous months forecast. Prediction of river flows is now being used by Greater Wellington Water as input to its water supply planning for summer low flow periods.

- The "Island Climate Update" monthly bulletin
  The National Climate Centre (NCC) has published a further 12 issues (61 to 72) of the monthly circular entitled "The Island Climate Update" (ICU). This NZAID, funded bulletin provides an overview of the present climate in tropical South Pacific Islands and a forward outlook, which continues to be published, and circulated widely throughout the South Pacific. (http://www.niwa.co.nz/ncc/icu/archive).

  The ICU, produced by NIWA's NCC in collaboration with SOPAC, is a multi-national project with important contributions from the meteorological services from countries around the region. The bulletin provides El Nino/Southern Oscillation and seasonal rainfall forecasts, discusses climate developments each month and provides a tropical rainfall and cyclone outlook for the next three months. It also includes an editorial on some topical aspect of interest to end-users.

  Support has been obtained from NZAID via SOPAC to extend this activity through 2006 and to focus on climate effects on end users and a more collaborative and consultative approach with the recipient countries.

- "Water Resources Update" bulletin
  The National Centre for Water Resources (NCWR) has published a further 5 issues (14 to 18) of the bulletin entitled "Water Resources Update" (http://www.niwa.co.nz/ncwr/wru/archive) This publication summarises seasonal groundwater, river flows, water clarity, water temperature and slime (periphyton) and focuses on a number of topical issues confronting New Zealand scientists.

- EDENZ real-time water resources information
  NIWA has developed a real time environmental data site called EDENZ (**E**nvironmental **D**ata **E**xplorer **N**ew **Z**ealand) which is available to the public on the web (http://www.edenz.niwa.co.nz) .

  EDENZ provides visitors with near real-time access to Foundation for Research, Science & Technology (FRST) Public Good Science and Technology (PGS&T) funded data that are collected from the NIWA nationwide network of monitoring stations, installed as a component of the Nationally Significant Database programme.

  Data on this site are automatically transferred using a national telemetry network and are un-audited. The goal of this programme is to provide comprehensive and accessible data as a basis for improved knowledge on New Zealand's climate and freshwater resources.

  The programme collects, stores, and disseminates data from national monitoring networks, and comprises two core nationally significant databases - the Climate Database and the Water Resources Archive. The data include air temperature, barometric pressure, wind direction, rainfall, lake and river water levels, river flows and sediment loads, and river water quality variables.

  A key aspect of the archiving programme is application of stringent quality control procedures ensuring national consistency and providing assurance that data can be confidently used for scientific and planning purposes.

1.5 Participation in international scientific meetings

1.5.1 Meetings hosted by the country

NZ Hydrological Society Annual Symposium
The annual conference of the New Zealand Hydrological Society, was held from the 28 November to 2 December 2005 in Auckland, New Zealand with the theme "Where Waters Meet". The

Symposium was run in conjunction with the International Association of Hydrogeologists (IAH), Australian Chapter and the New Zealand Society of Soil Scientists (NZSSS)

UNESCO – Pacific HELP Initiative
The UNESCO funded Pacific Islands HELP workshop was held in conjunction with the Integrated Catchment Management (ICM) Symposium in Nelson from 7-11 November 2005.

The Symposium was an opportunity for Pacific Island experts in water resources, watershed or catchment management, to meet and exchange experiences from their particular contexts. Importantly, the Symposium examined the global HELP programme from a Pacific perspective, and developed a set of recommendations as to how the Pacific can best benefit from, and contribute towards, the HELP catchment area network, taking into consideration the very specific conditions existing in the Pacific region. These recommendations will form the basis upon which UNESCO will support integrated catchment management in the Pacific through the HELP and IHP programmes in the coming years. (NIWA has had involvement with the Vanuatu Government in the setting up and operation of the only HELP basin in the tropical Pacific Islands – on Maewo Island).

Pacific Island participants from Cook Islands, Fiji, Samoa, Vanuatu, Solomon Islands, Papua New Guinea, and Federated States of Micronesia, attended the workshop and NIWA staff facilitated and presented aspects of its involvement and experiences in ICM matters, and hydrometric services in the Pacific. All countries formulated plans on how best they could gain from involvement in the HELP programme.

1.5.2 Participation in meetings abroad

New Zealand was represented at the 13th RSC meeting and scientific conference held in Bali, Indonesia, 24-25 November 2005 by Dr Ibbitt and Mr Curry.

1.6 Other activities at regional level

1.6.1 Institutional relations/co-operation

There is considerable contact between New Zealand and other UNESCO Member Countries in the Asia-Pacific region, principally through overseas development assistance and consulting. For example, the Tideda hydrological database management system has been or is being installed in various agencies in Australia, Cambodia, Indonesia, Malaysia, Vietnam, Cook Islands, Fiji, Samoa, Solomon Islands, Papua New Guinea, Vietnam and Vanuatu. Many such contacts have been enabled via the IHP, even though subsequent work has been in the context of bi-lateral assistance.

New Zealand Government Assistance In Development (NZAID) recognises the importance of effective water management in efforts to achieve sustainable development in the Pacific and look forward to continuing their engagement in the Pacific Type II Partnership Initiative on Sustainable Water Management.

Pacific Island Mentoring and Technical Assistance
NIWA staff were involved in liaising with, and mentoring, of staff of the various water resources agencies in the various Pacific Island nations throughout the year. This involved technical assistance with hardware and software systems and general advice on the installation and operation of hydrometric stations. A proposal is currently being considered by SOPAC / NZAID for the funding of this essential activity.

Negara Brunei Darussalam – hydrometric network development
Several missions were provided by NIWA under contract to the Government of Brunei JKR (Department of Public Works) involving the delivery of hydrometric hardware and software and associated training for the installation and commissioning of a network of 27 hydrometric recording

stations. This included training of JKR staff in the various river gauging techniques using state-of-the-art acoustic doppler current profiler flow gauging equipment supplied under the contract. A further three and a half week mission was undertaken to commission audits and train staff at JKR, Department of Public Works in Bandar Seri Begawan. Operational Procedure manuals for the Hydrology section of JKR were also compiled and supplied.

Peoples Republic of Laos – Hydrometric Services
NIWA provided back-up support to an Australian consultant working for the Nam Theun 2 Power Company on the supervision and analysis of hydrometeorological data collected by the Department of Meteorolgy and Hydrology (DMH).

Singapore – Public Utilities Board
NIWA provided hydrometric database and telemetry systems software (TIDEDA & Flosys) together with customised manuals under contract to the Singapore Public Utilities Board

Solomon Islands – UNESCO PP Grant
Advice and assistance was given to the the Solomon Islands Water Resources Division (WRD) in the procurement of hydrological logging, computing and stream gauging equipment and calibration and servicing of existing stream gauging instruments as part of a US$15k Participatory Grant from UNESCO – Paris.

Lao PDR/Cambodia – UNESCO PP Grant applications
The Chairman assisted Lao and Cambodian hydro-meteorological agencies to prepare PP Grant applications to upgrade their hydrological data processing facilities.

1.6.2 Completed and ongoing scientific projects

None

2. FUTURE ACTIVITIES

2.1 Activities foreseen until December 2006

NZ Hydrological Society Annual Symposium
The annual conference of the New Zealand Hydrological Society, will be held in Christchurch, New Zealand from the 20-23 November 2006. The theme for this years conference is “Resource management under stormy skies: water allocation at the cross roads”. The themes for the conference are:

- The use of science within the Resource Management Act
- Innovative water management
- Future land use options
- Integration of science, management and community
- Future climates: science and management
- Air and water quality
- Resource measurement: issues, challenges and new ways forward
- Preventing and mitigating natural disasters

It is a joint conference run by the New Zealand Hydrological Society, the New Zealand Association of Resource Management and the Meteorological Society of New Zealand,, bringing together hydrologists, meteorologists and resource managers to present scientific research and debate issues around water management.

14th Regional Steering Committee Meeting
Attendance at the 14th RSC meeting in Bangkok from 19-20 October 2006 and associated technical meeting.

Lao PDR visit

Prior to the 14th RSC meeting the Chairman will visit Lao PDR to make presentations to the Mekong River Commission and the Department of Meteorology and Hydrology, and discuss problems of common interest.

2.2 Activities planned for 2007

Scientific activities planned at the national level are, as explained in Section 1.1.3, within the context of the research programme funded by the Foundation for Research Science and Technology (FRST). A significant proportion of this activity will be in areas that are included within the IHP, but is not explicitly implemented as a component of the IHP.

Future activities are expected to depend very much on decisions reached by the Regional Steering Committee, and we are committed to participate in its deliberations, with the intention of being involved in future scientific work at the regional level.

NIWA Courses

Further training courses for regional council and NIWA staff will be provided as follows:

- Hydrological data collection
- General environmental data logging
- Hydrological statistics

These courses are also open to overseas participants.

Snow and Ice Monitoring Network

A new project, funded from NIWA's Strategic Capex, has been initiated this year for the establishment of a snow and ice monitoring network to measure snow depth and mass, glacier thickness and meltwater outflow, and high-elevation climate data.

Snow and ice are New Zealand water resources that are likely to be subject to significant change over the next 20-100 years, depending on the pace of global climate change. Such changes will have significant impacts on the hydro-electricity, agriculture and tourism/skiing industries. The changes are likely to be increased rainfall and temperature, leading to possibly less snow and more rain, more river flow and less snow cover in winter, and possibly less river flow in spring. These projected changes in the amount and seasonal pattern of river flows have not been quantified in detail, and remain research questions. Such changes would be desirable for electricity generation (assuming current demand patterns are unchanged), but undesirable for irrigators and tourism/skifield operators.

New Zealand does not have a seasonal snow monitoring network at all. The lack of such a network has been obvious over the last 6 months, when spring and summer rainfall has been low over the hydropower catchments, but there was not enough information to determine how much winter snow was left to help buffer against the low rainfall. Some information is available through end-of-summer snowline surveys, however, there is no national network for on-the-ground monitoring of glacier thickness and extent.

Hydrological support programme proposal for the Pacific

During the 1st course of the Pacific Islands Hydrological Training Programme held in Suva in April/May 2004, it was identified that major constraints to effective operation for most countries were skills shortages, failure of equipment, inadequate resources for repair and servicing of instruments, and the lack of funds for software purchase and maintenance. These constraints were further evident during the 2nd and 3rd courses which were held in Suva during April / May 2005 and June 2006. It is obvious that many of these constraints have a massive negative effect on the availability of information on water in Pacific Island countries – but that they are individually minor issues that could be resolved by some carefully targeted, practical training and "collegial" support.

A project whereby NIWA provides hydrological database software maintenance, instrument and equipment repairs and maintenance, database management support, an in-country technical colleague mentoring and a year-round technical support service has been proposed jointly with SOPAC and in collaboration with the National Hydrological Services (NHS's) in the Pacific. NZAID have indicated its support for such a programme which will provide continuity of assistance to NHS's and compliment parallel bilateral water resources based aid projects. Plans are to commence this support programme if and when approved.

2.3 Activities envisaged in the long term

Continuation of the:

- NZAID funded Pacific Hydrological Training Programme as required;
- NZAID funded monthly "Island Climate Update" publication with stronger links to end users.
- Monthly NZ "Climate Update" publication.
- Periodic "Water Resources Update" publication.

Commencement of the formal Pacific-wide hydrological support programme (if approved), as outlined in Section 2.2 above.

14th IHP REGIONAL STEERING COMMITTEE MEEETING FOR SOUTH EAST ASIA AND THE PACIFIC BANGKOK, THAILAND (19 – 20 October 2006)

REPORT OF THE PACIFIC ISLAND COUNTRIES

by

Ben Parakoti
Director, Water Works
Cook Islands

INTRODUCTION

The Pacific Island Countries (PIC) Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, and Vanuatu are members of UNESCO.

The 11th meeting of the IHP Regional Steering Committee for Southeast Asia and the Pacific (RSC) convened in Fiji 2003 enabled the participation of representatives from many Pacific Island Countries (PICs) and resulted in the admission of the PICs as new members to the RSC.

It also marked the culmination of several years of dialogue and cooperation between SOPAC, UNESCO and WMO on hydrology and water resources activities and provided an opportunity to further advance regional cooperation within the Pacific and establish linkages to partners in the Southeast Asia region. Since the 11th RSC, Pacific Island Countries have regularly participated in IHP Regional Steering Committee meetings on a rotational basis. The Pacific is represented by the Cook Islands at the 14th RSC to be held in Bangkok, Thailand 16-20 October 2006.

1. ACTIVITIES UNDERTAKEN IN THE PERIOD OCTOBER 2005 – OCTOBER 2006

Meetings of the IHP National Committees

1.1.1 Decisions regarding the composition of the IHP National Committee

During RSC11 it was generally agreed that there was value in continued collaboration between water resources managers and hydrological scientists from the Pacific and Southeast Asia, and this could be facilitated by the creation of an IHP focal point in each Pacific Island Country through the National Hydrological Service.

The proposal to represent the region in future RSC's and associated conferences on a rotational basis was accepted. Requirements for the chosen country delegate are presentation of the region's activities relevant to the RSC and presentation of a scientific paper at the associated conference.

The order of representing countries was discussed and by ballot the countries will be approached for attendance in the following order: Niue; FSM; **Cook Islands**; Kiribati; Fiji; Vanuatu; Solomon Islands; Nauru; Tonga; Marshall Islands; Samoa; Tuvalu; Palau. The countries that were in attendance at the 11th RSC meeting got the privilege to start the sequence. When more than one country can be invited, the list will automatically drop down to the next country.

Letters were sent in April 2004 from SOPAC and UNESCO Apia Office to seek nominations of IHP focal points and a deputy and to date confirmations from 10 countries have been received.

It was proposed that future involvement and correspondence regarding Pacific contributions to the International Hydrological Programme (IHP) of UNESCO and the Hydrology and Water Resources Programme of SOPAC be dealt through the IHP focal point. In order to keep the three organizations informed, all relevant correspondence from the two organizations will be copied to each respective National Representative.

The harmonization of SOPAC's, UNESCO's and WMO's programmes on hydrology and water resources will greatly benefit the efficiency and effectiveness of delivery into the PICs. This has been demonstrated by the collaboration on the WMO/UNESCO/SOPAC Hydrology Training Programme, a three-year training programme completed this year through support provided by NZAID.

Actions that will be supported under this partnership include studies on floods and droughts in the region, a programme that involves communities in catchment management and monitoring, Hydrology for the Environment, Life and Policy (HELP) and activities under the Hydrological Cycle Observing System (HYCOS) programme.

We are grateful that the IHP RSC and UNESCO gave recognition to the Pacific region by allowing representation of Pacific Island Countries in future RSC meetings and activities.

1.1.2 Status of IHP-VI activities

Based on earlier UNESCO and SOPAC meetings held in 1994 and 1997 water resources projects to be carried out under the International Hydrological Programme were identified and included: projects on catchments and communities; groundwater recharge; groundwater pollution by sanitation.

An additional ENSO workshop in September 1999 had identified drought assessment in the Pacific as an additional priority. Funding from UNESCO in 2002 enabled the start of the Catchment and Communities project in Vanuatu executed by the Directorate of Geology, Mines and Water Resources (DGMWR) in collaboration with NIWA (New Zealand) and SOPAC. One of the catchments in Vanuatu has now been adopted as an "evolving HELP basin" within UNESCO's Hydrology for the Environment Life and Policy project (HELP).

A HELP Symposium organized in New Zealand in 2005 resulted in the drafting of a HELP Framework for Action in the context of the Pacific Regional Action Plan on Sustainable Water Management. Furthermore, groundwater monitoring is being assisted through UNESCO's Participation Programme and Apia Office in Niue and the Cook Islands, and a water resources assessment is being carried out in Micronesia under a joint MAB-IHP initiative.

1.1.3 Decisions regarding contribution to/participation in IHP-VI

1.2 Activities at regional level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

Pacific HELP Symposium held in New Zealand

The Pacific Hydrology for the Environment, Life and Policy (HELP) Symposium (7-11 November 2005, Nelson) marked the first formal HELP event to take place in the Pacific region. The Symposium was hosted jointly by the New Zealand crown research institute Landcare Research, Ltd. and UNESCO Apia Office. It focused on devising ways in which HELP can contribute to strengthening catchment area management practices in the Pacific considering the limited data collection and processing capacity in the region.

The Symposium was attended by a total of 10 representatives of 6 Pacific high volcanic island countries (Papua New Guinea, Solomon Islands, Vanuatu, Cook Islands, Samoa, and Fiji) and Japan, as well as by a broad range of stakeholders and scientists working in and around the Motueka Basin area. Also present were representatives of the South Pacific Applied Geoscience Commission (SOPAC), the Australasian HELP Regional Coordination Unit, NIWA (New Zealand's National Institute for Water and Atmospheric Research), and the UNESCO Regional Bureau for Science in Jakarta.

Part of the Symposium programme was a very comprehensive field trip to the Motueka Demonstration HELP Basin. The field trip involved discussions with a very broad range of stakeholders in Motueka, including forestry and farming communities, as well as several representatives of the local Iwi (Maori indigenous groups). Iwi representatives also attended sessions throughout the week, providing additional perspective to the discussions.

The Pacific participants provided case studies of particular catchment management issues in their respective countries, and as part of the concluding session developed a series of draft national frameworks for action under the heading "HELP in the Context of the Pacific Regional Action Plan on Sustainable Water Management – A Framework for Action".

A proceedings document containing all presentations and discussions at the Symposium will be published by UNESCO Apia Office in cooperation with Landcare Research, Ltd. (New Zealand) this year. Advance copies of this paper are available from UNESCO Apia Office on request.

1.2.2 Participation in IHP Steering Committees Working Groups

The Federated States of Micronesia was scheduled to have represented the PIC representative the RSC13 and associated Symposium and meetings. However, due to unforeseen circumstances, the Micronesian delegate was unable to attend the meeting. The Pacific report was delivered by the representative of the UNESCO Apia Office. The Pacific was furthermore represented by the presence of delegates from Papua New Guinea, New Zealand and Australia.

1.2.3 Research/applied projects supported or sponsored

Niue receives UNESCO Participation Programme Grant for Groundwater Monitoring

Following Niue's attendance at the 12th RSC meeting of the International Hydrological Programme, Niue's Department of Water Works received confirmation of support by UNESCO for a groundwater monitoring programme.

The objectives of the programme are - besides the establishment of a **groundwater resources assessment and monitoring programme** - to obtain a clear understanding of the hydrogeology of Niue, determine possible and potential contamination of the groundwater from land-based activities, adopt effective measures to address the vulnerability of the freshwater supply during

natural disasters such as droughts, assist in securing government approval of Water Resources Regulation that legalizes and enforces the Water Resources Act of 1996, and to develop effective education & awareness programmes for communities in protecting the islands main water source from contamination and include these in school curricula.

The results of the groundwater assessment and monitoring programme will be disseminated to other Pacific Island Countries, specifically to benefit other uplifted limestone islands such as Nauru, Kiribati (Banaba) and Tonga. Potentially, a publication could be developed as contribution to the IHP.

Drilling in Niue commenced in October 2005 accompanied by a geophysical survey, water quality monitoring and the installation of the first borehole loggers. For more information on the groundwater monitoring programme please contact Andre Siohane, Director of Water Works at [waterworks@mail.gov.nu].

Biosphere Reserves for Sustainable Community-driven Management of Natural Resources in Micronesia

In 2005, the Pacific's first two UNESCO Biosphere Reserves - Utwe in the Federated States of Micronesia and Ngaremeduu in Palau - were approved by the Man and the Biosphere Bureau at its meeting in Paris. The Federated States of Micronesia nominated an additional Biosphere Reserve - Ant Atoll - in 2006.

As contribution to UNESCO's MAB-IHP Joint Programme on Biosphere Reserves for Sustainable Community-driven Management of Natural Resources in the Federated States of Micronesia a national freshwater resource management study was proposed.

UNESCO in cooperation with SOPAC and key partners agencies in the four states of FSM, will undertake a national assessment of FSM's freshwater resources and their management. The resulting document will serve as a guideline for future UNESCO-IHP action in FSM and the wider Micronesian sub-region. The study will be closely linked to the emerging Ant Atoll (proposed) and Utwe Biosphere Reserves, which will serve as pilot sites for follow-up action on integrated water resources management. Based on the experiences of the Ant Atoll and Utwe Biosphere Reserve establishment process, the study will furthermore offer comments on the potential of the Biosphere Reserve format for freshwater resource management in the small island context.

Aitutaki Cook Islands groundwater monitoring

Aitutaki, an "almost atoll" island in the Cook Islands, is reliant on groundwater for the bulk of water supplied to the local and sizeable tourist population. Upgrading of the water supply system through a donor funded project 10 years ago also established a Water Monitoring Programme consisting of an extensive salinity, temperature and water level monitoring schedule. However, the Programme proved difficult to maintain as equipment which broke down was not replaced and there was a need for external technical support.

