



**INTERNATIONAL HYDROLOGICAL PROGRAMME**

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**13<sup>th</sup> IHP Regional Steering Committee  
meeting for Southeast Asia and Pacific**

*Bali, Indonesia, 24-25 November 2005*

**FINAL REPORT**

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**IHP-VI Regional Steering Committee meeting | No. 13  
Regional Steering Committee for Southeast Asia and the Pacific  
UNESCO Jakarta Office, 2005**

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**The 13th IHP  
Regional Steering Committee Meeting for  
Southeast Asia and the Pacific**

**Bali, Indonesia  
24-25 November 2005**

Chairman: Mr Tran Thuc (Vietnam)  
Secretary: Prof Kaoru Takara (Japan)

UNESCO Representatives: Mr Giuseppe Arduino (Jakarta Office)  
Ms Pungky Utami (Jakarta Office)  
Mr Hans Decker Thulstrup (Apia Office)  
Mr R. Jayakumar (Beijing Office)  
Mr Bhanu Neupane (New Delhi Office)(SP)  
Ms Niloofar Sadeghi (Tehran Office)

Countries Represented: Australia, Cambodia, China, Indonesia, Japan, Korea (Republic of),  
Korea (DPR), Lao PDR, Malaysia, New Zealand, Papua New  
Guinea, Philippines, Vietnam, Thailand.  
(See Annex 1 for list of participants)

Observing Countries India, Mongolia, Myanmar, Nepal

## **1 OPENING**

Mr Tran Thuc welcomed the participants and observers from India, Nepal, Mongolia and Myanmar. Mr Thuc informed the meeting that IHP Sri Lanka also planned to attend, however, the representative unexpectedly passed away; the Chairman expressed his condolences. The Indonesian Organizing Committee was thanked for the excellent arrangements for the meeting.

## **2 ELECTION OF RAPPORTEUR**

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

## **3 ADOPTION OF AGENDA**

The draft agenda was presented by the Chairman, and following some clarification and minor adjustment to times and Item headings, the agenda at Annex 2 was adopted.

## **4 SECRETARIAT REPORTS**

### **4.1 UNESCO JAKARTA OFFICE REPORT**

Mr Arduino introduced the UNESCO representatives from the Apia, Beijing, Jakarta, New Delhi and Tehran offices who were participating to familiarize themselves with the operation of the RSC and its contribution to regional governance arrangements.

Mr Arduino reviewed the action items from the 12<sup>th</sup> RSC meeting in Adelaide, Australia, and reported on the activities carried out in the region since the last RSC meeting. Mr Arduino reported on the 26 December 2004 tsunami, its impact on the water resources of the affected areas and the activities UNESCO to address these. The need for individual countries to support their representatives participation in the RSC to ensure available funds were able to be directed to other high priority activities was emphasized by Mr Arduino. The complete report is attached as Annex 3.

During discussion of the report Mr Arduino clarified some issues about the Participation Programme and informed the meeting that the UNESCO Field Offices are not involved in, and cannot influence, the selection process. Mr Arduino also urged that the material for the Nagoya workshops be prepared before the workshop so that it is available for the students to use during the course and immediately after they return to their country.

In response to queries about the non-receipt of information about training courses and publication, Mr Arduino agreed to ensure that the IHP NatCom contact list is regularly updated.

*ACTION: Jakarta Secretariat to regularly update the NatCom contact list.*

## **4.2 UNESCO APIA REPORT**

Mr Thulstrup described the very successful relationship that UNESCO has with SOPAC in the Pacific, which has resulted in significant funds becoming available for the Regional Action Plan. The launch of the Pacific HELP basin and the recent HELP workshop that was held in New Zealand were also described. Mr Thulstrup informed the meeting that, following the discussion at the 12<sup>th</sup> RSC meeting, the book “Small Island Hydrology” has been reprinted. This is an excellent resource and copies are available from the Apia office. Mr Thulstrup’s complete report is attached as Annex 4.

## **5. REPORT FROM THE IGC VICE CHAIRPERSON**

Mr Liu Heng, IGC Vice Chairperson, briefly described the meetings of the 38<sup>th</sup> IHP Bureau held in June 2005 which was also attended by IAHS and WMO, and the reports of the 170<sup>th</sup> and 171<sup>st</sup> meetings of the Executive Board. The meeting was informed by Mr Liu Heng that water and associated ecosystems remain a priority, and that the budget related to these areas is unchanged. Other items described were:

- the need to improve communication between NatComs and to strengthen the weaker NatComs;
- the resolution on governance from the 12<sup>th</sup> RSC meeting in Australia. This was noted by the Bureau meeting, however, a decision on Regional Intergovernmental Councils has not been reached;
- new Guidelines for the operation and evaluation of Centres. These have been approved and it is proposed that the HTC (Kuala Lumpur) and IRTCHWE (Nagoya) be evaluated first; and
- that feedback can still be provided on the detail of the themes for IHP VII even though these have been endorsed.

In response to questions about identification of weak NatComs Mr Liu advised that many NatComs have very few activities and that one action would be to provide guidance on the range of activities that could be carried out. He also advised that a number of queries raised about the operation of Centres would be answered by referring to the new guidelines.

## **6 COUNTRY REPORTS**

All country reports are listed in Annex 5.

### **6.1 AUSTRALIA**

Mr Ross James referred to the formal establishment of the eWater Cooperative Research Centre and briefly described the formation of a National Water Commission, the objectives of a national Water Initiative being now implemented in Australia and the creation of the Australian Government Water Fund.

### **6.2 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. While a lack of resources has limited activities, some national water resources legislation and strategies have been prepared. Mr Long described a flood forecasting project undertaken with an NGO to provide improved warning levels to vulnerable communities, and said that the plan to update the hydrological data base will help with the preparation of data for AP Friend projects.

### **6.3 PR CHINA**

Mr Liu Heng informed the meeting of the appointment of a new Chairperson of the National Committee, Mr Deng Jian, Director-General of the Bureau of Hydrology. Mr Liu highlighted that healthy rivers is a 'hot topic' within China and as shown by the Healthy Yangtze Expert Workshop (January 2005) and the Symposium on Water Environment Protection of Yangtze River (October 2005). A wide range of water related activities is undertaken by many agencies in China and the IHP NatCom often acts in an advisory role, including on issues of bilateral cooperation.

In response to a request from Mr Basandorj (Mongolia) for greater co-operation and sharing of information, Mr Liu agreed to seek to include Mongolia in activities.

### **6.4 INDONESIA**

Mr Jan Sopaheluwakan reported on changes to the structure of the National Committee. He highlighted activities undertaken in ecohydrology referring to the demonstration site for the Centre for Ecohydrology and the possibility of a second demonstration site which includes the impact of coal mining. Mr Sopaheluwakan raised the possibility of UNESCO contributing to water resource issues related to tsunamis. Mr Arduino responded that in the next biennium there is a groundwater program for tsunami prone areas.

### **6.5 JAPAN**

Mr Takara apologized for the absence of Mr Takeuchi due to other responsibilities. Mr Takara informed the meeting that ICHARM will be officially established in January 2006 and summarized the activities detailed in the report. Cooperation between the Japanese IHP and the UNESCO Office in Beijing was highlighted as was a proposal to conduct research with

Mongolia. In relation to this research, Mr Arduino suggested that Mongolia submit a PP Proposal that is also supported by other countries.

#### **6.6 KOREA (REPUBLIC OF)**

Mr Hongkee Jee presented the activities detailed in the country report and drew meeting participants attention to activities shown in the tables in the report.

#### **6.7 KOREA (DEMOCRATIC PEOPLES REPUBLIC)**

Mr Jang Hyon Chol thanked the UNESCO offices in Jakarta and Beijing for making participation in the meeting possible. Mr Jang outlined the activities of the National Committee for IHP, emphasizing the impact of recent occurrences of floods and landslides and describing the flood warning systems in use. The construction of power stations for the supply of power and irrigation water, and also to mitigate the impact of floods was also described.

#### **6.8 LAO PDR**

Mr Manoloth Soukhanouvong presented an overview of the economy, climate, water resources and national development strategy of Lao. Also described were the responsibilities of the Department of Meteorology and Hydrology in improving water resources management. The need for upgraded hydrological analysis, introduction of new technologies and advice from countries in the region were highlighted.

#### **6.9 MALAYSIA**

Mr Mohamed Nor reported on behalf of Ir. Keizrul Abdullah, Chairman of the National Committee. Mr Nor drew the meetings attention to Table 1b in the Malaysian report where research projects carried under IHP VI are summarized. Mr Nor highlighted the success of the “River Exhibition” educational activity for secondary students undertaken by the National Committee and the “Eco-Hydrology Expedition for Regional (S.E.A) Student Exchange Programme planned for 2006.

#### **6.10 NEW ZEALAND**

Mr Richard Ibbitt summarized activities contained in the NZ report highlighting the recent 30 percent increase in funding for hydrometric networks which has offset the losses due to static funding over the last decade. Considerable activity is underway to upgrade stations, instrumentation and operating standards. NZAID funding has enabled collaboration with Fiji for the development of a Stream Health Monitoring Assessment Kit. Similarities in stream ecology should mean that the kit can be used in some other Pacific Islands Countries. Mr Ibbitt also informed the meeting about the HELP Stakeholder meeting held in early November in New Zealand which included participants from the Pacific Island Countries and the third and final course in the Pacific Hydrological Training Program which will be run in April/May 2006.

#### **6.11 PACIFIC ISLANDS**

Mr Hans Thulstrup presented the Pacific Islands report on behalf of Mr Phillip Komor who was unable to attend the meeting. Mr Thulstrup reviewed the background to the participation of the

Pacific Islands in the RSC, arrangements for rotating representation at the RSC meeting, and also informed the meeting about efforts to appoint focal points in each country to better coordinate UNESCO, SOPAC and WMO programmes. Proposed activities including Pacific HYCOS, 3<sup>rd</sup> Hydrological Training Course, wastewater training courses and the GEF Project development fund activities, were briefly described by Mr Thulstrup

#### **6.12 PAPUA NEW GUINEA**

Mr Maino Virobo described the increased membership (from 5 to 8) of the IHP National Committee but noted that the chairmanship is still unresolved. Mr Virobo informed the meeting that, while the Department of Environment and Conservation received 85 percent of its revenue from water use permits, routine data collection and station maintenance for the hydrometric network does not exist. The operation of key stations is temporarily in the hands of system operators such as mining and forestry companies. Mr Virobo reported to the meeting that all UNESCO funds misused during 2003 have now been repaid to UNESCO. Mr Arduino thanked Mr Virobo for his efforts in ensuring the funds were returned by PNG.

During discussion Mr Nor suggested that the region should look for ways that countries can be supported in maintaining their monitoring networks, and Mr Ibbitt commented that the situation in PNG highlighted the high cost of maintenance where site access was difficult, and the need to ensure that the data base systems used to store the data continue to provide access to the data.

#### **6.13 PHILIPPINES**

Mr Leonardo Liongson reported on the activities of the Philippines National Committee including: his appointment as interim Chairman of the committee; the highlighting a number of research projects undertaken; and a description of the involvement of the Philippines through Dr Tabios in the AP Friend Rainfall Intensity Project.

#### **6.14 THAILAND**

Ms Varunee Chareonsamran spoke to the country report noting the completion of the National Committee project to establish 29 river basin management committees in 25 basins and the completion of an Integrated Water Management Plan in 25 river basins. Ms Chareonsamran reported on a range of research projects supported by the National Committee and summarized future activities which include hosting the 14<sup>th</sup> RSC meeting in Bangkok in October 2006.

#### **6.15 VIETNAM**

Mr Le Dinh Thanh presented the country report which included that the IHP National Committee is in regular contact with the WMO Permanent representative to ensure related activities are coordinated, and that several Vietnamese participated in IHP courses and workshops during the past year.

The following observer countries presented a country report, which is also included in Annex 5



## **6.16 INDIA**

Mr Ramakar Jha described the operation of the Indian National Committee on Hydrology (INCOH) which also serves as the IHP National Committee. The Committee supports: research projects and seminars/symposia/courses/workshops; supports publication of the Hydrology Review Journal and state-of-art reports; and organizes a National Symposium on Hydrology. Mr Jha described a range of projects, workshops and courses that were aligned with IHP VI focal areas and also summarized new areas of interest which included: the international flood initiative and the sedimentation initiative; G-WADI program; and scientific studies on climate change, ecohydrology and hydrology of extremes. Mr Jha invited RSC member countries to participate in the international conferences being planned for 2006 and 2008 and requested a copy of the email list so that information could be distributed.

*ACTION: Provide email list so conference material can be distributed*

## **6.17 MONGOLIA**

Mr Basandorj presented the country report briefly describing a range of activities that included a training course on IWRM, establishment of a research and training centre on IWRM, and preparation of a number of water related project proposals. The hydrological case study in the Tuul River basin which has been supported by UNESCO was described by Mr Basandorj.

## **6.18 MYANMAR**

Ms Tin Yi thanked UNESCO for providing assistance to attend the meeting. Ms Yi informed the meeting that the IHP National Committee was established in August 2003 and described its membership, objectives and rules of operation. The future plans of the five working committees were outlined by Ms Tin Yi who also advised that the National Committee would like to collaborate with activities organized through the UNESCO Jakarta Office.

## **6.19 NEPAL**

Mr Madan Shrestha thanked UNESCO New Delhi and Jakarta for supporting participation in the RSC meeting. Mr Shrestha outlined the geography, climate and hydrology of Nepal and described studies that document deglaciation in the Himalayas which may be linked to climate change, and pointed out the importance of these changes for Nepal's water resources. The reactivation of the IHP National Committee during August 2005 and its program of activities, which includes a workshop on flood forecasting, were described by Mr Shrestha.

Mr Bhanu Neupane informed the meeting of a project on monitoring of glaciers and requested any parties interested in contributing to contact him.

## **7 PROGRESS ON ESTABLISHMENT OF UNESCO CENTRES IN JAPAN AND IN INDONESIA**

### International Centre for Water Hazard and Risk Management in Japan

Mr Kaoru Takara introduced a brochure handout on the preparation for the establishment in Japan of the International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO. Mr Takara described the preparations underway and announced that approval for the Centre was expected in December 2005 and establishing of the Centre would commence in January or April 2006 depending on financial programming. He further advised that

a post-doctoral student has already been approved and that ICHARM was looking to establish 4-6 positions, probably in 2006.

#### 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. Mr Jan reported that planning was still in progress and that LIPI had agreed to the centre being situated next to their Centre for Limnology at the Institute in Cibinong. He advised that there has been a good response from key players in Indonesia to the Centre, and that Indonesia was looking forward to agreement by UNESCO (at the 34<sup>th</sup> General Conference) to having the Centre adopted as one of the UNESCO's international centres. Mr Jan also advised that Indonesia was looking forward to receiving the future support and collaboration of RSC member countries for the Centre.

### **8 PROGRESS OF THE ESTABLISHMENT OF IHP NATIONAL COMMITTEE IN LAO PDR**

The Chairman requested an update on the status of progress towards the establishment of the Lao IHP Committee and Mr Manoloth outlined the situation. As yet Lao had not established a National IHP Committee.

Mr Manoloth advised that he had informed Mr Nitharath (Director-General of the Department of Meteorology and Hydrology) about the need and expectation for Lao to establish an IHP Committee, but was advised at the time that the Lao Government priorities lay elsewhere. Mr Manoloth advised the meeting that the second of December is the Lao National Day and that he will remind Mr Nitharath of the RSC's expectations at the Lao Water Resources Co-ordinating Committee (WRCC) meeting.

Mr Arduino advised that UNESCO Jakarta had sent a letter to Mr Nitharath in March 2005 describing the role of the National Committee for IHP and encouraging Lao to proceed with the formation of an IHP Committee. He advised the meeting that UNESCO were of the view that it was now up to the Lao authorities and that UNESCO would not get involved further as it was seen as a national issue for the Lao Government.

Mr Takara referred to last years resolution that Lao establish a National IHP Committee and asked Mr Manoloth what were the chances of Lao establishing an IHP Committee in the coming 12 months. Mr Takara suggested that, if helpful, another resolution be formulated.

Mr Manoloth responded that he believed that enough information has been provided by UNESCO and that no further assistance from the RSC would be needed.

Mr Neupane (UNESCO New Delhi representative) suggested that UNESCO Jakarta send Mr Nitharath a letter in which good and bad examples of National Committees were provided, to which Mr Arduino responded by saying that the example of Myanmar had already been provided to Lao and that this was the most recent IHP Committee to be formed in the region.

Mr Arduino offered to send Lao a follow-up reminder and request if more information was required and Secretary Takara agreed to discuss this with UNESCO Jakarta and send a follow-up letter to Lao.

*ACTION – Jakarta Office to send a reminder letter regarding formation of an IHP National Committee.*

## 9 IHP GOVERNANCE – OPINIONS FROM OBSERVER COUNTRIES

On behalf of the UNESCO Secretariat Mr Arduino presented the resolution from the last RSC meeting plus the accompanying supporting statement (see Annex II and Statement Attachment A of the proceedings of the 12th RSC meeting for the actual wording) reminding the meeting of the recommendation. The resolution was presented to the Inter-governmental Council (IGC) meeting and was accepted.

Mr Neupane (UNESCO Delhi Office observer) enquired regarding the applicability of the RSC model for Central Asia.

Mr Arduino advised that UNESCO Paris has discussed the concept of Regional Governmental Councils (RGC), and Secretary Takara indicated that the RSC meeting is a kind of RGC meeting and went on to point out that the SEAP RSC meeting had been successful for more than ten years. Observers from UNESCO Tehran (Ms Sadeghi) and India (Mr Neupane) supported the continuance of the present arrangements whereby countries on the fringe of the SEAP RSC are able to attend meetings as observers.

Mr Soontak Lee advised that the IGC structure was complicated and went on to outline the history of this matter to date. He advised that there seemed to be a move to have a central Paris-based meeting with preparatory regional meetings to decide who should attend the Paris meeting and presumably the topics the region wanted to rise at the meeting. He further advised the meeting that the majority of regions supported the central governance structure but the SEAP region did not because it cuts across its RSC functionality.

Mr Arduino advised that there is a proposal to set up a meeting similar to the RSC for the Central and South Asia region. However, funding is likely to constrain what could be achieved. He suggested a possible solution would be to have the RSC chairman or representative from the South Asia RSC attend the SEAP RSC meeting and vice-versa.

Mr Neupane advised that steps had already been taken to set up a South Asia RSC but that only three IHP NatComs (Nepal, India & Sri Lanka) were active. Furthermore he could not speak for what West Asia wanted to do. He went on to say that a meeting was being arranged of all the South Asian NatComs in Roorkee to get a functioning RSC going for South Asia. Once this was achieved he thought the next step would be to expand the meeting to include West Asian member states as observers. He suggested that such an arrangement would negate the need for an intergovernmental regional council.

The Mongolian delegate (Mr Basan) pointed out the size of the region in terms of land area and population to indicate that a combined S Asia and SE Asia Pacific region would be bigger than all the other regions put together.

The Nepal delegate said that S Asia had not been able to set up its own RSC but that he supported UNESCO Delhi office's initiative in doing so.

Malaysia (Mr Nor) pointed out that at the 38<sup>th</sup> session of the IHP Bureau, page 2, para 2, issues relating to the legal and financial implications of the various types of governance structure were still being investigated and that there was no consensus regarding the establishment of RSCs with respect to financial and legal aspects.

Mr Liu Heng said that the 39<sup>th</sup> Bureau meeting in May 2006 would debate the matter again and that we should retain our present resolution as no details of the alternative structures were available yet. He suggested that it might be beneficial to restate our resolution

*ACTION: Restate SEAP RSC's resolution to IGC re the status and functionality of RSCs.*

Mr Soontak Lee advised that there was no need to consider item 9 (this item) again at this meeting but that it was important to hear the views of the observers to the present RSC.

With that comment the Chair thanked the observers for their opinions and comments.

## **10 REPORT ON THE ASIAN PACIFIC FRIEND (TECHNICAL SUBCOMMITTEE MEETING)**

Mr Ross James presented a summary of the proceedings of the TSC meeting held at the Ramadi Bintang Bali Hotel on Monday 21 November 2005. The salient points were as follows (for further details refer to RSC minutes):

### Rainfall IFD project

- Data from 9 countries had been received for testing in the IFD rainfall project.
- IFD analyses had been received from 4 countries.
- Analyses for another 4 countries were almost complete.
- It was agreed that all analyses will be completed and supplied for analysis by 31 December 2005.
- Comparison of the results and recommendations will be prepared by Messrs Daniell, Tabios and others as required.
- It was suggested that a second workshop around March / April 2006, may be necessary to prepare the report on the results for the Cuba FRIEND conference.
- Report to the Cuba conference to be prepared by Daniell and others as required by April 2006.
- It was agreed that the data should be placed in the AP-FRIEND data archive.

### Design Flood Project

For the second phase - Design Flood Project, Mr James advised that substantive work had not yet started – but that it was suggested at the TSC meeting that this should not proceed until the IFD report has been completed, thus allowing the IFD report to be completed on time, and to utilize the experience gained from the IFD project. A decision on commencement of the design flood project was still to be made.

*ACTION: Decide on commencement of Design Flood Project – possibly at the second IFD workshop in March / April 2006??*

### Catalogue of Rivers

Mr James advised that the TSC meeting agreed that there is still a need to assemble costing information for printing of a further Catalogue of Rivers (Volume VI) from various countries in order to decide whether the costs will be within the available funds. Further discussion on the catalogue of Rivers is included under the next Agenda Item.

Following Mr James' presentation delegates commented as follows:

Mr Nor advised that Malaysia was still re-establishing its HTC server following a transfer from one government department to another (now the Ministry of Natural Resources & Environment) and estimated that it will be another 1-2 months before the HTC can receive data. In the meantime he suggested that the nodes in Australia and Japan be used for the placing and accessing of data.

Mr James advised that, if possible, it would be better to wait until the HTC's server was up and running.

Mr Arduino commented that he thought it was more important to concentrate on the report / chapter for the Cuba conference than placing data immediately.

Mr Lee agreed commenting that it was also important to get started on the second project of AP-FRIEND, i.e., the design flood estimation project.

Mr Takara agreed with both the previous speakers and spoke about the need for the data archive to begin assembling data relevant for eco-hydrology and flood prevention studies to help international research initiatives besides AP-FRIEND.

Mr Xu advised that he had found problems accessing the data, and that it was difficult to make proper comparisons between different stations. He suggested the establishment of a data committee to screen data and provide guidance on data access.

Mr Liongson raised the issue of the agenda for a second IFD workshop and enquired whether it would be before or after the results of the Daniell et alii report.

Richard Ibbitt moved that a decision on the need for a second workshop, and if so, its agenda, be left up to Messrs Daniell and Tabios.

Mr James supported the motion and reinforced that the 31 December 2005 deadline for countries to supply their data analyses to Messrs Daniell, Tabios and Arduino must be met by all countries. (*TSC ACTION ITEM*)

Mr James further stated that the researchers may well find a productive expansion of their work based on the initial findings.

Mr Nguyen stressed the importance of getting together to discuss the findings once the results of the analyses had been done.

Mr Ibbitt again moved that the RSC empower Messrs Daniell and Tabios to make the necessary decisions regarding the proposed second IFD workshop.

Chairman Thuc summarised the following action items:

- that all countries email their data analyses result to Messrs Daniell, Tobias and Arduino by 31 December 2005; and,
- that Messrs Daniell and Tobias decide on the timing, location and content of the second IFD workshop.

Mr Arduino commented that attendance at the second IFD workshop should be on the basis of countries contributing their data analyses.

The meeting adjourned at 1715 hrs and was rescheduled to commence at 0830 hrs instead of 0900 hrs on the following day (25 November 2005)

The meeting reconvened at 0830hrs on 25 November 2005

## **11 CATALOGUE OF RIVERS FOR SOUTHEAST ASIA AND THE PACIFIC, VOLUME VI**

An overview of the 5 published volumes of the Catalogue of Rivers was presented by Mr Tachikawa followed by a summary of the recommendations from the “Fifth Year Review of the Catalogue of Rivers for Southeast Asia and the Pacific” conducted by Daniell, Tachikawa and

Lee. The overall recommendation of the review was that publication continue but with changes to its format and content. The report of the review is included as Annex 7.

During discussion, cost was identified by several speakers as a critical factor that will determine whether publication can continue or not. UNESCO Jakarta has budgeted USD10,000 to publish the next volume subject to satisfactory quotations for its production. Mr Nor agreed to obtain cost estimates for producing 1,000 CDs. The Chairman requested that other countries also provide quotations, if possible. The cost information will finally determine whether the next volume can be produced within the available budget.

*ACTION: Mr Nor to obtain cost estimates for producing 1,000 CDs of a volume of the Catalogue of Rivers. Quotations also to be provided by other countries if possible.*

Following further consideration of the Review recommendations by the meeting and, subject to satisfactory cost estimates, the following points were agreed.

- Volume VI to be published as a CD only
- The river basins included will be a mixture of rivers selected from Volumes 1 – 5 with updated higher resolution data and additional information and possibly some new rivers selected by individual countries.
- The river basin descriptions and data time series will be included on the CD
- 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.
- Mr Tachikawa will provide guidelines for the selection of river basins to be included from Volumes I – V.
- Mr Tachikawa will provide each country with details of the basin information and data required and details of data formats.
- Editors proposed for the publication are: Chikamori, Daniell, Tachikawa, Tran Thuc, Pawitan and Liongson.
- The proposed time-frame for publication is:
  - 31 January 2006  
Determined format and details of CD publication  
Advise countries of details
  - October 2006 (RSC 14)  
Countries provide basin information to Mr Chikamori
  - 28 February 2007  
Finalize formatting and send to publisher
  - March 2007  
Volume VI published.

## **12 TECHNICAL PROPOSAL FROM THE RSC FOR 2005-2006 – DISCUSSION AND APPROVAL FOR IHP VI (2002-2007) AND RELATED ACTIVITIES**

Mr Arduino briefly described the 2 years budget cycle of the UNESCO General Conference and presented the main line of actions resulting from the 33<sup>rd</sup> General Conference held in October 2005. Mr Arduino outlined the operation of the Participation Programme as a means of securing funds for regional projects.

## **13 PREPARATION FOR THE 4<sup>TH</sup> WORLD WATER FORUM**

Mr Takara reminded the meeting that UNESCO had a booth at the very successful 3<sup>rd</sup> WWF held in Japan and requested that the RSC consider what presence the region should have at the 4<sup>th</sup> WWF. The booth at the 3<sup>rd</sup> WWF was used to distribute a range of UNESCO and regional

material. The meeting was also informed by Mr Takara of the formation of the Japan Water Forum after the 3<sup>rd</sup> WWF. The Japan Water Forum is very active in preparing for WWF4 and will be organizing sessions and displays.

During general discussion it was agreed that the RSC should have a presence at the 4<sup>th</sup> WWF and that Mr Takara will discuss with the Japan Water Forum the possibility of the RSC having a booth for the display and distribution of regional material and also the possibility of joining some of the sessions being organized.

*ACTION: Mr Takara to discuss with Japan Water Forum RSC booth and session participation at 4<sup>th</sup> WWF.*

Mr Bhanu Neupane informed the meeting of his involvement in preparations for WWF4, including the preparation of a regional paper, mainly by SOPAC. He referred to the possible formation of a Water Forum for Asia-Pacific, similar to AMCAU (African Ministers council for water) and suggested it may be appropriate to join these efforts.

In order to encourage regional participation at the 4<sup>th</sup> WWF the Chair agreed with the suggestion from Mr Nor that a letter be sent from the RSC to all countries requesting governments support participation of members at the 4<sup>th</sup> WWF.

*ACTION: RSC write to countries to request governments support participation at the 4th WWF*

Mr Liu informed the meeting that China would be sending an official government delegation and also a delegation of experts, at least 50 people. Other organizations in China may also send delegates.

## **14 PREPARATION FOR THE NEXT IGC, JULY 2006**

The meeting was informed by Mr Arduino that next meeting of the IHP Bureau will be held on 2-4 May 2006 and the Intergovernmental Council on 3-7 July 2006. The IGC meeting will be preceded by the Kovacs Colloquium on 30 June to 1 July.

The new members of the IGC from the region are Australia, Japan, Kazakhstan, and Nepal and the continuing members are China, India, Malaysia.

The question of RSC support for election of IGC Vice-Chairperson and resulting Bureau membership was raised and during discussion Mr Lee requested that, in the future, there be more open discussion in the RSC about who can best represent the region. The recent practice of alternating the Vice-Chairperson between the eastern and western members of Electoral Group IV was discussed with China being the current Vice-Chairperson. Mr Nor informed the meeting that Malaysia wished to stand for election as Vice-Chairperson and support for this was expressed by some countries however other representatives were unable to express support without further advice. The meeting concluded that while the RSC supported the right of member countries standing for Vice-Chairperson it was unable to support any particular country.

## **15 ORGANIZATION OF THE 14<sup>TH</sup> RSC MEETING IN THAILAND IN 2006**

Ms Varunee Chareonsamran presented the arrangements for the 14<sup>th</sup> RSC meeting which will be held at the Grand Hotel in central Bangkok in conjunction with the 3<sup>rd</sup> APHW conference 16-18 October 2006. A brochure for the APHW conference was distributed.

Ms Varunee Chareonsamran requested that the RSC advise whether a separate RSC symposium should be run in parallel with the APHW conference or whether the RSC should join the AHPW

conference. Considerable discussion resulted on the merits of these options; particularly with respect to the duration of the APHW conference (3 days), the duration of the RSC meeting (1.5 days) and the scheduling of a field trip (0.5-1 day). Other issues raised during discussion were conference registration fee, suitability of conference theme and the need to meet the APHW schedule of dates.

The Chairman summarized the conclusions of the discussion as follows:

- The symposium theme should be the responsibility of the local organizing committee
- The RSC symposium should run parallel with APHW on 16-17 October
- A field trip should be organized on the 18<sup>th</sup> October
- The RSC should be held on 19-20 October
- A separate IHP conference publication be prepared
- Mr Takara to discuss financial matters with the Thai IHP.

