

The Asian Wetland Inventory Regional Workshop

8 - 9 April 2002
Phnom Penh, Cambodia



Summary Report



Compiled by:
Lee Shin Shin & Alvin Lopez
Wetlands International - Asia Regional Programme

April 2002



The Asian Wetland Inventory Regional Workshop

**8 - 9 April 2002
Phnom Penh, Cambodia**

Organised by:

Wetlands International
&
National Centre for Tropical Wetland Research, Darwin

In co-operation with:

Ministry of Environment, Cambodia

"This workshop was organised with financial support from the Dutch Ministry of Foreign Affairs (DGIS) under the Conservation And Wise Use of Wetlands - Global Programme and the AEON Foundation, Japan."

Citation:

Lee, S.S. & Lopez, A. 2002 (compilers). The Asian Wetland Inventory Regional Workshop, 8 – 9 April 2002, Phnom Penh, Cambodia - Summary Report. Wetlands International, Kuala Lumpur, Malaysia.

WELCOME NOTE

Dear participants,

We would like to take this opportunity to thank you all for making an effort to participate in this important regional workshop on the Asian Wetland Inventory. The AWI is a vital regional initiative working to provide a comprehensive information base for wetland conservation and sustainable development. The AWI aims to determine the status of Asia's wetlands through the development of a wetland inventory database. The AWI also involves national training and capacity building efforts.

This workshop is intended to illustrate the need and import of wetland inventory. It is also intended to inform a diverse range of stakeholders about AWI. Finally, this workshop will demonstrate the techniques and methods utilized by AWI and present examples of successful case studies.

Reliable information for management of natural resources is the basis on which all decisions with regards conservation and development are made. In 1999, Wetlands International undertook a global review of wetland inventories on behalf of the Ramsar Convention. The review demonstrated that the existing inventory base was inadequate. Lack of a standardised, systematic approach to wetland inventory across the Asian region has made it impossible to accurately assess the extent, pressures and degree of degradation of Asian wetlands. Recognizing this urgent need, the contracting parties of the Ramsar Convention called on participating governments to collaborate with Wetlands International to review and further develop existing models for wetland inventory.

Responding to this call, the AWI programme was initiated by Wetlands International in 1999 with initial funding support from the Ministry of Environment Japan and the endorsement of the Standing Committee of the Ramsar Convention. Wetlands International, in collaboration with the Australian National Centre for Tropical Wetland Research (NCTWR), and the Wetland Inventory and Monitoring Specialist Group (WIMSG) has been responsible for the initial development of the project. The AWI provides an effective tool for collecting information for managing natural resources derived from or dependant on wetlands. It further provides a framework for considering individual habitats and sites within and outside of established jurisdictional boundaries. The AWI approach has recently provided the framework for the development of the Wetland Inventory Protocol for the Ramsar Convention.

As the AWI moves into the next phase of implementation, we are moving on to involve more national governments in the development of this programme. This workshop is that step forward and we are seeking more active participation from the national level. Within this folder you will find various materials relevant to the respective sessions. A checklist of contents is attached. We hope this information will assist you in understanding the AWI approach and process better. We have also attached a needs analysis questionnaire. Your responses to the questionnaire will aid in the analysis and assessment of national needs. Your answers will also assist in the determination of potential contributions towards development and implementation of the AWI. This will help to guide the AWI as it addresses national, regional, and global priorities.

In the near future a team from the AWI will set out to visit nations in the region. The objective of the visits is to meet with various government officials and seek feedback regarding the progress and direction of the programme. We hope this workshop and future visits will facilitate greater participation in this important regional conservation and sustainable development initiative.

We wish especially to thank the Ministry of Environment of the Royal Government of Cambodia and Wetlands International Lower Mekong Basin Programme for their cooperation and assistance in organising this workshop. We look forward to increased involvement of the Asian nations in this important regional initiative working to develop a comprehensive information base for wetland conservation and sustainable development.