Since the end of 2004 SOPAC, with funding support from UNESCO, and in cooperation with the Department of Water Works in Rarotonga have been working with the Aitutaki Water Supply to build water resources management capacity. The Department of Water Works have developed a GIS database of the water supply infrastructure on Aitutaki through a CIDA funded climate adaptation project and have trained local staff in its use. Local staff have also been involved in the Pacific Hydrological Training Courses facilitated by SOPAC in collaboration with UNESCO and WMO and funded by NZAID. In addition, new monitoring equipment has been purchased and a programme mapped out to continue training and developing capacity not only to collect but to analyze and interpret monitoring data in order to be able to make informed decisions on how to best manage the water resources of Aitutaki. This work is a good example of how members of the Pacific Partnership on Sustainable Water Management (see below) can effectively work together to promote sustainable water management in the Pacific.

World Water Day

"Water and Culture" is the theme for this year's World Water Day supported by UNESCO as the lead UN agency. The theme challenges us to look at the many ways of using, conserving and celebrating water, anchored in different cultural traditions across the Pacific and the world. Water plays a central role in many religions and beliefs. As a source of life, it represents (re)birth and as water cleanses the body, it purifies it. Both these qualities confer a highly symbolic status to water.

SOPAC, UNESCO and Live and Learn Environmental Education (LLEE) organized a number of events as part of an overall Pacific World Water Day campaign under the theme of "Water & Culture" with the overarching motto "Plan for Water, Plan for Life, Water for Life". Awareness materials comprising of posters, photo packs, stickers and water & culture bags were produced and distributed throughout the Pacific region. With support from SOPAC, UNESCO, LLEE and other partners, special World Water Day celebrations, including cultural performances, competitions and other activities under the "Water and Culture" theme were organized in Samoa and Fiji to mark the day.

1.2.4 Collaboration with other national and international organizations and/or programmes

Australia Water Research Facility

A project on Catchment-based risk assessment research is being carried out by the Australia Water Research Facility (AWRF) in the Solomon Islands. It aims to develop a framework determining priorities for water resource management actions in catchments.

Water resource managers face numerous constraints around ownership of the resource, financing, lack of awareness, poor legislative framework and limited technical capability. Managers must choose the most effective actions for greatest benefit with limited information. Recent activities in developing the Water Sector Steering Committee, and the efforts through the Solomon Islands Water Governance Program provide a foundation for an integrated analysis of issues affecting catchment management. The Department of Environmental Health from the Ministry of Health, the Water Resources Division from the Ministry of Natural Resources, and the Solomon Islands Water Authority are currently engaged in this sector wide approach.

In January 2006, an analysis of priorities for the water sector by the SOPAC administered Solomon Islands Water Governance Program identified four key pilot areas for attention: policies; legislative framework; creating and organizational framework; and awareness. At a recent study visit to Samoa for the same program, water shortages in catchments, a lack of data and awareness were raised as key priorities.

For more information on the AWRF, please see www.watercentre.org

Island Climate Update

NZAID agreed to the continue funding of a programme to provide monthly climate information through the **Pacific Island Climate Update** (ICU), and to address basic hydrological training needs of small island countries in the Pacific.

The publication of the ICU continues, and plans are being developed to broaden its scope to include additional information for end users in Pacific islands, such as effects of forecasted climate on the Pacific islands' water resources (rainfall, surface and ground waters).

A wider distribution of the ICU will enhance the application of climate information by climate sensitive sectors such as energy, water supply, agriculture, etc. The ICU will be disseminated to a

wider group of end-users in the Pacific, including national hydrological services, water utility managers and disaster managers**.**

SOPAC and SPREP have reviewed the level of success of the ICU in achieving its objective through a survey questionnaire. Continuation of the programme is foreseen for the next 3 years under a new joint proposal.

For more information, please see: www.niwa.co.nz/ncc

Stream Health Monitoring Kits for Pacific Islands

The Fiji Institute of Technology and NIWA are working together to develop a Stream Health Monitoring Kit (SHMAK) for the Pacific Islands. The kit is to be used by school teachers as well as scientific researchers as a tool in assessing stream health. Mr Suren Alastair of NIWA is at present analyzing the data and deriving MCI values and other criteria to be used as classifications for the Pacific Islands.

For more information, please see: www.niwa.co.nz/ncc

Pacific HYCOS

Pacific Island Countries have noted significant deficiencies in their national and local capacity to carry out essential water resources assessment and monitoring. The lack of information on water quantity and quality prevent small island countries from conducting proper planning, development and sustainable management of their limited and vulnerable water resources. Most small island countries do not have adequate baseline data that is readily available for planning and development and lack reliable hydrological databases.

Pacific HYCOS is a regional initiative to improve the management and protection of Pacific Island Countries' freshwater resources, through the provision of appropriate water resources management systems. The Pacific HYCOS is one of the regional components of the World Hydrological Cycle Observing System (WHYCOS), a World Meteorological Organization (WMO) programme targeting the improvement of basic observation activities, strengthening regional and international cooperation and promoting free exchange of data in the field of hydrology.

The Pacific HYCOS project was developed by WMO in collaboration with the South Pacific Applied Geoscience Commission (SOPAC) and in consultation with countries and territories in response to the hydrological needs of the region. The Project focuses on several core activities to be carried out including flood forecasting, water resources assessment in major rivers, water resources databases, drought forecasting, groundwater and water quality monitoring and assessment.

The 3-year project (2006-2009) with a total cost of 3,524,970 Euro will be implemented by SOPAC with its in-country counterparts at the National Hydrological Services in collaboration with WMO, UNESCO and the Fiji Meteorological Service. The EU Water Facility will fund up to 2,524,970 Euro with further contributions for the project provided through several regional programmes established by SOPAC and its partner organizations, including UNESCO.

Other initiatives

UNESCO's Small Islands Voice

In March 2006, UNESCO's discussion forum **Small Islands Voice** focused on Wastewater and Sanitation issues in small island countries. In response to a Pacific article on wastewater and sanitation problems in the region many messages were being sent. UNESCO has compiled all

the responses and organised them by subject for your future reference.

For more information, please see: www.smallislandsvoice.org

Pacific Dialogue on Water and Climate

The **Pacific Resource Centre on Water and Climate** was established at the SOPAC Secretariat. The Centre, supported by the Asian Development Bank (ADB), will continue to assist in achieving the goal of the Pacific Dialogue on Water and Climate: "to improve the capacity in water resources management to cope with the impacts of increasing variability of the world's climate, by establishing a platform through which policymakers and water resource managers have better access to and make better use of information generated by climatologists and meteorologists".

The Centre established a Pacific Water and Climate Focal Group, promoted implementation of the Pacific Hydrological Cycle Observing System (HYCOS) project, promoted South-South transfer of knowledge through the Caribbean-Pacific Joint Programme for Action on Water and Climate, and disseminated relevant Case Studies on Water & Climate.

For more information, please see:
www.sopac.org/tiki/tiki-index.php?page=Pacific+Resource+Centre+on+Water+and+Climate

and www.waterandclimate.org/home.html

Climate Predictions for Pacific Island Countries

The Australian Bureau of Meteorology (BOM), in collaboration with a number of partners, is implementing an AusAID-funded project entitled "**Enhanced application of seasonal climate predictions in Pacific Island Countries".**

The project aims to develop the seasonal prediction capacity in Pacific Island Countries, similar to the Australian Bureau of Meteorology, so that the National Meteorological Services (NMSs) have the ability to perform seasonal forecasts, or at least have access to forecasts specifically tailored to their region/country.

The project commenced in mid 2003 in the nine participating Pacific Island Countries: Fiji, Cook Islands, Vanuatu, Samoa, Tonga, Niue, Solomon Islands, Kiribati and Tuvalu. It is scheduled to be completed by early 2007.

The project consists of four parts:
Development and installation of PC-based climate prediction software;

1. Training of NMS personnel in the use of the climate prediction software and the establishment of a climate prediction service;
2. Facilitation of linkages between NMS staff and clients making climate sensitive decisions; and
3. Training of clients in the effective and prudent use of prediction information.

As part of the project a number of pilot projects were identified to further develop the capability of NMS staff to provide climatological information, including drought forecasts, to water agencies and other stakeholders. An integral part of the pilot projects for is the enhancement of the climate prediction software package (SCOPIC) to provide information about historical droughts based on a drought index approach and the development of forecasts of hydrological variables such as streamflow or groundwater availability. Pilot project workshops have been held in the Solomon Islands (March 2006) and Vanuatu (July 2006).

For more information, please see: www.bom.gov.au/climate/pi-cpp/index.shtml

Pacific Water Focal Groups

As part of the services of the Partnership Coordination Unit you can now join one or more of the **Pacific Water E-mail Focal Groups**. Everyone working in the Pacific is facing challenges of remoteness, isolation and lack of access to information and human or technical resources.

With the Water E-mail Focal Groups we aim to address these challenges by building an active network of people working in the water sector in the region. By exchanging experiences and offering a forum for asking questions and promoting discussion, it is hoped that some of the issues that water specialists face can be addressed.

Four separate groups have been set up in the areas of Hydrology and Water Resources; Water Engineering; Water Quality; and Wastewater and Sanitation. You can subscribe to any of the groups as follows:

The Hydrology and Water Resources group is co-ordinated by Alena Lawedrau and comprises mainly of hydrological technicians and focal points for UNESCO's International Hydrological Programme. To join, send an e-mail to: PICHydrologicalNetwork-subscribe@yahoogroups.com or alena@sopac.org.

The Water Engineering group is primarily targeted at those working at water utilities and is co-ordinated by Mathias Kleppen. To join send an e-mail to PICWater-subscribe@yahoogroups.com.au or mathias@sopac.org

The Water Quality group has members from both the water supply and health sectors and is co-ordinated by Tasleem Hasan. To join send an e-mail to water_quality-subscribe@yahoogroups.com or tasleem@sopac.org

The Wastewater focal group looks at raising awareness on water, sanitation and hygiene issues and implementation of the Pacific Wastewater Policy and Framework for Action with membership from wastewater operators, specialists as well as NGO's and is coordinated by Kamal Khatri. To join send an e-mail to wastewater_group-subscribe@yahoogroups.com or kamal@sopac.org

1.3 Educational and training courses

Contribution to IHP courses

Please refer to Section 1.2.1

1.3.2 Organization of specific courses

Pacific Hydrological Training Programme

During a WMO Experts Meeting in Nadi, Fiji (October 1999) hydrological training needs were identified as a high priority for small island countries in the Pacific. Thanks to a partnership arrangement between WMO, UNESCO, SOPAC and NIWA with a financial contribution from NZAID, this is now being addressed through the establishment of a Hydrological Training Programme for the Pacific region.

SOPAC's Community Lifelines Programme, in collaboration with UNESCO and WMO, organized the third course of the Hydrological Training Programme for hydrological technicians from the South Pacific region in June 2006.

The 3rd Course of the Hydrology Training Programme, similar to the 2nd course, was split into

two groups: 1) for participants from high volcanic island countries, which are dominated by surface water resources, and 2) for participants from atoll and high limestone island countries, which are dominated by groundwater resources.

The Surface Water course consisted of 3 weeks of training from 12 June to 30 June 2006 at the SOPAC Secretariat's training room in Suva, Fiji with participants in attendance from Cook Islands, Fiji, Palau, Papua New Guinea, Samoa, Solomon Islands and Vanuatu.

The Groundwater course consisted of 2 weeks of training from 19 June to 30 June 2006 with participants in attendance from the above countries as well as Kiribati, Maldives, Niue, Tonga and Tuvalu.

Following participant's recommendations there were several joint sessions for both the Surface water and Groundwater groups in the 2nd and 3rd week of the course and joint field trips were organized to complete a water resources assessment exercise on one of Fiji's outer islands located near Levuka, the old capital of Fiji. A separate course for the North Pacific Island Countries will be organized in October 2006.

For further information regarding the programme please contact Ms. Alena Lawedrau-Moroca at alena@sopac.org.

Introduction to Flood Hydrology, River Modeling and Floodplain Mapping Training

A training course on 'Introduction to Flood Hydrology, River Modeling and Floodplain Mapping' was held in Apia from 13th July – 3rd August, 2006. The facilitating team consisted of the newly established Water Resources Division of the Samoa Government, SOPAC/EU Reducing Vulnerability & HYCOS personnel, and an EU consultant from HR Wallingford in the UK.

A core-group of five staff of the Government of Samoa attended the flood modeling/management training workshop:

- 2 from Hydrology with regards to flood monitoring responsibilities
- 1 from Meteorology with regards to flood prediction/forecasting responsibilities
- 2 from PWD with regards to drainage and infrastructure/flood protection works

The area of interest was the Vaisigano River, the largest fluvial system that drains into Apia. The first two days of the workshop were focused on river hydrology and included a field visit to the headwaters of the Vaisigano. It was also the testing grounds for two trainees that had recently attended the 3rd course of the Pacific Hydrological Training Programme (see above), where they each led a stream-gauging team. Results from the stream gauging exercise were computed at the workshop venue and were part of the data sets used in setting up the HEC/HMS model for the Vaisigano. The second week of the training workshop was solely dedicated to data gleaning and cleaning. Meteorological data sets from the Met office were analyzed along with Hydrological data and infrastructure specifications.

HEC-HMS/RAS modeling software from the US Army Corps of Engineers was used for the training workshop, and the trainees found the software to be very user-friendly. There were lecture sessions and actual modeling (hands-on) of the Vaisigano during the 3rd and final week of the training.

USP establishes Pacific Water Virtual Learning Centre (WVLC)

The University of the South Pacific has signed a Memorandum of Understanding with the United Nations University - International Network on Water, Environment and Health (UNU-INWEH) to formalize the establishment of a Regional Centre of the **UN Water Virtual Learning Centre** (WVLC) in the Pacific. The programme of the WVLC Regional Centre will focus on improving

water resource management and water services of developing countries, and to improve training and education in the water sector. The MOU was signed on 19 May 2005 by the Vice-Chancellor of USP, Professor Anthony Tarr, and the Assistant Director of UNU-INWEH, Dr Colin Mayfield.

The Regional Centre is part of a pilot programme of the UN's project on Capacity Building to Improve Water Management and to Accelerate Sustainable Investments in the Water Sector which is to see the establishment of WVLC's in Africa, Asia and the Pacific, focused on training in Integrated Water Resources Management.

The main objective of WVLC Pacific Regional Centre, which will be located at USP's School of Pure and Applied Sciences (SPAS), is to provide adult training in Integrated Water Resource Management through a core curriculum in distance learning using the Internet, CD-ROM etc. The project aims to assist current managers, scientists and policy makers to improve water resource management practices in Pacific Island Countries. The programme will target professionals in the water sector wishing to upgrade their knowledge of integrated water management. Its long-term goal is to enhance national capacities for the development and implementation if sustainable water strategies at local, regional, sub-regional and basin scales.

The courses designed by UNU-IWEH will assist in meeting USP's long term objectives and visions to introduce courses in water resources and management, aligned with the objectives of the WVLC programmes. The Integrated Water Resources Management curriculum will comprise 10 courses and will run as a pilot project for approximately 10-15 months. The courses include an introduction to IWRM; Water Transfer; The Terrestrial Ecosystem and the Impacts of Land Use Changes; The Aquatic Ecosystem; Aquatic Ecosystem Health and Impact Assessment; Water Use; Wastewater; Governance and Community based approaches; Organizational infrastructure and Management and Applying Integrated Water Resources Management. Students who complete the course successfully will receive a UNU Diploma in Integrated Water Resources Management.

The course will run through the Continuing Education stream of the Distance and Flexible Learning Support Centre (DFLSC) which provides a range of educational opportunities no matter where a student is located using USP's advanced satellite communications Network, USPNet, audio conferencing tutorials via USPNet, and access to online learning through email. Apart from coordinating the programme, USP will also provide academic expertise in the areas of Environmental Science, Aquatic Ecology, Earth Science, Land Management, Hydrology, Geography, Chemistry, Sociology, Law, Public Administration and Management.

GPA and UNESCO-IHE develop Pacific Wastewater Training Course

A **training course for wastewater management** has been jointly developed by UNEP's Global Programme for Action for the Protection of the Marine Environment from Land-based Sources of Pollution (GPA/UNEP) with the UNESCO-IHE Institute for Water Education.

The wastewater training course is addressing one of the Guiding Principles of the Pacific Wastewater Policy and Framework for Action and will be implemented in the Pacific region in 2005-2006 by a consortium of SOPAC, USP-IAS, IOI, in collaboration with SPREP, UNESCO-IHE, GPA/UNEP and UN/DOALOS.

Using UN/DOALOS Train-Sea-Coast standards as well as the GPA Strategic Action Plan on Municipal Wastewater and the UNEP/WHO/UN-HABITAT/WSSCC Guidelines on Municipal Wastewater Management, the training will provide participants with analytical tools, substantive information and skills on how to select, plan and finance appropriate and environmentally sound municipal wastewater management systems.

The training is divided into 3 modules:

Module 1: Objective oriented planning
Module 2: Conventional and innovative approaches to municipal wastewater management
Module 3: Presentation skills

A training needs assessment for the Wastewater Training Program has been completed, demonstrating that there are not many opportunities for training in wastewater management in the Pacific region. Respondents in the field of water/wastewater management indicated that the training would be beneficial to them. The programme is designed to build capacity within the water/wastewater sector and will be focused at manager or senior supervisor level. Participants should ideally come from a wastewater utility or equivalent responsible government department.

The first training was organized in Suva, Fiji Islands in 2005, with consecutive courses organized in Guam and in Port Moresby, PNG June 2006. The outcome was increased capacity among participants to identify and formulate feasible projects to improve wastewater management that are cost-effective and can be financed, operated and maintained in practice.

Postgraduate Diploma in Integrated Water Resources Management (IWRM)

Applications were invited for persons wishing to enroll for study towards a **Postgraduate Diploma** in **Integrated Water Resources Management** (IWRM). The course will be offered by the University of the South Pacific (USP) in Distance and Flexible Mode as a pilot project on behalf of the United Nations University (UNU). The course will run on a part-time basis for approximately 18 months, coordinated through the UN Water Virtual Learning Centre (WVLC), newly established at USP (see above). Ten fully funded scholarships or study positions were available for suitably qualified postgraduate students from the 12 member countries of the USP region and the selection of students has been completed. Upon successful completion of the course, participants will receive a Diploma from UNU. The course is expected to start in late 2006 and UNESCO, FSPI and SOPAC are on the advisory committee of the programme.

1.3.3 Participation in IHP courses

None

1.4 Publications

HELP in the Context of the Pacific Regional Action Plan on Sustainable Water Management - a Framework for Action.

A proceedings document containing all presentations and discussions from the November 2005 Pacific HELP Symposium (see above) entitled “HELP in the Context of the Pacific Regional Action Plan on Sustainable Water Management – A Framework for Action” will be published by UNESCO Apia Office in cooperation with Landcare Research, Ltd. (New Zealand) this year.

The UNESCO/SOPAC research projects on groundwater recharge and pollution that were carried out in Kiribati and Tonga resulted in several IHP publications that have been distributed throughout the region.

Hydrology and Water Resources of Small Islands: A practical guide (reprinting) - UNESCO IHP Studies and Reports in Hydrology 49, Editor: A. Falkland

In most small islands water development projects often do not achieve their goals. This is often because the technologies, design and materials are not suitable for either the environment or the

cultural habits of the population, or because the operation and maintenance cost were excessive. The situation is aggravated by lack of qualified personnel. Combined with geological and other physical complexities and exposure to natural disasters, hydrological and water resources problems must be carefully considered.

This guide has been prepared to assist technicians, hydrologists, engineers and managers in the identification, assessment, development, management and protection of water resources of islands. It is intended to be a guide to the selection of methods and practices appropriate to the special conditions of small islands.

Copies of this publication can be requested from SOPAC at alena@sopac.org or UNESCO Apia Office at hans@unesco.org.ws

1.5 Participation in international scientific meetings

Meetings hosted by the Pacific Island Countries

Science, Technology and Resources Network (STAR) Meeting, 2006

The Science, Technology and Resources Network (STAR) associated with SOPAC's Annual Session provides a platform for scientists, experts and practitioners to exchange information and present findings from scientific research of relevance to the themes chosen for the STAR Meetings.

At this year's STAR Session held in September 2006 in Honiara, Solomon Islands, scientists, experts and scholars convened for two days of presentations and dialogue. They also exchanged information and provided recommendations to SOPAC's Council relevant to the different working programmes for SOPAC, including its Water Sector programme.

The STAR session included presentations relevant to IHP on: Niue's Groundwater Monitoring Programme supported by UNESCO and SOPAC, Cook Islands Catchment Management supported by GEF IWP and SPREP as well as various presentations on regional collaborative programmes.

Following the 2nd Pacific Partnership on Sustainable Water Management Steering Committee Meeting, recommendations from the STAR Water Working Group to SOPAC Council were formulated as follows:

Recommendations

The STAR WWG recommends unanimously that Council:

1. Advocate specific inclusion of water and sanitation in the Pacific Plan as a key strategic sector and specify that the Pacific Plan be consistent with the Pacific Regional Action Plan on Sustainable Water Management.
2. Encourage all member states to promote the importance of integrated water and sanitation management in their national development strategies and plans and to increase investments at the local and national level in addressing the Millennium Development Goals for water and sanitation.
3. Recommend that SOPAC seek a mechanism to sustain the Coordination Unit for the Pacific Partnership Initiative on Sustainable Water Management.
4. Recommend that SOPAC develop an initiative for monitoring regional progress on meeting the Millennium Development Goals for water and sanitation.
5. Recommend that SOPAC continue to provide assistance to Pacific SIC to improve Water Governance.