*ACTION: Mr Takara to discuss financial matters of RSC14 and symposium with Thai IHP.*

## **16 ORGANIZATION OF THE 15<sup>TH</sup> RSC MEETING IN 2007**

Mr Liongson informed the meeting that the Philippines IHP National Committee wished to express interest in hosting the 15<sup>th</sup> RSC meeting in Manila in 2007 and that a PP proposal had been prepared seeking funding support. The Philippines was thanked and the offer accepted.

## **17 ADOPTION OF RESOLUTIONS**

Mr Takara described two resolutions to be considered by the meeting as follows:

### **(1) Augmentation of members of the RSC**

The resolution was presented in two variations; (1) inviting Mongolia and the Union of Myanmar to join the RSC and (1a) inviting Lao PDR, Mongolia and the Union of Myanmar to join the RSC. Following discussion it was agreed that, even though Lao PDR had previously been invited to join the RSC, Resolution RSCXIII-1a be adopted. The resolution is included in Annex 8.

### **(2) Asian Water Archive**

Mr Takara informed the meeting that the objectives of the resolution were to ensure the Water Archive is improved and can support research requirements for data by encouraging countries to submit data to the Water Archive. It was apparent from discussion that the resolution required modification to ensure that these objectives were clearly articulated and that it was directed towards the individuals/organizations/countries where action was required.

The meeting agreed that the data in the Water Archive needed to be improved and that while the intent of the resolution was agreed that the text needed further refinement. This will be carried out with assistance from the Secretariat and the refined resolution distributed for consideration at 14<sup>th</sup> RSC (Annex 9).

## **18 ELECTION OF RSC CHAIRPERSON**

The Chairman informed the meeting that his term finished at the end of this meeting and invited nominations for Chairperson for the next 2 years.

Mr Liongson nominated Indonesia to fill the position of Chairperson which was supported by China, Malaysia, New Zealand and Thailand. Mr Jan Sopaheluwaken advised the meeting that



Dr. Eddy Djajadiredja is the person nominated by the Indonesian IHP NATCOM as Chairperson. As there were no other nominations Mr Djajadiredja's appointment was accepted with acclamation by the meeting.

Mr Djajadiredja accepted the appointment, thanked everybody for their support and said he would work with all members to strengthen the RSC over the next 2 years.

## 19 OTHER ISSUES RAISED

### 19.1 LOGO

Mr Viribo inquired about the status of the RSC logo as he was not aware of it having being used on any publications or correspondence.

Mr Takara summarized the process followed in adopting the logo at RSC12 in Adelaide and the Chairman and Mr Lee informed the meeting that the logo is being used on letters sent out by the RSC.

Mr Arduino clarified this by saying that the UNESCO Jakarta Office is required to use UNESCO letterhead on its correspondence.

## 20 CLOSING OF THE MEETING

Mr Thuc, Chairman of the RSC, thanked the participants for their input to the meeting and the Indonesian IHP for their efforts in organizing the Symposium, field trip and the RSC meeting and closed the meeting at around 1400 hours on Friday 25 November.

By acclamation Mr Thuc was thanked for his efforts during his 2 year period as Chairperson of the RSC.

ACTION ITEMS	BY WHOM	DATE
1. Regularly update Natcom contact list	Jakarta Secretariat	
2. Provide email distribution list to Mr Jha for distribution of conference literature.	Jakarta Secretariat	
3. Send reminder letter to Lao PDR re formation of IHP NatCom	Mr Takara and Jakarta Secretariat	
4. Restate SEAP RSC's resolution to IGC re the status and functionality of RSCs??	RSC Chairperson and Secretary??	
5. Decide on commencement of Design Flood Project – possibly at the second IFD workshop in March / April 2006??	Daniell/Tobias	
6. Cost estimates to produce 1000 CDs for Catalogue of Rivers Vol6	Mr Nor Plus other interested countries	
7. Discuss with Japan Water Forum RSC booth and session participation at 4 <sup>th</sup> WWF.	Mr Takara	
8. RSC write to countries to request governments support participation at the 4 <sup>th</sup> WWF	Chairperson	ASAP
9. Discuss financial matters of RSC14 and symposium with Thai IHP	Mr Takara	

**ANNEX 1**

**PARTICIPANTS, 13<sup>TH</sup> MEETING OF THE IHP  
REGIONAL STEERING COMMITTEE FOR  
SOUTHEAST ASIA AND THE PACIFIC**

**ANNEX 1**  
**PARTICIPANTS, 13<sup>TH</sup> MEETING OF THE IHP**  
**REGIONAL STEERING COMMITTEE FOR**  
**SOUTHEAST ASIA AND THE PACIFIC**

<b>NAME</b>	<b>COUNTRY</b>
ROSS JAMES	AUSTRALIA
LONG SARAVUTH	CAMBODIA
VAN TAN VAN NGUYEN	CANADA
CHEN YUANFANG	CHINA
LIU HENG	CHINA
ZONXKUE XU	CHINA
CHOE HUNG SIK	D.P.R. OF KOREA
JANG HYON CHOL	D.P.R. OF KOREA
RAMAKAR JHA	INDIA
AGUNG BAGIAWAN	INDONESIA
EDDY A. DJAJADIREJA	INDONESIA
GADIS SRI HARYANI	INDONESIA
JAN SOPAHEL UWAKAN	INDONESIA
HIDETAKA CHIKAMORI	JAPAN
KAORU TAKARA	JAPAN
KEIKO KANZAKI	JAPAN
TADASHI TAMAKA	JAPAN
YASUTO TACHIKAWA	JAPAN
MANOLOTH SOUKHANOUVONG	LAO PDR
MOHAMMED NOR	MALAYSIA
D. BASANDORJ	MONGOLIA
GOMBO DAVAA	MONGOLIA
TIN YI	MYANMAR
MADAN L. SHRESTHA	NEPAL
BOB CURRY	NEW ZEALAND
RICHARD IBBITT	NEW ZEALAND
MAINO VIROBO	PAPUA NEW GUINEA
LEONARDO Q. LIONGSON	PHILIPPINES
SAMHEE LEE	REPUBLIC OF KOREA
HONGKEE JEE	REPUBLIC OF KOREA
SOONTAK LEE	REPUBLIC OF KOREA
KITCHAKARN PROMMA	THAILAND
VARUNEE CHAREONSAMRAN	THAILAND
LE DINH THANH	VIETNAM
TRAN THUC	VIETNAM
HANS THULSTRUP	UNESCO - APIA
R. JAYAKUMAR	UNESCO - CHINA
GIUSEPPE ARDUINO	UNESCO - JAKARTA
PUNGKY UTAMI	UNESCO - JAKARTA
BHANU NEUPANE	UNESCO - NEW DELHI
NILOOFAR SADEGHI	UNESCO - TEHRAN

**ANNEX 2**

**AGENDA, 13<sup>TH</sup> MEETING OF THE IHP  
REGIONAL STEERING COMMITTEE FOR  
SOUTHEAST ASIA AND THE PACIFIC**

**AGENDA, 13<sup>TH</sup> MEETING OF THE IHP REGIONAL STEERING COMMITTEE  
FOR SOUTHEAST ASIA AND THE PACIFIC  
Ramada Bintang Resort, Bali, 24-25 November 2005**

**Thursday 24 November**

- 1) Opening (9.00 a.m.)
- 2) Election of the Rapporteur
- 3) Adoption of the Agenda
- 4) Secretariat reports
- 5) Report from the IGC Vice Chairperson
- 6) Country Reports
- 7) Progress for the establishment of UNESCO Centres in Japan and in Indonesia
- 8) Progress of the establishment of IHP National Committee in Lao PDR
- 9) IHP Governance – opinions from observer countries
- 10) Report on the Asian Pacific FRIEND
- 11) Catalogue of Rivers for Southeast Asia and the Pacific, Volume VI
- 12) Technical Proposal from the RSC for 2006-2007 – Discussion and approval for IHP-VI (2002-2007) and related activities
- 13) Preparation for the 4<sup>th</sup> World Water Forum, Mexico, March 2006

**Friday 25 November**

- 14) Preparation for the next IGC, July 2006
- 15) Organization of the 14<sup>th</sup> RSC Meeting in Thailand in 2006
- 16) Organization of the 15<sup>th</sup> RSC Meeting in 2007
- 17) Adoption of Resolutions
- 18) Election of the RSC Chairperson
- 19) Other issues raised
- 20) Closing of the Meeting (Approximately at 14.00)

**ANNEX 3**

**SECRETARIAT REPORT  
BY  
UNESCO JAKARTA OFFICE**

**13<sup>TH</sup> IHP REGIONAL STEERING COMMITTEE MEETING  
FOR SOUTHEAST ASIA AND THE PACIFIC**

Bali, Indonesia, 24-25 November 2005

**UNESCO JAKARTA OFFICE**

Secretariat Report

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

### **1.1 Follow-up to the 12<sup>th</sup> IHP-RSC meeting**

A number of actions to be followed-up were identified during the 12<sup>th</sup> RSC meeting (UNESCO Office, Jakarta, 2004). Here below is a brief report on the current status:

*1. Review and update of the Small Island Hydrology Publication*

Mr Hans Thulstrup from UNESCO Office, Apia, Samoa, took care of the publication of 150 copies of “Hydrology and Water Resources of Small Islands: A practical guide”, UNESCO IHP Studies and Reports in Hydrology 49, Editor: A. Falkland. Copies of this publication can be obtained from the SOPAC Secretariat [arieta@sopac.org](mailto:arieta@sopac.org) or UNESCO Apia Office [hans@unesco.org.ws](mailto:hans@unesco.org.ws)

*2. RSC to assist Lao PDR in establishment of National IHP Committee*

Following Resolution RSC XII-1 “Lao PDR IHP National Committee, Recommendation on the Establishment of Lao PDR IHP National Committee”, UNESCO Office, Jakarta, on 30 March 2005 sent a letter to Mr. Nitharath Somsanith, Director General, Department of Meteorology and Hydrology, Ministry of Agriculture and Forestry, which included documents and information on the role, organization and functioning of the IHP National Committees.

*3. Terms of Reference for the Review of the Catalogue of Rivers to be determined and a Report be produced for the April Meeting of the TSC in KL*

The terms of reference were produced and discussed during the APFRIEND Meeting held in Kuala Lumpur, Malaysia, 5-6 June 2005.

*4. All data for uploading to the Archive be made available and uploaded onto the Archive*

No related activities were implemented.

*5. RSC 13th Meeting Dates and Programme to be Circulated*

This has been done through the official announcement sent to all IHP National Committees in June 2005.

*6. Resolution on Governance to be submitted to Intergovernmental Council Executive Committee*

Mr Liu Heng, Vice-Chairperson of the IHP Bureau (Region IV – Asia and the Pacific) brought the recommendation from the 12<sup>th</sup> RSC Meeting for SEAP (Resolution RSC XII-2) to the 38<sup>th</sup> Session of the IHP Bureau, held in Paris, 6-8 June 2005.

*7. Action item of TSC on information with regards APFRIEND Research and Meeting.*

Action were taken and information brought to the UNESCO APFRIEND MEETING “Design Rainfall and Design Flood Determination Meeting” Kuala Lumpur, 6-7 June 2005.



## **1.2 Workshops, training courses, symposia and travel grants**

### *1.2.1 International Workshop “Augmenting Groundwater Resources by Artificial Recharge in South East Asia”, Ho Chi Minh city, 15-17 December 2004*

The Workshop “Augmenting Groundwater Resources by Artificial Recharge in South East Asia” held in Ho Chi Minh City, from 15 to 17 December 2004, was organized by the Vietnamese Academy of Sciences and Technology with support from UNESCO Office, Jakarta. The workshop, attended by more than 40 participants from 9 countries (Australia, Cambodia, China, France, Italy, Malaysia, Philippines, Thailand, Viet Nam), aimed at introducing the techniques of artificial recharge, giving a review of experiences from around the world, in particular from existing artificial recharge sites, and producing a critical assessment of methodologies and the effectiveness of schemes to participants for application in South East Asia. The application of the techniques for augmenting groundwater resources by artificial recharge has certainly great advantages but has never been extensively utilized in the Southeast Asian region.

### *1.2.2 “ International Training Course on Hydrological Droughts and Low Flows”, Kuala Lumpur, Malaysia, 19-30 September 2005.*

This workshop was the seventh of a series jointly organized in the Asia-Pacific region since 1994 by the IHP National Committee of Germany and UNESCO Jakarta, in co-operation with the hosting of the Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific, Kuala Lumpur. While the previous workshops were mostly related to groundwater contamination, the 2005 training course objectives included training and discussion on techniques and tools for the analyses of surface water and groundwater droughts (droughts and low flow), with different themes such as hydro-climatology and drought sensitive regions around the world, drought-generating hydrological processes, frequency analyses and extreme value analyses, regionalisation and estimation at the ungauged sites, physically based modelling and assessment of human impacts, case studies and operation practice and application exercises with data from the Asia Pacific region.

The training, provided by 7 international lecturers (Germany, Norway, the Netherlands and UK), and attended by 24 participants from 11 countries (Indonesia, PNG, Philippines, Thailand, Viet Nam, China, India, Lao PDR, Sri Lanka, New Zealand and Malaysia) was organised by the HTC in Kuala Lumpur, with financial support from the German IHP/OHP-Secretariat and UNESCO Office Jakarta.

### *1.2.3 2<sup>nd</sup> Workshop of Ecotone and 4<sup>th</sup> Meeting of SeaBRnet, Pakse, Lao PDR, 3-7 October 2005*

In the framework of the IHP-MAP collaboration, UNESCO IHP Jakarta gave a substantial contribution in the organisation of the 2<sup>nd</sup> Workshop of Ecotone and 4<sup>th</sup> Meeting of SeaBRnet, Pakse, Lao PDR, 3-7 October 2005, attended by over 60 participants from 13 countries. With reference to IHP, the participants gave their opinion on the role of water in ecosystems and possible actions where IHP could be of important help.

*1.2.4 “UNESCO-Italy-Viet Nam Training Course on Artificial Recharge of Groundwater”, Ha Noi, 17-21 October 2005 and Ho Chi Minh City, 24-28 October 2005.*

As part of the capacity building activities within the Project for Artificial Aquifer Recharge in Hong Phong District, Binh Thuan Province, Viet Nam, two workshops scheduled in Ha Noi (17-21 October 2005) and Ho Chi Minh Universities (24-28 October 2005) on “Aquifer Recharge Techniques” were addressed to approximately 70 students with Master of Sciences degree. The training courses were carried out by qualified teaching personnel coming from the most representative research institutions of Viet Nam.

A considerable effort for the benefit of the UNESCO workshops was the demanding job of translation from English to Vietnamese of 2 known text books in hydrogeology such as of L. Huisman & T.N. Olsthoorn (Delft University of Technology) “Artificial Groundwater Recharge” and I. Gale, I. Newman, R. Calow, M. Moench “The Effectiveness of Artificial Recharge of groundwater: a review”.

*1.2.5 South Pacific HELP Symposium, Hydrology for the Environment, Life and Policy, Nelson, New Zealand, 7-11 November 2005*

Organised in conjunction with the Motueka Integrated Catchment Management Programme, a demonstration HELP Basin Project, the South Pacific HELP Symposium was held in Nelson, New Zealand from 7 to 11 November 2005 and attended by more than 80 participants from 10 countries. The symposium was organised by Landcare Research and UNESCO Apia and financially supported by UNESCO Jakarta and Apia Offices, which also provided financial support for participants from Fiji, Cook Islands, PNG, Samoa, Solomon Islands and Vanuatu. The first part of the event focussed on the Integrated Catchment Management in the Motueka Basin, while the second part concerned on pacific basin presentations, needs and future development of the HELP programme.

*1.2.6 Travel grants*

UNESCO Office, Jakarta, provided several travel grants to regional scientists in framework of the IHP Programme MAR (Managing Aquifer Recharge) to international events. In particular:

- 1 scientists from region attended the “ISMAR 5<sup>th</sup> International Symposium on Managing Aquifer Recharge”, held in Berlin, Germany, from 11 to 16 June 2005
- 2 scientists from the region attended the “GEF/STAP (Scientific and Technical Advisory Panel Secretariat) Workshop on the Managed Artificial Recharge of Groundwater” held in New Delhi, India, 19-22 September 2005.

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

*1.3.1 UNESCO - APFRIEND Meeting “Design Rainfall and Design Flood Determination Meeting” Kuala Lumpur, Malaysia, 6-7 June 2005.*

The UNESCO APFRIEND Meeting held in Kuala Lumpur, 6-7 June 2005, organised by UNESCO Office Jakarta and the Humid Tropic Centre in Kuala Lumpur and financially supported by UNESCO Office, Jakarta, was attended by 16 participants from 9 countries, in particular Australia, China, Indonesia, Rep. of Korea, Japan, Malaysia, New Zealand, Philippines and Viet Nam.

The meeting aimed to come up with a research plan for each of IFD (Intensity Frequency Duration) and Frequency Determination by addressing structure, techniques, time frames, and data needs. The four following main steps were discussed:

1. Developing a process for rainfall and flood frequency analysis;
2. Regional process applicable;
3. Quality control of data; and
4. Software and techniques that could be exchanged

The above topics were discussed under the following headings:

1. Design Flood; and
2. Design Rainfall.

Results on the above research will allow the continuation of APFRIEND phase II and the compilation of a comprehensive regional Asian Pacific chapter to be included in the global FRIEND report that will be presented in the next FRIEND conference, Cuba, November 2006.

### *1.3.2 Catalogue of Rivers for Southeast Asia and the Pacific*

During the APFRIEND Meeting held in Kuala Lumpur, 6-7 June 2005, Trevor Daniell presented the Catalogue revision made by himself, Yasuto Tachikawa and Soontak Lee.

Some comments were made on the report and these will be taken note of in producing the draft for distribution.

UNESCO IHP Regional Steering Committee for Southeast Asia and the Pacific has set down that a review of the Catalogue of Rivers for Southeast Asia and the Pacific should be conducted after five years. This review was to typically examine the uses, advantages and disadvantages and costs of continuing production of the Catalogue of Rivers for Southeast Asia and the Pacific and factors inhibiting the entry of accompanying data into the hydrological Water Archive database.

The current five volumes of the Catalogues of Rivers include more than 100 rivers. It must be recognised that this is a great accomplishment of RSC. The objectives of publishing the Catalogues stated in the preface of volume 1 were:

- To promote mutual understanding of hydrology and water resources of the region and of the neighbouring countries; and
  - To promote intra-national information exchange among different organizations in each country. This has been achieved to a great extent. However, to achieve the third objective:
  - To promote the establishment of an international data exchange and collaborative research network in the region
- Further cooperation in the region is required to achieve this objective.

## **1.4 Activities within UNESCO Jakarta**

#### 1.4.1 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<sup>2</sup>, 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<sup>2</sup> 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 2<sup>nd</sup> phase of the project, started in April 2005, included:

- the drilling of 3 water and monitoring wells in the vicinity of the previous 2 drilled during the 1<sup>st</sup> phase of the project (November 2004),
- extensive pumping operations of an approximate duration of 4 months,
- aquifer tracer tests together with chemical and microbiological analyses,
- cattle drinking pond relocation, 600 m upgradient of Nuoc Noi,
- installation of 2 meteorological stations (rainfall, evaporation, temperature and humidity) in Hong Phong Village and in Nuoc Noi.
- Installation of 4 automatic probes in the water wells for automatic and continuous monitoring of Pressure (water level), Temperature and electrical conductivity.

As part of the capacity building activities, two workshops scheduled in Ha Noi (17-21 October 2005) and Ho Chi Minh Universities (24-28 October 2005) on “Aquifer Recharge Techniques” were addressed to approximately 70 students with Master of Sciences degree. The training courses were carried out by qualified teaching personnel coming from the most representative research institutions of Viet Nam.

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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. More detailed information is included in the Annexed paper.

#### 1.4.2 Pilot Project for Community-based Flood Mitigation and Preparedness

*“During floods in early 2002, at least 30 people were killed and 300,000 were forced to flee their homes. The biggest flood in the city's history hit 168 of 262 sub-districts and paralysed the capital for days.”* (The Jakarta Post, 10.09.2003)

With its population exceeding twelve millions, Jakarta is considered as one of the most problematic “mega-cities” in the world for its intricate urban development issues. Being located in a coastal lowland area and cut across by thirteen rivers and many other streams, Indonesia’s capital city is affected by recurrent inundations, especially during the high rainy season. In February 2002, disastrous floods affected 24 % of its total area (around 650 km<sup>2</sup>), claiming at least 30 lives, and paralysing the city for days. One of the most-severely affected areas was the sub-district of Kelurahan Bidara Cina (East Jakarta), which is inhabited by approximately 44.000 persons. A high-density area (57.000 inhabitants/km<sup>2</sup>) was selected as pilot site for the implementation of the project (concerning more than 3.000 residents). Located along the Ciliwung River, this area is particularly vulnerable to inundations and was affected by five-year recurrent severe flooding.

Following Phase I and II of the project in the years 2003-2004, the Flood Mitigation Project continuation, a collaboration between UNESCO Office, Jakarta, and a local NGO (PPMA) is designed to improve the community’s understanding and awareness of natural and social components of floods and aims at strengthening the people’s preparedness to deal with these dramatic events. The final objective is to improve the community’s behaviour in order to reduce the vulnerability of the residents and their belongings. Each phase of the project was conceived in a way to be easily replicated at larger scale, with the ultimate goal of improving flood control in Jakarta.

The main activities of this project focused on strengthening the capacity of the community forum (which is created as a result from the previous facilitation, in collaboration with ITB) in initiating ideas on non-structural flood mitigation and preparedness measures. The forum has learnt to maintain network with local authority and collaborate with other community-based organizations at the local level. Several trainings and simulation have been held by the forum to other community members in order to disseminate the knowledge that the forum has gained beforehand. The establishment of a trained and prepared community forum can be considered as the major achievement of this project. The forum acquired the knowledge and the capacity to better deal with floods, to be prepared before, during and after disaster occurrence. Most of all, through its visibility within the community and through the daily contacts with the other residents, the forum is an important channel for disseminating the information to the rest of the community and ensuring that the whole community can better react to future floods. The forum has successfully conducted a simulation on flood evacuation in case flood occurs and trainings on economic-based activities. The forum has been actively involved in several events, particularly for simulation on community-based flood evacuation and flood preparedness. In cooperation with other relevant organizations dealing with floods, the project is planned to be replicated in other urban flood-prone areas.

#### 1.5 UNESCO Jakarta post-tsunami activities in Indonesia (water resources)

The 26 December 2004 tsunami generated by the Magnitude 9.0 earthquake off the coast of the northern tip of Sumatra, has created the country’s worst ever-natural disaster. Most of the casualties and damage took place within the Province of Nanggroe Aceh Darussalam, the Province of North Sumatra, as well as the Island of Nias. As of April 21, 2005, 128,515 were accounted for as dead,

93,837 as missing and 513,278 as displaced (source: BAKORNAS PBP, 2005 – Agency for the National coordination).

In the areas hit by the tsunami and by the earthquake on December 26 2004, many people lack access to clean water resources and drinking water is being provided through water tanks, a solution which is extremely costly, does not reach every individual and is unsustainable in the long term. The major reconstruction phase has already started, but, unfortunately, it seems to lack sustainable water distribution planning. In addition to that, the locations for the constructions of the Temporary Location Camps (TLC) were selected without taking into account water supply-related issues. For these reasons, the identification of uncontaminated groundwater resources is very urgent.

The tsunami, which hit Aceh on December 26, 2004, had serious consequences for water supply. Water supply infrastructures have been wiped out in many places. The flooding by seawater and the spreading of pollutants from waste, chemicals, and decomposing bodies during and after the tsunami, may have deteriorated the quality of groundwater (previously major source of water for domestic and agricultural use). During a UNESCO mission to Banda Aceh (28 February - 3 March 2005), some water samples taken from wells which resisted the tsunami (around 10 meters depths) were analyzed for physio-chemical parameters. The conductivity reaches very high levels, over the limits of our instruments (2,000  $\mu\text{S}/\text{cm K}25^\circ$ ). The situation is therefore alarming.

The Indonesian Government and International Organisations involved in the reconstruction phase lack basic essential data on shallow as well as deep groundwater conditions. The impact of the flooding on groundwater resources is still unknown. To our knowledge, up to now no comprehensive groundwater resources assessment has been carried out.

Following the proposal from BGR (Federal Institute for Geosciences and Natural Resources) UNESCO Jakarta helped to provide the Government of Indonesia with a hydrogeological project by means of a geophysical survey consisting in the following activities:

- Helicopter-borne spatial survey of the tsunami flooded area in Northern Sumatra
- Fresh water/saltwater layer determination down to 150 m from ground level
- Mapping of shallow saltwater intrusions due to the tsunami flooding
- Surveying of underground changes (compaction) in aquifers due to the earthquake
- Delivering a sound data base for hydrogeological mapping
- Locating flood secure freshwater reservoirs and waste deposit areas
- Training of counterparts on the EM (Electromagnetic survey) and processing system.

The project, organised with BGR, through its highly technological operational procedures, will provide essential hydro-geological data which are urgently needed, mostly in the coastal areas, in particular to extensions comprised between the shoreline and 3 to 5 km inland, mostly where flat morphology has allowed the sea water to flood.

All the above areas are characterized by the occurrence of permeable formations, represented by loose or semi consolidated sediments (gravel, sand, silt and clay), which have probably facilitated seawater infiltration during the tsunami flooding.

The hydro-geological investigation performed by BGR will allow the establishment of a groundwater occurrence and quality database, which will be of major importance to planners and policy makers during the reconstruction phase, both in the medium and long terms.

In addition to that, the groundwater assessment would also be a first step towards a long-term action plan proposed by UNESCO called “Groundwater Resources for Emergency Situations (GWES)”, which objective is to identify groundwater resources, naturally less vulnerable than surface waters to external impacts, to be immediately mobilized after natural disaster occurrences. For these reasons, UNESCO wishes that the BGR airborne survey could, in a second phase, cover a more extended area, beyond the boundaries of Aceh Province, and produce hydro-geological data for areas such as Padang (West Sumatra) and Bengkulu (South Sumatra).

## **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 2004-2005, was presented by UNESCO Office, Jakarta, at the meeting held in UNESCO Office, Jakarta, from 19 to 20 May 2005. 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 UNESCO Jakarta shall monitor the proceedings completed by Nagoya University regarding the IHP training course.
- 1.2 UNESCO Jakarta shall search for alternative methods of funding for the publication and distribution cost of the River Catalogue with support through its regular budget, JFIT, or other extra-budgetary sources.
- 1.3 UNESCO will engage in further efforts to request national contribution for delegates attending the regional steering committee, in order to reserve funds for more pressing concerns. UNESCO will remind participants of the limited nature of financial resources available for this purpose.
- 1.4 UNESCO Jakarta will encourage more countries to contribute to the IHP RSC meeting. The Jakarta office will provide the RSC countries with PP information in a timely and informative manner to prepare application. Appropriate mechanisms will be established to ensure competency among the delegates in the selection process.
- 1.5 UNESCO should install adequate follow-up mechanisms to prevent the loss of human resources after the conclusion of the training courses. This will include a database of past participants which may evolve into a network over time, utilizing the capacity of Nagoya University in its network maintenance.
- 1.6 UNESCO will send the final report of the RSC to MEXT.

## **2. PUBLICATIONS SINCE NOVEMBER 2004**

*Proceedings of the IHP Papers Presented at the International Conference on Water sensitive Urban Design 'Cities and Catchments', Adelaide, Australia. 22-23 November 2004.* Edited by James R., Daniell T., and Takara K. IHP-VI Technical Documents in Hydrology, No. 3. RSC for Southeast Asia and the Pacific. UNESCO Office, Jakarta, 2004.

*12<sup>th</sup> IHP Regional Steering Committee meeting for Southeast Asia and the Pacific.* Adelaide, Australia. 21-26 November 2005. Final Report. IHP-VI. No. 11. UNESCO Jakarta Office, 2004.

*Flood Mitigation, A Community-based Project: Maximizing Knowledge to Minimize Impacts.* UNESCO Office, Jakarta, 2004.



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**ANNEX 4**

**SECRETARIAT REPORT  
BY  
UNESCO APIA OFFICE**

**13<sup>th</sup> IHP REGIONAL STEERING COMMITTEE MEETING FOR  
SOUTHEAST ASIA AND THE PACIFIC  
Kuta, Bali, Indonesia 24-25 November 2005**

**UNESCO Apia Office  
Secretariat Report**

**Hans Dencker Thulstrup  
Science Programme Specialist**

## **1. Introduction**

The Pacific sub-region was to have been represented at the 13<sup>th</sup> RSC by the Federated States of Micronesia as per the agreement reached between Pacific representatives at the 11<sup>th</sup> RSC in Fiji, 2003. Unfortunately, the Pacific representative, Mr. Phillip Komor, was unable to travel to Bali. The main report on IHP activities in the sub-region will be delivered on behalf of Mr. Komor by the UNESCO Apia Office. 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. A major such undertaking during 2004-2005 has been UNESCO Apia's continued active participation in the Type II **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, we 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.

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 2nd session of this course was held from 4 - 22 April 2005 at the training venues of the SOPAC Secretariat and Fiji's Mineral Resources Department. Hydrological technicians from 13 Pacific Island Countries participated, including the Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

Funded by NZAID, the 3-week programme provided specialized training to technical staff of the national hydrological services of participating countries to assemble, maintain and apply data and information on national water resources, and to be able to pass this knowledge and skills on to others in the field of surface and groundwater hydrology.

The lectures for surface water hydrology were prepared and provided by John Fenwick, Pete Mason and Mike Butler of NIWA. The groundwater hydrology lectures were delivered by David Scott and Tony Falkland of Australia with extra modules provided by SOPAC's water quality officer, Tasleem Hasan, and by Dr Kifle Kahsai from the University of the South Pacific.