Dr. Max Finlayson
President
Wetlands International

Dr. Taej Mundkur
Regional Programme Director (Asia)
Wetlands International

*The Asian Wetland Inventory Regional Workshop
8 - 9 April 2002, Phnom Penh, Cambodia*

Programme:

Monday, 8th April 2002

- 08:15 Welcoming and registration of Participants
- 08:45 Opening remarks by Mr. Mam Kosal, Programme Director, Wetlands International Lower Mekong Basin Programme.
- 09:00 Speech by H.E. To Gary, Ministry of Environment, Royal Government of Cambodia.
- 09:20 Coffee break
- 09: 45 Introductory Session (Chairperson: Dr. Taej Mundkur, Wetlands International):
- Introduction to Wetland Inventory
 - Introducing the proposed Ramsar Framework for Inventory and the Asian Wetland Inventory (AWI), its long-term goals and objectives and its use as a multiple-stakeholder tool for wetland conservation and wise use.
 - Introduction to the AWI phase funded through the Dutch Ministry of Foreign Affairs (DGIS)
- Speakers:*** Dr. Max Finlayson, National Centre and Mr. Alvin Lopez, Wetlands International
- 10:45 Discussion
- 11:15 Technical Session 1
- Introduction to the Asian Wetland Inventory Manual and Datasheets (and Database framework)
- Speakers:*** Dr. Max Finlayson and Mr. John Lowry, National Centre for Tropical Wetland Research, Australia
- 12:00 Discussion
- 12: 30 Lunch
- 14:00 Technical Session 2 (Chairperson: Mr. Chen Kelin, Wetlands International – China, Co-chair: Dr. Jonathan Davies)
- A case study on implementation of the Asian Wetland Inventory – the Hokkaido experience...
 - Demonstrating the use of GIS tools in decision making and wetland management.
- Speakers:*** Mr. Koji Tagi, Wetlands International Japan and Mr. John Lowry, National Centre for Tropical Wetland Research, Australia.
- 15:00 Discussion and Q&A.
- 15:30 *Coffee Break*
- 16:00 Technical Session 3 – Training Exercise - Conducting an Inventory – Some practical exercises and simple modules
- Speakers:*** Dr. Jonathan Davies and Mr. John Lowry
- 17:30 End of Day 1 Sessions
- 19:00 Organised Dinner for all Participants

Tuesday, 9th April 2002

- 08:00 Breakfast
- 09:00 Developing the AWI initiative in Asia (*Chair : Dr. Max Finlayson; Co-chair: Mr. Alvin Lopez*)
- Opportunities for networking regional development and adoption of the AWI
 - Exploring stakeholder interest in the AWI and identifying areas for further development.
- 11:15 Coffee Break
- 11: 30 Evaluation and closing
- 12: 00 Closing speech by His Excellency Dr. Mok Mareth, Minister of Environment, Royal Government of Cambodia.
- 12: 30 Lunch
- 14: 30 Side event – Meeting of AWI Coordination Team Members (by invitation only)
- 17: 00 Close

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1.0 Background and Introduction:

The Asian Wetland Inventory (AWI) is a regional initiative to determine the status of Asian wetlands to ensure sound planning, wise-use, sustainable management and monitoring of wetlands. It involves the development of a comprehensive and dynamic Wetland Inventory Database and provision of training and capacity building of nations. Some of the main results to be achieved through this programme are:

- Increased awareness on the importance of wetlands and the need for a standardised inventory among relevant national government agencies across Asia.
- A dynamic and standardised Geographical Information System (GIS) and integrated relational database providing core data/ information on Asian wetlands to guide and support planning and conservation efforts by national governments, International Conventions, NGOs and others.
- A strengthened network of trained personnel in data collection techniques and skills required for implementation of the AWI at national and local level.
- Establishment of national inventory programmes and databases in all participating nations.
- Establishment of network of regional training programmes in wetland inventory
- Establishment of a monitoring programme for regular revision and updating information on wetlands of national and international importance in Asia.