6. Recommend that SOPAC ensures that continued assistance be provided to Pacific SIC on water resource assessment, monitoring, analysis, prediction and water demand management.

UNESCO HELP Symposium – please see 1.2.1 above

6th Session of the Working Group on Hydrology for WMO Regional Association V

The sixth session of the working group on Hydrology for the WMO Regional Association for the South-West Pacific (RA V) was held from **17 - 21 October 2005 in Nadi, Fiji Islands.**

The main purpose of this meeting was to review the various activities related to the regional programme in hydrology and water resources in the South-West Pacific based on the terms of reference of the Working Group and to review the follow-up to the implementation of the recommendation of the previous session.

Three days of the session were devoted for discussions on the various activities related to the regional programme in hydrology and water resources in region and detailed discussions on Pacific-HYCOS with SOPAC experts. The last two days were devoted to a training workshop on IWRM (Integrated Water Resources Management), Groundwater, Water and Climate (Drought Management) and Economic value of Hydrological products.

The Pacific HYCOS Project proposal developed by WMO in 2001 has received support from the WMO Tropical Cyclone Committee, Pacific Region Global Climate Observing System, Pacific Island Country National Hydrological Services, SOPAC and received a high recommendation as one of the priority Actions identified by the regional consultation meeting. The ACP European Union Water facility (EU WF) is providing support for HYCOS implementation in the Pacific.

The new chair of the WMO Working Group on Hydrology (Wg Hy) for Regional Association V (RA-V) was elected during WMO's RA-V meeting in Adelaide. Mr Charles Pearson at NIWA will take up this post for the next four years. In this capacity he has been preparing a workshop on Flood Forecasting to be held in Brisbane in April 2007 as first activity in collaboration with WMO, BOM and SOPAC. The meeting will be used to officially launch the Pacific HYCOS project to be implemented in 14 Pacific Island Countries under the EU-ACP Water Facility. Additional activities for RA-V will be discussed as part of the programme, including the development of a HYCOS programme for the South East Asian countries of RA-V.

For more information, please see: www.wmo.ch

Participation in meetings abroad

WHYCOS International Advisory Group (WIAG)

The WHYCOS International Advisory Group (WIAG) meets on a annual basis, and the 7th session preceded by a two day technical conference (30-31 January 2006) was held on 1-2 February 2006 at the WMO Secretariat, Geneva, Switzerland. SOPAC presented the history, background and development of the Pacific HYCOS project following the successful submission to the EU Water Facility.

4th World Water Forum

Following their successful participation in the 3rd World Water Forum, Pacific small island countries used the 4th World Water Forum and the preparatory meetings in Jakarta and Apia to review the implementation of the Pacific Regional Action Plan and the sister Action Frameworks for Action on Wastewater and Drinking Water Quality and Health and the related Partnership Initiative.

The Japan Water Forum supported the Pacific in its preparations and assisted the region to draft and finalize the Oceania sub-regional part of a Regional Position Paper for Asia and the Pacific that was presented at the 4th World Water Forum.

One of the main outcomes of 4WWF included the creation of the "Asia-Pacific Water Forum" (APWF), a new platform to gain political support for water management in the Asia-Pacific region. SOPAC will be the main focal point for the Oceania component of the Asia-Pacific Water Forum.

Third International Conference on Climate Impact Assessment

The International Conference on Climate Impact Assessment (ICCIA) was started 6 years ago (2000) by the Australian Greenhouse Office and donors which brought together scientists and environmentalists from around the globe who were working/conducting research on the impacts of Climate Change. The conference is held every two years and focuses on bringing together climate impact assessors to put forward climate prediction models and exchange ideas.

The Third ICCIA meeting held in Cairns Australia (23rd - 27th July) highlighted some of the problems faced by climate assessors in trying to persuade decision makers to act on these predictions. Pacific Islands Countries (PICs) lack the expertise and resources to develop forecasting models on their own and to implement strategies to reduce the impacts of climate change and sea level rise.

1.6 Other activities at regional level

1.6.1 Institutional relations/co-operation

Pacific Regional Action Plan on Sustainable Water Management

Leading to the World Summit for Sustainable Development (August 2002) and the World Water Forum (March 2003) an ADB/SOPAC-led regional consultation on Water in Small Island Countries was held in Sigatoka, Fiji. The consultation led to a Pacific Regional Action Plan on Sustainable Water Management (Pacific RAP) and Ministerial Declaration signed by 16 Pacific island countries. The meeting identified key messages for six themes: Water Resources Management, Island Vulnerability, Awareness, Technology, Institutional Arrangements and Finance.

UNESCO's International Hydrological Programme is an important partner for the development and implementation of the Pacific RAP.

For more information, please see:

www.sopac.org/tiki/tiki-index.php?page=CLP+Pacific+Partnership

Pacific Partnership Initiative on Sustainable Water Management

The overall aim of the UN's Type II Initiatives is to ensure coordination and increased partnerships in meeting the World Summit on Sustainable Development (WSSD) goals through its Plan of Implementation.

The Pacific Partnership Initiative on Sustainable Water Management is coordinated and facilitated by the intergovernmental organisation SOPAC (South Pacific Applied Geoscience Commission), which has the regional mandate to support the Pacific Island Countries in water & sanitation. SOPAC is assisted in this task by a deputy facilitator, the University of the South Pacific (USP).

The Partnership has a Facilitator (based at SOPAC) who is responsible for implementing the core functions of the partnership: liaising between the regional stakeholder groups and their sub-networks; researching and receiving stakeholder information on on-going and planned water activities; tracking donor and development agency programmes; identifying areas requiring implementation; and coordinating proposal submissions and project implementation. The Facilitator is also responsible for high-level advocacy of the strategic approach.

Monitoring and evaluation are carried out using a matrix inventory of previous, existing, planned and proposed activities, including details of the stakeholders involved, the intervention objectives, implementation duration and status, and anticipated impact.

The Facilitator enables countries and development agencies to: identify successful previous activities and therefore improve the sustainability of subsequent interventions; reduce and prevent duplication of activities; link country requirements to development programmes (and vice versa); and augment existing and proposed activities nationally and regionally.

A working group of CROP agencies (Council of Regional Organizations of the Pacific) and NGO representatives has been set up to act as the overall coordinating body of the Pacific Type II Initiatives. Facilitators are asked to report to this Sustainable Development Working Group on a regular basis.

UNESCO participates actively in the Pacific Partnership through the UNESCO Apia Office. All IHP activities for the Pacific region are either channeled through or undertaken in coordination with the Pacific Partnership, ensuring that all IHP activities are relevant to the region, in line with country priorities, and that duplication of efforts between partners is eliminated.

If you have comments on this Initiative or would like to make contributions and be further involved please do not hesitate to contact Marc Overmars at marc@sopac.org.

For more information, please see:

www.sopac.org/tiki/tiki-index.php?page=CLP+Pacific+Partnership

Completed and ongoing scientific projects

ACIAR

Follow-up is provided to the UNESCO/SOPAC research projects in Kiribati and Tonga through a project titled *Equitable Groundwater Management for the Development of Atolls and Small Islands.* Its overall aim is to provide the basis for sustainable use and equitable sharing of groundwater resources and their associated catchments between competing sectors, particularly agriculture, combining research on climate, groundwater, cropping and irrigation practices, economics, cultural traditions and social customs, and the aspirations and needs of stakeholders.

In low coral atolls, groundwater exists as freshwater lenses floating over saline transition zones, grading into seawater. To lessen the risk of seawater intrusion, groundwater is pumped from long, horizontal, infiltration galleries. Population growth, limited land, human activities including agriculture and frequent droughts place groundwater under stress. This project has four objectives:

1. to understand the impact of agriculture on groundwater resources;
2. to examine the impact of groundwater extraction on agriculture;
3. to explore management options for mitigating droughts; and
4. to combine this information with information on hydrology and on the economics and social aspects of island communities to produce a system to lessen conflicts over water allocation and use.

Work is being carried out in the Pacific on Tarawa Atoll in the Republic of Kiribati. Tarawa atoll has two regions - heavily populated, urbanized South Tarawa and sparsely populated rural North Tarawa. In the low islands studied, Bonriki and Buota in South Tarawa (currently used for groundwater extraction) and the undeveloped Abatao and Tabiteua in North Tarawa, the spatial extents of the groundwater lenses have now been measured. These measurements permitted water balance estimates - using the highly variable climate record - of sustainable pumping yields for fresh groundwater, and identified potential sites for additional galleries.

For more information, please see www.aciar.gov.au

2. FUTURE ACTIVITIES

2.1 Activities foreseen until December 2006

Pacific HELP

It is expected that the first projects arising from the Pacific HELP Framework for Action will be initiated in late 2006. Furthermore, the emerging Pacific HELP programme will be linked to the Pacific HYCOS and IWEM projects detailed below.

Pacific IWRM

The Global Environmental Facility (GEF) through UNDP signed a PDF-A agreement with SOPAC in November 2004 to develop an innovative programme on Sustainable Integrated Water Resources Management (IWRM) in Pacific Island Countries (PICs) in response to the request by the region's diplomatic missions at CSD12.

Based on the endorsement of 10 PICs, the GEF CEO approved entry into the GEF pipeline of this proposal and approved the request for financial resources to further develop the project and the PDF-B phase in the coming two years.

The full-sized project is to be implemented through UNDP and UNEP and executed by SOPAC through the Pacific Partnership in the period 2007 - 2012. The project will support PICs in the implementation of the Pacific Regional Action Plan on Sustainable Water Management that aims to improve the assessment and monitoring of water resources, reduce water pollution, improve access to technologies, strengthen institutional agreements, and leverage additional financial resources in supporting IWRM.

An Inception Meeting for the Pacific IWRM project was organized in conjunction with SOPAC's Annual Session from 21-27 September 2006 in Honiara.

WMO Flood forecasting workshop and HYCOS launch

An Inception Meeting for the Pacific HYCOS project will be organized from 23-26 October in Brisbane by SOPAC in collaboration with WMO and the Australian Bureau of Meteorology (BOM) with attendance of Pacific National Hydrological and Meteorological Services.

North Pacific 3rd Hydrology Training Course

The third course under the NZAID supported Pacific Hydrology Training Programme will be organized for the Marshall Islands, FSM and Palau from 2-6 October 2006 in collaboration with WERI, University of Guam.

Pacific MAB network meeting

The founding meeting of the proposed Pacific Man and the Biosphere Network (PacMAB) is scheduled to take place in Pohnpei, Federated States of Micronesia, in December 2006. One of the key topics to be discussed at the meeting will be the further development of MAB-IHP activities using Biosphere Reserves as test cases for approaches to sustainable management of water resources.

2.2 Activities planned for 2007

Implementation of Pacific HYCOS Project

Implementation of Pacific IWRM Project

Continuation of Pacific HELP project development

Continuation of the Pacific Island Climate Update

Continuation of the Pacific Climate Prediction Programme

2.2 Activities envisaged in the long term

As above.

14th UNESCO-IHP REGIONAL STEERING COMMITTEE MEEETING FOR SOUTH EAST ASIA AND THE PACIFIC

in conjunction with the International Symposium on Managing Water Supply for Growing Demand BANGKOK, THAILAND (16 – 20 October 2006)

NATIONAL REPORT OF THE PHILIPPINES

by

Leonardo Q. Liongson
Director, National Hydraulic Research Center
University of the Philippines
and
Chairman, Philippine National Committee for UNESCO-IHP

1.0 Introduction

The institutional members of the Philippine National Committee for the IHP are the following organizations, which are mandated with and engaged in research, development and management activities in the water sector:

Bureau of Soils and Water Management (BSWM), Department of Agriculture (DA)
Bureau of Research and Standards (BRS), Department of Public Works and Highways (DPWH)
Environmental Management Bureau (EMB), Department of the Environment and Natural Resources (DENR)
Flood Control & Sabo Engineering Center (FCSEC), Department of Public Works and Highways (DPWH)
Laguna Lake Development Authority (LLDA)
Local Water Utilities Administration (LWUA)
LPA & Associates (private sector)
Metropolitan Waterworks and Sewerage System (MWSS)
Mines and Geoscience Bureau (MGB), Department of the Environment and Natural Resources (DENR)

National Economic and Development Authority (NEDA)
National Hydraulic Research Center, University of the Philippines (UP-NHRC)
National Irrigation Administration (NIA)
National Mapping and Resource Information Authority (NAMRIA)
National Power Corporation (NAPOCOR)
National Water Resources Board (NWRB)
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Department of Science and Technology (DOST)
Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Department of Science and Technology (DOST)
Philippine Council for Aquatic and Marine Research and Development (PCAMRD), Department of Science and Technology (DOST)

University of Santo Tomas, Department of Civil Engineering (UST), Manila
University of the Philippines at Los Baños, College of Engineering and Agro-Industrial Technology (UPLB-CEAT), Los Baños, Laguna
Other Invited Universities:
Ateneo De Manila University, Manila Observatory (ADMU), Quezon City
Central Luzon State University (CLSU), Muñoz, Nueva Ecija
De La Salle University, Department of Civil Engineering (DLSU), Manila
University of San Carlos, Department of Civil Engineering & Water Resources Research Center (USC), Cebu City

2.0 Activities of the Water Resources Sector in the Philippines

This brief section provides an enumeration of the recent activities of the water resources sector in the Philippines during the period 2005-2006 as well as activities in previous years not included in the Philippine National Report submitted in 2005. These were incidental yet official activities undertaken or attended by the principals and nominees of Philippine institutions and stakeholders in the water sector who are the members of the PNC-IHP.

2.1 International and Regional Activities (2005-2006)

13th Regional Steering Committee Meeting for Southeast Asia and the Pacific UNESCO International Hydrology Programme (13th RSC Meeting for SEAP, UNESCO-IHP), in conjunction with the *International Symposium on Ecohydrology: Experiences and Best Practices of Ecohydrological Principles for Good Water Governance"*, 21 – 25 November 2005, Bali, Indonesia.

Workshop on Progress in Environmental Studies For Tropical and Subtropical Regions, 5 December 2005, organized by the Japan Society for the Promotion of Science (JSPS) Core University Programme on Environmental Engineering and the Department of Civil Engineering, College of Engineering, University of the Philippines, Beta Epsilon Multi Media Hall, Melchor Hall, U.P. Campus, Diliman, Quezon City, Philippines.

AUN-SEED-Net Joint Mini-Seminar on Environmental Technology, 1 March 2006, under the JICA-sponsored ASEAN University Network/Southeast Asia Engineering Education Development Network Centennial Memorial Hall, organzied by the Faculty of Civil Engineering and Chemical Engineering, Tokyo Institute of Technology, O-Okayama, Tokyo, Japan.

4th World Water Forum, 16-22 March 2006, Mexico City, Mexico, with participation by officials belonging to Philippine agencies such as DENR, NWRB, LLDA, and NGOs.

Philippine-Japan Joint Investigation of the Leyte Landslide of February 17, 2006, 21-25 March 2006, jointly undertaken by the Japanese University Consortium on Landslide led by Prof. Kyoji Sassa of Kyoto University and the Philippines agencies: Office of Civil Defense (OCD), Philippine Institute of Volcanology and Seismology (PHIVOLCS), University of the Philippines (UP) Department of Civil Engineering, the Province of Southern Leyte and concerned private engineering firms.

Regional Water Conference on Water Financing, 30-31 May 2006, organized by the Global Water Partnership Southeast Asia (GWP-SEA), Philippine Water Partnership (PWP) and Asian Development Bank (ADB), EDSA Shangrila, Ortigas Center, Pasig, Metro Manila, Philippines.

2nd Thematic Workshop on Water Allocation and Water Rights, 5-9 June 2006, Network of Asian River Basin Organization (NARBO), organized by the Philippine National Water Board (NWRB) and Laguna Lake Development Authority (LLDA), Manila, Philippines, with 26 regional participants.

2006 Asian-Pacific Regional Conference on Practical Environmental Technologies, 3 August 2006, organized by University of the Philippines-Diliman (Philippines) and Chia Nan University of Pharmacy and Science (Taiwan), Engineering Theater, College of Engineering,University of the Philippines-Diliman, Quezon City, Philippines.

2.2 National Activities (2005-2006)

1st National Meteorological-Hydrological Convention: "Weather, Climate and Water: Implications to Sustainable Development", 12-13 December 2005, organized by the Philippine Meteorological Society (PMS), Amihan Conference Room and Training Room, 2nd Floor, PAGASA Central Office, Science Garden Complex, Agham Road, Diliman, Quezon City, Philippines.

Approval by the Philippine National Commission for UNESCO on 16 February, 2006 of the regional proposal for the Philippines to host a "Regional Conference on Hydrology and Water Resources Management for Hazard Reduction and Sustainable Development (HRSD-2007)", to be held on 19-23 November 2007 in Manila, Philippines, in conjunction with the 15th Regional Steering Committee (RSC) Meeting of the UNESCO-IHP for Southeast Asia and the Pacific, under the Country Participation Programme. Letters of Support were also received from the pertinent organizations of the other member countries: Australia, China, Japan, New Zealand, Thailand and Vietnam.

General Assembly & Election - Philippine Water Partnership (PWP), 28 April 2006, Convention Hall, Bureau of Soils and Water Management Bldg., Diliman, Quezon City, Philippines.

General Assembly – Philippine Water Partnership (PWP), 25 September 2006, DCIEC Bldg., National Irrigation Administration (NIA) Compound, EDSA, Quezon City, Philippines.

Workshop on the National Flood Mitigation Framework Plan, 5 May 2006, Department of Public Works and Highways (DPWH), Manila, Philippines..

Roundtable Discussion and Workshop on Water Issues, 16 August 16, 2006, organized by the Philippine National Academy of Science and Technology (NAST) and National Research Council of the Philippines (NRCP), Hotel Philippine Plaza, Manila, Philippines.

National Multi-hazard Mapping Seminar-Workshop, 23-24 August 2006, organized by the Philippine Mines and Geosciences Bureau (MGB), Petrolab Building, Department of Environment and Natural Resources (DENR), Diliman, Quezon City, Philippines.

Organizational and Planning Meeting of the Philippine National Committee for UNESCO-IHP, 27 September 2006, held at the National Hydraulic Research Center (NHRC), University of the Philippines – Diliman, Quezon City, Philippines, (attendance: DPWH-FCSEC, LLDA, LPA & Associates, MWSS, NEDA, NWRB, PAGASA, UP-NHRC and UST).

PHILWATER 2006 - 14th International Conference and Exhibition on Water Resources Management: "Addressing Millennium Development Goals for Water and Sanitation", 10-13 October 2006, organized by the Philippine Water Works Association (PWWA), Bethel Guest House, Dumaguete City, Negros Oriental, Philippines.

UPD-HYDRO 2006 – A Training Program in Water Resources Technology, Module 1: Hydraulics, 12-14 October 2006, jointly offered by the National Engineering Center (NEC), National Hydraulic Research Center (NHRC) and the U.P. Engineering Research and Development Foundation, Inc. (UPERDFI), University of the Philippines – Diliman, Quezon City, Philippines.

2.3 Ongoing and Completed Programs and Projects (2005-2006)

Member institutions of the Philippine National Committee have undertaken programs and projects in the field of hydrology and water resources management during the period 2005-2006, including some with foreign technical assistance and aided by consultants. Some notable activities are as follows:

Bureau of Soils and Water Management (BSWM), *Drought Mitigation Measures.*

Bureau of Soils and Water Management (BSWM), *Integrated Watershed Management for Sustainable Soil and Water Resources Management of the Inabanga Watershed, Bohol Island, Philippines*.

Bureau of Soils and Water Management (BSWM), *Rainwater Harvesting*.

Bureau of Soils and Water Management (BSWM), *Rehabilitation/Upgrading of Regional and Provincial Soil and Water Analyses.*

Bureau of Soils and Water Management (BSWM), *Small Water Impounding Projects (SWIP).*

Flood Control & Sabo Engineering Center (FCSEC), Department of Public Works and Highways (DPWH), *Project for Enhancement of Capabilities in Flood Control and Sabo Engineering of the DPWH*, JICA.

Laguna Lake Development Authority (LLDA), *Environmental User Fee Program* (as centerpiece of Environmental Management Program).

Laguna Lake Development Authority (LLDA), *River Rehabilitation Program* .

Laguna Lake Development Authority (LLDA), *Lake Fishery Management Program.*

Laguna Lake Development Authority (LLDA), *Laguna de Bay Shoreland Management*.

Metro-Manila Development Authority (MMDA), *Effective Flood Control Operations System (EFCOS).*

National Hydraulic Research Center (NHRC), *Feasibility Study of the Proposed Infiltration Gallery Project in the Municipality of San Mateo.* Manila Water Company Inc. (MWCI).

National Hydraulic Research Center (NHRC), *Value Engineering Study for the Detailed Engineering Design of Pasig-Marikina River Channel Improvement Project, Phase I,* Department of Public Works and Highways (DPWH) and CTI Engineering International Co., Ltd .