The programme included classroom sessions as well as fieldwork at several locations. Overall emphasis was placed on data collection, processing and analysis techniques with other topics of relevance including data quality assurance, safety aspects for fieldwork and the use of survey equipment.

The Fiji Meteorological Services hosted the trainees to a tour of their complex in Nadi and provided an introduction to their work programme on weather forecasting and climate predictions.

#### **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. expect to publish the proceedings of the Symposium by early 2006.

### **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. Recognizing this need, UNESCO Apia has funded a SOPAC-led project to re-start the Aitutaki water monitoring programme by purchasing basic monitoring equipment and providing technical expertise to re-train and support local staff to carry out monitoring work.

Furthermore, Aitutaki has been selected as pilot site for a project called "Capacity Building to Enable Adaptation Measures in Pacific Countries (CBDAMPIC)" due to its unique almost atoll geography, previous vulnerability assessments, and community interest. The broad aim for the pilot project in Aitutaki is to increase the ability of the island communities to cope with climate change impacts on water resources through saline water intrusion and changing rainfall patterns.

Finally, UNESCO Apia Office supported the water supply department on Aitutaki to participate in the regional Hydrological Training Programme and provide technical support to continue the groundwater monitoring on the island.

### **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.

### **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 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 the Niue Water Works (waterworks@mail.gov.nu).

### **3.6 UNESCO's Small Islands Voice features Public Water Forum**

Following discussions between UNESCO Apia, UNESCO-CSI and SOPAC, UNESCO's global discussion forum **Small Islands Voice** featured a discussion on water supply and sanitation issues in small island countries timed to coincide with World Water Day 2005.

In response to a lead article on Fiji's water woes, many messages were submitted proposing solutions, with rainwater harvesting - individual households and villages collecting rainwater in buckets, tanks and underground cisterns – as the most favoured option. Desalination and utilizing underground water supplies were other options discussed.

For more information and to view the full record of the discussion, please see: [www.smallislandsvoice.org](http://www.smallislandsvoice.org).

## 4. Publications

- 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](mailto:arieta@sopac.org)) or UNESCO Apia Office ([hans@unesco.org.ws](mailto:hans@unesco.org.ws)).

## 5. Advisory services

During 2005, 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.

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## NATIONAL REPORT ON IHP RELATED ACTIVITIES AUSTRALIA

### 1. ACTIVITIES UNDERTAKEN IN THE PERIOD OCTOBER 2004 – SEPTEMBER 2005

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. Mr Bruce Stewart represented the IHP National Network at this meeting.

#### 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/full> and [http://audit.ea.gov.au/ANRA/atlas\\_home.cfm](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 negotiations 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/) (<http://www.coastal.crc.org.au/>)  
[CRC for Tropical Rainforest Ecology and Management](http://www.rainforest-crc.jcu.edu.au/) (<http://www.rainforest-crc.jcu.edu.au/>)  
[CRC for Water Quality and Treatment](http://www.waterquality.crc.org.au/) (<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**

Australia is in a strong position to provide input across the full range of Focal Areas. 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 health; 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**

- 4th Australian Stream Management Conference, 20-22 October 2004, Launceston, Tasmania. The theme of the conference was Linking Rivers to Landscapes.
- 1st National Salinity and Engineering Conference, 9-12 November 2004, Perth, Western Australia (<http://www.congresswest.com.au/salinity2004>) The conference theme was "Salinity - an enormous environmental, economical and social challenge" with major themes of: Innovation, Design, Climate Change, Integrated Systems and Management, Engineering, Economics, Education and Training, and Environmental Impact and assessment.
- 16th Australia New Zealand Climate Forum – Climate and Water, 8-10 November 2004, Lorne, Victoria
- Water Sensitive Urban Design 2004 – Cities as Catchments, 21-26 Nov 2004, Adelaide, South Australia. The conference explored the relationship between WSUD principles and the sustainability of urban and regional areas.
- 4th National Waterwatch Conference was held at The University of Melbourne, 7-10 February 2005
- 29th Hydrology and Water Resources Symposium, 21-23 February 2005, Canberra, ACT
- 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.
- OZWATER 2005, the biennial conference of the Australian Water Association was held in Townsville and Brisbane 5-11 May 2005.
- 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](http://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](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/](http://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 Komitee, 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 (in 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 Hydrosociences 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

#### 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 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., Meteutera 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., Meteutera, 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 (in 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 Hydrosiences 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 Hydrosiences 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.

## **1.5 Participation in international scientific meetings**

### **1.5.1 Meetings hosted by Country**

The 12<sup>th</sup> 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..

### **1.5.2 Participation in meetings abroad**

Bruce Stewart attended the 16<sup>th</sup> 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. Matura, 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

### **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 6<sup>th</sup> 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**

- 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 Brisbane 2005 Ozwater Convention & Exhibition, will have the theme of Watershed – The turning point for water. 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 – *Water for Life*. October 2006
- 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](http://www.enviroaust.net/e6))

- 30<sup>th</sup> 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 play 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 hydro-meteorological data collection and water resources development in the whole country. The main strategy of MOWRAM related to IHP is data information system.

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 2004 - November 2005

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.

Prepare Hydro-meteorological data and River catalogue for FRIEND and IHP.

### 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 short, 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 12 th Regional Steering Committee Meeting for Southeast Asia and the Pacific in conjunction with the International Conference on Water Sensitive Urban Design, Cities as Catchments, WSUD 2004 25-26 November 2004 Hilton Hotel, Adelaide, Australia.

## 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 Irrigation 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

### 3.1 Contribution to IHP Courses/Organization of Specific Courses.

None

### 3.2 Participation in IHP Courses.

None.

## 4. Plan for 2005

-To collaborate IHP activities and meeting as possibility.

-Improve flood forecasting system with more leading time 5 days, 7 days and link to the flood plane.

-Station network improvement.

-Improving hydrological database.

-To celebrate World Water Day 2006.



# National Report on IHP Related Activities

## Chinese National Committee

### 1. ACTIVITIES UNDERTAKEN IN THE PERIOD November 2004 — November 2005

#### 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.

**National Hydrological Regime Workshop** was held from 14-15 April 2005 in Hangzhou. 100 participants from each province and related ministries attended the workshop. Mr. E Jingping, Vice minister of Ministry of Water Resources in charge of flood control delivered his congratulation letter. In his letter, national hydrological service function and capacity were proud, some examples related to big floods of Huai River in 2003, some local floods and droughts in 200. Hydrologists played very important roles. The workshop was focused on experiences summary of flood forecasting and hydrological modernization. The technical promotion and progress for enhancing hydrological forecasting in next two year was also highlighted.

China-IHP Chairperson and some members working in hydrological fields attended the meeting with presentation on advanced technologies.

**2<sup>nd</sup> China Water Issues Forum** was held from 18-19 December 2005 in Beijing. The forum was organized by IAHS Chinese National Committee and IHP National Committee. About 110 participants from universities, institutions and hydrological organizations attended the forum. The forum focused on research and progress of water problem complexity and uncertainty. IAHS PUBS for International hydrological Decade was discussed as well. Some common understandings were

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1. This report is submitted to the 13<sup>th</sup> RSC meeting for the IHP UNESCO Southeast Asia and the Pacific, Bali, Indonesia, 21-26 November, 2005.

listed: (1) water problems complexity and uncertainty need hydrological experiments and new technology application; (2) New technology and methodology research are key to solve the problems; (3) enhancement of PUB should be related with China water problems. Chinese National Committees of IAHS and IHP co-organized the forum.

**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.

**Healthy Yangtze Expert Workshop** was held from 14-15 January 2005 in Wuhan. 30 famous experts jointed the workshop. Coordination between economic development and ecological protection is main issue. With 1.8 million square kilo meters in basin, to maintain a healthy Yangtze is not only related to Yangtze River itself, but also concerned of national social-economic sustainable development. The river basin authority should be a representative of the river. Under the principles of “development in protection and protection in development”, flood control, integrated water resources development and water environment protection; water resources management system must be accelerated. Four objectives for four stages are clarified as keeping safety in flood, reasonable water development, maintenance of good eco-system and stability of river state including stable bed. Some measures for healthy Yangtze were proposed. Member of China-IHP attended the workshop.

### 1.1.3 Decision regarding contribution to/participation in IHP-VII

China IHP National Committee organized an annual meeting on 11 November 2004 in Nanjing. The National Committee Regulation and Secretariat Working Method have been reviewed and approved. A visiting report on 16<sup>th</sup> Intergovernmental Council meeting in Paris has been delivered to members. National Committee also approved the decision of Chair’s meeting in August 2004 and guarantees to work closely with regional national committees for regional cooperation, especially for IHP-VII.

## 1.2 ACTIVITIES AT NATIONAL LEVEL IN THE FRAMEWORK OF THE IHP

### 1.2.1 National/local scientific and technical meetings

**National Flood Control and Drought Mitigation Meeting** was held from 1-2 January 2005 in Nanning. It is an annual meeting organized by National Headquarter for Flood Control and Drought Mitigation. Since flood control and drought mitigation must be based on coordination of each related organizations and agencies at different level, Ministry of Water Resources, Ministry of Land Resources, China Meteorology Agency and provincial flood control and drought mitigation organizations and agencies sent their high and senior officials for the meeting. About 200 participants joint the meeting.

Some members of China-IHP were invited to attend the workshop.

**National Meeting of Hydrological Agency Leaders** was held from 31 March to 2 April in Kunming. Mr. E Jingping, Vice Minister and Other high level Officials from related ministries, as well as 100 leaders from provincial level hydrological agencies attended the meeting. The meeting is a two-year regular meeting for summary of hydrological activities and arrangement of action plan for next two years. Some excellent hydrologists and outstanding hydrological organizations, including hydrological stations, were awarded. Chairperson of China-IHP was chairing the meeting.

**National Hydrology Symposium** was held from 6-8 December, 2004 in Nanjing. About 250 participants attended the symposium. The main theme of symposium is how provide hydrological information service for water resources development, allocation, saving and protection. Four topics were emphasized, including hydrological prediction and forecasting methodologies flood control and management, flood disaster and mitigation, information technology application.

China-IHP was co-organizer and main sponsor for the symposium. Some members of China-IHP presented their achievements.

**2<sup>nd</sup> 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 11<sup>th</sup> 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 brief the IHP-VII on eco-hydrology and ecosystem rehabilitation in the world.

### **1.2.2 Participation IHP Steering Committees/Working Groups**

Dr. Liu Heng, Dr. Chen Yuanfang, Dr. Li Zhijia, Dr. Liang Zhongming and Dr. Xu Zongxue participated in The 12<sup>th</sup> Regional Steering Committee Meeting for Southeast Asia and the Pacific and The International Conference on Water Sensitive Urban Design – Cities as Catchments from 21 - 26 November 2004 in Adelaide, Australia. They also participated in FRIEND technical sub-committee (TSC) meeting and coordination meeting of HTC during the symposium and promised to closely cooperate with regional counterparts to work on FRIEND projects and other activities. They also presented scientific papers during the symposium.

### **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**

**Sino-Norway Integrated Water Resources Workshop** was held from 11-12 January 2005 in Beijing. Norway Minister of Ministry of Oil and Energy lead a delegation attended the workshop. China Vice Minister of Ministry of Water Resources also attended. Three themes are focused in two may meeting, i.e., Integrated Water Resources Management, Small Hydropower as alternative of firewood for environment protection, Yellow river estuary protection and river mouth stability. Norway experts paid a visit to 9<sup>th</sup> water plant.

**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.

**Sino-Dutch Project Seminar on Ecological System and Integrated Water Resources Management of Lancang River Basin** was held from 22-23 November 2004 in Kunming. More than 100 participants from China, the Netherlands, USA, Finland and some NGOs participated in the seminar. The project is a pilot project for exploring integrated wetland and water resources management for small river basin. UNESCO-IHE took a leadership and invited many international and domestic organizations to join the research team. The project started from August 2003 and

completed in June 2005. Main actions and activities included investigation and researches, such as ecological function, water resources, soil erosion, landslide, river basin management and planning.

**The 20<sup>th</sup> 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.

**Sino-Australian Water Resources Workshop** was held from 31 January to 1 February 2005 in Canberra, Australia. Vice Minister of Australian Ministry of Agriculture, Fishing and Forestry and Chief Engineer of Chinese Ministry of Water Resources participated the workshop. The workshop focused on water right mechanism, integrated water resources management and pasture water conservancy. The workshop is a part of Sino-Australian cooperation on water resources. Each two year, there is a workshop to be held in China or Australia, respectively.

**19<sup>th</sup> ICID Congress and 56<sup>th</sup> 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 opening 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.

**2<sup>nd</sup> Workshop on Project Sponsored by ADB: China Flood Management Strategy** was held on 25 and 26 April 2005 in Beijing. A framework of flood management and action plan for China was proposed and debated. Some experts from the Netherlands, Japan and USA also joined the workshop and presented their newest achievement. Some representatives from ministries related to flood control and provincial participants joined the workshop as well. The project was started-up in October 2004 and will be completed in one year.

## **1.2.5 Other initiatives**

### **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 PUBLICATION**

## **1.5 PARTICIPATION IN INTERNATIONAL SCIENTIFIC MEETINGS**

### **1.5.1 Meeting hosted by the country**

**2<sup>nd</sup> 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.

### **1.5.2 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

## **1.6 OTHER ACTIVITIES AT A REGIONAL LEVEL**

### **1.6.1 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.

#### **1.6.2 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 2006**

The National Committee will continue and pay high attention for regional cooperation under IHP framework. WWAP and WWDR is key issue at present.

### **2.2 ACTIVITIES FORESEEN FOR 2007-2008**

More projects related to IHP-VI themes will be supported by Ministry of Water Resources through IHP national Committee. IHP National will continue to encourage scientific and technical symposia and workshops.

### **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 for regional cooperation.

# **REPORT OF THE INDONESIAN NATIONAL COMMITTEE for IHP DENPASAR, INDONESIA, NOVEMBER, 2005**

## **1. ACTIVITIES UNDERTAKEN IN THE PERIOD NOVEMBER 2004 – OCTOBER 2005**

### **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 Settlement and Regional Infrastructure, Agriculture, Transportation, Forestry, and from Universities.

The composition of the National Committee Organization are:

Chairman	: Jan Sopaheluwakan
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 Settlement and Regional Inf.
10. Joesron Loebis	Dept of Settlement and Regional Inf.
11. Willem Putuhena	Dept. of Settlement and Regional Inf.
12. Eulis Retnowati	Dept. of Forestry
13. Hery Harjanto	Meteorology and Geophysics Institute
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 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](mailto:gadissh@indo.net.id) or [limno@indo.net.id](mailto: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,

## 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.

## 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.

### 1.3.2 Participation in IHP Steering Committees/Working Groups:

- Jan Sopaheluwakan participated the 33rd General Conference of UNESCO in Commission III on Basic Science October , 12, 2005. During the debate on the Establishment of the European Regional Centre for Ecohydrology in Lodz, Poland, and the International Centre for Water Hazard and Risk Management (ICHARM) in Tsukuba, Japan, under the auspices of UNESCO, Indonesia strongly endorsed the establishment of the said centre. Indonesia also reported the on-going efforts furthering the Resolution XVI-3 of 16th session of the Intergovernmental Council IHP-UNESCO, 2004, concerning the Establishment of Regional Center for Ecohydrology in Cibinong Indonesia under the auspices of UNESCO.
- Chairman and committee members attended UNESCO IHP 12<sup>th</sup> Regional Steering Committee Meeting for Southeast Asia & the Pacific, Adelaide, Australia, 21 – 26 November 2004

### 1.3.3 Research/applied projects supported or sponsored:

- Saguling Reservoir demo site as an Ecohydrology research activity sponsored by IHP-UNESCO.  
Ecohydrology activities:  
1. Saguling demos site:  
The Asia Pacific Center for Ecohydrology started its activities in the Saguling Reservoir, West Jawa since 2004. The objectives in this demo site are twofold i.e. to reduce sedimentation rate and water quality control into the reservoir. The upper catchment area of the Citarum River (2000 km<sup>2</sup>) that flows into the

reservoir are monitored by various government institutions. A small sub-catchment area has been selected to construct hydrological observations. This area is bounded by steep mountains which is relative unaltered. Comparison between the two catchments will provide a comparison between anthropogenic effects on the catchment and those that is less altered.

## 2. Exploratory visits to East Kalimantan.

Coal mining in East Kalimantan has developed extensively during the last two decades in the middle catchment of the Mahakam River. Mining sites are located closely to the Mahakam River for easy and cheap way of transportation of the coal. A number of underground mining was developed but the main practice is open pit mining. Weathering of the exposed sedimentary beds leads to acid mine water production in the area. Increasing suspended sediments are the byproduct of these activities.

The two problem areas were explored in 2005. The Saguling Reservoir demo site is more ready for future developments while East Kalimantan is still in exploratory stage.

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

- In field activities, with PT Indonesia Power Electric Power Co. in problems related to management of water quality and reducing sedimentation in the Saguling Reservoir.

### **1.2.5 Other activities:**

Policy paper presentation on the Water World Day on March 22, 2005 at the Department of Public Works, Indonesia

### **1.3 Educational and training courses**

#### **1.3.1 Contribution to IHP courses:**

- Organizing the 3rd Ecohydrology Training Workshop that will be held in Bali, 21-26 November 2005.

#### **1.3.2 Organization of specific courses:**

None

#### **1.3.3 Participation in IHP courses:**

- The 14th IHP Nagoya Training Course: Hydrology in Asia Kuala Lumpur, Malaysia, 11-15 October 2004
  1. Asep Sofyan, Toshihiro Kitada Laboratory, Dept. of Ecological Eng., Toyohashi University of Technology
- UNESCO – AP FRIEND Meeting: Drought Frequency Duration and Flood Frequencies, Kuala Lumpur, 6-7 June 2005
  1. Agung Bagiawan, Experimental Station for Hydrology Research Institute for Water Resources
- International Training Course on Hydrological Droughts and Low Flows, HTC Kuala Lumpur, 26 – 30 September 2005

1. Mr. Askari Muhammad, Bogor Agricultural University, Laboratory of Hydrometeorology, Department of Geophysics and Meteorology, FMIPA IPB
2. Ms. Eleonora Runtunuwu, Indonesian Agroclimate and Hydrology Research Institute (IAHRI)

#### **1.4 Publications**

None.

#### **1.5 Participation in international scientific meetings**

##### **1.5.1 Meetings hosted by the country:**

None

##### **1.5.2 Participation in meetings abroad:**

- 11th World Lake Conference, Nairobi 31 October – 4 November 2005

#### **1.6 Other activities at regional level**

##### **1.6.1. Institutional relations/co-operation:**

##### **1.6.2 Completed and ongoing scientific projects:**

Preparations for the International Symposium on Ecohydrology in conjunction with the 13th Asia Pacific RSC meeting will be held in 21-25 November 2005 in Bali Island. It was also planned that the SAC-EH meeting will be held during this time. Two other meetings will be adjoined during the period November 2005 are the 3rd International Training Workshop on Ecohydrology and Annual Scientific Advisory Committee on Ecohydrology meeting.

## **2. FUTURE ACTIVITIES**

### **2.1 Activities planned until December 2006**

- The Asia Pacific Center for Ecohydrology (APCE) under the Indonesian Institute of Sciences is going to be operational and host activities in the region
- Attend the 4th World Water Forum in Mexico City, March 2006
- The 14th IHP-RSC meeting is planned to be held in Bangkok, Thailand, October 2006 or November 2006

### **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**

- APCE in Cibinong and The Saguling demo-site will have routine activities related to the training of eutrophication and sedimentation control for participants coming from the country as well as regional participants. A potential site for future ecohydrology activities and its related training in East Kalimantan Province, along the lower Mahakam River, the dynamic Delta and its coastal plain.

## NATIONAL REPORT ON IHP RELATED ACTIVITIES (September 2004 – November 2005)

### JAPAN

Various activities of UNESCO have been implemented under the supports of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). The following summary includes the activities of Japanese National Committee for the International Hydrological Programme (IHP) of UNESCO undertaken during September 2004 to November 2005.

#### 1. ACTIVITIES UNDERTAKEN IN THE PERIOD SEPTEMBER 2004 – NOVEMBER 2005

##### 1.1 Meetings of the IHP National Committee

###### 1.1.1 Decisions regarding the composition of the IHP National Committee

The composition of the National Committee is as follows. The Committee appointed the members in December 2003.

Chairman:	TAKEUCHI, Kuniyoshi*	Professor	Yamanashi University
Members:	FUKUSHIMA, Yoshihiro	Professor	Res. Institute for Humanity and Nature
	HADA, Shigeki	Professor	Kobe Women's University
	IKEBUCHI, Shuichi	Professor	Water Resources Research Center, DPRI, Kyoto University
	KOIKE, Toshio	Professor	Graduate School of Engineering, University of Tokyo
	MATSUI, Saburo	Professor	Graduate School of Global Environment Studies, Kyoto University
	MUSIAKE, Katsumi	Professor	Fukushima University
	NAKAMURA, Kenji	Professor, Director	Hydrospheric Atmospheric Research Center, Nagoya University
	NAKAYAMA, Mikiyasu	Professor	Graduate School of Frontier Science, University of Tokyo
	TAKARA, Kaoru	Professor	DPRI, Kyoto University
	TANAKA, Tadashi	Professor	University of Tsukuba
	YOSHIKAWA, Hiroyuki*	President	National Institute of Advanced Industrial Science and Technology
	YOSHITANI, Junichi	Precedence Researcher	Public Works Research Institute

(Note: \* indicates the member of the Japanese National Commission for UNESCO.)

###### 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, which had been 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-ROM for Vols. 1 and 2 was distributed at the Asian Pacific FRIEND (Flow Regimes from International Experimental Network Datasets) Workshop, Kuala Lumpur on 6-7 June 2005, as well as the 13th Session of IHP Regional Steering Committee (RSC) for Southeast Asia and the Pacific (SEA-PFRIEND: Prof Takara attended the November 2005 APF 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 analysed 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 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-VI

Decisions were made to contribute to:

- 1 Implementation of Asian Pacific FRIEND (Flow Regimes from International Experimental Network Datasets) and HELP (Hydrology for Environment, Life and policy)

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

### 1.2.1 National/local scientific and technical meetings

- 1 Participation in 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), Mr Tadahiko Sakamoto (PWRI), Mr Akira Terakawa (PWRI), Mr Daisuke Kuribayashi (PWRI), Mr Shigenobu Tazou (PWRI), Mr Kenji Suzuki (MLIT) and Mr Seiji Ito (MLIT))
- 2 CRASHIC (Climate Change and River Basin Integrated Control) 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. Next meeting will be held in Kyoto, Japan in April 2004.
- 3 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 as "Water and Carbon Cycles in Terrestrial Ecosystems" and "Oceanography Basis". The composition of Training Course WG was decided. The Head of WG since 2005 is Prof Ueda, HyARC Nagoya University.
- 4 An IHP-VII proposal was presented by Univ. of Tsukuba Group on the basis of discussions on IHP-VII at the IHP National Committee meeting on 3 August 2004. The proposal title is "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 described in Newsletter "IHP" No. 18 (June 2005).
- 5 ICHARM (International Center for Water Hazard and Risk Management): The establishment of ICHARM in Tsukuba, Japan under the auspices of UNESCO was approved with the supports of UNESCO member countries at the 33rd session of the UNESCO General Conference. Its outline is as follows.
  - 1) Objectives: The objective of the center is to conduct research, capacity-building and information networking activities in the field of water-related hazard and risk management at the local, national, regional and global level in order to prevent and mitigate the impacts of such hazards and thus to achieve sustainable and integrated river basin management.
  - 2) Functions: The functions of the center shall be:
    - (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 other working courses for practitioners and researchers on the global level and knowledge and information transfer activities including international symposia or workshops, and to engage in appropriate awareness-raising activities;
  - 3) Structure: The center shall be established as a part of the Public Works Research Institute (PWRI) and be operated under the responsibility of its Chief Executive, with the support of an Advisory Board.

### 1.2.2 Participation in IHP Steering Committees/Working Groups

- 1 Participation in 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), Mr Tadahiko Sakamoto (PWRI), Mr Akira Terakawa (PWRI), Mr Daisuke Kuribayashi (PWRI), Mr Shigenobu Tazou (PWRI), Mr Kenji Suzuki (MLIT) and Mr Seiji Ito (MLIT).
- 2 Japan participated in the establishment of the Regional Steering Committee (RSC) for Southeast Asia and the Pacific in 1993. 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), Chairman of the Technical Sub-Committee (TSC) for Asian Pacific FRIEND (APF) Phase 1 (1997-2002) in the framework of the RSC, while Prof Takara is playing a role of the RSC Secretary (1999-2006) and a member of APF Phases I and II.

### 1.2.3 Research/applied projects supported or sponsored

The MEXT granted a Grant-in-Aid for Scientific Research to Prof Takara, Kyoto University for FY 2004-2006 in order to promote a climate- and disaster-related international cooperative research in East Asia. Another fund (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, for FY 2002-2004.

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

The Japanese IHP National Committee has closely collaborated 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.
3. The International government and its branches relating to hydrology and water resources administration.
4. Nagoya University and other universities and research institutes.
5. The Chairman of the National Committee, Prof Takeuchi, terminated his 4-year service (2001-2005) as the President of International Association of Hydrological Sciences (IAHS) and information exchange is done from time to time between IAHS and IHP. Prediction in Ungaged Basin (PUB), an IAHS decadal programme, is actively implemented by the Mongolian IHP National Committee.
6. Collaboration with the Mongolian IHP National Committee will be initiated in the future based on discussion in Kyoto on 1<sup>st</sup> June 2005 between Japan National Committee representatives (Prof Takeuchi and Prof Takara) and UNESCO Beijing Office (Mr. Yasuyuki Aoshima, Director and Representative; Mr. R. Jayakumar, Programme Specialist for Science, Technology and Environment; and Mr. Shingo Ajisawa, Assistant Programme Specialist for Science, Technology and Environment).

1.2.5 Other initiatives

None.

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

2. IHP Training Courses:

The Hydrospheric 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 for IHP.

The 14th IHP training course (TC) on «Hydrology in Asia» was carried out in September 2004 at Kuala Lumpur, Malaysia to gather many participants (11 lecturers and 13 trainee (excluding 16 Malaysians) from 14 countries including Malaysia in Asia and Pacific regions. The humid Tropics Centre, Kuala Lumpur (HTC KL) kindly hosted the training course.

The course was focused on three major objectives: (1) Review of past TC's, (2) Activities on water issues in each country, (3) Discussion on the direction of future TC. Lectures and an excursion were also included. For the objective (1), UNESCO IHP activities and TC activities including HTC KL activities were introduced. For the objective (2), presentations from the participants from many countries were held. For the objective (3), first, the census of questionnaires to the past TC participants was presented. The opinions and comments were invited in a discussion sessions, one of which was a group discussion: one was on short-term, and the other was on long-term.

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1.3.2 Organization of specific courses

None.

- 1.3.3 Participation in IHP courses  
None.

#### 1.4 1.4 Publications

1. Text books for the 12th «Precipitation and water resources » and 13th «Effects of Pollutants on Atmospheric Environment » Training Courses.
2. « 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, 2004.
3. « MPMD-2005: Monitoring, Prediction and Mitigation of Water-Related Disasters », (Eds.) K. Takara, Y. Tachikawa and NMNS B. Nawarathna), Proceedings of International Conference on Monitoring, Prediction and Mitigation of Water-Related Disasters, Kyoto University, Kyoto, Japan, 12-15 January 2005, 790 pp.
4. « IHP », Newsletter on IHP activities of Japan, No.18, was published in June 2005, 59 pp. (in Japanese).
5. Catalogue of Rivers for Southeast Asia and the Pacific Vol. 1 (1995) and Vol. 2 (1997) CD-ROM version (March 2005).

#### 1.5 1.5 Participation in international scientific meetings

##### 1.5.1 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 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 First GWSP (Global Water System Project)-Asia Conference, Kyoto, 29-31 August 2005 (Dr Taniguchi, RIHN and others)
- 4 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 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 submit?

5 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. There is also Sri Lanka PUB but not present. Strong national interests were demonstrated towards hydrological sciences for improving prediction.

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

#### 1.5.2 Participation in meetings abroad

- 1 Seventh IHP/IAHS George Kovacs Colloquium, Paris, 17-18 September 2004 (Prof Takeuchi and Prof Takara)
- 2 16th Session of the IHP Intergovernmental Council, 20-24 September 2004, Paris, France (Prof Takeuchi; Prof Takara; Mr Akiyama, MEXT and others)
- 3 12th Regional Steering Committee (RSC) Meeting, 21-25 November 2004, Adelaide (Prof Takeuchi; Prof Takara; Dr Tachikawa, Kyoto U.; Dr Chikamori, Okayama U.; Mr
- 4 UNESCO-PPH/HELP Pacific Regional Conference, Motueka Riverbasin ICM (Integrated Catchment Management) Workshop, Nelson, New Zealand, 7-11 November 2005 (Dr. Kuraji, U. Tokyo; Dr. Kubota, RIHN; Ms. Hirakawa, Hiroshima U.)