The AWI Regional workshop was held from 8-9 April 2002 in Phnom Penh, Cambodia was targeted at government representatives and other identified stakeholders with interest in development and implementation of national or sub-regional inventory initiatives.

The aims of this regional workshop were to:

1. Introduce the need for inventory and the AWI to a wider range of identified stakeholders and to identify stakeholder interest.
2. Demonstrate the AWI technical tools and present case studies.

2.0 Outcomes of the workshop:

A total of 35 representatives from 10 countries across Asia (see Annexe 1 for participant list) participated in the workshop and these included representatives from the governments of Cambodia, China, Lao P.D.R., Malaysia, the Philippines, Thailand and Vietnam. Participation from other international / regional organisations included representatives from the Mekong River Commission (MRC), WWF, DANIDA, ICLARM (The World Fish Centre), and the ASEAN Regional Centre for Biodiversity Conservation. Representatives of the governments of Myanmar and Indonesia were also invited to the meeting, but were unable to attend. The IUCN Cambodia office had confirmed their participation, but did not attend.

His Excellency To Gary, Secretary of State, Ministry of Environment Cambodia delivered the opening speech to grace the occasion (see Annexe 2). On the first day (8th April), several presentations were made to introduce the participants to Wetland Inventory, the proposed Ramsar Framework for inventory and the AWI. Participants were also introduced to the main objectives and outputs of the project phase funded through the Dutch Ministry of Foreign Affairs (DGIS) by Mr. Alvin Lopez.

The first technical session by Dr. Max Finlayson and Mr. John Lowry provided participants with an introduction to the AWI manual and datasheets. In the second technical session, a case study on implementation of the AWI in Hokkaido, Japan was presented by Mr. Koji Tagi and the use of GIS tools in wetland inventory and decision making was illustrated further by Mr. John Lowry. In the third technical session, Dr. Jonathan Davies discussed inventory, assessment and monitoring and provided some practical approaches.

Annexe 3 contains the technical papers presented during the workshop. In some cases only abstracts are available. Key points of the discussions in relation to the various presentations are summarised in section 3.0.

The second day of the workshop (9th April) was aimed at identifying stakeholder interest and areas for future development of the Asian Wetland Inventory. Therefore, national representatives and other participants were given the opportunity to make a brief presentation on the situation of wetland inventory in their countries and to identify what the immediate priorities and needs were. Brief reports by the various national representatives and other organisations are presented in section 4.0.

The Phnom Penh Statement on Wetland Inventory (Annexe 4) April 2002 was approved by the participants as a formal record and conclusions of the workshop. The statement summarised the main issues discussed at the workshop and identified areas where future support was needed in order to develop further inventory initiatives at the national level.

The meeting was formally closed by His Excellency Dr. Mok Mareth, Minister of the Environment Cambodia in which he pledged full support (see Annexe 5) of the AWI initiative and endorsement for the application of the AWI approach in Cambodia.