National Hydraulic Research Center (NHRC), *San Roque Reservoir Sedimentation Study*, National Power Corporation.

National Hydraulic Research Center (NHRC) and Department of Civil Engineering - University of the Philippines, *Various faculty-led and student researches in Stochastic Rainfall Modeling, Rainfall Frequency Analysis, Distributed Rainfall-Runoff Modeling, Regional Flood Frequency Analysis, Groundwater Flow and Contaminant Transport Modeling, Infiltration Gallery Modeling, Flood Hydraulics by 1-D River Network Models and 2-D Finite-Volume Models, and Sediment Transport by Finite-Volume Models.*

National Water Resources Board (NWRB), *Case Study on the Application of Strategic Planning and Management (SPM) for IWRM*, UN-ESCAP.

National Water Resources Board (NWRB), *Study on Regionalization of Water Tariffs for Private Utilities*, ADB and IDP.

National Water Resources Board (NWRB), *Performance Improvement and Benchmarking of Small Towns Water Utilities Project,* WSP and Aus-AID.

National Water Resources Board (NWRB), *Enhancement of Processing Water Permit Applications, Billing and other related Information Systems and Creation of Water Resources Regional Council in Region 7,* World Bank and Woodfields.

National Water Resources Board (NWRB), *Expansion of Benchmarking of Small Towns' Water Utilities in the Philippines*, World Bank and WSP.

PAGASA, *Flood Forecasting and Warning System for Dam Operations (FFWSDO).*

PAGASA, *Global Network for Isotope Monitoring (GNIP)*, IAEA and WMO.

PAGASA, *Special Tropical Cyclone Reconnaissance, Information Dissemination and Damage Evaluation (STRIDE) Team*.

PAGASA, *Strengthening of Flood Forecasting and Warning Administration*, JICA.

PAGASA, *Weather Modification Experiment (WEMEX) Rainfall Stations.*

2.4 Major Water Resources Development Projects in the Philippines

Department of Interior and Local Government (DILG) - 1 Project
Rural Water Supply and Sanitation Project (Phase 5)

Department of Public Works and Highways (DPWH) - 10 Projects
Agno and Allied Rivers Urgent Rehabilitation Project
Agno River Flood Control Project (Phase 2-A)
Agno River Flood Control Project (Phase 2-B)
Iloilo Flood Control Project (Phase 2)
KAMANAVA Area Flood Control and Drainage System Improvement Project
Laoag River Basin Flood Control and Sabo Project
Lower Agusan Development Project (Flood Control Component Phase 2)
Metro Manila Flood Control Project - West of Mangahan Floodway
Pasig-Marikina River Channel Improvement Project (Phase 1)
Pinatubo Hazards Urgent Mitigation Project (Phase 2)

Development Bank of the Philippines (DBP) – 1 Project
LGU Urban Water Sanitation Program (APL2)

Land Bank of the Philippines (LBP) – 1 Project
Water District Development Project

Local Water Utilities Administration - 4 Projects
Expansion and Rehabilitation of the Baguio Water System
Provincial Cities Water Supply Project (Phase 4)
Provincial Cities Water Supply Project (Phase 5)
Provincial Towns Water Supply I/II

Metropolitan Waterworks and Sewerage System - 1 Project
Second Manila Sewerage Project

National Irrigation Administration - 14 Projects

Agno River Integrated Irrigation Project
Adallam River Irrigation Project
Bago River Irrigation System Rehabilitation and Improvement Project
Balog-Balog Multipurpose Project
Banaoang Pump Irrigation Project
Bohol Irrigation Project (Phase 2)
Casecnan Multipurpose Irrigation & Power – IC (Irrigation Component)
Comprehensive Agrarian Reform Project-Irrigation Component
Help for Catubig Agricultural Advancement Project (HCAAP)
Lower Agusan Development Project (Irrigation Component)
Malitubog - Maridagao Irrigation Project
Small River Irrigation Project
Southern Philippines Irrigation Sector Project (SPISP)
Tarlac Groundwater Irrigation System Reactivation Project

3.0 Participation in IHP Activities

3.1 Catalogue of Rivers for Southeast Asia and the Pacific

The Philippines is currently preparing the electronic data and information required for its contribution to Volume VI of the Catalogue of Rivers, which consists of the selected river basins in *Water Resources Region 1 (Ilocos Region)* of the Philippines, such as the Laoag River Basin and the Abra River Basin.

The Philippines has contributed to Volume V (2004) of the Catalogue of Rivers one chapter on the largest lake-river basin of the country, the *Pasig-Marikina River and Laguna de Bay (Ilog Pasig-Marikina at Lawa ng Laguna de Bay).* The Philippines previously contributed the *Ilog Magat* and *Ilog Pampanga* in Volume I (October 1995) and the *Ilog Itaas ng Agno* in Volume II (December 1997).

In the 9th Coordination Committee Meeting of the Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific, held at Bali, Indonesia on 22 November 2005, the Philippines agreed to submit to the regional database the electronic files of the geographical and hydrological information present in the contributed chapters on Philippine rivers in the Catalogue of Rivers.

The CD of the electronic files of all geographical and hydrological information present in Volume V (2004) of the Catalogue of Rivers for the Philippine contribution, *Pasig-Marikina River and Laguna de Bay (Ilog Pasig-Marikina at Lawa ng Laguna de Bay)*, is being submitted during this 14th RSC Meeting for storage in the regional database maintained by the Regional Humid Tropics Center, Malaysia. The hydrological data for the contributions on Agno,

Magat and Pampanga River Basins will be updated from 1995 to the present before submission to the regional database.

3.2 AP-FRIEND

Prof. Guillermo Q. Tabios III had volunteered in the UNESCO APFRIEND Phase II Meeting held at Cititel Mid Valley, Kuala Lumpur Malaysia last June 6-7, 2005 to assemble and collate storm rainfall (from 2 to 3 stations) and flood flow data (if available) to be provided by each country (Australia, China, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Vietnam) by June 30, 2005 and to assist Prof. Trevor Daniell to write the document on design flood methodologies and case studies for Asia-Pacific countries.

Prof. Leonardo Q. Liongson presented the "Report on Design Rainfall Frequencies: AP FRIEND Project", prepared by Prof. Tabios of the Philippines during the Technical Sub-Committee Meeting for APFRIEND on November 20, 2006 in conjunction with the 13th IHP-RSC Meeting in Bali, Indonesia.

3.3 The Sixth Phase of IHP (IHP VI)

The Philippines, through the many water-related agencies belonging the Philippine National Committee, undertakes water resources research, development and management programs and projects supportive of the global efforts within the themes covered by the IHP-VI (2002-2007) - Water Interactions: Systems at Risk and Social Challenges:

Theme 1 - Global Changes and Water Resources
Theme 2 - Integrated Watershed and Aquifer Dynamics
Theme 3 - Land Habitat Hydrology
Theme 4 - Water and Society
Theme 5 - Water Education and Training

3.4 IHP Workshops, training courses and symposia

The Philippines nominated two participants in the IHP training workshops held in the period:

The International Sediment Initiative Workshop on Sediment Management in South and Southeast Asia, 24-25 April 2006, AIT Center, Bangkok, Thailand . Philippine participant: Peter Paul M. Castro, University of the Philippines

The Sixteenth IHP Training Course "Oceanography Basics", 26 November – 9 December 2006, jointly organized by the Hydrospheric Atmospheric Research Center (HyARC) of the Nagoya University, Japan, and UNESCO Office-Jakarta, Nagoya and Ehime, Japan. Philippine participant: Maria Antonia Tanchuling, University of the Philippines.

4.0 Concluding Remarks

The Philippine National Committee for IHP expresses its thanks and gratitude to the IHP-RSC and the UNESCO Jakarta Office for their continuing support to the Philippines to participate in the IHP activities in the region.

Fourteenth Meeting of IHP Regional Steering Committee for the Southeast Asia and the Pacific
19th October, 2006
Bangkok, Thailand

Country Report on Papua New Guinea International Hydrological Program Activities: 2005-2006

Prepared & presented by:
Maino Virobo
Secretary
Papua New Guinea IHP National Committee

1. Introduction

The Department of Environment and Conservation (DEC) participated in the activities of the International Hydrological Program Decade (IHPD) through then Bureau of Water Resources (BWR) from 1965-1974, the forerunner of the International Hydrological Program (IHP). With the launching of the latter in 1992, the Papua New Guinea (PNG) IHP National Committee was formed in January 1992 with a view to participating actively in IHP.

The total membership of the PNG IHP National Committee is eight (8), and drawn from various government agencies and institutions of higher learning. Over the period 2005-2006, PNG experienced some upheaval in UNESCO participation, particularly the training component. Perhaps, it can be attributed to the recognition of some water events unfolding in 2005 and 2006, such as low water availability and in preparedness towards phenomena relating to climate change and global warming.

The position of PNG IHP National Committee chairperson is yet be resolved, nevertheless the secretariat is performing that responsibility. Secretarial support is being provided by the Principal Hydrologist with occasional assistance received from Field and Support Services branch of Department of Environment and Conservation and the office of PNG National Commission for UNESCO.

The secretariat generally disseminates to all members, information on meetings/seminars, training courses and workshops organized by the UNESCO. It also distributes publications and newsletters that it receives from UNESCO.

The PNG IHP National Committee performs its roles, which are formulated by an Executive Committee consisting principally of the following agencies;

(a) Department of Environment and Conservation (DEC),
(b) University of Papua New Guinea (UPNG),
(c) Geological Survey of Department of Mining, and
(d) National Weather Service (NWS) of Department of Civil Aviation.

2. Activities Organized by the National Committee

The number of membership has been maintained at 8 to ensure a wide range of interest is captured from varying water sector agencies. The latest inclusions reflect the conditions both in the terrestrial and marine environments and the monitoring of the community health standards at local and national levels.

3. Other Hydrological and Water Related Activities Conducted by Individual Water Agencies

3.1 Rural water supply and sanitation

Improving water supply and sanitation condition of the rural communities is an ongoing national challenge. National Department of Health (DoH) through its Community Water Supply and Sanitation sector in conjunction with other line agencies, such as Geological Survey, National Weather Services, PNG Waterboard (Commercial Water Authority) and Department of Works are extending their programs on reliable rural and sustainable community water supply and hygienic living into the remote areas of the country.

3.3 Water use permitting

Permit to use water, either as an abstracted volume or as a dilution component in PNG is processed through the national Environment Council in which DEC administers. The Council meets regularly to deliberate on water-use permit applications, ranging from small-scale domestic use to industrial processing. DEC generates about 85% of its annual revenue through water use permitting.

3.4 Hydrometeorological data monitoring

3.4.1 DEC hydrometric network

The hydrometric network has not been serviced, which has been the case since 1996. Localized priority stations have been visited but on had hoc basis. Requests through external donor agencies are proving to be successful and will see some of the priority catchments attended to. Pacific HYCOS, an initiative from SOPAC will cater for station rehabilitation at a national level, while Ramu River Hydrological Stations Rehabilitation is project specific and will cater for the 3 hydrological stations and 1 rainfall station in the Ramu Catchment. This is also SOPAC initiative where funds will be drawn from European Development Fund.

3.4.2 Public services

Use of technical personnel from DEC has become frequent for the 2005-2006 period. Additionally, significant volumes of data have been sold to private sector involved in energy industry. Mini hydropower schemes are proving to be popular due to environment friendliness and cheap operation cost. It is the most viable energy source proposed for the rural communities.

4. Participation in Regional Programs

4.1 Research and publications

PNG's obligation to regional activities includes river catalogue publication and contribution data towards AP-FRIEND regional database:-

(i) River Catalogue Volume VI (Laloki River) currently in progress although the future remains uncertain; and

(ii) Contributing to the regional database.

4.2 Meetings and short term training

Maino Virobo attended the 13th RSC Meeting and participated in the International Training Workshop on *Ecohydrology* from 24-28 November 2005, Bali, Indonesia.

Maino Virobo attended the IHP training course on *Carbon Cycles and Terrestrial Ecosystems* in Nagoya, Japan 26 February to 11 March 2006.

John Ari attended the *Surface Hydrology Training Course* in Suva, Fiji from 12 – 30 June 2006.

Nason Yube attended the *Groundwater Training Course* in Suva, Fiji from 19-30 June 2006.

5. Future Tasks

A number of tasks have been identified and to be taken on board for 2006 and 2007. They include;

(a) Continuation of the River catalogue project,
(b) Contribution towards regional data base upgrade,
(c) Participation in short term tailored training programs organized by the regional international agencies,
(d) Preparation for the implementation of Ramu River Hydrological Network Rehabilitation project,
(e) Development of plans and implementation strategies for the Pacific HYCOS program in the Pacific, and
(f) Continue implementation of the *user pay policy*, with the aim of generating revenue for self-sustainability.

6. Concluding Remarks

The activities presented in this report clearly reflect the strength of Papua New Guinea's IHP is towards UNESCO and IHP, either at national or regional levels. As a result of PNG's gradual economic recovery and poor annual budgetary allocations, the PNG IHP National

Committee's commitment to hydrology and water resources matters and issues are hardly tangible.

Furthermore, the next issue on River Catalogue Project once again hinges on the funding levels and the degree of enthusiasm shown in pursuing this project and perhaps, other related projects.

UNESCO Jakarta office and most recently the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) have funded our participation at the international workshops, conferences and Regional Steering Committee meetings. This indeed is highly commended.

The proposed Ramu Hydrological Station Rehabilitation and Pacific HYCOS projects are good indicators of resurgence, however it is hoped the projects are not only sustainable but be able to deliver the projected goods and services.

NATIONAL REPORT ON IHP RELATED ACTIVITIES

THAILAND

1. ACTIVITIES UNDERTAKEN IN THE PERIOD November 2005 – October 2006
   - 1.1 Meeting of the IHP National Committee
     - 1.1.1 Decision regarding the composition of the IHP National Committee
     - 1.1.2 Status of IHP-VI activities
     - 1.1.3 Decisions regarding contribution to/participation in IHP-VII
   - 1.2 Activities at national level in the framework of the IHP
     - 1.2.1 National/local scientific and technical meetings
     - 1.2.2 Participation in IHP Steering Committees/Working Groups
     - 1.2.3 Research/applied projects supported or sponsored
     - 1.2.4 Collaboration with other national and international organizations and/or programmes
     - 1.2.5 Other initiatives
   - 1.3 Educational and training courses
     - 1.3.1 Contribution to IHP courses
     - 1.3.2 Organization of specific courses
     - 1.3.3 Participation in IHP courses
   - 1.4 Publications
   - 1.5 Participation in international scientific meeting
     - 1.5.1 Meetings hosted by the country
     - 1.5.2 Participation in meetings abroad
   - 1.6 Other activities at regional level
     - 1.6.1 Institutional relations/co-operation
     - 1.6.2 Completed and ongoing scientific projects
2. FUTURE ACTIVITIES
   - 2.1 Activities planned until December 2007
   - 2.2 Activities foreseen for 2008-2009
   - 2.3 Activities envisaged in the long term

National Report on IHP Related Activities
Thailand

1. Activities undertaken in the period of November 2005- October 2006

1.1 Meeting of the IHP National Committee

1.1.1 Decision regarding the composition of the IHP National Committee

According to the reshuffle of the Director-General of Department of Water Resources in early 2005.Thailand National Committee for IHP (THC-IHP) is now having Dr. Siripong Hungspreug, Director-General of Department of Water Resources served as a Chairman of this committee. The present composition of THC-IHP consists of 22 members as follow:

Chairman : Dr. Siripong Hungspreug, Director-General of Department of Water Resources

Vice Chairmans : Professor Kasem Chunkao, Environmental College, Kasetsart Universities

Mr. Virat Khao-Uppatum, Deputy Director-General of Department of Groundwater Resources

Secreatary : Mr. Boontham Sirichai, Director of Bureau of Research - Development and Hydrology

Members : Representatives from concerning agencies and individuals are as follows :

1. Bureau of Royal Rainmaking and Agricultural Aviation
2. Royal Irrigation Department
3. National Park, Wildlife and Plant Conservation Department
4. Hydrographic Department
5. Meteorological Department
6. Marine Department
7. National Research Council of Thailand
8. The Thailand Research Fund
9. Secretarial of the Thai National Commission for UNESCO
10. Department of Ground Water Resources
11. Electricity Generating Authority of Thailand
12. Mrs.Wajee Ramnarong
13. Mr.Thawatchai Tingsanyacharee
14. Associate Professor Suravuth Pratishthananda
15. Mr.Satcha Sethabuth
16. Mr.Veeraphol Taesombat
17. Ms.Sukontha Aekaraj
18. Mrs.Poonsook Vimukatayon

The mailing address are as follow :

Thailand National Committee for the IHP
Department of Water Resources
180/3 Rama 6 Road, Samsen Nai District,
Phayathai Bangkok, 10400, Thailand
Tel : +66-22986604 Fax: +66-22986604
Email : sukontha_a@monre.go.th

Due to some changes of the administration structure and responsibility in the Department of Water Resources in the past year, meeting of National Committee for IHP could not be held conveniently. But our concerns on better management of water resources are increasing as well as the needs to collaborate with the national and international organizations on water resources.

1.1.2 Status of IHP-VI activities

a) Implementation of the Integrated Water Resources Management in 29 small sub-basins out of 25 major river basins.
b) Organization of the Training on Information, Education, and Communication for the stakeholders and local communities in the river basins.
c) Training on Flood Forecasting and Management in Upper Mun-Chi River Basin
d) Installation of Flood and Landslide Early Warning System: People Participatory Approach and Community Based in Upland Risk Area
e) Construction of the water supply systems to provide clean water for consumption targeting for all villages of the whole country.

1.1.3 Decisions regarding contribution to/participation in IHP-VII

Thailand National Committee for the IHP offers its support to the proposal framework for IHP-VII. Some specific issues that should be highlighted are

- Methodologies for integrated river basin management
- Promotion of public awareness on water management.
- Institutional development and networking for WET
- Guidelines on the sustainable and Integrated Water Resources Management with due consideration to public's living quality and participation.
- Increasing the available water sources by improving both existing natural and man-made water sources.
- Flood and Drought Management

1.2 Activities at national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

- Workshop on Hi-tech in Meteorological and Hydrological data, 24 February 2006, Bangkok
- National Workshop on Increasing Efficiency in Integrated Water Resources Management, 4-5 May 2006, Nakhon Pathom
- Workshop on Water Resources Management Strategy in Thailand, 21-22 June 2006, Bangkok

1.2.2 Participation in IHP Steering Committees/Working Groups

a) The representatives from TNC-INP attended the 13th Regional Steering Committee Meeting for the IHP in Southeast Asia and Pacific on International Symposium on Ecohydrology 21-27 November 2005, Bali Indonesia
b) Meeting and Discuss Initiatives possible grounds for cooperation around the International Flood Initiative and International Sediment

Initiative with Sustainable Water Management Section Division of Water Sciences UNESCO, in Bangkok on 31 January 2006

c) UNESCO PCCP-South & Southeast Asia Brainstorming, in Bangkok on 21 April 2006.

1.2.3 Research/applied projects supported or sponsored

a) Study on Antecedent Precipitation Index for Flood and Landslide Early Warning System.
b) Study on the Impact of Tsunami on Inland Water Resources
c) Area-based Water Resources Management System Development along with Decision Support System and Social Process in Rayong Province Area
d) Study on Development and Management in Inundated Area for Flood Mitigation in Chao Phraya River Basin by Royal Initiative Project
e) Water Resources Management by Local Community
f) Decision Support System in Land Use Planning as a tool for River Basin Management in Eastern Part of Thailand.