### 1.6 Other activities at regional level

1.6.1 Institutional relations/co-operation  
None.

1.6.2 Completed and ongoing scientific projects  
None.

## 2. FUTURE ACTIVITIES

### 2.1 Activities foreseen until April 2006

### 2.2 Activities foreseen until December 2006

1. The Japanese IHP National Committee plans the 16th IHP Training Course on 26 February to 11 March 2006, which will be organized by HyARC, Nagoya University, with the theme "Water and Carbon Cycles in Terrestrial Ecosystems". The first week, trainees will be at Nagoya University (HyARC and Graduate School of Environmental Studies) to have a series of lectures and practical sessions in English, followed by the second week in which trainees will join a technical tour to the Center for Environmental Remote Sensing (CEReS), Chiba University, and the Earth Simulator Center, Japan Marine Science and Technology Center (JAMSTEC). Part of this IHP training course is co-organized by the 21st Century COE Programme at Nagoya University: Dynamics of the Sun-Earth-Life Interactive System. Thus some candidates will be financially supported, in part, by the fund of the COE Programme. The general aim of the 15th IHP short course is 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<sub>2</sub>O and CO<sub>2</sub> and numerical model, are the basis for the understanding. The course will focus to two major subjects. First is to examine leaf- and canopy-scale exchange processes of heat, water vapour, and carbon dioxide with surrounding atmosphere. Second is 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.
1. Fifteenth IHP Training Course "Water and Carbon Cycles in Terrestrial Ecosystems", jointly organized by the Hydrospheric Atmospheric Research Center (HyARC) of the Nagoya University, Japan and UNESCO Office, Jakarta (Regional Science Bureau for Asia and the Pacific). The training course will be held in Nagoya and Chiba, Japan, from 26 February to 11 March, 2006.
2. 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.
3. 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.
  4. UK-Japan Flooding and Coastal Defence Workshop, British Embassy, Tokyo, Japan, 31 January to 4 February 2006.
  5. UNESCO-GRAPHIC (Groundwater Resources Assessment under the Pressures of Humanity and Climate Changes) International Symposium will be 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 Hydrogeologist), IGRAC (International Groundwater Resources Assessment Center), etc.
  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.
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  8. UK-Japan Flooding and Coastal Defence Workshop, British Embassy, Tokyo, Japan, 31 January to 4 February 2006.
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  10. Participation in the 17<sup>th</sup> Session of the IHP IGC at UNESCO Headquarters in July 2006.
  11. Participation in the 14<sup>th</sup> Session of the RSC in Thailand in October 2006.

### **2.3 Activities planned for 2006-2007**

1. Participation in RSC activities including Asian Pacific FRIEND and the Catalogue of Rivers.
2. Nagoya University IHP Training Courses, 2006 and 2007.
3. Implementation of projects related to IHP-VI Focal Areas.
4. Research on HELP basins.
5. Collaboration with UNESCO-MAB activities.
6. Activities related to the International Center for Water-related Hazards and Risk Management (ICHARM), which will be established in Tsukuba in 2006, under the auspices of UNESCO.

### **2.4 Activities envisaged in the long term**

1. Participation in IHP-VI (2002-2007) projects and RSC activities.
2. Nagoya University IHP Training Courses.
3. Information dissemination through a web page of the National Committee.
4. IHP-VII (2008-2013) planning.

NATIONAL REPORT ON IHP RELATED ACTIVITIES  
IN  
REPUBLIC OF KOREA

November, 2004

Korean National Committee  
for  
The International Hydrological Programme  
Republic of Korea

## **1. ACTIVITIES UNDERTAKEN IN THE PERIOD JUNE 2002-NOVEMBER 2004**

### **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, 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. 2002 IHP Representative Basin Studies	<ul style="list-style-type: none"> <li>·Distribution of hydrological data by electronic publication( )</li> <li>·Assessment of hydrologic behavior due to agricultural land use and paddy cropping system changes( )</li> <li>·Review and evaluation for IHP fifth phase studies</li> <li>·Collection and fundamental analysis of hydrological data of the Representative basins</li> <li>·Preparations of River Catalogue - Vol. 9</li> </ul>	Theme 1, 2 and 5	Korean rivers	MOCT	Major Gov. input	Report and Papers
2. 2003 IHP Representative Basin Studies	<ul style="list-style-type: none"> <li>·Distribution of hydrological data by electronic publication( )</li> <li>·Analysis of runoff effect by agricultural land use changes( )</li> <li>·Study on flash flood forecasting and management for mountainous region( )</li> <li>·Water science studies</li> <li>·Development of internet water education program</li> <li>·Collection and fundamental analysis of hydrological data of the Representative basins</li> <li>·Preparations of River Catalogue - Vol. 10</li> </ul>	Theme 1, 2 and 5	Korean rivers	MOCT	Major Gov. input	Report and Papers
3. 2004 IHP Representative Basin Studies	<ul style="list-style-type: none"> <li>·Distribution of hydrological data by electronic publication( )</li> <li>·Study on flash flood forecasting and management for mountainous region( )</li> <li>·Study of urbanization effect on river water and sewage quality</li> <li>·Water conflict factors and solution in Korean river basins</li> <li>·Development of image education system for water resources education and training</li> <li>·Collection and fundamental analysis of hydrological data of the Representative basins</li> <li>·Preparations of River Catalogue - Vol. 11</li> </ul>	Theme 1, 2, 4 and 5	Korean rivers	MOCT	Major Gov. input	Report and Papers
4. Asian/Pacific FRIEND Studies	<ul style="list-style-type: none"> <li>·Preparation of River Catalogue data</li> <li>·Basic hydrologic analysis in AP FRIEND river basins</li> </ul>	Theme 1 Area 1.1	Korean rivers	MOCT		Report and Papers
5. Special program on the low-flow management	<ul style="list-style-type: none"> <li>·Low-flow management system simulation</li> <li>·River water quality variation</li> <li>·Changing climate and runoff conditions</li> </ul>	Theme 1 and 2	Korean rivers	MOCT MOE MOA		Report and Papers
6. Water resources management during extreme flood and drought	<ul style="list-style-type: none"> <li>·Extreme flood and drought modelling</li> <li>·Water resources management techniques during extreme hydrologic periods</li> </ul>	Theme 1, 2 and 3	Korean rivers	MOCT MOA		Report and Papers
7. Special program of regional cooperation		Theme 4 and 5		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	
<b>Theme 1</b>	<b>Global Changes and Water Resources</b>								
Focal Area 1.1	Global estimation of resources : water supply and water quality	<ul style="list-style-type: none"> <li>·Low-flow management in consideration of water quality improvement and changing environment in river systems</li> <li>·Developing environmentally sound – sustainable development and management strategies of water resources</li> <li>·Development of water archive and contribution of Korean hydrological data and water quality data to global and regional studies</li> <li>·Comparative global and regional analyses of water resources</li> <li>·Developing national water quality management strategies</li> </ul>							
Focal Area 1.2	Global estimation of water withdrawals and consumption	<ul style="list-style-type: none"> <li>·Comprehensive studies of alternative means to save and conserve water resources for future demand</li> <li>·Evaluation of national water use and demand</li> <li>·Evaluation of groundwater resources and developing suitable management strategies for their withdrawals and consumption</li> </ul>							
Focal Area 1.3	Integrated assessment of water resources in the context of global land based activities and climate change	<ul style="list-style-type: none"> <li>·Integrated studies of water resources changes due to man-made activities</li> <li>·Comprehensive analyses of climate change and its effect to water resources</li> <li>·Assessment of water resources due to land use change</li> </ul>							
<b>Theme 2</b>	<b>Integrated Watershed and Aquifer Dynamics</b>								
Focal Area 2.1	Extreme events in land and water resources management	<ul style="list-style-type: none"> <li>·Hydrological studies of extreme events in Korean river basins</li> <li>·Developing the best flood warning systems and the use of radar-based rainfall information</li> <li>·Evaluation of national drought characteristics and their alternative measures</li> <li>·Water resources management during extreme flood and drought</li> </ul>							
Focal Area 2.2	International River Basins and Aquifers	<ul style="list-style-type: none"> <li>·Developing strategies of international river basin management</li> </ul>							
Focal Area 2.3	Endorheic Basins								
Focal Area 2.4	Methodologies for integrated river basin management	<ul style="list-style-type: none"> <li>·Development of integrated river basin management systems in Korean river basins</li> <li>·Integrated urban water management</li> <li>·Assessment of surface water and groundwater resources in watershed and aquifers</li> </ul>							
<b>Theme 3</b>	<b>Land Habitat Hydrology</b>								
Focal Area 3.1	Drylands								
Focal Area 3.2	Wetlands								
Focal Area 3.3	Mountains	<ul style="list-style-type: none"> <li>·Studies of hydrological processes in mountain watershed</li> <li>·Flash flood and runoff characteristics in mountain hillslope basins</li> </ul>							
Focal Area 3.4	Small islands and coastal zones	<ul style="list-style-type: none"> <li>·Studies of hydrology and water management in small islands and coastal zones</li> <li>·Assessment of groundwater resources in small and volcanic islands</li> <li>·Studies of water supply and alternate water resource systems in small islands and coastal zones</li> </ul>							

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							
<b>Theme 4</b>	<b>Water and Society</b>								
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							
<b>Theme 5</b>	<b>Water Education and Training</b>								
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 hydrologists 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- , 2008-2014), 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 ;

- Global Changes, Watersheds and Aquifers
- Governance and Socio-Economics
- Water and Environmental Management
- Water Quality, Human Health and Flood Security

## 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 the Korea Water Resources Association, Korean Society of Civil Engineers, ICOLD Korean National Committee, IWRA Korea Geographic Committee, 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 2002~2004. As Chairman of Working Group 3 (WG3) of the Asian Pacific FRIEND project, one delegate (Professor Soontak Lee) organized and sponsored a WG3 report preparation meeting and an International Symposium in 2002 at Yeungnam University, Taegu, Republic of Korea.

### **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 2002~2004 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).

#### **(1) Hydrological data base (Asian Pacific Water Archive)**

- to create a common hydrological data base for the region by bringing together existing data sets from individual member countries.
- Collecting hydrological data from river basins of the Catalogues of Rivers as the first step and then from the river basins for Asian Pacific FRIEND.
- Compiling all catchment characteristics including hydrological data from related river basins

#### **(2) Floods**

- to analyze the flood data to develop design procedures in the region.
- Evaluating characteristic regional patterns in flood regimes.
- Reviewing flooding frequency analysis and rainfall/runoff analysis methods of flood estimation.

#### **(3) Low flows**

- to analyze the low flow data to develop for estimating a range of low flow and water resources throughout the region.
- Investigation of the characteristics of low flow regimes from the data base for the estimation of dry season flows.
- Developing appropriate standard analysis techniques to account for the observed variability of flow regimes in the region.
- Regional modelling of low flows physically based and conceptual modelling, studies to multi-variate low flow studies at the regional and Asian scale.

#### **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 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 the Korean Water Resources Association. In these specific courses, special topics are dealt with practical application in river basins.

### **1.4 Publication**

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.

### **1.5 Participation in international scientific meetings**

#### **1.5.1 Meetings hosted by the country**

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

- Asian Pacific FRIEND Working Group 3 Meeting
- International Symposium on Drought Problems and Alternate Water Resources



·2004 International Symposium on Hydrological Environment

Both meetings were held at the Yeungnam University and Grand Hotel, Taegu, Republic of Korea in 2002 and 2004

### **1.5.2 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 2005, foreseen for 2006-2007 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 symposia will be organized until December 2005 as the IHP- activities of IHP-KNC.

- 2005 International Symposium on Hydrological Environment
- International Symposium on Hydrology, Ecohydrology and Water Resources

**Report on the Activities of National committee for IHP, DPR Korea**  
**November 24-25, 2006, Bali, Indonesia**

Availing myself of this opportunity, I would like to express my deep thanks to UNESCO Office, Jakarta and Beijing, Indonesia National Committee for IHP for kindly inviting us to this meeting.

First, I would like to briefly outline the activities of National Committee for IHP, DPR Korea.

Recently, frequent occurrence of flood and landslide due to heavy rainfall is causing great damage to human lives and economic activities in our country.

So, National Committee for IHP, DPR Korea is actively working for Disaster Prevention Preparedness from water related risks and local investment is being made for this work.

In the rainy season (CHANGMA season in Korea), as it is often flooded by typhoon and heavy rainfall, the State Flood Disaster Prevention Preparedness Panel is temporally established and the necessary measures are taken all over the country .

Regarding the International cooperation on Disaster Prevention Preparedness, the SHMA contact the Hydrological Component on the UNESCAP/WMO Typhoon Committee, so that we are on going under the project for flood hazard mapping and sediment disaster warning.

The State Hydrometeorological Administration (SHMA) is playing a great role so as to operate flood monitoring and forecasting system on the rivers and reservoirs all around the country for twenty-four hours a day from June to September every year.

Models for flood forecasting in the Hydrological research Institute, SHMA are Xinanjing model, Unit hydrograph, Nash hydrograph method, Maskingum routing method, Dynamic wave model, DHI software and Artificial neural network methods, which is world-widely used recently.

And the SHMA calculate the hydrological model parameters and draw map of the flood hazard, using GIS tools and DEM data.

In rainy season, rainfall and hydrological data from all monitoring stations is transmitted to the SHMA by computer and radio network every three hours a day.

Received data is checked in real-time to record in SQL and SERVER database. Using this real-time data and forecasted rainfall data, flood forecasting result is informed to several relevant agencies.

On the other hand, there are many hydraulic structures like hydro-power stations and in river basins including Taedong river in our country.

So that most of the rivers are controlled by artificial means in our country, the optimal operational schemas of upper reservoirs is established in order to decreased flood disaster and use the water resources rationally.

We are also paying attention to the construction of large, medium and small sizes of hydro-power stations at the riversides throughout the country to solve the problem of lack of electricity and prevent from flood disaster and also for the integrated water resources utilization.

This year, Nyongwon hydro-power station was constructed in upstream in Taedong river, and a number of medium-small power stations have been constructed and operating. And also for integrated water resources utilization in Taedong river, 153 Km (one hundred fifty three) of natural flow irrigation system from Taegak Ri to Taesong lake was completed in 2002 (two thousand two).

This channel is supplying water for irrigation about 100,000 ha (hundred thousand) in fifteen cities, countries and districts using natural flow, so that we could supply water to these area without any use of electricity.

In October 2005 (two thousand five) another irrigation channel Pakma-Cholsan waterway have been constructed.

The total length of channel is 290 Km (two hundred ninety) and it is supplying water through natural flow to vast areas in 6 cities and countries including Sinuju city.

Following the research objectives of Korean National Committee for IHP, the state hydrological Administration reevaluated the water resources of the country according to the changeable climate condition and correctly decided and introduced hydrological characteristics for hydraulic structure construction design to save a lot of material and labors for construction.

We are also developing hydrological Information system based on Web and SQL database, which focus on water-related data collection, monitoring,

preprocessing, analyzing and also for hydrological forecasting and information service.

And we are ongoing for the study on methodologies for evaluation, forecasting, decision-making on integrated water resources management using GIS and RS techniques.

In order to prevent from flood hazard and put the water resources management on a scientific basis in the future, we are planning to increase the Authority involvement in this work and further develop the scientific research work using advanced technology.

On the behalf of the National Committee for the IHP, DPR Korea, I sincerely hope that UNESCO office Jakarta and Beijing would like to actively cooperate and support for the development of hydrology in the DPR Korea in the future.

Thank you very much.

**DEPARTMENT OF METEOROLOGY AND HYDROLOGY**

**COUNTRY REPORT**

**Of**

**Lao P.D.R.**

Prepared by

Mr. Manoloth SOUKHANOUVONG

Deputy Chief of Hydrology Division

**UNESCO-IHP**

**13<sup>TH</sup> REGIONAL STEERING COMMITTEE MEETING  
FOR SOUTHEAST ASIA AND THE PACIFIC**

**RAMADA BINTANG RESORT,**

**BALI, INDONESIA,**

**21-25 NOVEMBER 2005**

## CONTENTS

- THE COUNTRY LAO P.D.R.
- THE NATIONAL DEVELOPMENT STRATEGY
- PRESENT STATUS OF DMH
- HYDRO-METEO NETWORK IN LAO
- RECOMMENDATION AND REQUEST
- CONCLUSION

### (a) THE COUNTRY:

**The Lao People's Democratic Republic** (Lao PDR) is a landlocked country situated in the center of the Indo-Chinese peninsula, sharing border with China, Vietnam, Myanmar, Thailand and Cambodia. Lao PDR is a relatively large area of 236.800 km<sup>2</sup>, about 90 percent of territory within the Mekong River basin and is one of the six greater Mekong sub-region countries. The large natural share 30 percent of the Mekong River watershed and contributes 35 percent of the annual flow and a very significant portion of its hydropower potential. It has been estimated that the country has a generating potential of 18.000 MW; of which only 1-2 percent has been develop so far. The Lao PDR is the second least populated country in ASEAN with the lowest population density of 18 in habitants per km<sup>2</sup>. The majority of the population is farmers. The government has set the target for increasing forest cover to 17 million ha of the country, or which 9.5 million ha will be watershed protection forest, 3.5 million ha will be conservation forest, 4 million ha will be production forest.

**The country** is divided into 16 provinces, one special region and one municipality, with a population of 4.7 million and more than 11.000 villages. The 20 percent (1 million) urban population is divided between Vientiane Prefecture (420 000), the one special region and 16 provincial capitals (320 000) and some 130 small town settlements (260 000). There are over 68 ethnic groups in Lao PDR, divided into three categories: Lao Loum, Lao Theung and Lao Soung. Whilst these categories cover many groups, they essentially describe their preferred living environment, being, respectively, lowland, mid-level and highland. About 60 percent of the population is Lao Loum, living in river valleys especially around Vientiane, Savannakhet and Pakse. Approximately 30% of the people are Lao Theung and 10% Lao Soung.

**The climate** of the Lao PDR is tropical. Two monsoons, the northeast and the southwest dominate the general circulation over the territory. The northeast monsoon affects the territory from November to mid-March, when atmospheric pressures are high. It is a dry period with low humidity and temperature. The southwest monsoon affects the territory from mid-May to mid-October. It is the period of heavy and frequent rainfall and high humidity. A short drought period of about two weeks is normally experienced between June and July after which rainfall becomes more frequent and heavy rainfall is expected from cyclone disturbances, which are classified, according to the wind speed generated as depressions, tropical storms or typhoons. Flooding usually occurs when two or more of these cyclone disturbances occur in rapid succession, or when the Equatorial Trough Zone (ETZ), which is the forward edge of the southwest monsoon, has passed in one of its more active stages, and a tropical storm follows shortly thereafter. Annual rainfall distribution is normally as 83% from May-September, 7% October-December and about 10% from January-April, the mean annual rainfall ranges from 900-3500 mm. The flow in the lower Mekong basin derives largely from rainfall and its discharges in turn reflects the pattern of rainfall distribution during the year. The upper Mekong basin, which constitutes 24 percent of the total basin area, contributes only 18 percent of the annual runoff. The river begins to rise following the onset of the monsoon in

May and attains the maximum level in August or September for upper stations, and September or October for down stream stations.

**(b) THE NATIONAL DEVELOPMENT STRATEGY.**

The Governments commitment to liberate the country from being one of the world's least developed nations and to eliminate mass poverty by the year 2020 is reflected in its development strategy. The main thrust areas leading to the year 2020 are:

1. Food production
2. Commodity production
3. Shifting cultivation stabilization
4. Rural development
5. Infrastructure development
6. Expansion of external economic relations and cooperation
7. Human resource development
8. Services development

***The MAF programmed are:***

1. Food production
2. Commodity production
3. Stabilization/reduction of slash and burn cultivation
4. Irrigation development scheme
5. Agriculture and forestry research programme
6. Human resources development program

**1. LEGAL AND INSTITUTIONAL FOR WATER RESOURCES DEVELOPMENT.**

The law of water and water resources has been established on November 1996 at the National assembly. On April 1998 Lao Government has established new committee concerning water and water resources matter is called Water Resources Coordination Committee (WRCC) in Science Technology and Environment Agency (STEA), Office of Prime Minister (OPM). Prime Ministerial Decree No.09/PM of 8 February 1999 sets down details on the Organization and Activities of the WRCC, consisted of:

Chairman	Vice president of STEA.
Vice Chairman	Director General of DMH
Member	Director of Communication Department, MCTPC.
Member	Director of Environment Quality Development Department, STEA.
Member	Director of Lao National Mekong Committee Secretariat
Member	Director of Electricity Department, MIH.
Member	Chief of the Hygiene and Environment Division, MOH.

**(C). THE PRESENT SITUATION OF DEPARTMENT OF METEOROLOGY AND HYDROLOGY**

DMH, established in 1954 and from 1 June 1955 become to the member of WMO, is a technical department under the Ministry of Agriculture and Forestry. 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. Their function as follows:

1. Administration Division and finance Division:

- To coordinate with other divisions and Hydro-Meteorological province, capital city and special Zone.
- To administrate and manage the staff, government staff, temporary staff and experts in each division the concern to department.
- To administrate and inform the human resources development plan in short term, medium term and long term with the Hydro-meteorological system.
- Mange and administrate, secretariat work, manage and distribute official document, information, weekly report and other arrangement.
- Manage, usage and take care of properties, vehicle and equipments.
- Planning, finance and budget.

2. Technical Division:

- Select modern science and technology and suitable to the situation.
- Making rules and principles of hydro-meteorological work.
- Follows up and evaluate the work plan and technical development project.
- Study, suggest, follow up and evaluate the implementation of technical rule and principles.
- Disseminate the information of meteorology and Hydrology.
- Report the situation of meteorological and hydrological activities all over country.
- Coordinate and cooperate with international organization.
- Hydro-meteorology study

3. Weather forecasting and aeronautical Division:

- Weather Forecast and making meteorological information for aviation.
- Provide the information, warning of hydro-meteorology to reduce the damage from natural disaster.
- Short, medium and long-term forecast.
- Exchanging the meteorological and hydrological data, information at national and international level.

4. Meteorological Network and Agro-Meteorological Division.

- Survey for setting up and manage the meteorological network .
- Observation of meteorological data, pollution and earthquake.
- Install the meteorological equipment, machine, pollution and earthquake station.
- Inspection and maintenance the meteorological equipment.
- Study and making rules of meteorology and aeronautical telecommunication system.
- Experiment, quality control and calibrate the measuring equipments.
- Coordinate with the sections concern for making weather forecasting to use in agricultural sector.
- Making handbooks and rules of technical work.



- Study and experiment of the modern technology of meteorology and agro-meteorology and report the result to inform to seminar technical meeting.

#### 5. Hydrological Division.

- Collecting hydrological data all over the country.
- Survey, install the hydrological equipment.
- Making the hydrological forecasting.
- Coordinate with the concerned organization and report the hydrological situation.
- Survey of watershed and inventory of river basin all over the country.
- Collect, analyse the water quality and sediment's concentration.
- Making handbook an technical rules.

#### 6. Climatological Division.

- Collecting, checking and processing data.
- Hydrological and meteorological, earthquake and air pollution database management and storage.
- Weekly, monthly, yearly weather report and data processing.
- Provide the data to the user in social-economic development.
- Study and apply the new technology, and report the result to the seminar technical meeting.
- Assessment the natural disaster and climate monitoring.

#### 7. Provincial Meteorological and hydrological service.

- Observe, collect and transmit the hydro-meteorological data to DMH
- Receive the daily warning forecast information from headquarter and disseminate it to provincial radio and TV and rural community.

The department has an establishment of 206 staff, of which 74 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.

### 1. Data collection

**At national level:** Public telephone, Fax and HF radio transceivers network that used for both Hydro and Meteorological data collection.

**International level:** The connection between Vientiane and Regional telecommunication Hub (RTH) Bangkok by global telecommunication system (GTS) (Only Meteorological information.) DMH is connected to Hanoi by 9600 BPS satellite link PSTN (Receive only) through which data are received. The internet is one of international public telecommunication network, there are many website to get the image satellite and tropical advisory as from TC pilot project web site of WMO.

### 2. Data transmission.

1. About 16 synoptic stations are sending 4 times a day (00, 03, 06, 09, UTC) to regional Bangkok
2. For 4 synoptic stations such as Luangprabang, Vientiane, Savannakhet and pakse transmit 8 times a day (00,03, 06, 09, 12, 15, 18, 21 UTC) through GTS via RTH Bangkok.
3. Three day city forecast consist 4 cities: Luangprabang, Vientiane, Savannakhet and pakse are sending every day by GTS

3. Progress medium range weather forecast (Weekly forecast) one time a week.
4. One-monthly forecast
5. Long-range weather forecast, seasonal forecast for agriculture sector and flood forecast management program.
6. Monthly climate message transmits through GTS via RTH Bangkok on the beginning of the month.
7. Terminal aerodrome forecast (TAF) and METAR to international and domestic airport.
8. The real time of hydrological data at 07h 00 one time/day is sending to MRC by email as Concern on agreement.

### **3. Data processing, Analysis, archiving system.**

1. In head quarter of DMH, there is data storage and data processing centre. The main activity is to process all climatic data in accordance to **Clicom 3.1** procedures (Climate computing) and for the hydrological data, DMH use **HYMOS** modelling for processing and analysis the stream flow data
2. Weather situation use **Synergies** and **Wedis** software for analysing the surface, Upper air chart and tropical cyclone forecast from TC web site Project under WMO (As JMA, KMA)
3. Daily Rainfall forecast and 7 days forecast from NOAA

### **4. Data distribution:**

The hydrological data DMH and WAD are sharing for operation and management of the hydrological network in LAO P.D.R. DMH is responsible to collect hydro-meteo data in central province and in some province in southern region. On the other hand, WAD is responsible for northern region and mainstream of Mekong River. Data are exchanged between two line agencies on the concern and agreement.

### **5. Weather and Flood forecasting Methodologies**

#### **5.1. Weather forecast Methodologies:**

1. DMH use synoptic method for daily weather forecast.
2. Use stressing concept and pressure falling methods for forecast position of tropical cyclone.
3. Forecast daily temperature by using GPV input to Kalman filter equation.
4. For 1 month and 3 months forecast, we use statistical method, which is correlated between long time period of local rainfall or temperature and SOI or SST to forecast probabilistic of three categories (Normal, below normal and above normal).

#### **5.2. Flood forecast methodologies:**

- DMH is responsible for flood forecasting along Mekong River as the National flood-forecasting centre.
- The main activities are water level forecast for 6 key stations and inflow forecast to the Nam Ngum Reservoir during the wet season of each year (but 24 hours forecast only).

#### **- Methodologies are used:**

1. Stage Correlation between upstream and down stream by using lag time. (For the Mekong River)
2. Flow correlation between upstream and real inflow to the reservoir, which is computed by the Storage capacity curve of the Dam (For the Nam Ngum Dam)

### **6. Forecast and warning Dissemination**

#### 6.1. Times of publication:

##### **6.1.1. Daily weather forecast (24 hours a head). A main content of forecast consist:**

Mean minimum, mean maximum and weather forecast includes 22 stations and divide in to 5 zone: Northeast, Northwest, Capital city, central and southern.

- Time of issue 11h00 am local time.
- Duration time from 19h00pm today to 19h00pm tomorrow.
- Places disseminates to National Radio, Capital city radio, TV, News papers, MAF, Ministry concerned, Company, aviation, provincial Hydro-Meteorological Station, NDMO and others.
- Daily dissemination is 28 times a day = 750 times per month.
- The accuracy of daily forecast 75-80%
- 3 days city weather forecast 30 times per month
- Weekly forecast once times per week and 4 times per month. Accuracy is 65%
- Monthly forecast once per month and time of issue is every 5<sup>th</sup> of the month with is accuracy 60%
- 3 month forecast once per month, and update every month. The time of issues every 5<sup>th</sup> of the month.

#### *6.1.2 Food forecast along Mekong River:*

- One time per day (30 times per month) From June to September.
- Daily and weekly forecast for Nam Ngum Dam
- The accuracy is 80%

## **7. HYDROLOGY.**

In 1985 hydrological activities were transferred from the Ministry of telecommunication and transport to the DMH. However, this transfer was incomplete, some hydrological equipment and some the hydrological network of observation programs. Unreliable equipment, under-staffing and limited national resources is the main area of deficiency that has to be overcome. Hydrological measurements are only taken in the rainy season in the Mekong River and its tributaries for flood forecasting and other related hydrological applications. In practice, most of the staff gauges are not operational due to the poor conditions of instrument, limited budget and limited quantity and quality of hydrological technicians.

**Compilation of Hydrological Data:** Statistic Data Center of DMH compiles all collected data by computer. However, compiling/filing and examination of hydrological data are very poor at the DMH due to shortage of manpower and no updated management of computer. For examples, it was identified that runoff data such at water level and river discharge have been collected and compiled at more than 35 stations, but longer-term data of more than 10 years are compiled at only 11 stations of 9 river basins.

**Hydrological Observation Networks:** Hydrological stations have been established at 116 sites over the country for observatory of the Mekong River and its main tributaries. However, observation activities are stopped at 12 of water level gauge stations due to technical and management reasons such as insufficient maintenance works of equipment/instrument, shortage of consumable materials, lack of staff, shortage of budget, etc. The operating hydrology stations consist of 60 stations managed by DMH and other 42 stations operated by Waterways Administration Division (WAD), MCTPC. The observatory items are shown in the following table.

### *Observatory Item of Hydrology Station.*

<b>Observatory Item</b>	<b>No. of Station</b>	<b>DMH</b>	<b>WAD</b>
Water Level, Discharge, Silting and Water Quality	17	13	4
Water Level and Discharge	36	21	15
Water Level	107	86	21
<b>Total</b>	160	120	40

Surface water quality is analyzed once a month at the laboratory of the Department of Irrigation (DOI) for 13 items including pH, EC, Ca+Mg, Ca, Mg, Na, CO<sub>3</sub>, HCO<sub>3</sub>, Cl, SC<sub>4</sub>, SAR and B. however, only a few stations follow the required observatory operation as designated above, and most case are only water level observation. Water level has to be observed five times a day at 7:00, 10:00, 13:00, 16:00 and 19:00 in the rainy season of May to September, and twice at 7:00 and 19:00 in the dry season. However, twice a day is prevailing.

The DMH carried out the measurement of river flow discharge of the Mekong's tributaries in the dry season with an assistance of JICA expert, and this result is reported in May 1998. Although all the measured records do not indicate the least dry season discharge, these are very valuable date in assessment of river characteristics in the dry season. These data revealed that the characteristics of river basins, in terms of unit runoff (lit/sec/km<sup>2</sup>), are not always similar in the adjacent basins.

Observation on water level and rainfall has started at the Veunkham, Pakcheng and Hineheup hydrological stations since June 1994 using starlogger system. The transferring and compilation of hydrological data did used by HYMOS software. Due to have limited budget for management and maintenance 4 set of the starlogger was bleak down; event the DMH staffs can operate the starlogger system and compilation of hydrological data.

### **C. CONCLUSION:**

Water and Water Resources Management are seen as a means for improving social conditions within a water resources while sustaining the physical and biological that support rural economic. It is now reviewed as a variable planning and implementation framework, that is consistent with existing policy and programs concerning rural development, land allocation and hydropower development.

The operation and Management of the hydro-meteorological network, and also water resources in the Lao PDR is ongoing. However constraints exist due to difficulties such as equipment and we have also limited budget. To ensure a good operation and maintenance of the Hydro-meteorological network and water resources, it is recommended to supply more equipment and particularly from the remote sites in order to secure observation network. To develop formal training and education in hydro-meteorology of existing and future subject matter specialist, hydrologists and superior technicians.

And also the hydrological analysis we have to be upgraded data, new technology such as software/hardware and apply new methodology such as our former boss (Mr. Khamthong Soukhathamavong) has been done before and we hope to have advice from you UNESCO and Southeast Asia and Pacific Countries.

**13<sup>th</sup> RSC IHP UNESCO MEETING  
FOR SOUTHEAST ASIA AND THE PACIFIC  
ADELAIDE AUSTRALIA**

**( 21 NOVEMBER 2005 - 26 NOVEMBER 2005 )**

**COUNTRY REPORT**

**OF**

**MALAYSIAN NATIONAL COMMITTEE FOR IHP**

**(1 NOVEMBER 2004 – 15 NOVEMBER 2005 )**

**BY**

**DATUK IR. HAJI KEIZRUL BIN ABDULLAH**

**CHAIRMAN**

**MALAYSIAN NATIONAL COMMITTEE FOR IHP**

**COUNTRY REPORT 2005 (2004/2005) OF  
MALAYSIAN NATIONAL COMMITTEE FOR IHP**

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## 1. ACTIVITIES UNDERTAKEN IN THE PERIOD OCTOBER 2003 – OCTOBER 2004

The Malaysian National Committee for IHP was formed in 1975, and comprises 30 governmental agencies and institutions of Higher Learning as listed in Appendix A.

### 1.1 Meetings of the IHP National Committee

a) The EXCO meeting were held as follows:-

Year 2005      17 January 2005 in Kota Bharu, Kelantan  
                     09 May 2005 at DID HQ in Kuala Lumpur  
                     11 November 2005 at DID HQ Kuala Lumpur

b) The Annual General Meeting were held as follows:-

Year 2005                      35<sup>th</sup> AGM on 15 July 2005  
   Prime City Hotel, Kluang Johor.

#### 1.1.1 Decisions regarding the composition of the IHP National Committee

The National Committee of IHP Malaysia 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 Ir. Keizrul Abdullah, the Director General of the Department of Irrigation and Drainage (DID) Malaysia and the Secretary is Ir. Low Koon Sing 9 from 1<sup>st</sup>. Mac 2005) in place of Ir. Abdul Rahim Kaparawi (from 2<sup>nd</sup> Jan 2004 to 28 March 2005) who succeeded Ir. Chong Sun Fatt, all were from DID respectively. The Secretariat is provided by the DID.

There was no election of EXCO in the 34<sup>th</sup> AGM as the election of EXCO in the 33<sup>th</sup> would serve the two (2) year term from November 2005 to September 2007

The 35<sup>th</sup>. Annual Meeting held on 15 July 2005 reelected members of EXCO 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 these activities are carried out by the three standing committees and their working groups. The three standing committees are:

- (a) Committee on Research (JKP) under the chairmanship of Humid Tropics Center, Kuala Lumpur (HTCKL)
- (b) Committee on Education, Training and Public Information (JKPLPA), headed by the University Technology Malaysia (UTM).
- (c) Committee on Standardization of Hydrological Practices (JKPAH), under the chairmanship of Department of Irrigation and Drainage Malaysia (DID)

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

### **1.1.2 Status of IHP-V and IHP VI activities**

MIHP through its Standing Committee on Research played important role in preparing proposal for research project. Among the committee members are the experts from various government departments, universities and research institution. The meeting were frequently held to discuss research project in line with the proposed plan of IHP VI UNESCO (2002 – 2007).

MIHP has identified several proposed research projects to be undertaken by the respective lead agency. see Table1(a)

### **1.1.3 Decisions regarding contribution to/participation in IHP-VI**

None

## **1.2 Activities at national level in the framework of the IHP**

### **1.2.1 National/local scientific and technical meetings**

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

### **1.2.2 Participation in Regional IHP Steering Committee**

None

### **1.2.3 Research projects sponsored**

The Standing Committee on Research under MIHP has carried out several research project undertaken by the respectively lead agency. See Table 1(b)



#### **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 (JIHP)

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 organised activities including workshops, seminars and basic course in Hydrology at National Level. In addition MIHP organized the 2005 World Water Day Celebration in collaboration with government agencies, NGOs and private sectors. The activities carried out included launching by Honorable Parliamentary Secretary to the Ministry of National Resources and Environment the national seminar, the national exhibition, drawing and coloring contest, articles and feature writings in the electronic and mass media (see Table 2)

### **1.3 Educational and training courses**

In the Year 2004 several school talks on hydrology and environment were organised with participation over 10,000 students from Secondary Schools.

Seminar and workshop on Sustainable Water Management was organized at Research Centre for the school at the Pengkalan Chepa, Kelantan on 17<sup>th</sup> Mac 2005. 96 students participated in one day seminar. School teachers and Standing Committee on Education, Training and Public Information under MIHP were involved in organizing the seminar and workshop.

“River Expedition” for school secondary students at national level was carried out at Endau – Rompin at National Park in Johor under the sponsorship of the Malaysian National Commission of UNESCO (SKUM). The organizing committee was lead Standing Committee on Education, Training and Public Information under MIHP

#### **1.3.1 Contribution to IHP courses**

None

#### **1.3.2 Organisation of specific courses**

None

#### **1.3.3 Participation in IHP courses / seminars**

The MIHP Secretarial members involved in organizing the Seminar and Workshop on Sustainable Environmental Management sponsored by Kelantan State Department Environment.

## **1.4 Publications**

Publications contributed by MIHP are as follows:

1. The Report on Sungai Pahang for River Catalogue Vol. 5 by MIHP has contributed to UNESCO publication

## **1.5 Participation in international scientific meetings**

### **1.5.1 Meetings hosted by the country**

None

### **1.5.2 Participation in meetings abroad**

Dr. Hj. Mohd. Nor b. Hj. Mohd. Desa attended the 12<sup>th</sup> Regional Steering Committee IHP UNESCO Meeting in Adelaide from 21 Nov. – 26 Nov. 2004 on behalf of MIHP Chairman. Ir. Hj. Kezrul b. Abdullah

## **1.6 Other activities at a regional level**

Application for a participation programme grant 2004 - 2005 for the project on “River Eco-Expedition” for Regional (S.E.A.) Student Exchange Programme on Hydrological and Environmental Expedition has been resubmitted for consideration to the Malaysian National Commission for UNESCO.

### **1.6.1 Institutional relations/co-operation**

The MIHP was represented by Deputy Director General II of Department of Irrigation and Drainage Malaysia at the 16<sup>th</sup> IGC Meeting in UNESCO Paris from 16 – 24 September 2004 as a member of the ad hoc Committee on IHP Governance.

### **1.6.2 Completed and on-going scientific projects**

Refer to Table 3 & 4.

## **2. FUTURE ACTIVITIES**

### **2.1 Activities planned for 2006 and beyond**

The “Eco-Hydrology Expedition” for Regional (S.E.A.) Student Exchange Programme on Hydrological and Environmental Expedition under the sponsorship of Malaysian National Commission of UNESCO (SKUM) is planned to be held in 2006.

Other proposed activities are listed in Table 5

### **2.2 Activities foreseen for 2006 - 2007**

Yearly programme similar to programme for the year 2005

### **2.3 Activities envisaged in the long term**

Being planned.

**Table 1(a): Proposed research projects by MIHP/DID under Experimental Applied Research (EAR) IRPA 2004 in conjunction with IHP phase VI**

<b>Theme / Focal Area</b>	<b>Title</b>	<b>Agencies</b>
Theme 2	<b>Integrated Watershed Dynamics</b>	
Focal Area 2.1	a) Establishment of Landside Hazard Assessment Map Expressway and Cameron Highlands	UiTM,MINT,KUiTTHO,JPS JMG
	b) Runoff Generation of Processes and Time of Concentration Forested and Agricultural Experimental Catchment	UTM,MINT,USM,FRIM,JMG
Focal Area 2.2	a) Determination Of Event Mean Concentration (EMC) Values Of Suspended Sediments And Nutrients Urban Discharge Monotoring At Stations Of Sg. Kerayong And Taman Mayang WP. Kuala Lumpur	UiTM, MINT,,KUiTTHO,DID, MMS,UPM
Focal Area 2.3	a) Establishment of a Rainfall Erosivity Profile along North-South Expressway	UiTM,MINT,KUiTTHO,DID, MMS,UPM
Theme 3	<b>Regional Perspective</b>	
Focal Area 3.1	a) Development of Temporal Pattern for Urban Areas and PMP Derivation for Peninsular Malaysia	HTC,MMS
Focal Area 3.2	a) Heat Island Effects in Urban Areas and Correlation with Rainfall Runoff Pattern	MINT,USM,UiTM
	b) Detailed Hydrological Balance Study of Paya Indah	HTC,DID,UTM,FRIM, MINT,MMS,JMG
Focal Area 3.5	a) Effects of Logging on the Muda/ Pedu Reservoir Phase II	DID,UPM,MINT,UTM, MADA,DOAKedah, UKMLestari,JPnk,JMG,DOA,FRIM
Focal Area 3.7	a). Development of runoff characteristics to validate Manual Saliran Mesra Alam (MASMA)	USM,DID,MINT,KUiTTHO HTC
	b) Development of Urban Stormwater Management Model (SWMM) and GIS for Decision Support System	USM,JPS
	c). Performance Indicator of Stormwater Gross Pollutant Trap for Urban Drainage System	JPS,USM,UTM,HTC

**Table 1(b): Research projects sponsored by IRPA carried out under IHP phase VI**

<b>Theme / Focal Area</b>	<b>Title</b>	<b>Agencies</b>
Theme 2	<b>Integrated Watershed Dynamics</b>	
Focal Area 2.1	a) Development of Temporal Pattern for Urban Areas and PMP Derivation for Peninsular Malaysia	HTC Kuala Lumpur, MMS
Theme 3	<b>Regional Perspective</b>	<b>Agencies</b>
Focal Area 3.2	a) Development of Runoff Generation and Catchment Responses in Forested and Agricultural Sites	UTM, MINT,USM,JMG
	b) Detailed Hydrological Balance Study of Paya Indah Wetlands, Selangor	DID,UTM, FRIM, MINT, MMS, JMG, HTC Kuala Lumpur
Focal Area 3.7	a). Development of runoff Characteristics to Validate Manual Saliran Mesra Alam (MASMA)	USM, DID, MINT, KUiTTHO, HTC Kuala Lumpur,

**Table 3: Malaysian IHP Research Activities Under IHP Phase V**

<b>* No .</b>	<b>Title</b>	<b>Status</b>	<b>Agencies Involved</b>	<b>Completion Date</b>	<b>Funding Agency</b>
1. (6.1/6.2)	Effects of Logging on the Muda/Pedu Reservoirs.	Study in progress and scheduled to be completed in December 2005. Progress as scheduled.	DID/UPM/UTM/JPSM/MINT/MADA/FRIM/LESTARI/UKM/JPNK/DOA	December 2005	DID & MADA
2. (6.2)	Highlands Hydrology Study phase 2.	Received RM 146 000 in 2001. Applying for additional allocation under the 8 <sup>th</sup> . Malaysian Plan (2001 – 2005)	UTM/ITM/UPM/DID/JBA/TNB/JAS/MINT/JKR/FRIM	December 2005	IRPA
3.	Research on Urban Hydrology Kerayong Catchment	Data Processing and Analysis	HTC/DID/USM/UiTM	December 2004	DID

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

**Table 4 : Asian Pacific FRIEND research project**

<b>No .</b>	<b>Title</b>	<b>Status</b>	<b>Agencies Involved</b>	<b>Completion Date</b>	<b>Funding Agency</b>
1.	Establishment and Dissemination of Water Archive started 1997	2 more river basins are included ie. Muda River & River Pari.	DID	2005	Malaysian Government.
2.	Assessment and modification of available hydrological computer models to suit local conditions and possible applications for the region.	Study on going	HTC / USM	2005	Malaysian Government.
3.	Assessing the performance of a topographic-based model, TOPMODEL, in simulating runoff response in tropic regions, in particular for basin in Malaysia.	Study in progress	DID	2005	Malaysian Government.

**Table 2. Activities Carried Out by Malaysian IHP for 2004/2005**  
(from October 2004 - October 2005)

Item	Activity	Period and Venue	Lead Agency
<b>1.</b>	<b>World Water Day 2005</b>		
i.	Launching by Hon. Parliamentary Secretary to the Minister of National Resources and Environment Malaysia	19 March 2005 Kota Baru	MIHP
ii.	National Exhibition	18 – 19 March 2005 Kota Bharu Kelantan	DID Kelantan
iii.	Drawing and Coloring Contest	19 March 2005 Kota Bharu	MOE
iv.	National Seminar on “Water and Disasters”	20 – 21 March 2005	MANCID
v.	Publicity	During the World Water Day Celebration	Radio & TV Malaysia, local newspapers and bulletin
vi.	Open Day of Water Treatment Plant	19 March 2005 – 14 April 2005	PWD
<b>2.</b>	<b>Seminar /Workshop/Technical Talk</b>		
i.	Seminar and Workshop on Sustainable Water Management at Research Centre	17 March 2005 Pengkalan Chepa Kelantan	JKPLPA
ii	Talks on Hydrology to school	Through out Malaysia in the year 2005	JKPLPA

**Table 5: Future Activities by Malaysian IHP for 2004 - 2005**

**A) Seminar/Conference/Workshop**

Item	Activity	Period and Venue	Prop. Lead Agency	Funding Agency
1.	World Water Day 2006.	2 <sup>nd</sup> . April 2006	MIHP	Government of Malaysia
2.	Talks on Hydrology to Schools.	Through out Malaysia in the year 2005	MIHP	Government of Malaysia
3.	Seminars and Workshops on MIHP research projects.	Through out the year 2006 in Kuala Lumpur	HTC/DID	Government of Malaysia
4.	Technical Talks on Hydrology and Water Resources Issues	February 2006 July 2006 December 2006	MIHP	Government of Malaysia
5.	Technical Visits to water Resources Project	April 2006 September 2006	MIHP	Government of Malaysia
6.	River Expedition	July 2006	MIHP	Suruhanjaya UNESCO Malaysia (SKUM)
7.	Sustainable Water Management Camp inclusive of Seminar and Workshop	April 2005	MIHP	Government of Malaysia



### CURRENT MEMBERS OF THE MIHP

1.	DID * <sup>1</sup>	-	Department of Irrigation and Drainage (Secretariat)
2.	DOA	-	Department of Agriculture
3.	DOE * <sup>2</sup>	-	Department of Environment
4.	DOF	-	Department of Forestry
5.	EPU	-	Economic Planning Unit
6.	FELDA	-	Federal Land Development Authority
7.	FRIM * <sup>2</sup>	-	Forest Research Institute of Malaysia
8.	DMG * <sup>1</sup>	-	Department of Minerals and Geosciences
9.	MACRES	-	Malaysian Center for Remote Sensing
10.	MMS * <sup>1</sup>	-	Malaysian Meteorological Service
11.	MNCU * <sup>1</sup>	-	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 * <sup>2</sup>	-	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 * <sup>2</sup>	-	Universiti Sains Malaysia
23.	UTM	-	Universiti Teknologi Malaysia
24.	KUiTTHO	-	Kolej Universiti Technology Tun Hussein Onn
25.	UiTM	-	University of Technology MARA
26.	NAHRIM	-	National Hydraulics Research Institute of Malaysia
27.	HTC	-	The Regional Humid Tropics Hydrology Water Resources Center for Southeast Asia and the Pacific
28.	KTAK	-	Kementerian Tenaga, Air dan Komunikasi Malaysia
29.	KPKT	-	Kementerian Perumahan dan Kerajaan Tempatan
30.	JKIM	-	Jabatan Kemajuan Islam Malaysia

Note: \*<sup>1</sup> - Permanent EXCO Member

\*<sup>2</sup> - Elected EXCO Member

13<sup>th</sup> IHP REGIONAL STEERING COMMITTEE MEETING  
FOR  
SOUTH EAST ASIA AND THE PACIFIC  
BALI, INDONESIA  
(21 – 26 November 2005)

## **NATIONAL REPORT OF NEW ZEALAND**

### **1. ACTIVITIES UNDERTAKEN IN THE PERIOD OCTOBER 2004 – SEPTEMBER 2005**

#### **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 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. Accordingly the year has seen 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. 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 upgrade of about 180 hydrometric stations is scheduled to be implemented in the coming year (2005/06). In addition the automation / telemetry of a number of key climate stations has, and is being implemented each year. 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”.

### **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. This year substantial effort was put into reviewing the draft budget for Major Programme II - Natural Sciences, which includes the IHP, in document 33 C/5, and helping to brief the New Zealand team to the General Conference on hydrological matters relevant to the SE Asia-Pacific region.

Dr Ibbitt and Mr Curry attended the 12<sup>th</sup> RSC meeting held in Adelaide, Australia and attended the Technical Steering Committee meeting associated with the 12<sup>th</sup> 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.
- International Year of Freshwater  
Arising from the the International Year of Freshwater The Royal Society of New Zealand has continued to organise the New Zealand wide sampling of streams by school groups to determine stream health. NIWA is providing assistance to schools through making staff available to comment on the results. See <http://nwp.rsnz.org/> for details
- SHMAK Validation in Fiji  
NIWA has had its NZAID project "Development of a **Stream Health Monitoring Assessment Kit; Education leading to action**" for Pacific Islands, (PAC-SHMAK), approved. This project commenced with NIWA developing its New Zealand SHMAK for use by schools and community groups in Fiji, and will run over a period of 2 years. 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. These students were also taught how to identify the different freshwater invertebrates found in the streams that they surveyed. A total of 150 streams have been surveyed, flowing through relatively undisturbed catchments, modified rural catchments, and urban areas. The most commonly collected animals were midges, caddisflies, mayflies, shrimps and snails. By examining changes in the relative densities of these different animals in different streams, and understanding how different habitat and water quality parameters influence these animals, it is possible to produce a system where stream health can be determined based on the types of invertebrates living there. Staff at NIWA are currently analysing relationships between the biological communities and physical characteristics of each stream, as the first step in producing PAC-SHMAK. It is expected that a draft version of this kit will be ready in early 2006. This will be validated in Fiji, and any significant changes made. 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.

### **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 responsible for running the HELP basin project organize a stakeholder meeting. This years meeting has been expanded to include participants from the Pacific Island Countries – see section 2.1 of this report for more information.

### **1.3 Educational and training courses**

#### **1.3.1 Contribution to IHP courses**

##### 14<sup>th</sup> IHP Training Course - Hydrology in Asia

New Zealand sent an earth sciences expert, Dr McConchie of Victoria University's School of Earth Sciences to the UNESCO funded "14<sup>th</sup> IHP Training Course - Hydrology in Asia" that was held in Kuala Lumpur, 11-15 October 2004. This course was jointly organised by the Humid Tropics Centre in Kuala Lumpur, the Hydrospheric Atmospheric Research Centre, Nagoya University, and UNESCO Office, Jakarta.

##### Workshop on Intensity-Duration-Frequency (IFD) Rainfall

New Zealand also sent an IFD specialist, Dr Craig Thompson of NIWA, to the APFRIEND Workshop on Intensity-Duration-Frequency (IFD) Rainfall Research Direction at the Regional Humid Tropics Hydrology and Water Resources Centre (HTC) in Kuala Lumpur from 6-7 June 2005. Dr Thompson has been collaborating with Dr Tabios III of the Philippines, amongst others, to analyse the APFRIEND datasets for IFD relationships.

#### **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 Big Rivers

The New Zealand Hydrological Society, in conjunction with the Local Authority Monitoring Environment Group (LAEMG), hosted a Workshop on Big Rivers in Timaru on 9 March 2005 to promote the interchange of ideas and techniques associated with the use of the latest technology to monitor time-series, and real-time data in large rivers.

### NIWA Courses

Courses were provided by NIWA for regional council and NIWA staff on:

- Environmental data logging
- Optimising hydrological data quality
- Use of hand-held and continuous water quality sensors
- Hydrological statistics
- Managing extreme weather and flooding

### Pacific 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 is funding a three year Hydrological Training Course developed for hydrological technicians from the Pacific region. The first course comprising 4 weeks on surface water was held at the SOPAC Secretariat in Suva, Fiji, and the second course, held from 4-22 April 2005, also at that venue, included a mix of surface water and groundwater hydrology. Both courses comprised surface water training provided by experienced field hydrologists from the NIWA (John Fenwick, Mike Butler & Pete Mason) whilst the groundwater component in the second course 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 2<sup>nd</sup> course were from Kiribati, Marshall Islands, Palau, Nauru, Niue, Guam, Tonga and Tuvalu.

The third and final course in the programme is to be run in April/May 2006 and will build on the training provided in the first two, and will include more advanced tutorials and exercises in surface water, groundwater and applied use of climate information.

#### **1.3.3 Participation in IHP courses**

##### International Training Course on Hydrological Droughts and Low Flows

New Zealand sent a participant (Mr Roddy Henderson of NIWA) to the International Training Course on Hydrological Droughts and Low Flows at the Regional Humid Tropics Hydrology and Water Resources Centre (HTC) in Kuala Lumpur from 26-30 September 2005. During his time in Kuala Lumpur Mr Henderson gave a talk on low flow estimation to a group of staff and students at the University Technology Malaysia (UTM).

See also 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:

- 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 (64 to 75) 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 (49 to 60) 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, that 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 (9 to 13) 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.

## **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 16-19 November 2004 in Queenstown, New Zealand with the theme “The Water Balance”.

### **1.5.2 Participation in meetings abroad**

New Zealand was represented at the 12th RSC meeting and scientific conference held in Adelaide, Australia, 25-26 November 2004 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.

#### 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.

#### 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 Meteorology 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

#### NZAID – Cook Islands

In-country technical assistance and training was provided by NIWA as part of the last year of a five-year bilateral aid water resources assessment project through NZAID funding to Cook Islands. An extension to this programme which is to include groundwater monitoring and investigations, is being proposed by the Cook Islands Government.

#### Fiji Public Works Department

Assistance was provided by NIWA to the Fiji Public Works Department with the operation of their hydrometric instrumentation and telemetry systems.

#### UNESCO – Catchment & Communities Project – Vanuatu

NIWA provided an honorary liaison and technical advisory service to the Vanuatu Department of Geology, Mines & Water Resources on the Catchment & Communities project and HELP basin.

#### Flood forecasting – Fiji

Two proposals were prepared by NIWA for flood forecasting in Fiji at the request of the Fiji Public Works Department. One is for the upgrading of the existing telemetered Aquitel system run by the Public Works Department in the Rewa catchment near Suva. And the other is for a new flood forecasting system proposed for the Navua River following devastating floods during which lives were lost and the Navua hospital had to be evacuated. The Navua system is likely to be part of an EU-funded project through SOPAC.

### **1.6.2 Completed and ongoing scientific projects**

None

## **2. FUTURE ACTIVITIES**

### **2.1 Activities foreseen until December 2005**

#### NZ Hydrological Society Annual Symposium

The annual conference of the New Zealand Hydrological Society, will be held in Auckland, New Zealand from the 28 November to 2 December 2005. The theme for this years conference is “Where Waters Meet”, which proposes to explore the transition phase where water transforms from one expression to another.

#### Pacific Islands HELP Workshop

Plans are well advanced for the hosting of a UNESCO funded HELP workshop for Pacific Island countries which is to be held in conjunction with the AGM for the Motueka (NZ's only HELP basin) Integrated Catchment Management (ICM) project to be held in Nelson 7-11 November 2005.

Hosted by UNESCO, Landcare Research & NIWA this workshop aims to allow Pacific participants to view first hand how a HELP basin is operated and managed with a view to maximising the regional benefits from the newly established “evolving” Talise HELP basin on Maewo Island in Vanuatu. Participants from Cook Islands, Fiji, Federated States of Micronesia, Papua new Guinea, Samoa and Solomon Islands are expected to give a presentation on barriers to managing land use impacts on the rivers and the coast in their countries and practical problems and issues to managing and monitoring catchment areas; and the workshop seeks to identify ways in which these issues can be addressed using ICM techniques and the Talise basin data.

### 13<sup>th</sup> RSC Meeting

Attendance at the 13<sup>th</sup> RSC meeting in Bali from 24-25 November.

### Lao PDR visit

Dr Ibbitt 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 following his attendance at the RSC meeting.

## **2.2 Activities planned for 2006**

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.

### Hydrological support programme proposal for the Pacific

During the 1<sup>st</sup> 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 2<sup>nd</sup> course which was held in Suva during April / May 2005. 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.

### Pacific Hydrological Training Programme

As mentioned in Section 1.3.2 above the third course of the Pacific Hydrological Training Programme is to be run in April / May 2006 and will include an introduction to Groundwater and



Climate Information as well as a follow-up on Surface Water. Trainees from Kiribati, Marshall Islands, Palau, Nauru, Niue, Guam, Tonga and Tuvalu will be in attendance.

### **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.

**13<sup>th</sup> IHP REGIONAL STEERING COMMITTEE MEETING  
FOR  
SOUTH EAST ASIA AND THE PACIFIC  
BALI, INDONESIA  
(21 – 25 November 2005)**

**NATIONAL REPORT OF PACIFIC ISLAND COUNTRIES**

**by**

**Phillip Komor  
Water Engineer  
Dept of Transportation, Communication & Infrastructure  
Federated States of Micronesia**

**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 11<sup>th</sup> meeting of the Regional Steering Committee for Southeast Asia and the Pacific convened in Fiji 2003 enabled the participation of representatives from many PICs and resulted in the admission of the Pacific Island Countries 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 excellent opportunity to further advance regional cooperation within the Pacific and establish linkages to partners in the Southeast Asia region.

**1. ACTIVITIES UNDERTAKEN IN THE PERIOD OCTOBER 2004 – SEPTEMBER 2005**

**1.1 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 11<sup>th</sup> 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 organisations informed, all correspondence will be copied to each respective National Representative.

The harmonization of these three programmes 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, which commenced this year through invaluable support provided by NZAID. This assistance is part of New Zealand's contribution to the Pacific Partnership Initiative on Sustainable Water Management under the Johannesburg Programme of Implementation.

Other 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, 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 one of the basins within UNESCO's Hydrology for the Environment Life and Policy project (HELP). Furthermore groundwater monitoring is being assisted through UNESCO's Participation Programme 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**

None.

### **1.2.2 Participation in IHP Steering Committees Working Groups**

None.

### **1.2.3 Research/applied projects supported or sponsored**

#### Niue receives UNESCO Participation Programme Grant for Groundwater Monitoring

Following Niue's attendance at the 12<sup>th</sup> 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, to assist in establishing 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 (Banaba) and Tonga.

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 ([waterworks@mail.gov.nu](mailto:waterworks@mail.gov.nu)).

#### Joint Programme on Biosphere Reserves for Sustainable Community-driven Management of Natural Resources in Micronesia

Two *Biosphere Reserves* have been established in the Federated States of Micronesia (FSM), And Atoll in Pohnpei and Utwe Walung in Kosrae.

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 proposed.

UNESCO in cooperation with SOPAC and the key partner 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 And Atoll and Utwe Walung Biosphere Reserves, which will serve as pilot sites for follow-up action on integrated water resources management. Based on the experiences of the And Atoll and Utwe Walung 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 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. This monitoring programme has not been 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. Recognising this need SOPAC has secured funding from UNESCO to re-start the Water Monitoring Programme by purchasing some basic monitoring equipment and providing technical expertise to re-train and support local staff to carry out monitoring work.

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

#### Island Climate Update

NZAID agreed to the funding of a programme to provide monthly climate information through the **Pacific Island Climate Update** (ICU) and develop and strengthen the basic hydrological training needs of small island countries in the Pacific.

The publication of the ICU has been continued 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 island's 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. As a result of SOPAC's involvement, 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.

[www.niwa.co.nz/ncc](http://www.niwa.co.nz/ncc)

#### NIWA

Besides being involved in the development of the **hydrological training programme and the Catchments and Communities** project NIWA collaborates with the Fiji Institute for Technology (FIT) to test a water

quality testing kit called SHMAK in catchments in Fiji with schools and communities. If the trial proves successful this method can be used in other countries.

NIWA will be assisting in developing a Hydrology Support Programme for the Pacific to augment the needs of National Hydrological Services beyond the current hydrological training programme which will be assessed in connection with the approval for the HYCOS project.

[www.niwa.co.nz](http://www.niwa.co.nz)

### 1.2.5 Other initiatives

#### UNESCO's Small Islands Voice wraps up Public Water Forum

UNESCO's discussion forum **Small Islands Voices** focused around the occasion of **World Water Day** in March 2005, on water supply and sanitation issues in small island countries.

In response to an article on Fiji's water woes, many messages were being sent with Rainwater harvesting - individual households and villages collecting rainwater in buckets, tanks and underground cisterns - as most favoured option. Desalination and utilizing underground water supplies were other options discussed.

The need to conserve water, regardless of the source, was a theme running through many of the responses. While we had insufficient space to post all of the replies, UNESCO has compiled all the responses and organised them by subject for your future reference.

#### Pacific Dialogue on Water and Climate

The **Pacific Resource Centre on Water and Climate** is now established at the SOPAC Secretariat. The Centre, established under Asian Development Bank (ADB) funding, 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 will aim to establish a Pacific Water and Climate Focal Group, promote implementation of the Pacific Hydrological Cycle Observing System (HYCOS) project, promote South-South transfer of knowledge through the Caribbean-Pacific Joint Programme for Action on Water and Climate, and disseminate relevant Case Studies on Water & Climate.