1.2.4 Collaboration with other national and international organizations and/or programmes

a) Collaboration with Mekong River Commission in Appropriate Hydrological Network Improvement Project, Basin Development Plan, Water Utilization Program and Environment Program and Flood Mitigation Management Program
b) Collaboration with Typhoon Steering Committee
c) Collaboration with APN Inter-Government on Global Change
d) Collaboration with Convention on Climate Change

1.2.5 Other initiatives

a) ASEM Waternet

1.3 Educational and training courses

1.3.1 Contribution to IHP courses

-

1.3.2 Organization of specific courses

- Training for Trainer on the Integrated Water Resources Management, 12-14 July 2006, Bangkok

1.3.3 Participation in IHP courses

a) One representative attended training courses on Hydrological Drought and Low Flows on 26-30 September 2005 in Malaysia
b) One representative attended training courses on Water and Carbon Cycles in Terrestrial Ecosystems on 26 Feb -11 March 2006, Japan

1.4 Publications (in the previous year of 2001 up to 2006 has not reported in the previous national report)

1.4.1 Water Resources Management

- Study on Status and Research Issue in Water Resources Management
- Thailand Integrated Water Resources Management System

- The Study to Identify Critical Area for Water Resources Management in Pasak River Basin
- Reuse of Effluent from Domestic Wastewater Treatment Plant in agricultural
- Interactive Multiple Goal Analysis for Water and Land Resources Management : Case Study in Maeklong River Basin, Thailand

1.4.2 Hydrology
- Hydrodynamic Flow Measurement in the Lower Chao Phraya River Basin.
- Effectiveness Aspect of Surface Water Management and Impact on Groundwater
- Runoff Coefficient Analysis

1.4.3 Flood and Drought Management
- Development of Master Plan for Management of Water - Related Natural Disasters : Floods, Droughts and Landslides
- Development of Master Plan for Management of Natural Disasters : Floods and Droughts
- Development of Master Plan for Management of Natural Disasters : Landslides
- Provision of the Flood Early Warning Model

1.4.4 Groundwater Management
- Groundwater Potential and Demand Study for Groundwater Management in the Northern Part of Lower Central Plain
- Groundwater Data Monitoring for the Northern Part of Lower Central Plain and Groundwater Model Data Linkage System Development

1.4.5 Institute Management
- Development of Effective Water Institutions – A Case Study in Mae Klong River Basin
- Development of Effective Water Management Institutions – A Case Study in Bang Pakong River Basin in Thailand

1.4.6 Policy
- Water Sector Profile and Strategy for Thailand
- Water Charge Management
- The Feasibility Study of Privatization on Water Resources Management

1.4.7 Information Technology
- Development of Information Technology System and Public Relations for Management of Risk Lands : Floods, Droughts and Landslides

1.5 Participation in international scientific meeting

1.5.1 Meetings hosted by the country
- The 14th RSC Meeting for UNESCO-IHP Southeast Asia and the Pacific in conjunction with International Symposium on Managing water Supply for Growing Demand, 16-20 October

2006, Bangkok, Thailand

1.5.2 Participation in meetings abroad

A representative from Thailand participated in

- The 1st and 2nd Thematic Workshop on Water Allocation organised by NARBO in December 2005 and June 2006 in Vietnam and Philippines.
- The 4th World Water Forum, 16-22 March 2006, Mexico City, Mexico.
- The 9th River Symposium, 4-7 September 2006, Brisbane, Australia.

1.6 Other activities at regional level

1.6.1 Institutional relations /co-operation

- TNC-IHP has remained close coordination and contacts with UNESCO Jakarta Office in many activities.
- Close coordination and contacts with the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and World Meteorological Organization (WMO) as member of the Typhoon Committee

1.6.2 Completed and ongoing scientific projects

- Formulation of the Integrated Master Plan of Water Resources Management in 25 Major River Basin in Thailand
- Study on Antecedent Precipitation index for Flood and Landslide Early Warning System.
- Study on the Impact of Tsunami toward the Inland Water Resources

2 FUTURE ACTIVITIES

2.1 Activities planned until December 2007

- Strengthen the cooperation with other countries in the Lower Mekong River Basin.
- Raise public awareness and education in Integrated Water Resources Management
- Raise public participation in Integrated Water Resources Management.
- Implementation of Integrated water Resources Management in a pilot river basin.

2.2 Activities foreseen for 2008-2009

- Continuation of Collaboration with RSC for Asia and Pacific
- Continuation of involvement in *Asian-Pacific FRIEND*
- Enhancing activities contributed to IHP-VII
- Enhancing activities in Flood and Drought Management
- Continuation of promotion on Integrated Water Resources Management.
- Expansion of an Integrated water resources Management implementation to the rest of the country.

2.3 Activities envisaged in the long term

- Enhancing activities contributed to IHP-VII

- Enhancing activities in Flood and Drought Management
- Expansion of an Integrated water resources Management implementation to the rest of the country.
- Continuation of raising public awareness and education in water resources management
- Continuation of raising public awareness in efficient water resources management
- Continuation of raising public participation for better water resources management

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VIET NAM NATIONAL COMMITTEE FOR THE IHP

62 Nguyen Chi Thanh, Dong Da, Ha Noi, Viet Nam
Tel: (84-4) 8359540, Fax: (84-4) 8355993, Email: thuc@netnam.vn

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NATIONAL REPORT ON IHP RELATED ACTIVITIES

I. ACTIVITIES UNDERTAKEN IN THE PERIOD AUGUST 2005 - OCTOBER 2006

1.1 Meetings in the IHP National Committee

1.1.1 Decisions regarding the composition of the IHP National Committee

The Committee has remained unchanged during the period under review, with the Chairman being Dr. Tran Thuc, Director of Institute of Meteorology and Hydrology - Ministry of Natural Resources and Environment.

1.1.2 Status of IHP-VII activities

Prepare for the participation/contribution to IHP-VII activities.

1.1.3 Decisions regarding contribution to/participation in IHP-VII

1.2 Activities at a national level in the framework of the IHP

1.2.1 National/local scientific and technical meetings

Scientific and technical meetings are generally held within the context of the Ministry of Natural Resources and Environment and professional societies (particularly the Viet Nam Natural Resources and Environment, Viet Nam Fluid Mechanics, and Viet Nam Geography Societies). There have been no meetings specifically under the aegis of the IHP. The Chairman and the Secretary of the IHP National Committee meet regularly to discuss IHP matters.

1.2.2 Participation in IHP Steering Committees/Working groups

Viet Nam participated in the establishment of the Regional Steering Committee for Asia-Pacific. The members of the Viet Nam National Committee for the IHP have attended and participated actively in all of the annual meetings of the Regional Steering Committee.

Participate in Asian Pacific FRIEND, contribute to the IDF study.

1.2.3 Research/applied projects supported or sponsored

- *Study on Risk of Water Supply Shortage and Draught Risk Mapping for the Southern Central Region and Central Highlands of Vietnam*, Project funded by the Government of Viet Nam.
- *Water Resources Planning for the Economic Zone of the Red River Delta*, Project funded by the Project funded by the Government of Viet Nam
- *Tsunami Risk Mapping for Viet Nam Coastlines*, Project funded by the Project funded by the Government of Viet Nam.
- *Study for the Re-establishment of Flood Warning Level for River of Viet Nam*, Project funded by the Government of Viet Nam
- *Climate Change Impacts on Water Resources and Adaptation Measures for Huong River Basin*, Research project funded by the Netherlands Climate Assistance Program.
- *Flash Flood Zoning and Warning for Mountainous Areas of Viet Nam*, Research project funded by the Vietnamese Government.
- *Drought Zoning and Mapping for Southern Central Region and Highlands of Viet Nam*, Research project funded by the Vietnamese Government.
- *Development of a Decision Support Framework for Water Management for Ca River Basin*, Research study funded by the Ministry of Natural Resources and Environment.
- *Environment Flow Study for Cau River*, Research study funded by the Ministry of Natural Resources and Environment.
- *Study on the Water Quality Target for the Red River*, Research study funded by the Ministry of Natural Resources and Environment.

1.2.4 Collaboration with other national and international organizations

- In collaboration with the Acid Deposition Monitoring Network in East Asia (EANET) organinzing the Sixth Senior Technical Managers meeting in Ha Noi.
- In collaboration with Lund University, Sweden, organized a Workshop entitled "*Integrated Water Resources Management and a number of Technical Tools*".
- In collaboration with the Hydro-meteorological Service of Viet Nam, WMO and ESCAP, organized the "*38th Typhoon Committee Meeting*" in Ha Noi.
- The VNNC IHP has yearly meeting with the Vietnam National UNESCO Commission,
- The Chairman and Secretary General of the National Committee are in frequent contact with the Vietnam's Permanent Representative to the

WMO. This contact enables coordination of activities under the aegis of IHP and the WMO in Viet Nam,

- Cooperate with Ministry of Natural Resources and Environment of Viet Nam and other Agencies to organize a meeting on the occasion of the World Water Day,
- Members/representatives of Vietnam NCIHP participated and contributed to many national councils.

1.2.5 Other initiatives

1.3 Education and training courses

1.3.1 Contribution to IHP courses

None.

1.3.2 Organization of specific courses

None.

1.3.3 Participation in IHP courses

Several Vietnamese have participated in IHP courses and workshops during the reporting period.

1.4 Publications

- In collaboration with UNESCO Office in Ha Noi publish a book entitled "*Illustration Handbook of Water Resources of Viet Nam*".
- Thuc. T. and Tuyen. H. M., Hydraulics Computations for the Lower Mekong River Basin to Study Flood Drainage for the Plain of Reeds in Viet Nam, Proceeding, International Workshop on Role of Water Sciences in Transboundary River Basin Management, Ubon, Thailand.
- Thuc T. and Ca V. T. (2006), "Coastal Erosion at Phan Thiet City, Vietnam and possible solutions", Proceeding, *International Symposium on New Technologies for Urban Safety of Mega Cities in Asia*, Thailand

1.5 Participation in international scientific meetings

- Attending the 13th Regional Steering Committee Meeting for Southeast Asia and the Pacific.
- Attending and presenting paper at the International Symposium on New Technologies for Urban Safety of Mega Cities in Asia, Singapore.

- Attending and presenting paper at the 2nd Asian Science and Technology Forum, Tokyo, Japan.
- Attending and contributing to the workshop on Linking Climate Change Adaptation and Disaster Risk Management for Sustainable Poverty Reduction, Geneva, Switzerland.

1.6 Other activities at a regional level

1.6.1 Institutional relations/co-operation

None

1.6.2 Completed and ongoing scientific projects

None under the aegis of IHP-VI

II. FUTURE ACTIVITIES

2.1 Activities planned for 2006-2007

- Attending meeting of 15th IHP Regional Steering Committee for Southeast Asia and the Pacific.
- Participating in regional and national activities of IHP.

2.2 Activities envisaged in the long term

Unknown at this time.

ANNEX 7

REPORT OF THE WATER RESOURCES CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC (HTC), KUALA LUMPUR, MALAYSIA

THE REGIONAL HUMID TROPICS HYDROLOGY AND WATER RESOURCES CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC (HTC Kuala Lumpur)

United Nations Educational, Scientific and Cultural Organization

REPORT

10TH CO-ORDINATION COMMITTEE MEETING
THE GRAND HOTEL, BANGKOK, THAILAND
19TH OCTOBER 2006

CCMEET 010/2006

The Regional Humid Tropics Hydrology and
Water Resources Centre for SouthEast Asia and The Pacific,
No.2, Jalan Ledang off Jalan Duta,
50480 Kuala Lumpur, Malaysia

October 2006

Website : http://www.htckl.org.my

THE REGIONAL HUMID TROPICS HYDROLOGY AND WATER RESOURCES CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC
(HTC KUALA LUMPUR)

10TH CO-ORDINATION COMMITTEE MEETING
THE GRAND HOTEL, BANGKOK, THAILAND

19TH OCTOBER 2006

CCMEET 010/2006

TABLE OF CONTENTS;

1.0 Invitation Letter

(**100**)dlm.PPS.21/4/7
Jilid 1

Chairman, National Committee for IHP **21** September 2006

Dear Sir,

10th Co-ordination Committee Meeting for the HTC Kuala Lumpur at The Grand Hotel Bangkok, Thailand 19 October 2006

In conjuction with the International Conference and the 14th Regional Steering Committee Meeting for the IHP for Southeast Asia and the Pacific, I am pleased to inform you that 10th Co-ordination Committee Meeting will be held at The Grand Hotel Bangkok, Thailand tentatively on the 19th October 2006 at 5.00pm.

2. Please find attached a copy of the provisional agenda, a participation form and minutes of 9th Co-ordination Committee Meeting for your perusal. Your attendance is appreciated to ensure the success of the meeting. Please keep us informed as soon as possible of your attendance by returning the duly completed form to :-

Director,
HTC Kuala Lumpur,
Department of Irrigation and Drainage Malaysia,
No. 2, Jalan Ledang off Jalan Duta,
50480 Kuala Lumpur,
Malaysia.
Tel : 603-20958700
Fax : 603-20953366

Thank you for your kind cooperation.

Regards,

[DR. HAJI MOHD NOR BIN HAJI MOHD DESA]
Secretary,
Co-ordination Committee,
The Regional Humid Tropics Hydrology and
Water Resources Centre for Southeast Asia and The Pacific,
(HTC Kuala Lumpur)

c.c Y.Bhg. Datuk Ir. Haji Keizrul bin Abdullah,
Chairman Co-ordination Committee,
HTC Kuala Lumpur,
DG DID Malaysia.

cc meeting/pentabiran/sham

The Chairman,
Malaysian International Hydrological Programme,
Department of Irrigation and Drainage Malaysia,
KM 7, Jalan Ampang,
68000 Ampang,
Kuala Lumpur.
(Attn: Ir. Lea Bea Leang)

Director,
Hydrology Section
Public Works Department,
P.O. Box 128, Lautoka,
FIJI ISLANDS.

Ms. Dyah Rahayu Pangesti,
Chairperson National Committee for IHP,
Indonesian Institute of Science (LIPI),
Jakarta 12710,
INDONESIA.

Mr. Bruce Stewart
Chairperson National Committee for IHP,
Assistant Director (National Operations),
Bureau of Meteorology,
GPO Box 1289,
Melbourne, Victoria, 3001
AUSTRALIA.

Mr. Kuniyoshi Takeuchi,
Chairperson National Committee for IHP,
c/o International Scientific Affairs Division,
Science and International Affairs Bureau,
Ministry of Education, Science, Sports and Culture (MONBUSHO),
3-2-2 Kasamigaseki, Chiyoda-ku,
Tokyo 100,
JAPAN.

Mr. Soontak Lee,
Chairperson, Korea National Committee for IHP,
Director General, Ministry of Construction and Transportation,
The Second Unified Government Building,
Kwashon-si, Kyonggi-fo 427-760,
Seoul 427-760,
REPUBLIC OF KOREA.

Chairman National Committee for IHP,
General Directorate of Irrigation, Meteorology and Hydrology,
Ministry of Agriculture, Forestry and Fisheries,
No. 51, Norodom Boulevard,
Phnom Penh,
CAMBODIA.
(Attn: Mr. Saravuth Long)

Mr. Yuanfang Chen,
Chairman National Committee for IHP,
Director, Bureau of Hydrology, MWR,
2 Lane, 2 Baiguang Road,
Beijing 100761,
PEOPLE'S REPUBLIC OF CHINA.

Mr. Tran Thuc,
Chairperson,
Vice Director,
General Hydrometeorological Service,
Vietnam national Committee for the IHP,
No. 4, dang Thai Than,
Ha Noi,
VIETNAM.

Mr. Richard P. Ibbit,
Chairman,
New Zealand National Committee for IHP,
National Institute of water and Atmospheric Research (NIWA),
P.O. Box 8602, Chrischurch,
NEW ZEALAND.

Mr. Suravuth Pristishtananda,
Chairman National Committee for IHP,
Director General, Royal Irrigation Department,
Secretariat of the Prime Minister,
Government House, Thanon Nakhon Pathorm,
Bangkok 10300,
THAILAND.

Director – General,
Department of Meteorology & Hydrology,
Ministry of Agriculture & Forestry,
P.O. Box 811, Vientiane,
LAO PDR.
(Attn: Mr. Somphanh Vithaya)

Mr. Leonardo Liongson Quessado,
Chairman National Committee for IHP,
National Hydraulic Research Center,
U.P. College of Engineering,
Diliman, Quezon City 1101,
PHILIPPINES.

Mr. Giuseppe Arduino,
Programme Specialist in Hydrological & Geological Sciences
UNESCO Office Jakarta,
Regional Science Bureau for Asia and the Pacific,
UNESCO House,
Jalan Galuh (II) No. 5,
Kebayoran Baru,
P.O. Box 1273/JKT,
Jakarta 12110,
INDONESIA.

Mr. Choe Hung Sik,
Chairperson,
National Committee for IHP,
Vice-Administrator,
State Hydrometeorological Administration,
Qesong-Dong,
Central District,
Pyongyang,
DPR KOREA.

Mr. Kaoru Takara,
Disaster Prevention Research Insitute (DPRI),
Kyoto University, Gokasho,
Uji, Kyoto 611-0011
JAPAN.

2.0 Provisional Agenda

The Regional Humid Tropics Hydrology and Water Resources Centre For Southeast Asia and the Pacific (HTC Kuala Lumpur)

10th Co-ordination Committee Meeting at The Grand Hotel Bangkok, Thailand 19 October 2006 at 5.00 pm

Provisional Agenda

1.0 Opening by the Chairperson

The Chairman of the Co-ordination Committee (CC) will open the meeting at 5.00 pm on October 19 2006.

2.0 Election of Rapporteur

The CC will elect a rapporteur to assist the Secretary to record the discussions and major conclusions of the meeting.

3.0 Report of the 9th CC Meeting

The CC will go through the report of the 9th CC Meeting.

4.0 Report by the Director of HTC Kuala Lumpur

The Director will present report of activities of HTC Kuala Lumpur for the period of 2005/2006.

5.0 Future direction of HTC Kuala Lumpur

IHP Phase VII (2008 – 2013)

6.0 Other matters

Networking, collaborative projects, funding, etc.

7.0 Closure of meeting

3.0 Minutes of the Ninth Co-ordination Committee meeting

NINTH CO-ORDINATION COMMITTEE MEETING OF THE REGIONAL HUMID TROPICS HYDROLOGY AND WATER RESOURCES CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC

Alor Room, Ramada Bintang Bali Resort
Bali, Indonesia, 22 November 2005

Minutes

Participants

Name	Country	E-Mail
Mohamed Nor MOHAMED DESA	Malaysia	drmohdnor@water.gov.my
Ross JAMES	Australia	r.james@bom.gov.au
Saravuth LONG	Cambodia	lsaravuth@online.com.kh
Van Than Van NGUYEN	Canada	Van.tv.nguyen@mcgill.ca
Heng Heng	China	hliu@china.com
Yuanfang CHEN	China	yfchen@mail.edu.cn
Zongxue XU	China	zongxuexu@vip.sina.com
Seree Supratid	China	seree@rangsit.rsu.ac.th
Agung Bagiawan IBRAHIM	Indonesia	bagiawan@bdg.centrin.net.id
Peter HEHANUSSA	Indonesia	phnussa@indosat.net.id
Joesron LOEBIS	Indonesia	joesron@melsa.net.id
Kaoru TAKARA	Japan	takara@flood.dpri.kyoto-u.ac.jp
Samhee LEE	Korea (Rep of)	Samhee.lee@kict.re.kr
Hong Kee JEE	Korea (Rep of)	hkjee@yu.ac.kr
Soontak LEE	Korea (Rep of)	leest@yu.ac.kr
Mandoloth Soukhanouvong	Lao PDR	msoukhanouvong@yahoo.com
Richard IBBITT	New Zealand	r.ibbitt@niwa.co.nz
Bob CURRY	New Zealand	r.curry@niwa.co.nz
Leonardo Q LIONGSON	Philippines	LQL@engg.upd.edu.ph
Maino VIROBO	PNG	wrmb@daltron.com.pg
Varunee Chareonsamran	Thailand	varunee46@hotmail .com warunee_c@mnre.go.th
Giuseppe ARDUINO	UNESCO	g.arduino@unesco.org
TRAN Thuc	Vietnam	thuc@netnam.vn
Le Dinh Thanh	Vietnam	ldthanh@wru.edu.vn

1. Opening by the Chairperson

The meeting commenced at 5:15pm with Mr Mohamed Nor, Director of the HTC, welcoming participants and apologizing for the absence of the Chairman, Mr Keizrul Abdullah, who was unable to attend but sent his bet wishes. With the agreement of the meeting Mr Nor accepted the role of Chairman.

Mr Nor expressed the desire that the UNESCO endorsed Centres in the region share their experience and resources to ensure there is maximum benefit for the region and thanked the Indonesian Organizing Committee for providing the facilities for the meeting.

Mr Nor informed the meeting that there were some problems with the address list used to distribute the agenda and report for this meeting to the Chairs of each IHP NatCom which may have resulted in some participants not receiving the material before the meeting. Mr Nor undertook to regularly obtain updates of the address list from UNESCO Jakarta.

ACTION: Mr Nor to regularly update the NatCom address list

2. Election of Rapporteur

Mr James was elected Rapporteur for the meeting.

3. Report of the 8th Coordination Committee meeting

The Chairman referred the meeting to the booklet that was distributed and which included the Minutes of the 8th Co-ordination Committee Meeting held in Adelaide, Australia. Some editorial corrections to the minutes were identified: Section 3 heading should be 7th not 6th and Mr Tran Thuc should be recorded as a participant at that meeting.

In commenting on discussion at the 8th meeting regarding project proposals, Mr Nor informed the meeting that no projects proposals had been received since the 8th meeting. He emphasized that the HTC was established as a resource for the region and collaborative projects proposed by countries was a way of making use of this resource.

Mr Liu proposed that the minutes be accepted, this was seconded by Mr Liongson and accepted.

4. Report by the Director of HTC

Mr Nor referred to Section 4 of the booklet which contained his report as HTC Director. Mr Nor spoke to his report providing comments and additional information on some sections as follows.

2.1 International Workshop on Flash Flood Disaster Mitigation in Asia, Japan 28 Feb-04 Mar 2005

Mr Nor advised that WMO and PWRI are planning to hold a workshop on flooding in Costa Rica during 2006 at which the outcomes of the workshop in Japan will be presented. There were no specific activities planned as a result of the workshop.

Mr Nor informed the meeting that a proposal for a flood forecasting project was included as Appendix 3 in the booklet and he requested countries to consider submitting other proposals for flood forecasting projects to the HTC.