<http://www.sopac.org/tiki/tiki-index.php?page=Pacific+Resource+Centre+on+Water+and+Climate>

[www.waterandclimate.org/home.html](http://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:

1. Development and installation of PC-based climate prediction software;
2. Training of NMS personnel in the use of the climate prediction software and the establishment of a climate prediction service;
3. Facilitation of linkages between NMS staff and clients making climate sensitive decisions; and
4. Training of clients in the effective and prudent use of prediction information.

Activities to date included:

1. High level discussions on the project were undertaken with appropriate Government officials from all potential participating Pacific Island Countries from February to May 2004.
2. Computer procurement purchased and delivered to each participating PICs National Meteorological Service. PI-GCOS kindly contributed AUD15000 towards the purchase.
3. Training and assisting NMS personnel in the establishment and provision of a climate prediction service was conducted from June to September 2004. Four-day on-site training took place in Fiji, Vanuatu, Samoa, Tuvalu, Tonga, Cook Islands and Solomon Islands.
4. The project is now well into its second and most important phase which involves the roll-out of the Seasonal Forecast System (called SCOPIC) to the local NMSs, training of local NMS personnel in statistics and forecast production and distribution, and the conducting of stakeholder workshops. The 3-day "Stakeholders' Workshop on Application of Climate Predictions" will be completed by early July in all nine PICs.
5. The implementation of the pilot project on sugarcane in Fiji started with a 2-day workshop on "Raising Awareness on Linking Climate Forecasting and Decision Making Practices for the Fiji Sugar Industry" from 21st to 22nd March in Lautoka, Fiji. This workshop was a joint effort of the Project Team and the Fiji Sugar Study Team (Fiji Meteorological Service, University of the South Pacific and the Fiji Sugar Corporation).
6. Other pilot projects will commence after July 2005 involving water management, media and fisheries. The pilot projects will aim to demonstrate application of climate data to management planning.

<http://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, we hope to assist in tackling some of the issues that water specialists face.

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](mailto:PICHydrologicalNetwork-subscribe@yahoogroups.com) or [alena@sopac.org](mailto:alena@sopac.org).

The Water Engineering group is primarily targeted at those working at water utilities and is co-ordinated by Sarah Davies. To join send an e-mail to [PICWater-subscribe@yahoogroups.com.au](mailto:PICWater-subscribe@yahoogroups.com.au) or [sarah@sopac.org](mailto:sarah@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](mailto:water_quality-subscribe@yahoogroups.com) or [tasleem@sopac.org](mailto: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 co-ordinated by Kamal Khatri. To join send an e-mail to [wastewater\\_group-subscribe@yahoogroups.com](mailto:wastewater_group-subscribe@yahoogroups.com) or [kamal@sopac.org](mailto:kamal@sopac.org)

## **1.3 Educational and training courses**

### **1.3.1 Contribution to IHP courses**

None.

### **1.3.2 Organisation 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.

The 2<sup>nd</sup> WMO/UNESCO/SOPAC **Hydrological Training Course** on Surface & Groundwater was held from 4 - 22 April 2005 at the training venues of the SOPAC Secretariat and Fiji's Mineral Resources Department. Hydrological technicians from 13 Pacific Island Countries participated including the Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

The 3-week NZAID funded programme, was aimed at providing specialized training to technical staff of the National Hydrological Services of participating Pacific Island Countries to assemble, maintain and apply data and information on national water resources, and to be able to pass this knowledge and skills on to others, in the field of surface and groundwater hydrology.

The lectures for surface water hydrology were prepared and provided by John Fenwick, Pete Mason and Mike Butler from the National Institute for Water & Atmospheric Research (NIWA) in New Zealand. The groundwater hydrology lectures were delivered by David Scott and Tony Falkland with extra modules provided by SOPAC's water quality officer, Tasleem Hasan, and by Dr Kifle Kahsai from the University of the South Pacific.

The programme included classroom sessions as well as fieldwork on the island of Makuluva, east of Suva and at the water intake at the Savura Catchment. Overall emphasis was placed on the techniques of data collection, processing and analysis with other topics of relevance including data quality assurance and safety aspects for fieldwork and the use of survey equipment.

The Fiji Meteorological Services hosted the trainees to a tour of their complex in Nadi and provided an introduction to their work programme on weather forecasting and climate predictions.

#### 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 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. 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.

This 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 implementation of a WVLC in Africa, Asia and the Pacific focussed on training in Integrated Water Resources Management. The main objective of WVLC Pacific Regional Centre, which will be located at the 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. This 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 of sustainable water strategies at local, regional, sub-regional and basin scales.

The courses designed by UNU-INWEH will assist in meeting USP's long term objectives and visions to introduce courses in water resources and management which strongly believes in 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; Organisational 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 co-ordinating 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 and it became evident that there are not many opportunities for training in wastewater management in the Pacific region. However, 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 be from a wastewater utility or equivalent responsible government department.

The first training will be run from 24-29 October, 2005 in Suva, Fiji Islands with consecutive courses expected in 2006. In a later stage, distance and flexible learning, e-learning or correspondence learning can be considered as modes of delivery. The primary expected outcome is to increase capacity to identify and formulate feasible projects to improve wastewater management that are cost-effective and can in practically be financed, operated and maintained.

#### Postgraduate Diploma in Integrated Water Resources Management (IWRM)

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.

Applicants should have obtained an undergraduate degree or tertiary qualification from a recognised University, or alternatively possess a relevant professional qualification with demonstrated experience and achievement relevant to the proposed IWRM programme of study. In addition, applicants should preferably be currently employed in the water sector or a related field, and must provide the written agreement of their employer to participate in the programme. Preference will be given to those applicants with affinity to water resources management.

Two copies of your application, including full *curriculum vitae* plus certified copies of academic qualifications and transcripts must be forwarded to Dr. Kifle Kahsai, the Coordinator of the UN Water Virtual Centre and Earth & Environmental Sciences Programme, The University of the South Pacific, Suva, Fiji. Applicants must request two professional referees to forward signed reports (quoting reference number) to the Coordinator by the closing date, 30<sup>th</sup> September 2005. Please note that applications and referees reports sent by e-mail will only be accepted if it is signed.



### 1.3.3 Participation in IHP courses

none

### 1.4 Publications

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** - UNESCO IHP Studies and Reports in Hydrology 49, Editor: A. Falkland

In most small islands water development projects have not achieved any goal. This is often because the technologies, design and materials were not suitable for either the environment or the cultural habits of the population, or because the operation and maintenance cost were excessive. Combined with geological and other physical complexities and the exposure to natural disasters, the hydrological and water resources problems, must be carefully considered. The situation is aggravated by lack of qualified personnel.

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 obtained from the SOPAC Secretariat ([arieta@sopac.org](mailto:arieta@sopac.org)) or UNESCO Apia Office ([hans@unesco.org.ws](mailto:hans@unesco.org.ws))

### 1.5 Participation in international scientific meetings

#### 1.5.1 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 researches of relevance to the themes chosen for the STAR Meetings.

At this year's STAR Session held on **26 September 2005 in Apia, Samoa**, scientists, experts and scholars all convened for 2 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.

##### 24<sup>th</sup> Pacific Islands Environment Conference

As part of the **24<sup>th</sup> Pacific Islands Environment Conference** (PIEC 2005) organised by the US Environmental Protection Agency (US EPA Region 9) in Guam 20-24 June 2005, a working session was held on water, wastewater and public health.

This session focussed on three particular areas: (1) the link between public health issues and drinking water; (2) developing a water and wastewater utility training program; and (3) a regional perspective to water quality monitoring and the adoption of the Water Safety Plan concept.

In the first part facilitated by Bill Davis (USEPA) public health experts discussed the linkage of how utility operations, particularly drinking water, can have an impact on public health and the critical role utility operations play in protecting public health.

The second part of the session comprised of a workshop by Skeet Arasmith (ACRP) on developing an actual utility water and wastewater training program to build and develop operator knowledge and capacity.

The third part gave an introduction to the Pacific Regional Action Plan on Sustainable Water Management Sustainable Water Management and outlined the implementation progress and future plans within the Pacific region with specific reference to water quality monitoring and the adoption of the Water Safety Plan concept with presentations by Marc Overmars (SOPAC); Steve Iddings (WHO Pacific Regional Office); and Abraham Hicking (RMIEPA).

## 1.5.2 Participation in meetings abroad

### UNESCO HELP Symposium

The UNESCO HELP (Hydrology for Life, Environment and Policy) Symposium is to be held from **7 - 11 November 2005 in Nelson, New Zealand**. One purpose of the Symposium is 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 is 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 presentations and discussions will assist UNESCO and their partners to have a clear indication of where the need to focus their assistance is to develop HELP related activities in the Pacific. 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.

### World Meteorological Organisation

The **WMO Hydrology Working Group for Regional Association V (RA V)** met 7-11 October 2005 in Nadi, Fiji. Reports on activities included the Pacific Hydrology Training Programme and the submission of the HYCOS programme to the ACP EU Water Facility.

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 considering support for HYCOS implementation in the Pacific and have selected the HYCOS proposal prepared by SOPAC, WMO, UNESCO and the Fiji Meteorological Service for the second round of their 1<sup>st</sup> Call for Proposals. The assessment of the submissions is expected by the end of 2005.

<http://www.wmo.ch/>

### Pacific Preparation for the 4<sup>th</sup> World Water Forum

The regional consultation in preparation for the 3rd World Water Forum (3WWF) in 2003 resulted in a strategic framework for the region to address small island countries water and sanitation issues, this being the Pacific Regional Action Plan on Sustainable Water Management (Pacific RAP).

Regional, national and local action programmes have since been developed and are in various stages of implementation. The Japan Water Forum (JWF) that arose from the Japanese 3WWF Secretariat has approached SOPAC to assist in drafting and finalizing the Pacific sub-regional part of the Regional Position Paper for Asia and the Pacific, which is to be presented at the 4th World Water Forum (4WWF) from 16th-22nd March 2006 in Mexico.

The Science, Technology and Research network (STAR) Water Working Group, held in association with SOPAC's Annual Session, will provide a first opportunity to provide this input and will be organized on September 26, 2005 at the Kitano Hotel in Apia, Samoa, in collaboration with the JWF and the Pacific Water Association (PWA).

All members of the Pacific Partnership Initiative on Sustainable Water Management are invited to provide comments on the draft position paper and make recommendations on the Pacific contributions in Mexico.

### The Asia-Pacific Regional Synthesis Meeting for the 4<sup>th</sup> World Water Forum

A Regional Synthesis Meeting was held on Monday, October 24, 2005 organised by the Japan Water Forum in collaboration with GWP South East Asia, GWP South Asia, GWP CACENA, Korean Water Forum, SOPAC and the Secretariat of the 4th World Water Forum.

The Objectives of the meeting were to:

- Synthesize the sub-regional process
- Finalize the "Regional Document" with adding the common message from the Asia-Pacific region.
- Discuss the program of "Regional Day" at the 4th World Water Forum

The Pacific Position Paper discussed and amended during the Pacific preparation meeting in Apia was presented at the meeting. All the documents and presentation files from the meeting, including the summary of the common message from the region, are available on the Japan Water Forum website. <http://www.waterforum.jp/eng/apsubregions/>

## **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 that was signed by 16 Pacific island countries. The meeting identified key messages for six themes viz. 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.

[http://list.sopac.org.fj/Secretariat/Programmes/H2O/3rd\\_world\\_water\\_forum/index.html](http://list.sopac.org.fj/Secretariat/Programmes/H2O/3rd_world_water_forum/index.html)

#### Pacific Partnership Initiative on Sustainable Water Management

The overall aim of the Type II Initiatives is to ensure coordination and increased partnerships in meeting the 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.

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 [marc@sopac.org](mailto:marc@sopac.org)

### **1.6.2 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 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.

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, firstly in Tarawa Atoll in the Republic of Kiribati and then in the Kingdom of Tonga.

Tarawa atoll has two regions, heavily populated, urbanised 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 their groundwater lenses have now been measured. These measurements permitted water balance estimates, using the highly variable climate record, of their sustainable pumping yields of fresh groundwater and identified potential sites for additional galleries.

A critical concern in small island communities with land overlying fresh groundwater stores is the impact of groundwater pumping for reticulated water supplies on traditional crops such as swamp taro and coconuts. On Bonriki, the community attributes a general decline in productivity of coconuts and taro to groundwater pumping. An extensive study of shallow groundwater drawdown and salinity by pumping from all infiltration galleries on Bonriki and Buota found the mean drawn down due to pumping was close to the the theoretically predicted drawdown. This was an order of magnitude less than diurnal tidal fluctuations of groundwater that coconut tree roots are exposed to. Pumping also had a negligible influence on groundwater salinity. A theoretical study of the width of the saline transition zone beneath the freshwater lens estimated pumping increased its width by 37% but the frequent El Niño droughts increase the transition zone width by 90%. Examination of the sparse coconut trees at Bonriki and a review of their physiology indicate declines in productivity are due to senescence and a lack of crop management. The abandonment of swamp taro was caused by taro beetle invasion in South Tarawa.

Because of the scarcity of land on small islands, agricultural activities, such as market gardens and swamp taro production, often encroach over shallow groundwater reserves. The use of animal manures and inorganic fertilisers, construction of open wells for watering and increased cropping density of coconut trees have raised concern over impacts on groundwater. Extensive sampling of groundwater on Bonriki revealed *E. Coli* and elevated nitrate and dissolved organic carbon levels in areas with market gardens and abandoned swamp taro pits. Large concentrations of hydrogen sulfide were also found due to reduction of sulfate in groundwater. Chlorination and air sparging removes these materials.

The water balance model was used to examine impacts of coconut tree density on groundwater recharge. Tree density had little influence during major wet periods. During droughts, however, it has a major impact causing significant periods of net groundwater loss. Predictions are consistent with measured groundwater salinity records. Analyses of the drought impact on the thickness and salinity of the of the freshwater lens predicted watertable falls of up to 400 mm during prolonged droughts, close to the measured decrease of 440 mm. Predicted increases in salinity of the freshwater lens are consistent with observed increases and with measured saltwater intrusion. The nonparametric method of identifying droughts can provide a lead time of about three months warning of droughts.

Local and expert knowledge on groundwater and water supply has been collected and this has been incorporated with the hydrology and salinity dynamics into a Multi-Agent System for groundwater use and management, AtollScape. The system includes all the principal actors in water extraction and use, down to households. A role playing game, AtollGame to explore different scenarios through use of AtollScape and reduce conflicts has been developed. A two-day trial of the game with relevant representatives from the

islands of Abatao and Tabiteua and key government stakeholders produced a flow chart of financial, technical and social solutions and a proposal for a sequential refining of the process to arrive at equitable management options.

[www.aciar.gov.au/](http://www.aciar.gov.au/)

## **2. FUTURE ACTIVITIES**

### **2.1 Activities foreseen until December 2005**

none

### **2.2 Activities planned for 2006**

Following the 1<sup>st</sup> and 2<sup>nd</sup> course of the UNESCO/WMO/SOPAC hydrological training programme, the 3<sup>rd</sup> course will be carried out in April/May 2006 and will be split in two groups: one on surface water and one on groundwater. Participation in the course is expected from the countries attending the 1<sup>st</sup> and 2<sup>nd</sup> course: Cook Islands, Fiji, Federated States of Micronesia, Papua New Guinea, Samoa, Solomon Islands, Vanuatu (Surface Water); and Kiribati, Marshall Islands, Palau, Nauru, Niue, Tonga and Tuvalu (Groundwater).

#### Hydrological support programme proposal

During the 1<sup>st</sup> and 2<sup>nd</sup> course of the Pacific Islands Hydrological Training Programme it was identified that major constraints to effective operation for most countries were skills shortages, failure of equipment, inadequate resources for repair or upgrading and the lack of funds for software. It is obvious that many of these constraints have a massive negative effect on the availability of information on water – but that they are individually minor issues that could be resolved by some carefully targeted, practical training and “collegial” support.

A proposal has since been established in collaboration with the National Hydrological Services (NHS's) in the Pacific and the National Institute of Water and Atmospheric Research (NIWA) in New Zealand which will seek funding for a support programme in addition to the hydrological training programme. The further development of this programme will be done in conjunction with the Pacific HYCOS project.

### **2.2 Activities envisaged in the long term**

#### GEF Project Development Fund approved for 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.

Further design for this project in a so-called PDF-B phase, requires all partnership members' input and additional information on the follow-up will be provided in the coming months.

Thirteenth Meeting of IHP Regional Steering  
Committee for the Southeast Asia and the Pacific  
24<sup>th</sup> November, 2005  
Bali, Indonesia

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**Country Report on Papua New Guinea International  
Hydrological Program Activities: 2004-2005**

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Prepared & presented by:  
**Maino Virobo**  
Principal Hydrologist  
*for* Papua New Guinea IHP National Committee

Country Report on  
PAPUA NEW GUINEA IHP Activities:  
2004-2005

## **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 2004-2005, 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 2004 and 2005, such as low water availability and in preparedness towards phenomena relating to climate change.

The position of PNG IHP National Committee chairperson has not been resolved, nevertheless the secretariat is performing that responsibility while the issue is being addressed. Secretarial support is being provided by the principal hydrologist with occasional assistance received from WRM branch of DEC 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 PNG IHP national committee for the period 2004-2005 organized for a meeting to elect a new chairperson. Due to poor response received, the election of the chairperson has been deferred.

The number of membership has been increased from 5 to 8, to ensure a wide range of interest is captured from varying water sector agencies. The latest inclusions are Department of Health (DoH), National Forest Authority (NFA) and Department of Agriculture and Livestock (DAL).



### **3. Other Hydrological and Water Related Activities Conducted by Individual Water Agencies**

#### **3.1 Rural water supply and sanitation**

The 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 and Department of Works are extending their program on reliable rural and community water supply and hygienic living into the remote areas.

#### **3.2 Sea level rise and extended dry weather**

The threat by unprecedented rise in sea level and extended dry weather has brought together all agencies responsible and dealing with water to develop new adaptation methods to counter these natural hazards to minimize their potential impacts.

#### **3.3 Water use permitting**

Permit to use water either as an abstracted volume or as a dilution ratio in PNG is processed through the national Environment Council in which DEC administers. The Council meets to deliberate on numerous 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 present network of hydrometeorological stations in PNG operated by DEC is well below the minimum number required to provide accurate representation of the country's hydrological, and some components of meteorological regime. And according to the World Meteorological Organization (WMO) guidelines for network design and establishment (station density), this is extremely inadequate to meet the growing hydrological and meteorological needs of the country.

Routine data collection and station maintenance for the national hydrological network currently does not exist. Sites of significant value such as those used for monitoring domestic water supply and hydropower generation in which DEC is mandated to monitor are temporarily under the care of the system operators.

### 3.4.2 Public services

Individuals, non-government organizations, landowners groups, private and business entities have engaged DEC's WRM technical officers to conduct water resources and environment impact assessment studies, investigate issues relating to flooding, river bank and bed erosion, and loss of immobile water. In 2005, there has been a remarkable increase in demand for technical officers' to take up such challenges, and combating new issues never been explored. The user pay policy, which is enshrined in the PNG **Environment Act 2000**, is paving the way for the marketing of our capabilities.

## **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. Data used in the river catalogue (vol. II, III, IV & V) have been supplied to Kuala Lumpur, Malaysia.

### **4.2 Meetings and short term training**

**Mr. Maino Virobo** attended the 12<sup>th</sup> RSC Meeting and participated in the International Symposium on *Water Sensitive Urban Design: Cities as Catchments* from 22-26 November 2004, Adelaide Australia.

**Mr. John Ari** attended the *Hydrology Training Course* held in Suva, Fiji from 4 – 22 April 2005.

**Mr. Maino Virobo** participated in a five-day training course on *Low Flow and Drought Estimation* held in Kuala Lumpur, Malaysia from 19 - 23 September 2005.

**Mr. Michael Wau** attended the 4<sup>th</sup> Workshop on UNESCO's HELP program on Integrated Catchment Management (ICM), held in Nelson, New Zealand from 7 - 11 November 2005.

### **4.3 Refund of misused UNESCO-IHP funds**

The UNESCO funds misused in 2003 have been paid. The last payment of US\$2000.00 was transferred to UNESCO Jakarta account on the 16<sup>th</sup> November 2005.

## 5. Future Tasks

A number of tasks have been identified and to be taken on board for 2005 and 2006. They include;

- (a) Continuation of the River catalogue project (if the future is certain),
- (b) Contribution towards regional data base upgrade,
- (c) Participation in short term tailored training programs organized by the regional international agencies,
- (d) Preparation of the proposal for the rehabilitation of the Ramu River hydrological network monitoring,
- (e) Further development of the Laloki River integrated water resources management project proposal, 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 reflects the strength of Papua New Guinea's IHP is towards UNESCO and IHP, either nationally or at a regional level. As a result of PNG's slow economic recovery and poor annual budgetary allocations, the PNG IHP National Committee's commitment to hydrology and water resources matters and issues is yet to be recognized at all levels of its participation.

The Laloki River basin, which was to be included in the 'River Catalogue Project, Volume VI' issue is currently in progress despite the uncertain future. Furthermore, the next issue once again hinges on the funding levels and the degree of enthusiasm shown in pursuing this project and perhaps, other related projects.

Participating in regional affairs and issues do not come easy. Most importantly, PNG IHP National Committee does not receive regular funding support from its members, which otherwise is not a mandatory obligation. Nevertheless, 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.

The compiling of the volume VI issue of the river catalogue was a task not competently handled by the officers assigned in its early stages of development, thus lead to its inevitable delay. Despite that set back the progress has been remarkable.

**13<sup>th</sup> UNESCO-IHP REGIONAL STEERING COMMITTEE MEETING  
FOR  
SOUTH EAST ASIA AND THE PACIFIC**

**in conjunction with the  
International Symposium on Ecohydrology  
“Experiences and Best Practices of Ecohydrological Principles  
for Good Water Governance”  
BALI, INDONESIA  
(21 – 25 November 2005)**

**NATIONAL REPORT OF THE PHILIPPINES**

**by**

**Leonardo Q. Liongson  
Director, National Hydraulic Research Center  
University of the Philippines  
and  
Acting 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 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)

*Prospective members from the academe who will contribute to the R&D activities in hydrology and water resources:*

Ateneo De Manila University, Manila Observatory (ADMU)  
De La Salle University, Department of Civil Engineering (DLSU)  
University of San Carlos, Department of Civil Engineering & Water Resources Research Center (USC)  
University of Santo Tomas, Department of Civil Engineering (UST)  
University of the Philippines at Los Baños, College of Engineering and Agro-Industrial Technology (UPLB-CEAT)

## **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 2004-2005 as well as activities in previous years not included in the Philippine National Report submitted in 2004. 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 (2004-2005)**

*1st Global Water Partnership Southeast Asia (GWP SEA) Steering Committee Meeting, 7 June 2004, Kuala Lumpur, Malaysia.*

*1st Organizational Meeting of Global Water Partnership Southeast Asia (GWP SEA), 4-5 October 2004, Lankawi, Malaysia.*

*GWP Regional Toolbox Workshop with Toolbox Users and Non-users, 4 November 2004, Hanoi, Vietnam.*

- 2nd GWP SEA Steering Committee Meeting*, 5-6 November 2004, Hanoi, Vietnam.
- 3rd GWP SEA Steering Committee Meeting*, 14-15 March 2005, Yangon, Myanmar
- 2nd Southeast Asia Water Forum*, Global Water Partnership Southeast Asia (GWP SEA), 29 August – 2 September 2005, Denpasar, Bali, Indonesia.
- 4th GWPSEA Steering Committee Meeting*, 30-31 August 2005, Denpasar, Bali, Indonesia.
- 12<sup>th</sup> Regional Steering Committee Meeting for Southeast Asia and the Pacific UNESCO International Hydrology Programme* (12<sup>th</sup> RSC Meeting for SEAP, UNESCO-IHP) in conjunction with the *International Conference on Water Sensitive Urban Design – Cities as Catchments*. (WSUD2004), 22-26 November 2004, Hilton Hotel, Adelaide, Australia.
- International Workshop on Augmenting Groundwater Resources by Artificial Recharge in South East Asia*, Vietnamese Academy of Sciences and Technology and UNESCO Jakarta Office, 15-17 December 2004, Ho Chi Minh City, Vietnam.
- International Conference on Monitoring, Prediction, and Mitigation of Water Related-Disasters* (MPMD-2005), Disaster Prevention Research Institute (DPRI), Kyoto University, 12-15 January 2005, Clock Tower Centennial Hall, Kyoto University, Kyoto. Japan.
- UNESCO APFRIEND Phase II Meeting*, Humid Tropics Centre, 6-7 June 2005, Cititel Mid Valley, Kuala Lumpur, Malaysia.
- AUN-SEED-Net Workshop on Disaster Mitigation and Management in ASEAN Countries*, ASEAN University Network/Southeast Asia Engineering Education Development Network, 3-4 August 2005, Phuket, Thailand.
- International Training Course on Hydrological Droughts and Low Flows*, National Committee of the Federal Republic of Germany for IHP, Humid Tropic Centre, and UNESCO Office Jakarta, 26-30 September 2005, Kuala Lumpur, Malaysia.
- 2005 IHES International Symposium on Hydrological Environment*, International Hydrologic Environmental Society (IHES), Water Resources Research Center. School of Civil and Environmental Engineering, Yeungnam University, 28-29 October 2005, Daegu, Republic of Korea.

## **2.2 National Activities (2005)**

*National Dialogue on IWRM and Water Financing Challenges*, Philippine Water Partnership (PWP), 30 March 2005, SEAMO Innotech, Commonwealth Avenue, Diliman, Quezon City, Philippines

*General Assembly - Philippine Water Partnership (PWP)*, 30 March 2005, SEAMO Innotech, Commonwealth Avenue, Diliman, Quezon City, Philippines.

*Training Course on GWP Toolbox on Integrated Water Resources Management*, Philippine Water Partnership (PWP), 1 August 2005, Ateneo de Manila University, Loyola Heights, Quezon City, Philippines.

*Ongoing and completed activities of the Philippine Water Partnership (PWP) in 2004-2005:*

SEA Output 1.2 - Convene National Dialogues/Multi-sectoral Forums.

SEA Output 2.5 - Raise Regional and National Awareness on IWRM and Implement Enhanced Communication Strategy.

SEA Output 4.2 - Establish and/or Strengthen Country Water Partnerships.

*Integrated Water Resource Management Summit for Central Luzon*, National Economic and Development Authority - Region IV (NEDA-IV), 29-30 August 2005, Mimosa Leisure Resort, Clark Field, Pampanga, Philippines.

*PHILWATER 2005 - 13th International Conference and Exhibition*, Philippine Water Works Association (PWWA), 18-21 October 2005, The Pryce Plaza Cagayan De Oro City, Philippines.

*1<sup>st</sup> National Meteorological-Hydrological Convention with its theme: Weather, Climate and Water: Implications to Sustainable Development*. Philippine Meteorological Society (PMS), 12-13 December 2005, Amihan Conference Room, 2<sup>nd</sup> Floor, PAGASA Central Office, Science Garden Complex, Agham Road, Diliman, Quezon City, Philippines

## **2.3 Ongoing and Completed Programs and Projects (2004-2005)**

Member institutions of the Philippine National Committee have undertaken programs and projects in the field of hydrology and water resources management during the period 2004-2005, 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) 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). *Water Resources Assessment for Prioritized Critical Areas (Phase I). Final Report (Metro Manila)*, World Bank and CEST, Inc.

National Water Resources Board (NWRB). *Water Resources Assessment for Prioritized Critical Areas (Phase I). Final Report (Metro Cebu)*, World Bank and CEST, Inc.

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), *Master Plan Study on Comprehensive Agusan River Basin Development*, CTI, Halcrow 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 - 12 Projects  
*Bago River Irrigation System Rehabilitation and Improvement Project*  
*Banaoang Pump Irrigation Project*  
*Bohol Irrigation Project (Phase 2)*  
*Casecnan Multipurpose Irrigation & Power – IC (Irrigation Component)*  
*Central Luzon Irrigation Project (CLIP)*  
*Help for Catubig Agricultural Advancement Project (HCAAP)*  
*Irrigation Systems Improvement Project II (ISIP 2)*  
*Lower Agusan Development Project (Irrigation Component)*  
*Malitubog - Maridagao Irrigation Project*  
*Southern Philippines Irrigation Sector Project (SPISP)*

*Tarlac Groundwater Irrigation System Reactivation Project  
Water Resource Development Project*

### **3.0 Participation in IHP Activities**

#### **3.1 Catalogue of Rivers for Southeast Asia and the Pacific**

The Philippines is poised to contribute to Volume VI of the Catalogue of Rivers the selected river basins in *Water Resources Region 1 (Ilocos Region)* of the Philippines. 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).

#### **3.2 AP-FRIEND**

This is the report of Dr. Guillermo Q. Tabios who was granted a travel grant by UNESCO Office, Jakarta for his attendance in the UNESCO APFRIEND Phase II Meeting held at Cititel Mid Valley, Kuala Lumpur Malaysia last June 6-7, 2005. The main objective of this meeting was to discuss the APFRIEND Phase II and the improvement of River Catalogues future publication:

- Presented country report on status and studies of design rainfall and design flood techniques and applications in the Philippines.
- Participation in workshop sessions on design flood (Group 2) to discuss data needs, currently used methods used and develop research plans to determine design floods for various countries of Asia-Pacific.
- Volunteered 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. Then this data will be sent out to various country representatives for design rainfall and flood analysis to be reported at the IHP-RSC Meeting in Bali, Indonesia this November 2005.
- Volunteered to assist Prof. Trevor Daniell to write document on design flood methodologies and case studies for Asia-Pacific countries.

- Volunteered to present report on design rainfall and design flood document to be prepared by this APFRIEND group in the IHP-RSC Meeting in Bali, Indonesia this November 2005.

### **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 sent two participants in the IHP training workshops held in the period:

*International Workshop on Augmenting Groundwater Resources by Artificial Recharge in South East Asia*, Vietnamese Academy of Sciences and Technology and UNESCO Jakarta Office, 15-17 December 2004, Ho Chi Minh City, Vietnam. Philippine participant: Prof. Guillermo Q. Tabios III of the University of the Philippines.

*International Training Course on Hydrological Droughts and Low Flows*, National Committee of the Federal Republic of Germany for IHP, Humid Tropic Centre, and UNESCO Office Jakarta, 26-30 September 2005, Kuala Lumpur, Malaysia. Philippine participant: Ms. Jessy T. Roque of the National Water Resources Board (NWRB).

### **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.

# NATIONAL REPORT ON IHP RELATED ACTIVITIES

## THAILAND

### 1. ACTIVITIES UNDERTAKEN IN THE PERIOD November 2004 – October 2005

- 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 2006
- 2.2 Activities foreseen for 2007-2008
- 2.3 Activities envisaged in the long term

## National Report on IHP Related Activities Thailand

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### 1. Activities undertaken in the period of November 2004- October 2005

#### 1.1 Meeting of the IHP National Committee

##### 1.1.1 Decision regarding the composition of the IHP National Committee

Thailand National Committee for IHP (THC-IHP) consists of 22 members. The present composition of THC-IHP is as follows:

- Chairman:** Mr.Siripong Hungspreug, Director-General of Department of Water Resources
- Vice Chairmen:** Professor Kasem Chunkao, Environmental College, Kasetsart University  
Mr.Virat Khao-Uppatum, Deputy Director-General of Department of Water Resources
- Secretary:** Mr.Boontham Sirichai, Director of Bureau of Research, Development and Hydrology, Department of Water Resources
- 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 Tingsanyachalee
  14. Associate Professor Suravuth Pratishtananda
  15. Mr.Satcha Sethabuth
  16. Mr.Veeraphol Taesombat
  17. Ms.Sukontha Aekaraj

During this period, Thailand National Committee for IHP (THC-IHP) held a meeting to revise and review all activities to conduct the new National Policy and Master Plan on Hydrology.

##### 1.1.2 Status of IHP-VI activities

- a) Completely establishment of the 29 River Basin Management Committees in 25 major river basins of Thailand
- b) Completion of 25 river basins of Integrated Water Management Plan
- c) Training and disseminating information, educating and communicating to the stakeholders and local communities in the river basins

### 1.1.3 Decisions regarding contribution to/participation in IHP-VII

Thailand National Committee for the IHP presented its support to the proposal framework for IHP-VII. Some specific issues that should be highlighted are: considering socio-economics, funding for local water resources projects/initiatives and their sustainability should be explored and the health scope should include the component of increasing water supply in rural area both quantity and quality in order to contribute to attaining the MDG goals. Thailand launched targeting of 100% of household access to pipe water supply in 2008.

## 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

- a) The representatives from TNC-INP attended the 12<sup>th</sup> Regional Steering Committee Meeting for the IHP in Southeast Asia and Pacific on 21 - 26 November 2004.

### 1.2.3 Research/applied projects supported or sponsored

- a) *Appropriate Hydrological Network Improvement Project*. It was settled in order that the hydrological data submission could be linked in a systematic pattern which is so called telemetry system. At present, the data from each station are transferred to MRCS. The stations are always developed to be able to efficiently transfer the data.
- b) *Study, survey and design 25 hydrological stations for the main river basins in Thailand*. The study is set forth to provide the improvement plan and develop existing hydrological stations. The implementation for 32 stations have already completed in various river basin namely Salawin, Ping, Wang, Yom, Nan, Chao Phraya, Sakaekrang, Pasak, Thachin and Maeklong.
- c) *Hydrologist Database Development*. To update the hydrological database to cope up with the current information technology and to be able to sustain enormous hydrological data in the future, the linkage between the headquarter and the local sections are connected through web applications of the Department of water Resources. This could increase efficiency of the involved units to catch up with sudden situations.
- d) *Establishment of network for flood warning and landslide risk warning*. It is temporally installed in 40 villages in the North, Northeastern and East regions of Thailand. Warning System is one way to prevent and relieve disaster. This early warning system is simply operated, enable to analyze disaster in advance, and warning on time.
- e) *Flood Warning by Using Rainfall Data and API*. The API is calculated with other data such as runoff, climatic, condition etc. In Thailand the API equals to over 150 mm. Except for Chantaburi and Trad Province in the eastern region and the southern region, where the API is exceeding 250 mm., which indicators that flood is always happened.

- 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 in the Lower Mekong Basin
  - b) Collaboration with Mekong River Commission in Basin Development Plan, Water Utilization Program and Environment Program
  - c) Collaboration with World Water Assessment Programme II (WWAP II) in preparing Thailand Case Study to be included in World Water Development Report II (WWDR II)
- 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
    - a) One representative attended training courses on Hydrological Drought and Low Flows on 26-30 September 2005 in Malaysia
- 1.4 Publications
  -
- 1.5 Participation in international scientific meeting
  - 1.5.1 Meetings hosted by the country
    - Thailand in cooperation with Asian Development Bank (ADB) organized the 2<sup>nd</sup> Regional Meeting on National Water Sector Apex Bodies, Bangkok, Thailand, April 2005
    - Thailand in cooperation with Maekong River Commission (MRC) will organize the International Forum on Integrated Water Resources Management of the Mekong River Basin, Chiang Rai Province, Thailand 28-29 November 2005
  - 1.5.2 Participation in meetings abroad
    - Representatives from Thailand participated in
      - Network of Asian River Organization (NARBO) Members Consultation Workshop on RBO Benchmarking, Batu, Indonesia, 29-30 November 2004
      - Inter-governmental Meeting Level of the Asia-Pacific Network for Global Change Research (APN), Japan, 12-14 April 2005
      - International Workshop on River Basin Management at the Lowest Appropriate Level, Poland, 22-25 May 2005



- Forum on Water Issues in Southeast Asia: Present trends and Future Directions, Singapore, 16-17 August 2005
- The 2<sup>nd</sup> Southeast Asia Water Forum, the Ministerial Meeting and the 5<sup>th</sup> Meeting of ASEAN Working Group on Water Resources Management, Bali, Indonesia, 29 August-4 September 2005
- Meeting on Sustainable Water Resources Management, Spain, 24-25 November 2005

## 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.

### 1.6.2 Completed and ongoing scientific projects

Participating in World Water Assessment Programme as one of the case study

## 2 FUTURE ACTIVITIES

### 2.1 Activities planned until December 2005

-

### 2.2 Activities foreseen for 2006-2007

- Establishment of network for flood warning and landslide risk warning (Phase 2)
- Attending the 6<sup>th</sup> Meeting of ASEAN Working Group on Water Resources Management, Philippines, February 2006
- Attending the World Water Forum, Mexico
- The National Research Council of Thailand in cooperation with the Asia Pacific Association of Hydrology and Water Resources (APHW) will be organized the 3<sup>rd</sup> APHW Conference on “Wise Water Resources Management Towards Sustainable Growth and Poverty Reduction” in Bangkok, Thailand, 16-19 October 2006.
- TNC-IHP will be organized the 14<sup>th</sup> Regional Steering Committee Meeting for the IHP in Southeast Asia and the Pacific back to back with the 3<sup>rd</sup> APHW Conference.

### 2.3 Activities envisaged in the long term

## **NATIONAL REPORT ON IHP RELATED ACTIVITIES**

### **I. ACTIVITIES UNDERTAKEN IN THE PERIOD AUGUST 2004 - OCTOBER 2005**

#### **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.

The Chairman of VNNC IHP has been awarded a medal by Viet Nam UNESCO Commission in recognition of his contribution to the UNESCO cause.

##### *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.

##### *1.2.3 Research/applied projects supported or sponsored*

- *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.
- *Tsunami Risk Mapping for Coastal Areas 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 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 “*38<sup>th</sup> 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, including IHP Training course, Kula Lumpur, Malaysia.

## 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 Hien N. X. (2004), “Flood Forecast for the Red River System”, Proceeding, *International Symposium on New Technologies for Urban Safety of Mega Cities in Asia*, Singapore.

## 1.5 Participation in international scientific meetings

- Attending the 12<sup>th</sup> 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.

## 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 2005-2006

- Attending meeting of 14<sup>th</sup> 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.

## Changes in Hydrological Systems of Mongolia

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### *Background*

The total surface water resource of Mongolia is estimated as 599 km<sup>3</sup>/year, and is composed mainly from water stored in lakes (500 km<sup>3</sup>/year), glaciers (62.9 km<sup>3</sup>/year) and rivers 34.6 km<sup>3</sup>/year. The amount of 34.6 km<sup>3</sup>/year consists of the river runoff formed within Mongolia (30.6 km<sup>3</sup>) and water inflow from adjacent country (4 km<sup>3</sup>/year) (Myagmarjav, Davaa, 1999). The amount of water resources in the renewable ground water has been estimated as 10.8 km<sup>3</sup>/year (Jadambaa, 2002). The surface and groundwater resources play vital roles in the country's economy, especially in agriculture, livestock production, industry and domestic water supply. For example, 31% and 25% of the total population of Mongolia receive water as tap water or as tank distribution, which mostly come from groundwater; 36% directly from groundwater well and 10% from rivers. The total water withdrawals in 1996 were equal to 0.40 km<sup>3</sup>, 25.2% of which were used for municipal needs, 25.8% for industry, 34.6% for livestock, 7.9% for irrigated arable land, and 6.5% for other needs.

Hydrological survey conducted in 2003 estimated that there are 5565 rivers and streams, 683 of which dried, 9600 springs and 1484 of which dried, 374 mineral waters, 10 of which dried, 4193 lakes and ponds, 760 of them dried in last few years /table 1/. Average channel density of 0.05 km/km<sup>2</sup> in the country. These water resources in these water bodies originate in Central Asian high mountains ranges and drain into three main river basins of the Arctic Ocean Basin (AOB), the Pacific Ocean Basin (POB) and the Asian Internal Basin (AIB).

As described above nearly 84% of the total surface water resources are in lakes. This calls for the adaptation of a proper lake resource management. There are 3060 lakes with surface area  $A > 0.1$  km<sup>2</sup> (Tserensodnom, 2000). The biggest lake in terms of surface area is Lake Uvs ( $A = 3518.3$  km<sup>2</sup>). By the volume and depth of water, Lake Khuvsgul is the biggest and contains 93.6% of the total surface and fresh water resources in Mongolia.

Glacier forms at elevation above 2750 m with mean air temperature of  $-8^{\circ}\text{C}$  and annual precipitation about 380 mm (Baast, 1999). In Mongolia, glaciers are distributed in area of between  $46^{\circ}25' - 50^{\circ}50' \text{ N}$ ,  $87^{\circ}40' - 100^{\circ}50' \text{ E}$ , at altitude of 2750-4374 m. Spatial distribution is sporadic and decreases from north-west to south-east. In total, 262 glaciers exist with the total area of 659 km<sup>2</sup> (Dashdeleg et al., 1983). Surface area of the biggest glacier valley, Potanin's glacier in Altai Tavan Bogd, is 53.5 km<sup>2</sup>. Mean depth of Mongolian glacier has been estimated as 55.8 m, and the total water resources accumulated in glacier is estimated as 62.9 km<sup>3</sup> (Dashdeleg et al., 1983).

Glacier areas are decreasing in last years in Mongolia. Changes in area are compiled in Table 2. Glaciers in the studied area reduced their area during the period from 1940s to 2000. The magnitude of the reduction ranges from about 10 % to 30 % /Kadota and Davaa, 2003/ due to climate change. Over the last 60 years the average air temperature in Mongolia has increased by about  $1.56^{\circ}\text{C}$  (Dagvadorj, 1994, 1999).

**Table 1. Total numbers of rivers, springs, lakes and mineral waters in Mongolia, in 2003**

Name of provinces /Aimag/	Rivers and streams		Springs		Mineral waters		Lakes and ponds	
	total	dried	total	dried	total	dried	total	Dried
Arkhangai	546	124	474	123	31	3	249	32
Bayan-Ulgii	293	17	736	42	13		1180	217
Bayankhongor	299	61	837	55	22		104	38
Bulgan	449	62	668	238	36		254	27
Gobi-Altai	219	2	779	35			75	0
Gobisumber	3	0	19	1	2		1	0
Darkhan-Uul	21	4	27	13			4	2
Dornogobi	0	0	345	50	4		1	0
Dornod	156	39	354	121	24		515	233
Dundgobi	1	0	187	15	5		12	0
Zavkhan	217	19	444	18	15		118	2
Orkhon	5	0	28	7			4	1
Uvurkhangai	294	51	530	97	37	3	110	20
Umnugobi	2	1	559	20	5		18	0
Sukhbaatar	35	22	368	41	6		55	4
Selenge	596	90	208	70	28	2	46	6
Tuv	537	94	413	103	17	1	235	72
Ulaanbaatar	72	22	106	22	20	1	4	1
Uvs	183	0	493	31	16		121	6
Khovd	214	7	468	10	9		201	4
Khuvsugul	1233	70	969	193	78		642	30
Khentii	246	17	588	179	6		247	65
Total in provinces	5621	702	9600	1484	374	10	4196	760
Total in the country	5565	683	9600	1484	374	10	4193	760

Main focus of the study was to reveal changes occurring in the hydrological system in river basins of Mongolia.

Kharkhiraa, Turgen, Tsambagarav and Tavanbogd glacier areas were 50.13, 43.02, 105.09 and 88.88 sq.km, estimated from topographic map, scaled as 1:100 000 and compiled in 1940s (Kadota and Davaa, 2003). Areas of the Kharkhiraa, Turgen, Munkhhaikhan, Tsambagarav and Sair glaciers were decreasing by 45.5, 33.7, 25.8, 21.4 and 42.5 percent since 1992 till 2002, respectively /table 2./.

**Table 2. Changes in glacier areas**

Glacier massif	25 June, 1992	10 Sep. 2000	8 Aug. 2002
Kharkhiraa	57.37	36.08	31.29
Turgen	51.03	34.74	33.83
Munhkhairkhan	36.96*	-	27.42
Tsambagarav	90.98	74.8	71.52
Sair	11.51	-	6.62

#### *Methods and data*

To reveal hydrological changes caused by changes in ecosystems in river basins of Mongolia have been analyzed integral factors such as storage ratio, runoff coefficient and water balance elements. Hydrological data of rivers and precipitation observed in meteorological stations in

Mongolia, since 1945 to 2003 years and normalized difference vegetation index (NDVI) data, as 10 days composite NOAA/NDVI 8 km resolution from 1982 to 2001, provided from NOAA/NASA Pathfinder data set have been used in the study.

1. Annual storage ratio  $\varphi$  series of the basin, expressed as ratio of area of hydrograph below annual average discharge to the total area of annual hydrograph indicates water regime regulating capability of the basin and its overall changes with time and space.

$$\varphi = \int_{k=0}^{k=1} T dk \quad //$$

where: T is days, k is the ratio of daily average discharge to yearly average discharge.

2. Runoff coefficient  $C$  expressed as ratio of runoff depth to the basin average precipitation, indicates changes in elements of water balance in the basin  $/6/$ . Observation data on runoff depth and basin average precipitation series are divided into two periods namely period with natural flow regime and period with influences of anthropogenic pressures in the basin. Then average runoff coefficient in the period of natural flow regime of river is determined by following:

$$C_{natural} = \frac{h_{natural\ regime}}{P_{basin}} \quad /2/$$

where,  $C_{natural}$  is runoff coefficient in the period of natural flow regime,  $h_{natural}$  is annual runoff depth, mm,  $P_{basin}$  is annual and basin average precipitation, mm in the same period.

Natural flow rate in the period of increased anthropogenic pressures is determined using the runoff coefficient in the period of natural flow regime and precipitation occurred in the period of increased anthropogenic pressures, as follows.

$$h_{natural\ in\ anthropogenic\ period} = C_{natural} P_{anthropogenic\ period} \quad /3/$$

Then, change in runoff will be the difference runoff in the period of natural flow regime  $/h_{natural\ in\ anthropogenic\ period}/$  and runoff, observed in the period of increased anthropogenic pressures  $h_{anthropogenic\ period}$ .

$$\Delta h = h_{natural\ in\ anthropogenic\ period} - h_{anthropogenic\ period} \quad /4/$$

### Results and discussions

Cyclic fluctuation of annual flows of river is clearly indicated by the curve  $\frac{\sum(k-1)}{C_v}$  verses with

time. Where  $K = \frac{Q_i}{Q_{average}}$ ,  $Q_i$  and  $Q$  average are annual and longterm average discharges of a river

at a gauging station. As example, the curve is shown for the Tuul River at Ulaanbaatar. There are 2 cycles. First cycle is observed in the period of 1945-1976 and second one is in the period of 1977-2003. These 2 periods are distinguished by rate of anthropogenic pressures. First period is considered to be the period of natural flow regime and second period is period with increased anthropogenic pressures in the basin  $/fig. 1/$ .



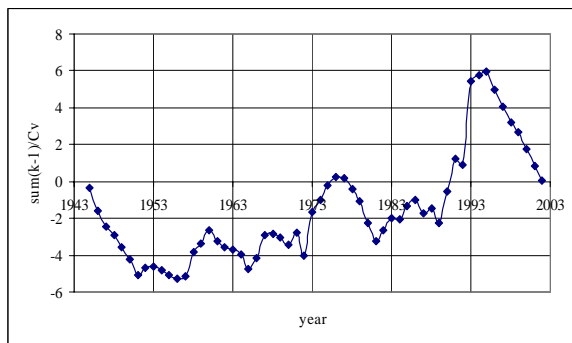


Fig. 1 Cyclic pattern of annual flows of the Tuul river at Ulaanbaatar /  $\frac{\sum (\frac{Q_i}{Q_{average}} - 1)}{C_v}$  verses with time, where  $C_v$  is coefficient variation of annual mean discharges ( $Q_i$ )/

In order to assess this type of influences to the Mongolian rivers, the runoff coefficient  $C$  was calculated at 17 selected stations. Then the calculated value of  $C$  was classified into two periods as described above: (1) early periods with undisturbed natural regime and (2) recent period with increasing human influences. Basin evapotranspiration was then calculated as the differences between the mean precipitation and the runoff for (1) and (2), separately.

Change of river flow can be classified into three groups according to the derived trend of the runoff coefficients as following:

1. River basins where the value of  $C$  has increased and evapotranspiration has decreased.
2. River basins where the value of  $C$  has remained the same. In another word, river basins remain with natural flow regime and water resources without human influences.
3. River basins where the value of  $C$  has decreased and evapotranspiration increased.

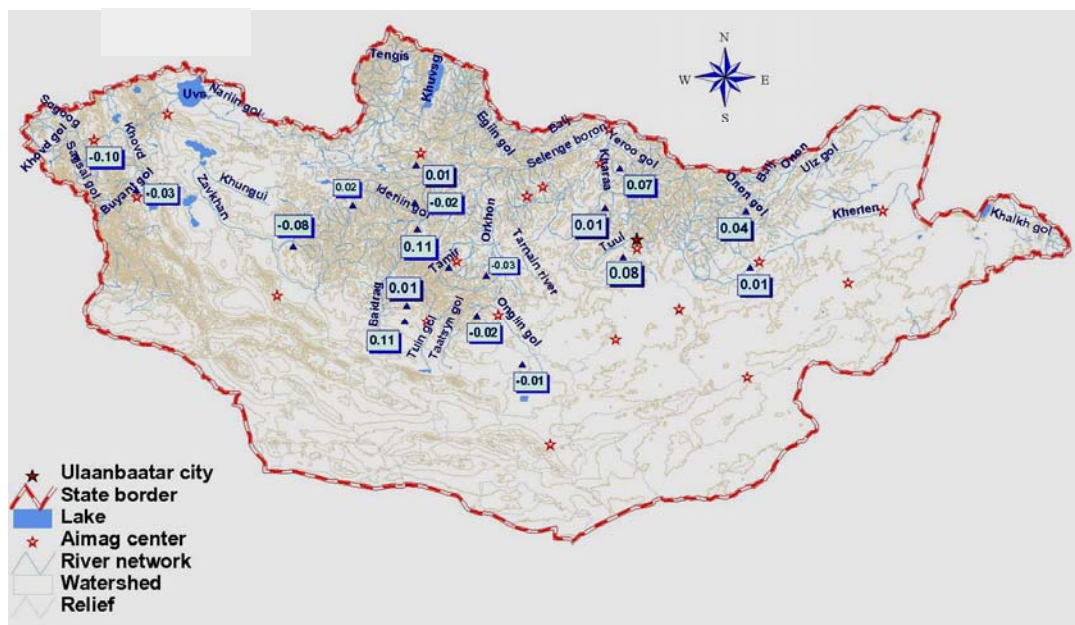
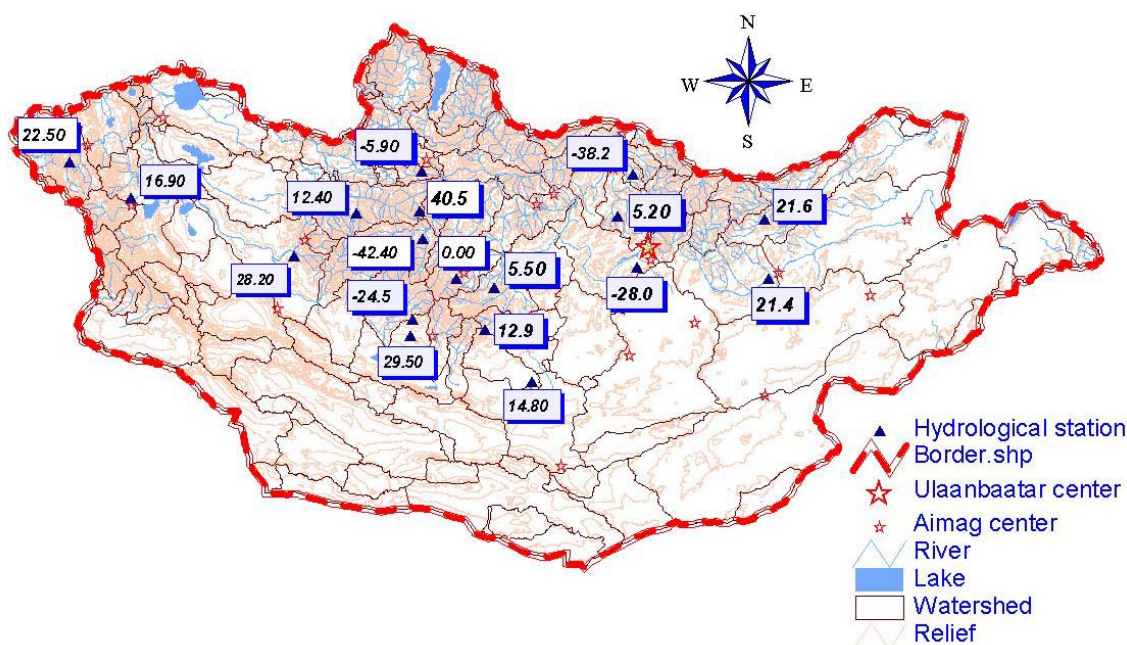


Fig. 2 Changes of runoff coefficients in river basins

Increase in runoff coefficient indicates the increase in overland flow due to decrease in roughness and vegetation cover. Meanwhile, decrease in runoff coefficient indicates increase in

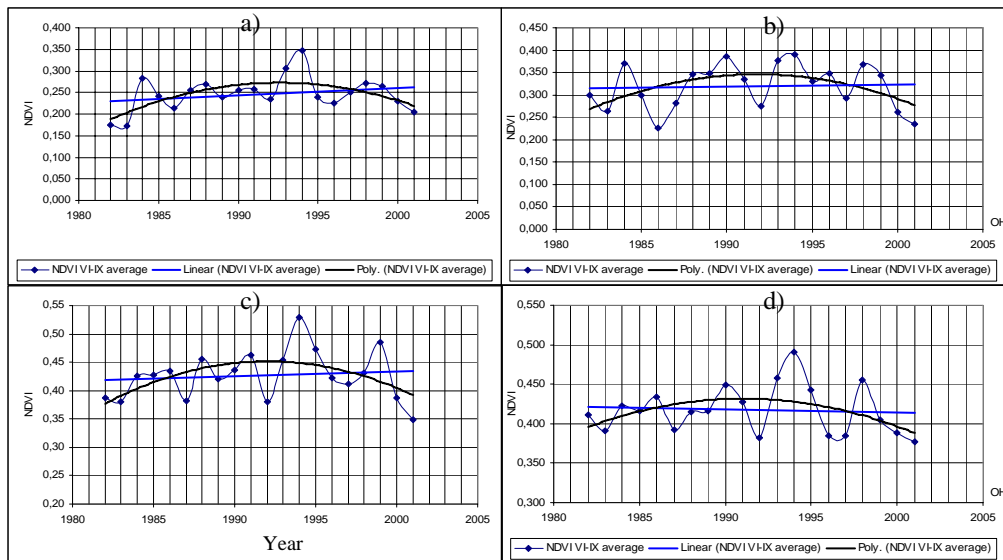
accumulation of water in a basin and eventually leads to increase in evaporation and recharge. River of the first group are located in basins where intensified timbering and pasture grazing. Rivers of the second group are located in basins, where concentrated lakes regulating water regime of rivers draining from and reservoirs used for mining /fig. 2/.

Basin average evapotranspiration has been estimated by simple water balance equation, assuming that change in water storage in year is near zero. Annual flow series are remarkably and basin average precipitation are slightly increasing, while evapotranspiration or evapotranspiration and change in water storage are drastically decreasing in last 60 years in river basins where degrades forest and vegetation cover due to wild fire, wood cut and overgrazing. In rest of basins evapotranspiration has been increasing in the same period /fig. 3/.



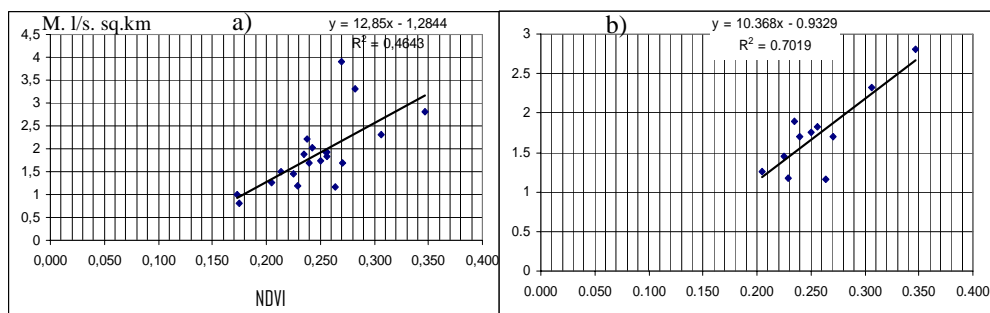
**Fig. 3 Changes of evapotranspiration in river basins**

Mongolia has short summer, extending from June to early September. Depending on the climate condition in river basin, its pasture vegetation condition changes within the years and also within 10 days. The long-term dynamic of average values of NDVI in June-August period in 1982 – 2001 and in various river basins of regions have been shown in Fig. 4. In general, the same pattern of NDVI is observed in river basins and 1994 was quite wet year and 2001 was drought year among last 20 years. However, linear decreasing trend is observed in upper Selenga river basin and increase in NDVI value is observed in rest of basins.



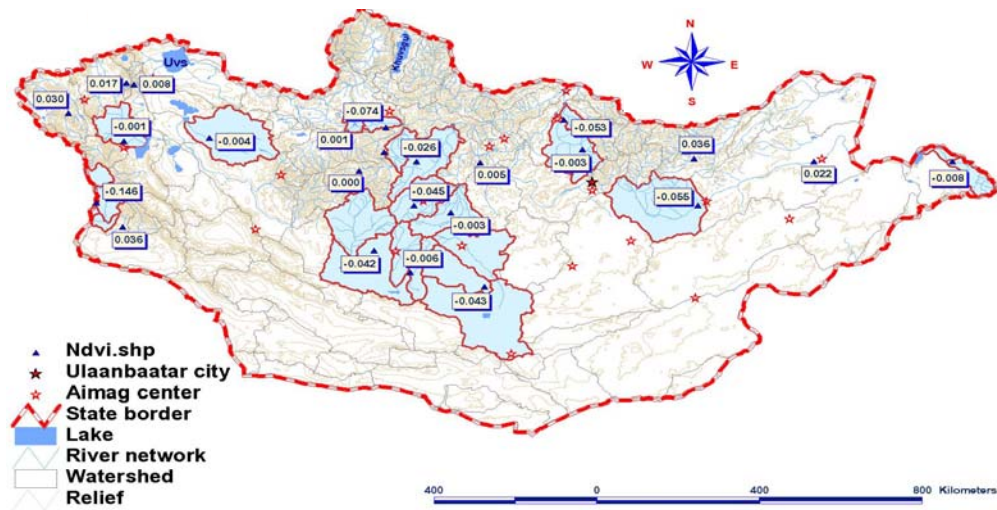
**Fig. 4 Dynamics of average values of NDVI in June-August period and in river basins of various region**  
*a- Bulgan river at Bulgan soum, b- Khalkh river at Sumber soum, c-Kherlen river at Undurkhaan, d-Ider river at Zurkh bag*

It is well known that vegetation cover consequently pasture condition is best in wet years. Therefore, there exists good relationship between average values of NDVI in June-August period and annual average of specific discharge of rivers located in various regions. As an example, the relationship between specific discharge of the Bulgan river at Bulgan soum and average values of NDVI in June-August period in the Bulgan river basin above the hydrological station is shown in fig. 5. The better relationship has been got from the NOAA/NASA Pathfinder and hydrological data collected in the period after 1991 than from the data of all 20 years.