ACTION: Countries to consider submitting proposals for flood forecasting projects

2.2 Training of Trainers Course on Local Water Management, Cairo, Egypt 3-8 May 2005
Mr Nor believed that the course was very successful and advised that he proposed to discuss with Cap-Net (SEA-CapNet in this region) the possibility of holding a course on IWRM in this region. Cap-Net provides seed money for courses. In conjunction with this Mr Nor requested that countries consider submitting proposals to HTC for capacity building projects in IWRM.

ACTION: Countries to consider submitting proposals for capacity building in IWRM

2.3 10th International Conference on Urban Drainage, Denmark 21-25 August 2005
Mr Nor informed the meeting that he hoped to involve HTC more with IAHT/IWA activities and was planning to prepare a proposal to host the 12th conference to be held in 2011. The 11th conference will be held in Scotland during 2008 and the 12th conference proposal must be submitted by the end of November 2005. Mr Nor was seeking funding support from DID Malaysia and requested endorsement for the proposal from this meeting and the RSC. Concern was expressed by some participants about uncertainties associated with the distant time frame. However, Mr Ibbitt proposed that the meeting give moral support to the proposal which was seconded by Mr Nguyen and accepted.

2.4 International Training Course on Hydrological Droughts and Low Flows, Malaysia 26-30 September 2005
Mr Nor informed the meeting that this course was also supported by UNESCO Jakarta wished to formally record his thanks to both UNESCO Jakarta and the IHP NatCom for the Federal Republic of Germany for funding the course which was held at the HTC.

4 Quality Management System
Mr Nor highlighted the successful outcome of the Review of the ISO 9001:2000 certification of the HTC.

5 Future Program and Activities
Mr Nor drew the meetings attention to the table of proposed activities in his report and advised that he was still seeking funding support for the first item, Study on Flood Forecasting and Warning. Mr Arduino commented that unfortunately UNESCO Jakarta was unable to provide assistance and recommended that a proposal should be submitted to the PP Program. Mr Liongson agreed to coordinate the preparation of the proposal.

ACTION: Mr Liongson to lead preparation of a PP proposal by Philippines, Vietnam, Thailand and HTC for the Flood Forecasting and Warning Study

Mr Lee said the holding of a meeting for the AP Friend IDF Research Project (Item 3) was not decided and would be discussed during the RSC meeting. Mr Nor responded that the HTC would seek to host the meeting if it is held.

Mr Nor informed the meeting that the Masters program (Item 5) has been launched, has 9 Malaysian students and is open to any overseas students. The meeting was also informed that a similar course is available in Vietnam at the Water Resources University.

Regarding Item 5 (Conference on Water for 2006) Mr Nor advised that conference details will be distributed soon.

6 Water Archive
Problems with access to the Water Archive resulting from the need to move and change the configuration of the HTC server when the HTC became part of the Ministry of Natural Resources and Environment were described by Mr Nor. The new URL is htc.water.gov.my/apfriend/wa. Mr Nor will discuss the configuration issues with Mr James with the objective of having the Water Archive functional as soon as possible.

ACTION: Mr Nor to ensure Water Archive is functional as soon as possible.

7 Finance and Human resources
In response to questions Mr Nor clarified that the USD250,000 shown in the table was in addition to the provision of office infrastructure.

During discussion following the Directors Report, Mr Ibbitt commented that he believed that the APF Rainfall IFD project held at the HTC in June 2005 should have featured more prominently in the report and not just as an appendix.

Mr Liu congratulated Mr Nor on the achievements of HTC. He expressed the hope that HTC, ICHARM and the 2 Centres in China would actively collaborate on common issues and hold joint activities such as workshops and symposia.

Mr Nor referred to the recommendation of the IHP Bureau on the operation of centres and Mr Liu commented that there will be new guidelines covering the performance of centres and that HTC and one of the centres in China (IRTCES) will be reviewed.

5. Future direction of HTC Kuala Lumpur

Mr Nor expressed the view that a paradigm shift was required in the focus of HTC which would see more emphasis on urban hydrology and ecohydrology. Mr Lee responded by expressing concern that HTC already has too much emphasis on urban drainage and that it needed to focus more on humid tropics hydrology. Mr Nor noted this view.

Mr Arduino commented that HTC has been successful in organizing training courses. He also noted that the HTC operates the Water Archive however countries are not providing data and so the HTC is not able to properly act as a gateway for data and information. Mr Arduino felt that this needed to be further discussed by the RSC. Mr Nor advised the meeting there is a plan to upgrade the computer server and said that HTC relied on cooperation from the countries for the Water Archive and server to be successful.

6. Other matters

Mr Liongson raised the issue of the Water Archive again saying he had looked at the Water Archive but found that the data was incomplete and that data provided by the Philippines was not included. Mr Liongson undertook to provide data for the Catalogue of River basins in the Philippines for inclusion in the Water Archive.

ACTION: Mr Liongson to provide data for the Catalogue of Rivers basins in the Philippines.

Mr Nor informed the meeting that data from the Water Archive were downloaded and used in the low flow course held at HTC.

7. Closure of the meeting

The Chairman thanked the meeting participants for their input, said he looked forward to ongoing discussion and collaboration, thanked the Indonesian IHP NatCom and the Local Organizing Committee for providing the venue for the meeting and closed the meeting at 6:45 pm.

8. Action Items

Action	**By whom**
1. Regularly update the NatCom address list	Mr Nor
2. Countries to consider submitting proposals for flood forecasting projects	Countries
3. Countries to consider submitting proposals for capacity building in IWRM.	Countries
4. Prepare a PP proposal for the Flood Forecasting and Warning Study	Mr Liongson (Philippines) with Vietnam, Thailand and HTC
5. Ensure the Water Archive is functional as soon as possible	Mr Nor
6. Provide data for the Catalogue of Rivers basins in the Philippines	Mr Liongson

4.0 Report of HTC Kuala Lumpur

THE REGIONAL HUMID TROPICS HYDROLOGY AND WATER RESOURCES CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC (HTC Kuala Lumpur)

REPORT PRESENTED AT THE 10th CO-ORDINATION COMMITTEE MEETING THE GRAND HOTEL BANGKOK, THAILAND 19 OCTOBER 2006

BY THE DIRECTOR

1.0 INTRODUCTION

This report highlights events and activities that had taken place since the 9th Co-ordination Committee Meeting (CC) in November 2005 at Bali Resort, Indonesia. Also provided in this report are future programmes and activities that will spur discussion by members.

2.0 ACTIVITIES IMPLEMENTED AND PARTICIPATED AT REGIONAL AND INTERNATIONAL LEVEL

2.1 The 7th International Conference on Urban Drainage Modelling in Conjunction with 4th International Conference on Water Sensitive Urban Design and Join Committee on Urban Drainage, Melbourne, Australia, 3 April to 8 April 2006.

The aim of this conference was to enhanced discussions of integrated approaches to urban drainage modeling, urban water management and urban design. The Director of the Centre attended the conference.

2.2 The Centre had become a life member of the International Water Association (IWA).

2.3 The 17th session of IGC (IHP) UNESCO

The 17th session of the Intergovernmental Council of the International Hydrological Programme (IHP) was held at UNESCO Headquarters in Paris from 3 to 7 July 2006. Forty delegations from member states attended, twelve governmental and non-governmental organizations and seven UN organizations were also represented. The Director of the Centre attended the session.

2.4 Water Centres Directors meeting in Asia and Pacific Region, UNESCO Paris, 4th July, 2006

First meeting of Water Centres of UNESCO for the Asia and Pacific Region was held on the 4th July, 2006 at UNESCO Paris. The meeting was participated by directors or representatives of centres, a few representatives of the member states representing the council from the Asia and Pacific region, and members of the IHP secretariat. The director of HTC Kuala Lumpur volunteered to chair the meeting.
The minutes of the meeting is as Appendix 1.

Following the meeting, a set of questionnaire has been prepared based on the general schema agreed is shown as Appendix 2.

3.0 ACTIVITIES IMPLEMENTED AND PARTICIPATED AT NATIONAL LEVEL

3.1 World Day for Water 2006.

The National level World Day for Water 2006 celebration was held on 22 April 2006 in Perlis. The theme for the Day was "Water and Culture". It was aimed at drawing attention and awareness on the fact that there were many people using and celebrating water as cultural traditions across the world.

Water And Culture is based on the 3 key goals:

i. Water is critical to nourishing and fostering life
ii. Water is life
iii. Water is an essential public good

The centre was one of the supporting organizations.

3.2 A two day seminar on River Protection and Watershed Modeling, University Teknologi MARA (UiTM), Shah Alam, 26 – 27 May 2006

This two day seminar was jointly organised by the MARA University of Technology, DID, HTC KL, IEM and KUiTTHO on the 26 – 27 May 2006, mostly attended by academics, researchers, local engineers and government officials. The main speaker was Prof Pierre Y. Julien of the Colorado State University.

It was aimed at giving insight and understanding amongst others in the general theory of watershed processes and modeling, river confluences and bifurcations, riverbank protection and river engineering. It had also presented some current project undertaken by DID in IRBM for two important river basins.

The Centre director and its deputy attended and participated in the seminar.

3.3 National Conference on Water for Sustainable Development Towards a developed Nation by 2020, 13 – 14 July 2006

National Conference on Water for Sustainable Development towards a Developed Nation by 2020 was held on 13th to 14th July in Port Dickson. HTC KL hosted the conference which was jointly organized by Malaysian Hydrological Society and Malaysian International Hydrological Programme. The conference was attended by local and foreign participants.

The objectives of the conference is to feature the national characteristics and water problems, historical development and experience, optimization of water resources, good practice in management of water supply, and others.

The conference themes are:

- National hydrological characteristics and water problem
- Experiences and approaches in water development
- Water management and regulatory program
- Other aspects of hydrology

3.4 Research

The Centre has been the coordinator for the research programme under the Malaysian National Committee for IHP. The financial support is obtained from the Ministry of Science, Technology and Innovation (MOSTI). The research projects highlighted below will continue until 2007.

1. Development of runoff characteristic to validate stormwater management manual (MASMA). Theme 3 FA 3.7

2. Development of temporal pattern for urban areas and PMP derivation for peninsular Malaysia. Theme 3 FA 3.1

3. Development of runoff generation and catchment responses in forested and agricultural sites. Theme 3 FA 2.1

4. Detailed hydrological and water balance study of Paya Indah Wetlands. Theme 3 FA 3.5

Three quarterly meetings amongst researchers were conducted so far in 2006 to discuss the financial progress and the milestone achievement of each project and its report were sent to the secretariat of the Ministry. About 10 papers were submitted and presented in the National Conference on Water Resources for Sustainable Development towards 2020 that was held in 13 -14 July 2006.

In addition, the committee had decided to submit another 6 research projects to MOSTI to be carried out in the period from 2006 to 2010.

4.0 QUALITY MANAGEMENT SYSTEM

Since the HTC Kuala Lumpur was awarded the prestigious ISO 9001:2000 quality management certification, continual improvement has always being carried out.

On the 13th April 2006, the first management review meeting was held and followed by an internal auditing by the Quality Division of DID on 21-22 Jun 2006. The Auditor's findings were classified as minor and corrective actions were taken to improve the quality system.

The surveillance audit was carried out from 15 to 16 September 2006. The Auditor had found sufficient evidence that the the HTC's quality management system has all this while been satisfactorily implemented and maintained in accordance to the requirement of the MS ISO 9001:2000. With that, SIRIM has agreed to accord the agreement with HTC to continue the certification for the next two years.

5.0 FUTURE PROGRAMME AND ACTIVITIES

No	Title	Year	Funding
1.	Studying on Flood Forecasting and Warning System for Humid Tropics Region.	2007	UNESCO Jakarta
2.	Regional Training Course on Urban Storm water Management for Tropics Region.	2007	Bidding for PP Grant (2006/2007) and possibly with the cooperation of German's
3.	Local Research Projects.	2006-2010	Funded by MOSTI
4.	AP FRIEND Phase 2	2005-	
5.	IHP Phase VII	2008-2013	

6.0 WATER DATA ARCHIVE

6.1 AP FRIEND Water Archive

The current status of Water Data Archive in catalogue Vol. 1 to Vol. V has not been improved since the previous meeting and is shown in the Appendix 3.

It is noted that the centre operates the Water Archive, however countries are not providing data and so the centre is not able to properly act as a gateway for data and information. Some issues highlighted in the previous RSC meeting is summarized as Appendix 4.

A paper is attached as Appendix 5 written by Hidetaka Chikamori and Yasuto Tachikawa for a Proposal for Revision of Cataloque of Rivers for Southeast Asia and the Pacific for discussion and comment from members of the Coordination Committee.

The plan to upgrade the computer server is underway. Problems pertaining to access to the Water Archive resulting from the need to reconfiguration of the HTC server when the centre became part of the Ministry of Natural Resources and Environment has been solved. The new address is : http://www.htckl.org.my/apfriend/wa. The Centre however relied on cooperation from the member countries for the enhancement of the Water Archive.

The centre has already initiated the AP Friend IDF Research Project in-house at national level. A small scale catchment of Sungai Kayu Ara in urbanised part of Kuala Lumpur has been selected for the development of a low return period regional IDF relationship using a generalised Pareto (GPA) distribution. The findings has been encouraging and research finding were submitted and the paper were presented in the National Water Resources Conference Towards a Developed Nation by 2020.

7. FINANCE AND HUMAN RESOURCES

7.1 Operation and Maintenance

The budget for the year 2006 is shown in Table 1.

Table 1 Financial status for 2006

No	Component	Amount (USD)	Contributing Agency
	Operation and Maintenance		
1.	Trust Account	37,145.00	Govt. of Malaysia
2.	Internal Budget	96,210.00	Govt. of Malaysia
	Sub-total	133,356.00	
	Emolument		
1.	Staff salary	94,473.00	Government of Malaysia
	Sub-total	94,473.00	
	TOTAL	**190,684.00**	

7.2 Research

The amount of Financial support received from MOSTI for 2006 and 2007 is shown in Table 2.

Table 2 Financial status for Research Activities 2006/2007

No	Title	Amount (USD)	Contribution
1.	Development of runoff characteristics to validate storm water management manual (MASMA).	32,895.00	Govt. of Malaysia /MOSTI
2.	Development of temporal pattern for urban areas and PMP derivation for peninsular Malaysia.	23,158.00	Govt. of Malaysia /MOSTI
3.	Development of Runoff Generation and Catchment Responses in Forested and Agricultural sites.	34,737.00	Govt. of Malaysia /MOSTI

4.	Detailed hydrological balance study of Paya Indah, Wetlands	33,947.00	Govt. of Malaysia /MOSTI
	GRAND TOTAL	**124,737.00**	

7.3 Staff

i.) Mr. Khairuddin Mohamed a technician, reported for duty in February 2006.

ii). Mrs Rohayahty a chief clerk, reported for duty in December 2005.

8. OFFICE COMPLEX

The Malaysian government has approved an allocation amounting USD 1.3 million under the 9th Malaysia Plan for expansion and extension of additional building facilities. This includes the construction of a mini-convention centre used for training courses, seminars, workshops and meetings The Department of Irrigation and Drainage Malaysia has commenced the planning and design of the facilities.

9.0 PUBLICATIONS

The following are the publications produced by the Centre :

1. M.N. Mohd Desa and P.R. Rakhecha (2006). Deriving highest persisting monthly 24-hr dew points in Malaysia for the estimation of PMP. 5th FRIEND World Conference, 27th Nov – 1st Dec 2006, Havana, Cuba. In print.

2. M.N. Desa M. and P.R. Rakhecha (2006). Probable Maximum Precipitation for 24-hr duration over an equatorial region : Part 2 – Johor, Malaysia. Journal of Atmospheric Research. In print.

3. M.N. Mohd Desa, A.M. Ishak, F.Mohamed, M.Z. Mat Amin (2006). Developing a Low Return Period IDF Curves Using 3P Generalised Pareto and 2P Exponential Distributions : Accepted for oral presentation, 7th International Workshop on Precipitation in Urban Areas, 7 – 10 Dec 2006, St. Moritz, Switzerland.

4. Proceedings of the National Conference on Water for Sustainable Development Towards a Develop Nation by 2020. Guoman Beach Resort, Port Dickson, Negeri Sembilan 13 – 14 July 2006.

10. CONCLUDING REMARKS

This report has given a brief account about activities carried out by the Centre during the reporting period. It is recommended that more effective long-term programme and activities be developed and shared among member countries. In pursuit of this, there is a need to increase our collaborative effort, as it would determine effective solution to our water related problems.

ACKNOWLEDGEMENT

The director wishes to thank all those involved directly or indirectly in giving various means of support towards all activities undertaken. The organizer for kindly hosting this 10th CC Meeting is also acknowledged. Finally the Director would like to thank UNESCO and IHP Thailand who kindly provide the necessary financial support and facilities to all who attended this meeting.

ABBREVIATIONS

APHW - Asian Pacific Association of Hydrology and Water Resources

ASPAC - Asia and the Pacific Region

DID - Department of Irrigation and Drainage Malaysia

HTC - Humid Tropics Centre Kuala Lumpur.

ICHARM - International Centre for Water Hazard and Risk management, Japan

IEM - The Institution of Engineers, Malaysia

IHP - International Hydrological Programme

IGC - Inter Governmental Council of the IHP UNESCO

IRTCES - International Research and Training Centre on Erosion and sedimentation China

IRBM - Integrated River Basin Management

IWA - International Water Association

IWRM - Intergrated Water Resources Management

KUiTTHO - Kolej Universiti Teknologi Tun Hussein Onn

MASMA - The Malaysian Urban Drainage Manual

MOSTI - Ministry of Science, Technolgy and Innovation, Malaysia

MEXT - Ministry of Environment, Science and Technology, Japan

MS ISO - Malaysian Standard/International Organization for Standardisation

PWRI - Public Works Research Institute, Japan

SIRIM - Standards and Research Institute of Malysia.

UiTM - Universiti Technologi MARA

UNESCO - United Nation Educational, Scientific and Cultural Organization

WMO - World Meteorological Organization

5.0 Appendix

Appendix 1: Minutes of the Meeting: Category II centers in Asia

1. A meeting of the Category II centers in ASPAC region was organized on 4th July 2006. The meeting was participated by directors or representatives of the centers, a few representatives of the member states representing the council from the ASPAC region, and members of the IHP secretariat. A detailed list of participants and email coordinates are provided in the annex. The director of UNESCO center on Humid Tropics in Kuala Lumpur volunteered to chair the meeting.

2. The meeting recalled the informal discussions that were held in Mexico during the 4th World Water Forum.

3. The meeting decided to revisit justification of cooperation between and among the centers. There was a consensus that increased cooperation between and among the centers in ASPAC will lead to:
    a. Improved exchange of information;
    b. Opportunity for increased cooperation for joint action, and fund generation;
    c. Transparency in program implementation and avoiding duplication of work, including opportunity for synergy
    d. Opportunity to identify Joint activities for implementation
    e. Opportunity to request for co-financing of activities

4. Agreeing on the extent of issues to be discussed and approve, the meeting decided to meet for two and a half day and discuss, inter alia, the following issues:
    a. The need and rational for cooperation between and among the centers considering the major strengths of each center in the region in terms of available facilities, already established linkages, access to resources, etc.
    b. Define roles of IHP national committees, UNESCO centers and regional/cluster offices to avoid duplication, modes of cooperation and agree on responsibility sharing strategy.
    c. Based on b. above, prepare a common agenda of operation and review currently planned activities in the region and identify areas when UNESCO water centers can contribute.
    d. Given the centers' status within the broader framework of IHP is still not properly defined, agree on proposal to be discussed in RSCs of ASPAC region.
    e. The meeting will decide and agree on:
        i. Communication strategy

Appendix 1

ii. Coordination mechanism
iii. Joint- activity development strategy
iv. Opportunity for collaboration for tapping external resources.
v. What activities to showcase and how, e.g., Case studies
vi. Multi-lateral MOU between and among the centers.
vii. Follow-up and monitoring strategy for the collaborative arrangement(s) agreed during the meeting.

5. The meeting agreed that an output oriented agenda would be needed because it will not only reduce the total duration of the meeting but also guide the meeting to its desired outcomes. It was agreed that a questionnaire would be developed based on the issues/questions that UNESCO centers would like to discuss during the meeting. The IHP secretariat will collate such inputs and develop a questionnaire and solicit inputs from the centers. A consolidated report will be drafted based on the reports of the centers and a realistic meeting agenda will be drawn based on the common issues raised.

6. The meeting charged the secretariat to be responsible for preparing the questionnaire report there of, and agenda in consultation with the center directors.

7. The meeting welcomed the offer of PR China and Malaysia to host the meeting. It was decided that decision will be taken after reviewing the type of services that will be offered for the organization of the meeting.