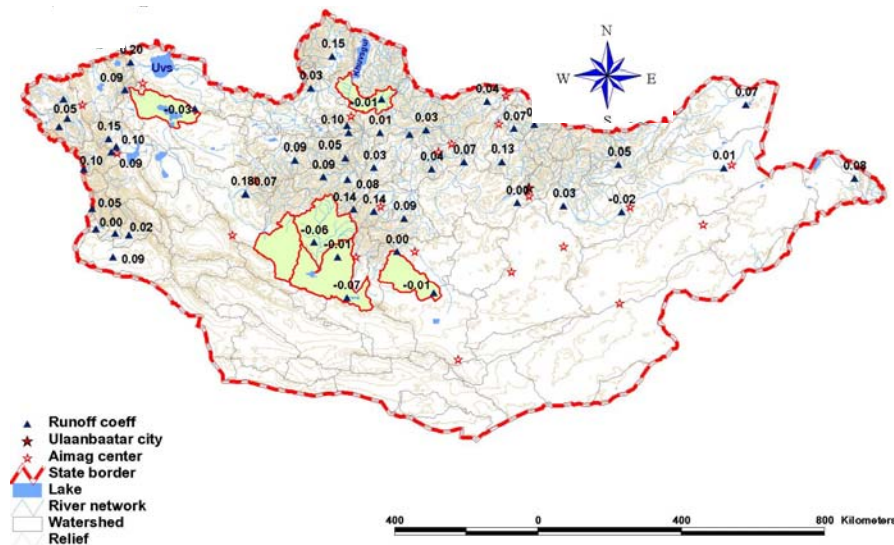
**Fig. 5 The relationship between average values of NDVI in June-August and annual average of specific discharge of the river Bulgan at Bulgan soum in 1982-2001, a- in 20 years, b- after 1991**

The change in NDVI has been estimated using the relationship and data on specific discharge of rivers for periods of 30-60 years. The changes in NDVI are negative in many river basins in central economic regions of Mongolia. However, positive changes tend to be in river basins of the Altai Mountain in the west and in the eastern slope of the Khentei Mountain in the east of Mongolia /fig.6/.



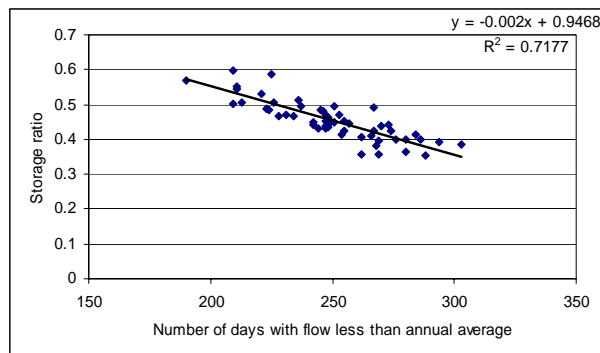
**Fig. 6** Changes in average values of NDVI during the period of June-August in 30-60 years

Storage ratio is an indicator of water regime regulating capacity of the basin. It is the function of forest, lake and marsh areas and also vegetation cover dynamics.



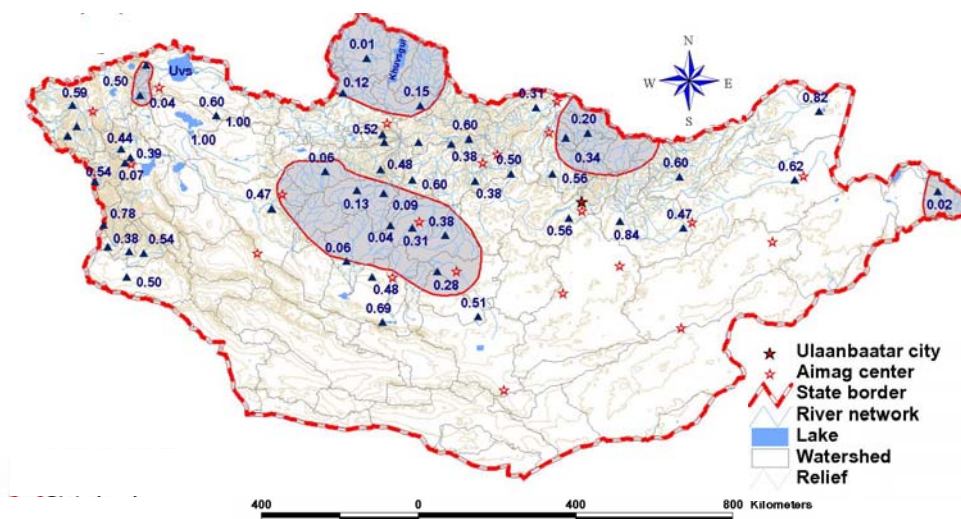
**Fig. 7** Changes in storage ratio indicating water regime regulating capability in the period of 1982-2001

Therefore, with decreasing NDVI the water regime regulating capability in a basin should be decreasing. Analysis of storage ratio series in the comparatively high flow period of 1982-2001 shows that storage ratio negatively changed in some river basins of Mongolia /fig.7/. With decreasing storage ratio of rivers increases number of days with flow rate less than annual average flow. This change leads to risks of higher flooding in the period of rainfall and drying up in low flow period. As an example, the relationship of the Tuul River at Ulaanbaatar is shown in following figure.



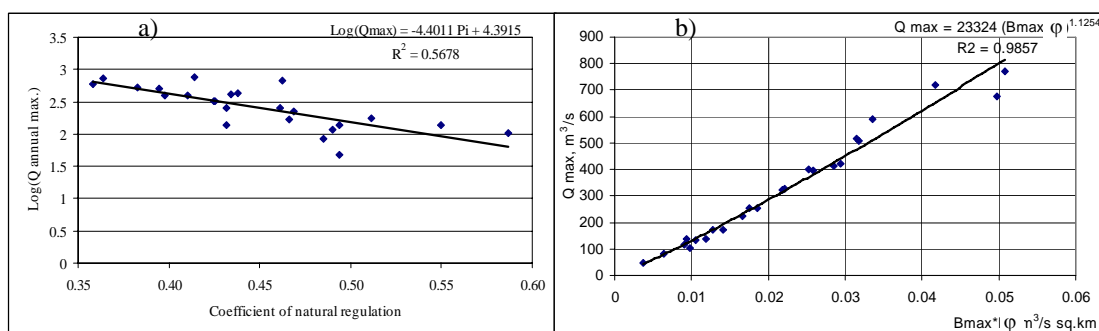
**Fig. 8 Relationship between storage ratio and number of days with flow rate less than annual average flow of the Tuul river at Ulaanbaatar**

The above-described relationship is weak in runoff formation zones and especially in forested area where water-regulating capability is high. Therefore, numbers of days with flow rate less than annual average flow is nearly constant. The relationship is strong in natural zones sensitive to anthropogenic pressures /fig. 9/.



**Fig. 9 Correlations /r<sup>2</sup>/ of storage ratio and number of days with flow rate less than its annual average**

Good negative relationship exists between annual maximum flows and annual storage ratio in a basin. Therefore, for the estimation of annual maximum flows, it is important to include flow regime regulating capability of a basin, especially for rivers where occurs degradation of vegetation cover. This is getting one of the bases for regional stream flow estimation in this changing environment. As example, the relationships were shown for the Tuul river at Ulaanbaatar /fig. 10/.



**Fig. 10 Relationships between annual maximum discharge and storage ratio (a), and specific discharge (b) for Tuul river at Ulaanbaatar**

For the Tuul River,  $Q_{\max}$  can be estimated by following empirical equation:

$$Q_{\max} = 23324 \cdot (B_{\max} \cdot \varphi)^{1.1254}$$

Where,  $Q_{\max}$  is annual maximum discharge, cub. m/s,  $B_{\max}$  is specific discharge, which is function of climate variables, cub. m/s sq. km,  $\varphi$  is storage ratio of the Tuul River.

Impacts of climate change and anthropogenic pressures as fire, overgrazing and wood cut are causing primarily changes in other hydrological characteristics of the river basin. Standard deviation of daily flows is drastically increased by 15.6 cub.m/s per year and evidences the increase of flood peaks and decrease of low flows. Water temperature of the river has been increased by 1.9 °C and number of days with ice cover and ice phenomena decreased by 12 and 8 days, respectively due climate warming.

### Concluding remarks

Analyses of storage ratio and runoff coefficient series show that water regime changes occur in river basins of Mongolia. Changes in natural components such as forest, vegetation and soil cover leading to predominantly change in hydrological regime. For the estimation of annual maximum flows, it is important to include flow regime regulating capability of a basin. This is getting one of the bases for regional stream flow estimation in this changing environment.

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1. Baast P. (1999): Catalog of Mongolian Glaciers, Ulaanbaatar, Unpublished report of Institute of Meteorology and Hydrology of Mongolia, 162 p.
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**NATIONAL REPORT ON IHP RELATED ACTIVITIES****MYANMAR****1. ACTIVITIES UNDERTAKEN IN THE PERIOD November 2004 - October 2005**

## 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 Decision 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 Publication

## 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 relation / cooperation

1.6.2 Completed and ongoing scientific projects

**2. FUTURE ACTIVITIES**

2.1 Activities planned until / December 2005

2.2 Activities foreseen for 2006-2007



## NATIONAL REPORT ON IHP RELATED ACTIVITIES

### MYANMAR

#### 1. ACTIVITIES UNDERTAKEN IN THE PERIOD November 2004 - October 2005

##### 1.1 Meeting of the IHP National Committee

###### 1.1.1 Decision regarding the composition of the IHP National Committee

The Myanmar National Committee for IHP (MNC-IHP) has been formed on 24 March 2003 comprising (20) members from 8 Ministries and 2 City Development Committees. The present composition of MNC-IHP is as follow;

Chairman: Major General Thein Swe, Minister for the Ministry of Transport

Vice Chairman: Mr. Pe Than, Deputy Minister for the Ministry of Transport

Secretary: Dr. San Hla Thaw, Director General of  
Department of Meteorology and Hydrology

Members: Representatives from departments and committees concerned are  
as follows;

1. Deputy Minister for the Ministry of Science and Technology
2. Deputy Minister for the Ministry of Agriculture and Irrigation
3. Director General of Directorate of Water Resources and Improvement of River System
4. Director General of Irrigation Department
5. Director General of Water Resources Utilization Department
6. Director General of Department of Forestry
7. Director General of Progress of Border Areas and National Races Department
8. Director General of Department of Hydro Electric Power
9. Director General of Department of Health
10. Secretary of National Commission for Environmental Affairs
11. Vice-Mayor of Yangon City Development Committee
12. Mayor of Mandalay City Development Committee
13. Professor of Civil Engineering Department of Yangon Technological University
14. Professor of Civil Engineering Department of Mandalay Technological University
15. Professor of Department of Mathematics, Yangon University

16. Head of Department of Engineering (Water & Sanitation),  
Yangon City Development Committee

17. Head of Department of Engineering (Water & Sanitation),  
Mandalay City Development Committee

Under MNC-IHP, the (5) working committees were organized according to the (5) Themes of IHP-VI. Each working committees consists of (10) members from the member departments and committees. The MNC-IHP normally hold one session each for the National Committee (NC) and Working Committee (WC).

#### 1.1.2 Status of IHP-VI Activities

Activities related to the themes of IHP-VI are implemented by the members of the working committees. The WC prepare the research papers and share the knowledges and experiences to the other national committee members. The annual sessions of NC accept the research papers from each working committee's activities and adopt the programmes for WC.

#### 1.1.3 Decision regarding contribution to/ participation in IHP-VII

MNC-IHP welcome the themes of IHP-VII and will participate with utmost thrust in the implementation of the themes.

### **1.2 Activities at National Level in the framework of the IHP**

#### 1.2.1 National/local scientific and technical meetings

First session of National Committee of MNC-IHP held on 4 August, 2003. In this session, the (5) working committees were organized based on the Themes of IHP-VI. The members in each committee separately coordinated and discussed upon their activities and functions and then draw the future plans and recommendations relevant to the theme assigned.

The other meetings are as follows;

No.	Name of meeting	Holding Date	No. of Research Papers Presented
1.	First Session of WC of MNC-IHP	29-3-2004 to 30-3-2004	6
2.	Second Session of NC of MNC-IHP	30-7-2004	6
3.	Second Session of WC of MNC-IHP	3-3-2005 to 4-3-2005	7
4.	Third Session of NC of MNC-IHP	12-7-2005	8

## 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

Myanmar become EANET (Acid Deposition Monitoring Network in East Asia) member country by the approval of Intergovernmental meeting of EANET, which was held in Japan, during 21-22 November 2005. So Myanmar is going to implement the responsible tasks assign by EANET.

## 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 Publication**

-

**1.5 Participation in International Scientific Meeting**

## 1.5.1 Meetings hosted by the country

MNC-IHP members participated in "Seminar on Water Resources Management System" which was jointly organized by Myanmar Maritime University and Saitama University of Japan. The Secretary of MNC-IHP delivered the opening speech at that seminar.

## 1.5.2 Participation in meetings abroad

The Secretary of MNC-IHP is a Permanent Representative of WMO, so he has contact and coordination with WMO's activities.

The representatives of MNC-IHP participated in

- 3<sup>rd</sup> Annual Mekong Flood Forum, Vientiane, Lao PDR, 7-8 April 2005

- Satellite Rainfall Estimation and Associated Technologies for the Mekong River Basin, Siem Reap, Cambodia, 19-22 April 2005
- Workshop on Flash Flood Warnings for the Mekong River Basin, Bangkok, Thailand, 30-31 May 2005
- Workshop on Satellite Rainfall Estimation and Associated Technologies for the Hindu Kush Himalayan (HKH) Region, Kathmandu, Nepal, 6-10 June 2005
- Informal and Academic Dialogue Process on the Development of the Mekong River Cooperation, Bangkok, Thailand, 12-13 September 2005
- Flash Flood and Sustainable Development in the HKH region, Lhasa, China, 22-29 October 2005

### **1.6 Other activities at regional level**

#### 1.6.1 Institutional relation / cooperation

-

#### 1.6.2 Completed and ongoing scientific projects

-

## **2. FUTURE ACTIVITIES**

### **2.1 Activities planned until / December 2005**

-

### **2.2 Activities foreseen for 2006-2007**

- The third session of WC of MNC-IHP is expected to hold in February 2006.
- The fourth session of NC of MNC-IHP is expected to hold in July 2006.
- The members of MNC-IHP will attend the 14th Regional Steering Committee for Southeast Asia and the Pacific.
- The members of MNC-IHP will participate in the international and national activities of IHP.

**ANNEX 6**

**MINUTES OF MEETING OF THE 11<sup>TH</sup> TECHNICAL SUB-COMMITTEE  
FOR THE ASIA PACIFIC FRIEND PROJECT**

**ASIAN PACIFIC FRIEND  
11<sup>th</sup> TECHNICAL SUB-COMMITTEE MEETING**

Ramada Bintang Bali Resort  
Bali, Indonesia, 21 November 2005

**Minutes**

**Attendees:**

<b>NAME</b>	<b>COUNTRY</b>
ROSS JAMES	AUSTRALIA
LONG SARAVUTH	CAMBODIA
VAN TAN VAN NGUYEN	CANADA
CHEN YUANFANG	CHINA
LIU HENG	CHINA
ZONGXUE XU	CHINA
A. W. JAYAWARDENA	CHINA – HONG KONG
CHOE HUNG SIK	D.P.R. OF KOREA
JANG HYON CHOL	D.P.R. OF KOREA
AGUNG BAGIAWAN	INDONESIA
EDDY A. DJAJADIREDJA	INDONESIA
HIDAYAT PAWITAN	INDONESIA
JOESRON LOEBIS	INDONESIA
PETER HEHANUSSA	INDONESIA
KAORU TAKARA	JAPAN
MANOLOTH SOUKHANOUVONG	LAO PDR
MOHAMED NOR	MALAYSIA
BOB CURRY	NEW ZEALAND
RICHARD IBBITT	NEW ZEALAND
LEONARDO Q. LIONGSON	PHILIPPINES
HONGKEE JEE	REPUBLIC OF KOREA
SAMHEE LEE	REPUBLIC OF KOREA
SOONTAK LEE	REPUBLIC OF KOREA
LE DINH THANTH	VIETNAM
TRAN THUC	VIETNAM
HANS THULSTRUP	UNESCO - APIA
GIUSEPPE ARDUINO	UNESCO - JAKARTA
PUNGKY UTAMI	UNESCO - JAKARTA

**1. Welcome**

Mr James welcomed the participants and apologized for the absence of the Chair, Mr Trevor Daniel who was currently on sabbatical leave in Germany.

**2. Election of Rapporteur**

Mr Thulstrup was elected as Rapporteur for the meeting.

**3. Confirmation of agenda**

The draft agenda was accepted (Attachment 1).

#### **4. Report from the AP FRIEND Meeting on Design rainfall and design Flood, Kuala Lumpur, 6-7 June 2005**

Mr Arduino presented an outline of the meeting held in Kuala Lumpur during June, including the agreed action. Mr Arduino advised that the proceedings of the meeting will be printed and distributed by early 2006.

#### **5. Presentation of design rainfall results received so far**

Mr Liongson, on behalf of Mr Tabios who was unable to participate in this meeting, summarized the data sets received and the results of analyses completed so far. Rainfall data sets were provided by; Australia, China, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Philippines and Vietnam. The IDF analysis of each of these data sets has been completed by Australia, New Zealand, Philippines and Vietnam.

#### **6. Other countries report on design rainfall analyses in progress**

Messrs Nor, Bagiawan, Takara and Lee (Malaysia, Indonesia, Japan, Korea respectively) in turn either summarized the results of the analyses of each data set carried out using their countries design rainfall analysis procedures or, informed the meeting of the status of these analyses. Mr Lui Heng advised that the analyses by China would be completed by the end of the year.

In response to comments by Mr Nguyen, an extensive discussion ensued concerning the appropriateness of some the statistical techniques being used in the analyses, the value of comparing the results obtained by each country given the different analyses applied to the data and the desirability of analysing each of the country data sets using a standard procedure so that results may be compared. To some extent the issues raised appeared to be a result of different interpretations of the objectives of the study. That is, the improved understanding of the design rainfall procedures currently used in each country leading to possible recommendations/guidelines for standardized procedures and the assembly of a regional data set to enable more extensive design rainfall analyses versus the immediate development of a standard design rainfall technique for the region using the assembled dataset.

The meeting agreed to continue with the analysis of all of the data sets by each of the countries and that an assessment/evaluation of these results will be prepared by Daniell/Tabios. The importance of a complete description of the design rainfall techniques used by each country being available to the people assessing the results was emphasised by Mr Nguyen Van Than Van. It was also agreed that Daniell/Tabios should consider drawing on the expertise of others, such as Mr Nguyen, when assessing the results of the analyses.

#### **7. Future of IDF work**

As a result of the discussions following the presentations the following steps and timetable were agreed.

- Analysis of all 9 data sets by the 9 countries to be completed by 31 December 2005.
- The completed analyses to be sent by email to Trevor Daniell, Guillermo Tabios and Giuseppe Arduino to ensure emails are not lost during the Christmas and New Year holiday period.
- Daniell and Tabios (and others as required) compare the results and prepare a report.
- Daniell and Tabios consider the need for a workshop (March/April??) to review the results of the analyses.
- Daniell and Tabios prepare a paper on the work for inclusion in the Friend conference in Cuba. (due by April 2006?)

#### **8. Floods (Design floods?) – what has been done?**

The work on design floods proposed at the Kuala Lumpur workshop has not progressed. Mr James proposed to the meeting that the design rainfall work be completed first. This would allow the experience gained in the rainfall project to be used to prepare a more detailed project plan for the

design flood project. Mr James suggested that, if the workshop to discuss the results of the design rainfall analyses proceeds, this would be a good opportunity to discuss the flood project. This was agreed by the meeting.

## 9. Other matters

Mr Nor raised the Catalogue of Rivers and pointed out that a decision on the future of the catalogue was required and that there was still a need to include the data from the catalogue basins in the Water Archive.

Mr Arduino informed the meeting of the report of the Review of the Catalogue of Rivers prepared by a small group following the recommendation at RSC 12 in Adelaide and advised that, as the report has not been printed or distributed, it will be difficult for this meeting to make any recommendations.

In the brief discussion that followed it was evident that many people held the view that the catalogue should continue to be produced. However, there were different views about whether it should be hardcopy, CD, web based or a combination of these. It was recognized that cost was a critical factor and that it was expensive to produce a print version. It was agreed that in the absence of the review report, recommendations could not be made to the RSC and that further discussion during the RSC meeting would be required.

Mr Arduino informed the meeting that UNESCO Jakarta has USD10,000 set aside to cover the production of the next volume of the Catalogue of Rivers and can agree to commit up to USD10,000 every 2 years if there is agreement that the publication continue.

All countries agreed that the data provided for the Catalogue of Rivers can be placed in the Water Archive.

## 10. Closure

The meeting was closed at 7:05pm

## 11. Action Items

<b>ACTION ITEMS</b>	<b>BY WHOM</b>	<b>WHEN</b>
1. Complete design rainfall analyses and forward to Daniell, Tobias and Arduino	Malaysia, Indonesia, Japan, Rep. Korea and China	31 December 2005
2. Prepare report of all design rainfall analyses	Daniell and Tobias	End January 2006??
3. Prepare paper of design rainfall project for Friend Conference in Cuba	Daniell and Tobias	April 2006??
4. Determine need for workshop in Mar/Apr 2006	Daniell and Tobias	



**Asian Pacific FRIEND  
11<sup>th</sup> Technical Sub-Committee Meeting  
Bali, 21 November 2005**

**Agenda**

1. Opening
2. Election of Rapporteur
3. Confirmation of Agenda
4. Report from the AP FRIEND Meeting Design Rainfall and Design Flood, Kuala Lumpur, 6-7 June 2005 (G. Arduino)
5. Presentation of design rainfall results available so far (L. Liongson and M. Nor)
6. Other countries report on design rainfall analyses in progress (Indonesia – A. Bagiawan – K. Takara – S. Lee)
7. Future of IDF work, which includes:
  - Countries to complete (time frame?)
  - Summary paper for the Cuba FRIEND by G. Tabios and T. Daniell
8. Floods (design floods?) – what has been done?
9. Other matters
10. Closure

**ANNEX 7**

**REPORT OF THE FIFTH YEAR REVIEW OF THE CATALOGUE OF RIVERS FOR  
SOUTHEAST ASIA AND THE PACIFIC**

**UNESCO IHP REGIONAL STEERING COMMITTEE  
FOR  
SOUTHEAST ASIA AND THE PACIFIC**

**FIFTH YEAR REVIEW OF THE CATALOGUE OF RIVERS  
FOR SOUTHEAST ASIA AND THE PACIFIC**

By

Trevor Daniell, Yasuto Tachikawa and Soontak Lee

June 2005

## **RESPONSE TO TERMS OF REFERENCE**

### **PREAMBLE**

UNESCO IHP Regional Steering Committee for Southeast Asia and the Pacific has set down that a review of the Catalogue of Rivers for Southeast Asia and the Pacific should be conducted after five years. This review was to typically examine the uses, advantages and disadvantages and costs of continuing production of the Catalogue of Rivers for Southeast Asia and the Pacific and factors inhibiting the entry of accompanying data into the hydrological Water Archive database.

The current five volumes of the Catalogues of Rivers include more than 100 rivers. It must be recognised that this is a great accomplishment of RSC. The objectives of publishing the Catalogues stated in the preface of volume 1 were:

- To promote mutual understanding of hydrology and water resources of the region and of the neighbouring countries; and
- To promote intra-national information exchange among different organizations in each country.

This has been achieved to a great extent. However, to achieve the third objective:

- To promote the establishment of an international data exchange and collaborative research network in the region

Further cooperation in the region is required to achieve this objective.

**OBJECTIVES OF REVIEW**

Examination of details under the objectives set for the review.

1. Identify and assess the advantages and disadvantages of continuing production of the catalogue, including identification of the uses and range of users of the catalogue

Advantages:

- Has enabled inclusion of all countries in the process;
- Supplies a ready data base for analysis of rivers in the region;
- Has brought together hydrologists of the Asia Pacific Region; and
- Used as a data source for Rivers in the Region - Increasingly as the number of Rivers increases.

Disadvantages:

Data that is available for catchments is not available but is if specific requests could be made to the supplying authority; and

Needs to have information from more rivers but also at shorter timescales eg less than 1 hour. —This becomes a limitation of the database that has specifically been constructed. This is required as more of the studies in the region are Rainfall runoff based.

Remarks

Could be integrated with other data bases of information that are available eg Global Runoff Data Center (<http://www.bafg.de/html/internat/grdc/grdc.htm>) in Germany based at Federal Institute of Hydrology.

Need to focus on several well maintained catchments in each region/country and publish YEAR CD (BOOK) of collected hydrological data. One of new collaboration ways of RSC would be as follows

2. Identify factors inhibiting the entry of accompanying hydrologic data into the database.

Time series data which is important needs to be included

Data is not available in a form easily retrieved by users and this is essential for usefulness

Time to enter the data as this is up to individual organisations and no funds have been available for the individual nodes

Lack of approval by collection authorities in some countries

3. Identify any format and/or data improvements that would increase the usefulness to research of the data in the catalogue and Water Archive and enhance their use.

Shorter time step information  
Geographical information Systems Information-  
Land use, Geology, Soil types, Topography

4. Provide recommendations to the RSC concerning the continued publication of the catalogue, including, if appropriate, possible improvements to the format and contents of the catalogue, data transfer arrangements and funding options.

### **Specific Recommendations**

#### Format of Publication

- Limit to a CD or Downloadable Electronic form from a web page
- Continue in a form different from present form but with more information on catchments
- Promote the data collection activities in the countries without regional or country based data bases to be able to provide digital information for both rainfall and streamflow (As a region we should endeavour to promote funding for this to happen)
- Limit Data availability to a number of designated catchments and supply more information at a greater detail to enable greater in depth studies. This could include: time series information of flows and rainfall at a greater resolution, rating curves for the flow information,
- GIS information for topography, geology, soils and Land Use.

One of new collaboration ways of RSC would be as follows:

- Each country chooses one or several catchments included in the Catalogue of Rivers.
- The selected catchment data needs to be maintained by a particular organisation and a commitment to prepare data for the catchment needs to given.

### **Proposal to be developed**

Before each RSC meeting, hydrologic data with digital format are collected; A Yearly CD with newly added/updated hydrologic data is published and uploaded on WEB pages.

Requirements of data for future studies needs to be addressed

Further Comments and availability on the website to include:

- Web addresses to appropriate hydrologic models (eg CRC Catchment Hydrology but in the future eWaterTool Kit models)
- Develop transferable hydrologic models and IDF relationships applicable across scales and regions, especially applicable to ungauged/less gauged basins.

Apply for funding to promote regional and country interaction to further develop hydrologic analysis for the region.

### COMMENTS ON 7 JUNE 2005

- **Takara:** Last months Prof. Takeuchi went to Jakarta Office and discussed about funds. Japan is not aiming to fund the next catalogues and the proposal was to secure funds from UNESCO Jakarta in the amount of \$10,000 at least for CD production every 2 years
- **Trevor:** comments on the quality of data rather than the format (data - all series of the flow data of a given catchment)
- **Takara:** reports that Yasuto Tachikawa agrees on give more data per catchment but Takeuchi refers to the “symbolology” of the catalogue as a concrete production from the region (...)
- **Trevor** it might be useful to give new data on new catchment with the integration proposed
- **Tabios;** in the long term a web site would be a good media where to place all the information
- **Trevor** HTC?? The role of HTC was agreed to be as a gateway for the regional flow and rainfall information/data
- **Soontak;** we should continue to complete the task the region has decided to pursue in the past
- **Tabios:** in a web site you can update-upgrade the information
- **Soontak** underline the importance of the unicity of the catalogue in the FRIEND community (no other region has achieved such results)
- **Trevor** so far the catalogue lack in term of details. In the future we hope to have detailed data that can be used for concrete purposes (design, etc.)

**ANNEX 8**

**AUGMENTATION OF MEMBERS – INVITATION OF LAO PDR, MONGOLIA,  
AND UNION OF MYANMAR TO THE REGIONAL STEERING COMMITTEE**



## RESOLUTION RSCXIII-1a

### Augmentation of members

#### Invitation of Lao PDR, Mongolia 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;
- Noting that Lao PDR, Mongolia 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, Mongolia and the Union of Myanmar to join the RSC as official members; and
- Requests the governments of related countries and UNESCO regional offices such as Beijing, Bangkok and Jakarta to assist their necessary actions to realize this.

**ANNEX 9**

**ASIA PACIFIC FRIEND (APF) ASIAN WATER ARCHIVE DATABASE  
MANAGEMENT SYSTEMS**

RESOLUTION RSCXIII-2 PROPOSED AND TO BE DISCUSSED FURTHER  
DURING THE NEXT 14<sup>TH</sup> 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 I (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.

\*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

**ANNEX 10**

**MINUTES OF THE MEETING OF THE 9<sup>th</sup> COORDINATION COMMITTEE OF  
THE REGIONAL HUMID TROPICS HYDROLOGY AND WATER RESOURCES  
CENTRE FOR SOUTHEAST ASIA AND THE PACIFIC (HTC)**

# 9<sup>th</sup> 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

FAMILY NAME	GIVEN NAME	COUNTRY	E-MAIL
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### 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 best 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 8<sup>th</sup> Coordination Committee meeting**

The Chairman referred the meeting to the booklet that was distributed and which included the Minutes of the 8<sup>th</sup> Co-ordination Committee Meeting held in Adelaide, Australia. Some editorial corrections to the minutes were identified: Section 3 heading should be 7<sup>th</sup> not 6<sup>th</sup> and Mr Tran Thuc should be recorded as a participant at that meeting.

In commenting on discussion at the 8<sup>th</sup> meeting regarding project proposals, Mr Nor informed the meeting that no projects proposals had been received since the 8<sup>th</sup> 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-04Mar 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 10<sup>th</sup> 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 12<sup>th</sup> conference to be held in 2011. The 11<sup>th</sup> conference will be held in Scotland during 2008 and the 12<sup>th</sup> 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](http://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