8. It was agreed that the meeting will be held in 2006, but the exact time will be decided based on consultation.

9. The meeting will be attended only by directors of the centers and the responsible officers from the IHP secretariat.

10. The centers will raise their own funds to participate at the meeting.

Appendix 1

Annex 1

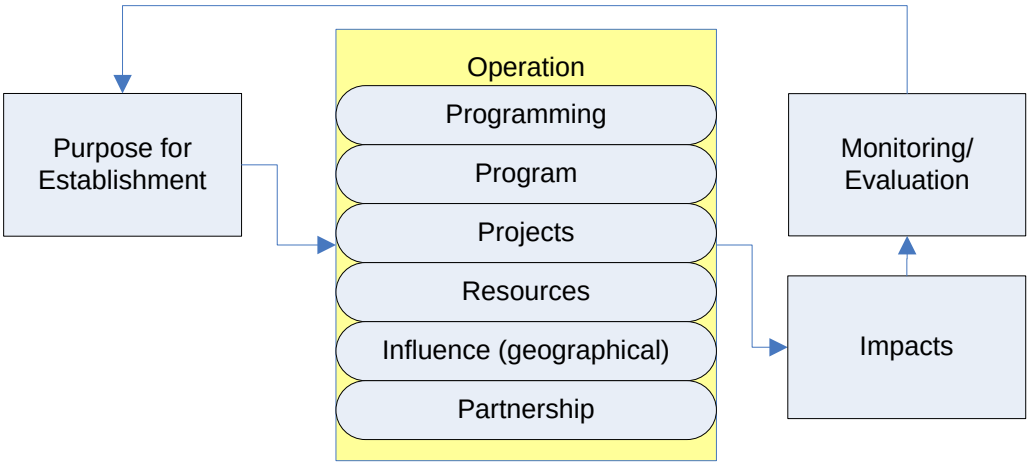
List of Participants:

SN	Name	email
1	Dr. Cheng Liu - IRTCES China	chliu@iwhr.com
2	Dr. Liu Heng	hliu@china.com
3	Mahavir Bhardwraj, Indian Delegation	dl.unesco8@unesco.org
4	Dr. Akira Terakawa-ICHARM, Japan	terakawa@pwri.go.jp
5	Ms. Patriciai Wouters, Dundee Centre	p.k.wouterse@dundee.ac.uk
6	Ms.Watanabe Akiko, Japan	deljpn.clt@unesco.org
7	Dr. Takeuchi Kuniyoshi, ICHARM	takeuchi@yamanashi.ac.jp
8	Eddy A Diajadine…	eddy_djajadireja@yahoo.com
9	Jan Sopaheluwakan	jans@lipi.go.id
10	Gadis Sri Hanyani	gadissh@ido.net.id
11	Reza Ardakanian	ardakanian@sharif.edu
12	Abdin Salih	a.salih@unesco.org
13	Giuseppe Arduino	g.arduino@unesco.org
14	Anil Mishra	a.mishra@unesco.org
15	Jayakumar Ramasami	r.jayakumar@unesco.org
16	Niloofer Sadeghi	n.sadeghi@unesco.org
17	Toshihiro Sonoda	T.sonoda@unesco.org
18	Bhanu Neupane	b.neupane@unesco.org

Appendix 2

Questionnaire

This is a follow-up to the informal meeting of the Directors and Staff of UNESCO Category II centers and IHP on the 4th of July 2006. As agreed, the following questionnaire has been prepared based on the general schema as presented in the diagram below.



Please provide your brief objective assessment of the listed questions. Your inputs will be utilized to firm up a discussion agenda to devise modalities for cooperation. A brief report will be drafted based on your inputs and will be sent to you before the proposed meeting]

Appendix 2

Name of the Centre:

Humid Tropics Centre Kuala Lumpur (HTC Kuala Lumpur)

Name of official filling the questionnaire:

Mohd Nor bin Mohd Desa

Brief Description of the center:

The Centre was officially established in October 1999. It has a Coordination Committee which meets once a year and headed by the Chairman of the Malaysian National Committee for IHP. It operates in the region of Southeast Asia and the Pacific covering some thirteen countries. Notable projects involved include the Asian Pacific FRIEND, River Catalogue, the Water Data Archive, Masters Degree Program in IWRM with Open University Malaysia, local research, etc. It has acquired a quality management system MS ISO9001: 2000 since 2003. See http://www.htckl.org.my for more details.

Manpower/Staff situation and arrangements:

See attachment

Propose for Establishment

1. *In your opinion, what is the need for establishing Category II Centres?*

   It helps promote implementation of IHP programme in the region

2. *Do you think the center has been carrying out its responsibilities as stipulated in its* inception document?

   We had MoU signed between UNESCO and the Government of Malaysia. I think so far we have been able to deliver our responsibilities successfully

3. *Do you think the roles and responsibility of the center has evolved/changed overtime?*

   To a certain extent yes.

4. *How do you think the roles and responsibilities have evolved/changed overtime?*

   Through new networking such as the Cap-Net (Capacity Building Network for IWRM of UNDP). The Centre has assisted the MyCapNet to implement a Masters Degree programme offered through the Open University Malaysia.

   The centre has also involved itself in the Joint committee on Urban Drainage of IAHR/IWA.

5. *What are factors leading to changes in the roles and responsibilities of the center?*

   The need to be address emerging and pressing issues like urban water management and capacity building in IWRM

6. *If the center has not been able to dispense its responsibility as stipulated, what do you think are the primary reasons?*

The biggest problem is capital to finance programme in the region. Secondly, each national IHP has its own priority in the ambit of its government. The level of priority therefore is different from one country to another and also the social and national focus is also diverse.

Operation:

7. *Are there any long-term policies and strategies in your Centre and what are the expected results?*

   Basically our strategies are based on the programme of UNESCO i.e. the medium term plan. The long-term policy is to cooperate and collaborate effectively and openly with all regional countries National Committees and all water Centres of UNESCO's and other partners.

8. *If yes, are these long-term policies and strategies prepared in consultation with UNESCO?*

9. *Could you please provide the list of other agencies/ authorities you consult before preparing your programs?*

   Normally the Centre has an annual Coordination Committee Meeting attended by the representatives of National Committees in the region of Southeast Asia and the Pacific and UNESCO as well as interested organization.

10. *Are you aware of UNESCO's programming cycle?*

    Yes

11. *Do you adhere to biannual planning of UNESCO while preparing your programs?*

    Yes

12. *If yes, what coordination mechanism exists between the center and the UNESCO's plan of operation?*

    We have a Coordination Committee which meets annually and present report in the Regional Steering Committeee of Southeast Asia and the Pacific (RSC)

13. *If no, how do you coordinate your activities with UNESCO's operation in the region?*

14. *Please provide/inform if you have working agreement with any other UNESCO category II Centers?*

    No

15. *Could you please provide the financial resources scenario/available financial resources for running the center?*

    The operational cost to run the Centre is wholly provided by the government of Malaysia.

16. *How do you meet/tackle administrative costs of your Centre?*

    Malaysia government

17. *How do you meet/tackle project costs of your Centre?*

Project costs come from two main sources namely the Malaysia government and UNESCO, e.g PP grant. There are other sources of funding such as the German OHP/IHP, MEXT of Japan, WMO, DFID UK, CapNet etc.

18. *Who are your principle donors?*

    No

19. *What is your idea for encouraging NGOs & IGOs to support your Centre's activities?*

    The idea to get NGOs & IGOs on board is most welcome. However cooperation from National Committees is crucial to identify which areas are viable to get support. They might be interested more on In terms of awareness raising and local action on IWRM etc

20. *What percentage of your project/administration costs come from UNESCO?*

    Small in comparison to research allocation obtained from the Malaysian Government.

21. *How are the financial arrangement agreed with UNESCO?*

    Based on project such as training course, organinsing conferences, meeting, etc but always on a shoe string budget.

22. *Do you think the Centre is cost-effectiveness vis-à-vis its outputs?*

    Yes

23. *Do your think documentation and information disseminated by your Centre satisfies minimum standards?*

    Yes

24. *What are the key lessons (positive or negative) from the activities carried out by your Centre since the beginning the Centre's establishment?*

    Participation of National Committees is based on the available fund. The National Committees rely so much on sponsored activities in other words 'supply-driven' sort of thing.

    It is being very difficult to initiate a programme and to obtain a follow-up.

25. *What is your suggestion for promoting the activities of your Centre? (technically and financially)*

    UNESCO has a primary role to play technically and financially. A vast majority of the National Committees are interested to implement activities if there are of direct benefit to them. The short annual meeting that we have at the moment is insufficient to bring about a change in planting more interest to cooperate among members. Activities should be made in such a way that they belong to the aspiration of member countries and largely create a feeling of ownership toward any activities being implemented.

    A common or pilot project beneficial to participating countries is one example where experts from various disciplines can work as a team and transfer knowledge and experience.

26. *Is there a need for establishing coordination mechanism between the Centres?*

We already have one. What we would like to improve upon is to have more frequent meetings and dialogue and exchange programme and visit.

27. *As all centers have different areas of expertise, is it possible to coordinate their activities?*

    Yes as long as there is no overlapping activities carried out by these Centres. It can bring effective results and reduce time for unnecessary 're-engineering.'

28. *If yes, how do you think the coordination mechanism should be developed and perfected?*

    Make use of the ICT and encourage exchange of information freely.

29. *What role do you think should be of UNESCO in supporting such coordination between the center?*

    UNESCO should provided technical know how and advice. Assigning short term associate expert to provide coordinating role among others is completely necessary. The UNESCO IHE Centre for Water Education should set to see their direct and active support in providing educational materials and recourse persons to the Centre.

Impact Assessment:

30. *What is your opinion about impacts of your Centre in solving water resources challenges in the region?*

    At the moment the impact is yet to be felt. But it takes time and effort to realize the impact provided all parties are giving their cooperation. The region is so diverse politically and also the level development makes it even more challenging to implement any action.

31. *Do you think that UNESCO has adequately realized the centers' role in solving water resources problems in the region?*

    Partly yes.

32. *If not, how do you think the centers' role could be better recognized?*

    UNESCO should give equal treatment to all Centres in their promotion and campaign. Involvement of the Centre in any working groups should be made more profound as it represents the voice of region. There is no need for UNESCO's office to carry out certain project on its own without having the involvement of the Centre. If the Centre is given the mandate and responsibility to implement a project then it will be on course to receive greater recognition.

33. *Are you satisfied with UNESCO's backstopping/supports to the center's activities and operations?*

    Generally ok but the Centre deserves top priority in terms of acquiring PP grant, training materials and document, etc.

34. *If not, what do you think is needed to change the modality of operation so that maximum synergy is made possible?*

    UNESCO should engage a direct consultation with the Centre especially where the Centre has little jurisdiction over the way certain projects are to be implemented. The

Appendix 2

Centre should be given full mandate when it come to project implementation and coordination.

What do you propose to do to improve the assessment of center's performance and UNESCO support?

A key performance indicator and/or system quality put in place.

Appendix 3

Rivers Catalogued in Vols. I to V

The following 114 rivers are compiled in the five volumes of the Catalogue of Rivers in Southeast Asia and the Pacific, which are products of UNESCO's International Hydrological Programme (IHP) regional activities in the frame work of the Asian Pacific FRIEND.

Country	Vol. I (1995)	Vol. II (1997)	Vol. III (2000)	Vol. IV (2002)	Vol. V (2004)
Australia	Burdekin River Pioneer River	Todd River East Finniss River	Torrens River Scott Creek		Snowy River below Lake Jindabyne
Cambodia	Prek Thnot	Stung Chinit			
China	Bei-jiang Jin-jiang Jiyun-he	Gan-jiang Taizi-he Ou-jiang	Bailong-jiang You-jiang Huang-he	Fen-he Hongshui-he Jialing-jiang Luan-he	Rong Jiang
Indonesia	Citarum Bengawan Solo Kali Brantas	Sungai Asahan Citanduy Kali Progo	Cimanuk Kali Serayu	Kali Tuntang Jeneberang River	Kali Ciliwung Kali Cisadane
Japan	Yoshino-gawa Ara-kawa Mogami-gawa	Chikugo-gawa Fuji-kawa Ishikari-gawa	Shimanto-gawa Shonai-gawa Watarase-gawa	Shinano-gawa Tone-gawa Yodo-gawa	Nagara-gawa Natori-gawa Yasu-gawa
Korea (Rep. of)	Pyungchang-gang Guemho-gang Miho-chun	Soyang-gang Nam-gang Gap-chun	Nam Han-gang Hwang-gang Guem-gang	Soemjin-gang Milyang-gang Sapkyo-chun	Banbyeon-chun
Lao PDR		Nam Khane Nam Ngum Sedone	Nam Theun/Cading Nam Sebangfay Nam Sebanghieng	Nam Ou Nam Suang Nam Sekong	Nam Ngiep Nam Sane Nam Song
Malaysia	Rajang Batang	Sungai Johor		Kelantan River Chalok River	Pahang River
New Zealand	Buller River	Motu River Hutt River	Taieri River	Mahurangi River	Motueka River
Papua New Guinea		Ramu Wara	Purari Wara	Sepik Wara	
Philippines	Ilog Magat Ilog Pampanga	Ilog Itaas ng Agno			Pasig-Marikina Laguna de Bay Basins
Thailand	Mae Nam Ping Mae Nam Mae Klong	Mae Nam Nan	Mae Nam Yom Mae Nam Wang	Prachinburi River Bang Pakong River Tonle Sap River East Coast Gulf River	Chao Phraya River Sakae Krang River Pasak river Tha Chin River
Viet Nam	Song Ky Cung Song Thu Bon Song Ba Song Srepok			Cau River Tra Khuc River	Chay River Houng River
Number of Rivers	25	24	20	25	20

Appendix 4

RESOLUTION RSCXIII-2 PROPOSED AND TO BE DISCUSSED FURTHER DURING THE NEXT 14TH RSC MEETING, 2006

Asian Water Archive

Upgrading Asian Pacific FRIEND database management systems

The IHP RSC for Southeast Asia and the Pacific

Recalling	that Asian Pacific FRIEND (APF) Phase 1 (1997-2001) accomplished certain results by forming Asian Water Archive and conducting comparative Hydrological studies in the region;
Noting	that APF and the Catalogue of Rivers for Southeast Asia and the Pacific (Vols. 1-5) have provided necessary data for scientific research and strengthened collaboration in the region, in a mutually complementary manner;
Recognizing	that data collected and stored so far in the Water Archive and the River Catalogues are not sufficient and not frequently updated; and upgrading the Archive is an urgent matter for the success of APF Phase II (2002-2007);
Also recognizing	that there are much expectation to APF Asian Water Archive and needs from UNESCO-related international water-related research communities and programmes such as HELP, IFI/P, ISI, IPL, GEOSS, GFAS, PUB, post-GAME*, and ecohydrology.
Urges	Member countries and relevant organizations to Provide more data necessary to the APF Asian Water Archive;
Requests	APF Technical Sub-Committee to facilitate the Activities relating to the Asian Water Archive and the Catalogue of Rivers; and the Humid Tropics Center in KL to frequently and efficiently upgrade the Archive in good cooperation with other nodes in Melbourne (Australia), Kofu (Japan) and others.

Appendix 4

*Notes:

HELP :	Hydrology for Environment, Life and Policy
IFI/P :	International Flood Initiative/ Programme
ISI :	International Sediment Initiative
IPL :	International Programme on Landslides
GAME:	GEWEX Asian Monsoon Experiment
GEOSS:	Global Earth Observation System of Systems
GFAS :	Global Flood Alert System of IFNet (International Flood Network)
PUB :	Prediction of Ungauged Basin, a decadal programme of IAHS

Appendix 5

Proposal for Revision of Catalogue of Rivers for Southeast Asia and the Pacific

Hidetaka Chikamori[1] and Yasuto Tachikawa[2]
[1]*Graduate School of Environmental Science, Okayama University, JAPAN*
[2]*Disaster Prevention Research Institute, Kyoto University, JAPAN*
[1]*tikamori@cc.okayama-u.ac.jp*
[2]*tachikawa@flood.dpri.kyoto-u.ac.jp*

September 13, 2006

1. Introduction

We propose to compile the next release (Vol.6) of Catalogue of Rivers as a database for rainfall and long-term rainfall-runoff analyses. The publication of the Catalogue will be limited to a CD or a Downloadable Electric form from a web page.

2. Problem Description

The series of Catalogue of Rivers for Southeast Asia and the Pacific has contributed to mutual understanding of hydrology and water resources of the region and of the neighboring countries by providing us a variety of valuable information of many river basins in this region. The release of the catalogues is one of the important achievements of IHP activities that show our strong collaboration.

For continuing publication of the Catalogue as an achievement of IHP, however, it is about time to change the editing policy. It is because the previously published five volumes have already covered most of representative rivers of each country. The catalogues include 114 rivers of thirteen countries, so that they have already provided sufficient information of characteristics of rivers in the region. Enriching data of the basins already included in the Catalogues will provide us more valuable information than increasing the number of basins in the Catalogues.

3. Project Summary

As the next step of the Catalogue of Rivers, we propose to compile the next release of the Catalogue as a database of time series of hydrometeorological data. The database will enable us to make rainfall analysis such as to develop Intensity-Duration-Frequency (IDF) relationship and rainfall-runoff analysis of river basins. This database would contribute to the hydrology and water resources research in the region as well as international research progress such as FRIEND, PUB, HELP, and GEOSS. It is expected to enhance the presence of IHP activity of Southeast Asia and the Pacific in the international water-related communities.

4. Project Details

We propose that the next volume of the Catalogue includes the data sufficient for daily (hopefully hourly) rainfall and rainfall-runoff analyses. The detail of the data collecting is shown below.

4.1 Selecting Target River Basins and Observing Stations

Each country/region would pick up one or several river basins from those already taken up in the Volumes I to V of the Catalogues. We can expect hydrometeorological data to be well managed in the basins included in the previously published Catalogues. At least one runoff observatory for each river basin with 500 - 5000 km^2 would be advisable. The candidate basins are listed in **Table 2**. Newly participating countries/regions are recommended to propose appropriate river basins.

Table 1. Hydrometeorological data required for rainfall and long-term rainfall-runoff analyses

Hydrometeorological data		Description
Runoff		Daily data.
Precipitation		Daily data.
Evapotranspiration	(Observed)	Daily data. Specify observing method and the detail of measuring equipment (evaporation pan, lysimeter etc.)
	(Estimated)	If either evaporation or evapotranpiration is not observed, estimated daily evapotranspiration is required. Specify estimation method (ex. Penman method).
Temperature		Daily average. If possible, daily minimum and maximum. It is required in the basins where snow falls in winter.

Note: Record length would be 20 years or longer for rainfall and 5 years or longer for river discharge and meteorological data (evapotranspiration and temperature) at more than one observation stations are desired. Hourly series are most preferable, if possible.

4.2 Collecting Hydrometeorological Data

Hydrometeorological time series data observed in the drainage area of the selected observing stations are collected. The collected data would include long-term rainfall for 20 years or longer and discharge data for five years or longer. The data of hydrological processes related to the water budget of the basin such as pan evapotranspiration or estimated evapotranspiration would also provided. The data requirements are shown below (See also Table 1).

(1) Observation interval:
Daily (hopefully hourly) for any kinds of hydrometeorological data.

(2) Record length:
20 years or longer for rainfall data and five years or longer for other meteorological data and river discharge data.

(3) Details of Observing Stations:
For estimating evapotranpiration or spatial distribution of snow cover or melting, altitude of observing stations and sensors (anemometer etc.) height from the ground surface would be required.

(4) Runoff:
Observing method of runoff would be clearly noted.

(5) Precipitation:
More than one rainfall observing stations are desired for estimating accurate areal precipitation.

(6) Evapotranspiration:
If evaporation or evapotranspiration is directly observed by using an evaporation pan or a lysimeter etc., daily data would be listed with measurement methods. Otherwise, the estimated evapotranspiration would be listed with the estimation method.

(7) Snow Cover and Snow Melting (if available):
These are important for analyzing rainfall-runoff relation where snow falls in winter. It is, however,

difficult to accurately estimate snow cover and snow melting. At least, time series data of temperature at many meteorological observing stations are required.

4.3 The other data required

Numerical topography and land use information is useful for development of hydrologic models. It would be helpful to include other kinds of thematic/geographic information available.

5. Fund

The fund required for publishing revised edition of the Catalogue is expected to be supplied by UNESCO.

6. Schedule

Information should be given to Prof. Chikamori at Okayama Univ., Japan at RSC meeting on October 19 and 20, 2006. Formatting should be finalized and sent to press, and Catalogue Vol. 6 will be published by the end of February 2007.

Table 2 Candidate river basins for publication of the Catalogue of Rivers Vol. VI

Country	Serial #	River Name	Volume	No.	Selected observatories	Area (km^2)	Relative discharge ($m^3/s/100km^2$)	Period of Statistics	Comments
Australia	Australia-2	Pioneer River	Vol. I(1995)	–	Marian Weir	1,320.0	1.62	1959 – 1987	3 large reservoirs & 3 weirs.
Cambodia	Cambodia-1	Prek Thnot	Vol. I(1995)	–	Anlong Touk	3,650.0	1.08	1964 – 1969	The observatory is located at the dam site. No larage facility in the upstream of the dam.
	Cambodia-2	Stung Chinit	Vol. II (1997)	–	Kampong Thmar	4,130.0	1.07	1962 – 1968	The observatory is located at the dam site. No significant water-control facility in the upstream of the dam.
China	China-14	Rong Jiang	Vol. V (2004)	–	Dongqiaoyuan	2,016.0	4.37	1953 – 1990	4 reservoirs in the basin. Tidal effect is anticipated.
Indonesia	Indonesia-8	Kali Serayu	Vol. III (2000)	–	Rawalo	2,631.0	10.39	1971 – 1995	A weir and a dam under construction at the upstream of the observatory.
	Indonesia-7	Cimanuk	Vol. III (2000)	2	Eretan	1,460.0	4.34	1956 1985	The observatory is located at a planned construction site of a dam. No water-control facility is found in the upstream.
Japan	Japan-7	Shimanto-gawa	Vol. III (2000)	–	Gudo	1,807.6	6.59	1952 – 1996	The observatory is located at the dam site. No large water-control facility in the upstream of the observatory.
Korea (Rep. of)	Korea (R. of) -2	Geumho-gang	Vol. I(1995)	–	Dongchon	1,529.0	1.00	1960 – 1992	No dam in the upstream of the observatory. No info. for observation interval.
	Korea (R. of) -1	Pyungchang -gang	Vol. I(1995)	–	Hoopo	1,621.0	3.19	1967 – 1985	No info. for observation frequency. Water level may be observed by manual reading.
Lao PDR	Lao-10	Nam Ngiep	Vol. V (2004)	–	Muang Mai	4,270.0	4.37	1987 – 2002	Water level is daily observed, and converted into discharge by using H-Q curve. No dam in the upstream. Too large basin?

Country	Serial #	River Name	Volume	No.	Selected observatories	Area (km^2)	Relative discharge ($m^3/s/100km^2$)	Period of Statistics	Comments
Malaysia	Malaysia-2	Sungai Johor	Vol. II (1997)	–	Rantau Panjang	1,130.0	3.32	1966 – 1995	Automated observation of water level and discharge. Linggui Dam may have affected runoff characteristics since 1992.
New Zealand	New Zealand-2	Motu River	Vol. II (1997)	–	Houpoto	1,393.0	6.54	1957 –	No artificial development. No water-control facility.
Papua New Guinea	PNG-1	Ramu Wara	Vol. II (1997)	–	Damsite	854.0	4.16	1965 – 1994	Probably, some water gauge is installed at Yongi Dam. No water-control facility. Daily observation is expected.
Philippines	Philippines-4	Pasig-Marikina -Laguna de Bay Basins	Vol. V (2004)	–	Marikina River	534.8	19.25	1988 – 2000	Concern about the influence of La Mesa Reservoir on runoff characteristics.
Thailand	Thailand-7	Bang Pakong River	Vol. IV (2002)	–	A. Sanamchaikhet, Chachoengsao	951.0	0.95	1969 – 1995	No information for water utilization in the basin. The rain gauge is located at the dam site?
	Thailand-3	Mae Nam Nan	Vol. II (1997)	–	Muang district, Nan province	4,609.0	0.83	1922 – 1995	
Viet Nam	Vietnam-1	Song Ky Cung	Vol. I(1995)	–	Lang Son	1,560.0	1.88	1960 – 1976	Twice a day observation of water level and 30 – 40 times observation of discharge. No info. for H-Q curve.
	Vietnam-5	Cau River	Vol. IV (2002)	–	Thac Buoi	2,220.0	2.33	1960 –	Observed at the upstream point of the dam. Preferable if daily discharge is available.
	Vietnam-7	Chay River	Vol. V (2004)	–	Bao Yen	4,960.0	2.82	1982 –	Observed at the upstream point of the dam. Preferable if daily discharge is available.

Appendix I. Objectives of the Catalogue of Rivers shown in the preface:

- To promote mutual understanding of hydrology and water resources of the region and of the neighbouring countries. This is essential for better regional co-operation in hydrological sciences as well as for water resources development and management.
- To promote intra-national information exchange among different organisations in each country. This is essential for the development of hydrological sciences and for better development and management of the water resources within each country.
- To promote the establishment of an international data exchange and collaborative research network in the region. This is expected to serve as a hop towards the start of an Asian FRIEND (Flow Regime from International Experimental and Network Data) Project in IHP-V, 1996 - 2001.

Appendix II. Current Contents of Catalogue of Rivers:

For each country:

Introduction
Acknowledgements

For each river:

Map of River
Table of Basic Data
  Name(s), Serial No., Location, Area, Length of the main stream, Origin, Highest point, Outlet, Lowest point, Main geological features, Main tributaries, Main lakes, Main reservoirs, Mean annual precipitation, Mean annual runoff, Population, Main cities, Landuse

1. General Description
2. Geographical Information
   - 2.1 Geological Map
   - 2.2 Landuse Map
   - 2.3 Characteristics of the River and Main Tributaries
   - 2.4 Longitudinal Profiles
3. Climatological Information
   - 3.1 Annual Isohyetal Map and Observation Stations
   - 3.2 List of Meteorological Observation Stations
   - 3.3 Monthly Climate Data
   - 3.4 Long-term Variation of Monthly Precipitation
4. Hydrological Information
   - 4.1 Map of Streamflow Observation Stations
   - 4.2 List of Hydrological Observation Stations
   - 4.3 Long-term Variation of Monthly Discharge Series
   - 4.4 Annual Pattern of Discharge Series
   - 4.5 Unique Hydrological Features
   - 4.6 Annual Maximum and Minimum Discharges
   - 4.7 Hyetographs and Hydrographs of Major Floods
5. Water Resources
   - 5.1 General Description
   - 5.2 Map of Water Resources System
   - 5.3 List of Major Water Resources Facilities
   - 5.4 Major Floods and Droughts
   - 5.5 Groundwater and River Water Quality
6. Socio-cultural Characteristics
7. References, Databooks and Bibliography

ANNEX 8

MINUTES OF MEETING OF THE 12TH TECHNICAL SUB-COMMITTEE FOR THE ASIA PACIFIC FRIEND PROJECT

The Grand Hotel
Bangkok, Thailand, 19 October 2006

Minutes

Attendees:

NAME	COUNTRY
ROSS JAMES	AUSTRALIA
TREVOR DANIELL	AUSTRALIA
LONG SARAVUTH	CAMBODIA
CHEN YUANFANG	CHINA
ZONGXUE XU	CHINA
AGUNG BAGIAWAN	INDONESIA
EDDY A. DJAJADIREDJA	INDONESIA
JAN SOPAHELUWAKAN	INDONESIA
HIDETAKA CHIKAMORI	JAPAN
KAORU TAKARA	JAPAN
MANOLOTH SOUKHANOUVONG	LAO PDR
MOHAMED FERDAOS	MALAYSIA
MOHAMMED NOR MOHAMED DESA	MALAYSIA
HTAY OO KYI	MYANMAR
BOB CURRY	NEW ZEALAND
RICHARD IBBITT	NEW ZEALAND
MAINO VIROBO	PAPUA NEW GUINEA
GUILLERMO TABIOS	PHILIPPINES
LEONARDO Q. LIONGSON	PHILIPPINES
HONGKEE JEE	REPUBLIC OF KOREA
SOONTAK LEE	REPUBLIC OF KOREA
SUKONTHA AEKARAJ	THAILAND
HANS THULSTRUP	UNESCO - APIA
GIUSEPPE ARDUINO	UNESCO - JAKARTA

1. Welcome

The TSC Chairman, Mr Daniell, opened the meeting at 8:00am and welcomed the participants.

2. Election of Rapporteur

Mr James was elected Rapporteur for the meeting.

3. Confirmation of agenda

The draft agenda was accepted (Attachment 1).

4. Report from TSC Chairman

Global FRIEND Report

Mr Daniell described the difficulties he experienced when preparing the regional report, which will be Chapter 7 in the Global Friend Report that will be presented at the FRIEND Conference in Cuba during December. The difficulties were a result of the lack of research activity, particularly in the Rainfall IFD Project. The regional report consists of some results from the IFD Project plus an ad-hoc compilation of research that has been undertaken by individuals in the region. Mr Daniell pointed out that the list was incomplete and that it must be recognized that more APFRIEND related research is occurring in the region.

FIGCC Meeting Saturday 2nd December 2006
The FRIEND Coordinating Committee will be meeting during the conference in Cuba. Mr Daniell has heard that there may be a request to hold the FRIEND 2010 conference in this region. Some initial inquiries about this possibility have already been received.

5. Discussion of AP FRIEND Phase 2

Mr Daniell briefly recalled the history of the Rainfall IFD Project, referred to the lack of follow-up on commitments made during previous TSC meetings and commented on the difference between individual research activities and responsibilities versus country responsibilities to participate in projects. The need for a strategy to ensure agreed actions were undertaken was raised. Mr Daniell highlighted the importance of these projects in making use of the increasing quantities and availability of data to improve the hydrological techniques and standards used in the region.

In response to the Chairman's comments a number of meeting participants offered suggestions on the way forward. These ranged from; the identification of 'champions' for each component of a project who would be responsible for increasing motivation and improving communication between researchers, to using smaller project groups of interested people to carry out the project work. It was emphasised during discussion that setting a direction or program of actions would not be successful if the reasons for the current inactivity were not identified and addressed.

Mr Ibbitt pointed out that considerable effort went into canvassing each country to identify priority issues and that rainfall IFD was the highest priority. It is not acceptable to move on to other projects without completing the rainfall IFD project. These other projects are also likely experience similar difficulties.

As a result of the discussion the representatives of the countries that had not submitted their rainfall analyses agreed to do so in a short timeframe as follows.

Country	**Due date**
Malaysia	1st week of November
Korea	6th November
China	13th November
Japan	13th November
Indonesia	13th November

The report from each country will include a description of the rainfall IFD technique used within the country for design and the results of the application of this technique to the data sets provided by each country participating in the Rainfall IFD Project. Upon receipt of the country analyses, Mr Tabios will complete a comparative analysis of the results.

ACTION: Countries to submit rainfall IFD analyses by the dates agreed.
ACTION: Mr Tabios to carry out a comparative analysis of the rainfall IFD results from each country.

Mr Daniell agreed to distribute the preliminary plans for the Flood Study Project when the rainfall analyses have been received.

ACTION: Mr Daniell to distribute Flood Study plans when the Rainfall Project analyses have been received.

6. Preparation of Catalogue of Rivers

Discussion of this Item did not occur as it was also included in the RSC Agenda.

7. Reports from representatives from National Committees

Due to time limitations this Item was skipped.

8. Development of Program of Activities

Discussion of this item occurred under Item 5 *Discussion of AP FRIEND Phase 2*.

9. APF Water Archive

Mr Daniell raised the problem of the AP FRIEND Water Archive not being operational for some time.

Mr Nor apologised for this and explained that the Humid Tropics Centre server that hosts the Water Archive has been moved to a new URL as follows – www.htckl.org.my. The need for a redirection at the old Water Archive URL was raised.

10. Closure

The Chairman thanked the participants and closed the meeting at 9:00am.

11. Action Items

ACTION ITEMS	**BY WHOM**	**WHEN**
1. Countries to submit rainfall IFD analyses by the dates detailed within the Minutes.	Malaysia Korea China Japan Indonesia	1st week November 6th November 13th November 13th November 13th November
2. Carry out a comparative analysis of the rainfall IFD results from each country.	Mr Tabios	?
3. Distribute Flood Study plans when the Rainfall Project analyses have been received	Mr Daniell	After action Item 1 completed

Asian Pacific FRIEND
12th Technical Sub-committee Meeting
Bangkok, Thailand, October 2006

Agenda

1. Opening

2. Election of Rapporteur

3. Confirmation of Agenda

4. Report from TSC Chairman –
   Global FRIEND Report
   FIGCC Meeting Saturday 2nd December 2006

5. Discussion on AP FRIEND Phase 2

- Direction
- Report for IFDs
- Direction for Floods
- Compilation of Research undertaken in Region that uses APFriend data

6. Preparation of Catalogue of Rivers

7. Reports from representatives from National Committees

8. Development of Program of Activities to be completed before next the Regional Steering Committee meeting

9. APF Water Archive

10. Closure

ANNEX 9

RESOLUTIONS

RESOLUTION RSC XIV-1

Augmentation of members

Invitation of Lao PDR and the Union of Myanmar to RSC

The IHP RSC for South East Asia and the Pacific

Recalling	that strengthening National Committees for IHP is important to activate their activities, promote science and technology and solve various water-related issues in each country;
Recognizing	that augmentation of RSC memberships strengthen the regional activities and contribute to IHP governance problems;
Also recognizing	that based on the RESOLUTION RSCXIII-1 adopted at the 13th Session in Bali, Mongolia has officially participated in the 14th Session of RSC in Bangkok;
Noting	that Lao PDR and Myanmar have participated in the previous RSC annual meetings as observers and that they have intention of joining RSC activities further;
Invites	Lao PDR and the Union of Myanmar to join the RSC as official members; and
Requests	the governments of related countries and UNESCO Jakarta Office to assist their necessary actions to realize this.

RESOLUTION RSCXIV-2

Asian Pacific FRIEND Water Archive

The IHP RSC for Southeast Asia and the Pacific

Recalling	that RESOLUTION RSCXIII-2 urged Member countries and relevant organizations to provide more data necessary to the Asian Pacific FRIEND (APF) Water Archive;
Noting	that APF and the Catalogue of Rivers for Southeast Asia and the Pacific (Vols. 1-5) have contributed to scientific research and strengthened collaboration in the region, in a mutually complementary manner;
Recognizing	that data collected and stored so far in the Water Archive and the River Catalogues are not sufficient and not frequently updated; and upgrading the Archive is an urgent matter for the success of APF Phase II (2002-2007);
Also recognizing	that the data included in the forthcoming volumes of the Catalogue of Rivers should contain more tractable data for scientific research such as longer time series with shorter-term (e.g., hourly) observations and be effectively related to the APF Water Archive;
Requests	RSC and associated Working Groups to facilitate the activities relating to the APF Water Archive and the Catalogue of Rivers
Requests	the Humid Tropics Center in KL to interact and collaborate directly with participating countries to source data and regularly upgrade the Archive with good cooperation with the other nodes in Melbourne (Australia), Kofu (Japan) and others.
Also requests	Member countries to provide data relevant to AP FRIEND activities

ANNEX 10

MINUTES OF THE MEETING OF THE 10th COORDINATION COMMITTEE OF THE REGIONAL HUMID TROPICS HYDROLOGY AND WATER RESOURCES CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC (HTC)

The Grand Hotel
Bangkok, Thailand, 19th October 2006

Minutes

Participants

FAMILY NAME	GIVEN NAME	COUNTRY	E-MAIL
ROSS	JAMES	AUSTRALIA	r.james@bom.gov.au
DANIELL	TREVOR	AUSTRALIA	trevord@civeng.adelaide.edu.au
LONG	SARAVUTH	CAMBODIA	lsaravuth@online.com.kh
CHEN	YUANFANG	CHINA	yfchen@mail.edu.cn
XU	ZONGXUE	CHINA	zongxuexu@vip.sina.com
SOPAHELUWAKAN	JAN	INDONESIA	jans@lipi.go.id
SRI HARYANI	GADIS	INDONESIA	gadissh@indo.net.id
TAKARA	KAORU	JAPAN	takara@mbox.kudpc.kyoto-u.ac.jp
TEREWAKA	AKIRA	JAPAN	terakawa@pwri.go.jp
SOUKHANOUVONG	MANOLOTH	LAO PDR	dmhvte@laotel.com
KEIZRUL	ABDULLAH	MALAYSIA	keizrul@water.gov.my
MOHAMED DESA	MOHAMMED NOR	MALAYSIA	drmohdnor@water.gov.my
OO KYI	HTAY	MYANMAR	Dg.dmh@mptmail.net.mm
CURRY	BOB	NEW ZEALAND	r.curry@niwa.co.nz
IBBITT	RICHARD	NEW ZEALAND	r.ibbitt@niwa.cri.nz
Q. LIONGSON	LEONARDO	PHILIPPINES	LQL@engg.upd.edu.ph
TABIOS	GUILLERMO	PHILIPPINES	gtabios@up.edu.ph
JEE	HONGKEE	REPUBLIC OF KOREA	hkjee@yu.ac.kr
LEE	SOONTAK	REPUBLIC OF KOREA	leest@yu.ac.kr
AEKARAJ	SUKONTHA	THAILAND	sukontha_a@mnre.go.th
TRAN	THUC	VIETNAM	thuc@netnam.vn
ARDUINO	GIUSEPPE	UNESCO - JAKARTA	g.arduino@unesco.org
THULSTRUP	HANS	UNESCO - APIA	hans@unesco.org.ws

1. Opening by the Chairperson

The Chairman Mr Keizrul Abdullah opened the meeting at 4:30pm instead of 5:00pm as scheduled so that there would be sufficient time to schedule a meeting on the Catalogue of Rivers Volume 6 following the HTC meeting. The participants were welcomed by the Chairman and referred to the Provisional Agenda in the booklet of documents distributed before the meeting.

2. Election of Rapporteur

Mr James was elected Rapporteur for the meeting.

3. Report of the 9th Coordination Committee meeting

The Chairman referred the meeting to the Minutes of the 9th Co-ordination Committee Meeting held in Bali, Indonesia reproduced in the booklet of documents and inquired if there were any comments. No comments were made and Mr Nor, Director of the HTC informed the meeting of progress with the Action Items as follows.

9th CC Meeting Action Item	Status
1. Regularly update the NatCom address list	Completed
2. Countries to consider submitting proposals for flood forecasting projects	No proposals received. Countries were again requested to submit proposals
3. Countries to consider submitting proposals for capacity building in IWRM.	No proposals received. Countries were again requested to submit proposals
4. Prepare a PP proposal for the Flood Forecasting and Warning Study	In progress
5. Ensure the Water Archive is functional as soon as possible	A new server has been installed and the Water Archive is operational. A new URL must be used http://www.htckl.org.my/apfriend/wa/
6. Provide data for the Catalogue of Rivers basins in the Philippines	Data for basins in Volume 5 provided

ACTION: Countries to identify any projects in 'Flood Forecasting' and 'Capacity Building in IWRM' that the HTC may be able to collaborate on or provide some support for and to submit project proposals to the HTC.

4. Report by the Director of HTC

The Report by the Director of HTC was presented in detail during the Regional Steering Committee Meeting earlier in the day. Consequently, Mr Nor only briefly referred to the main sections in his report.

In response to a question from Mr Arduino, Mr Nor clarified that the PP Grant referred to in Section 5.0 Future Program of Activities, was a bid that has been submitted for the current year and about which the success or failure is unknown.

Mr Nor also informed the meeting that the expansion of the HTC building is expected to be completed in approximately one year.

5. Future direction of HTC Kuala Lumpur

Mr Nor informed the meeting that UNESCO Centres such as HTC are being encouraged to work collaboratively with the IHP National Committee on projects. To this end, the HTC had distributed the IHP VII draft Strategic Plan to each country in the region and requested feedback on possible collaborative initiatives. The Chairman identified the need to first determine which of the Themes in the Plan were considered more relevant to each country.

This would enable common Themes and therefore possible areas of collaboration to be identified. The Chairman proposed the following action:

ACTION: HTC to redistribute the latest IHP VII Strategic Plan and countries to respond by identifying Themes that were considered relevant to them.

ACTION: HTC to identify common Themes and request and/or propose collaborative activities.

6. Other matters

Mr Nor referred to the Minutes of the 4th July informal meeting of the Directors of the UNESCO Category II Centres reproduced as Appendix 1 of the booklet of meeting documents. He outlined the proposal to hold a formal meeting of the Directors of Category II Centres to improve information exchange, increase collaboration and reduce duplication of effort.

Mr Lee raised a query about the Centres involved in the meeting and the different categories of UNESCO Centres. The categories were clarified by Mr Arduino who also confirmed that the meeting was of Category II Centres.

Mr Nor highlighted paragraphs 3 and 4 of the Minutes which contain a description of both the objectives of the proposed meeting and the issues to be discussed. The date of the meeting has not been determined. However, as preparation for the meeting a Questionnaire has been circulated to each Centre seeking details about the Centre and feedback on the issues to be discussed. Mr Nor referred to Appendix 2 which contained the HTC response to the questionnaire and requested that countries in the region provide feedback to HTC on any of these issues plus anything else they would like raised at the meeting of Directors.

ACTION: Countries provide feedback to the HTC on any issues to be raised at the meeting of Category II Centre Directors.

Mr Nor briefly referred to the APFriend Water Archive and to Appendix 3 of the booklet which lists the river basins included in the Catalogue of Rivers Volumes 1-6. There was some confusion as to how many of the river basins had data included in the Water Archive. Mr Nor undertook to check this.

ACTION: Check how many river basins have data included in the Water Archive.

7. Closure of the meeting

The Chairman thanked the meeting participants for their input and closed the meeting at 5:00pm.

8. Action Items

Action	By whom
1. Countries to identify any projects in 'Flood Forecasting' and 'Capacity Building in IWRM' that the HTC may be able to collaborate on or provide some support for and to submit project proposals to the HTC. (Was 9th Meeting recommendations 2 and 3)	Each Country
2. HTC to redistribute the latest IHP VII Strategic Plan and countries to respond by identifying Themes that are considered relevant to them.	HTC Each Country
3. HTC to identify common Themes and request and/or propose collaborative activities.	HTC
4. Countries provide feedback to the HTC on any issues to be raised at the meeting of Category II Centre Directors.	Each Country
5. Check how many river basins have data included in the Water Archive.	HTC