3.0 Summary of main points raised by the participants from the various discussions from day 1 of the workshop:

1. It was noted that it is critical to identify end users and involve them from the outset of the project.
2. It is important to inform the end-users the main uses and outputs of the AWI. The strategy for communicating this message to end users and other key stakeholders should be included in the communication strategy.
3. Involvement of cross-sectoral interests is important. The various sectors need to be identified and it is critical that they are aware of the inventory database and its relevance and usefulness to them.
4. Demonstration and pilot studies should include end-users of the inventory. In addition, assistance from Wetlands International country offices will be sought for implementation of pilot projects.
5. There was a suggestion to reorder the list of aims of the AWI that are stated in the brochure and other literature. Although “meeting international obligations and reporting information” is important, it was suggested that it is more important for the AWI to be providing information to the end-users.
6. With reference to the AWI Manual and datasheet, it was suggested that information on wetland goods and services are included at all levels of inventory (i.e. levels 1 – 4). This would be incorporated into the finalised version of the manual that is to be published by July 2002.
7. There was also a recommendation to include more general biodiversity features at level 1 & 2, in order to cater for user needs.
8. The development of information material should be encouraged and the use of national language to better inform all stakeholders should be advocated. This would mean that there is a need for translation of key information material into local languages.
9. The proposed database format needs to be carefully assessed. It was proposed that listings of categories were used in order to allow users to choose from the options. Wherever possible reliance on free text should be avoided.
10. It was advised against attempting to proceed with attempting to establish a centralized regional database if information could be met by various library collections. Meta data records of wetland inventory should also be developed.
11. It was seen as a priority to develop national capacity to implement national inventory as this information could also provide information for national planning and management of natural areas.
12. There is a need to emphasise the value of using GIS, but also noting that GIS is not the only method assessing information.
13. It is important that we include steps to identify existing data sources; sectoral agencies within countries may already have information that is sought under the inventory initiative.
14. The AWI team is requested to assist countries in determining the effort, costs and logistics involved in a conducting an inventory.

15. The need for ground survey in addition to remote sensing and data analysis needs to be emphasized.
16. It is also important to emphasise that wetlands do not operate in isolation. Therefore catchment-based activities and features need to be included.
17. Information on usefulness of a phased approach to wetland inventory should be included, i.e. starting with a general review, moving on to a simple inventory and at a later stage conducting a detailed inventory or by areas/regions within the country based on the level of threats or convenience.
18. It is critical that an outline is provided on the different types of data. It is necessary to determine what data may need to be shared for regional reporting and total data needed for national level inventory.
19. As far as possible we should be trying to add data rather than replace.

4.0 National Government Feedback (Day 2)

This session focused on:

- i) Feedback on current status and future plans for wetland inventory in the country.
- ii) Exploring stakeholder interest in the AWI and identifying areas for further development.
- iii) Identifying opportunities for networking of regional development and adoption of the AWI

Presented below is a summary of the various presentations by the national representatives.

4.1 Thailand

Reported by: Khun Nirawan Pipitsombat, Office of Environmental Policy and Planning, Ministry of Science Technology and Environment.

- 1) A wetland inventory was conducted in 1997-1999 with the support from the Danish Cooperation for Environment and Development (DANCED). It was reported that 7.5% of Thailand are wetlands. This was divided into three categories:
 - Internationally important wetlands – (61 in total)
 - Wetlands of national importance – a total of 208 of which 48 were priority sites.
 - Locally important wetlands (more than 40,000)
- 2) Nine internationally important wetlands are of high priority and are to be listed as Ramsar sites.
- 3) Ten internationally and nationally important sites required more survey and rehabilitation work.
- 4) The inventory results have been approved by the Cabinet. On 1 August 2000, a resolution was made. This resolution highlighted the 61 internationally important sites, the 48 priority sites of national importance and an additional list of wetlands that require protection/rehabilitation. National measures have been put in place. All development projects in national/internationally important sites are subject to an Environmental Impact Assessment (EIA).
- 5) There is a need to improve and update the inventory. For the next phase, Thailand would require:
 - training to survey and study wetlands using the AWI approach. It was noted that the 5 universities used different formats in the five areas of the country for the first inventory. Thailand plans to initiate the next inventory in 2 years.
 - funds and technical assistance for implementing this initiative.
- 6) If the budget for inventory is available, the next inventory can be scheduled in next year.

4.2. China

Reported by: Mr. Bao Daming, Division of Wetland Conservation, Ramsar Convention Implementing Office, State Forestry Administration.

- 1) China conducted an inventory from 1997-2002. The inventory will be published as a book "The China Wetlands"; and a press release ceremony will be held in June 2002.
- 2) China has begun to implement their National Wetland Action Plan. As part of this plan, a total of 12 projects, including 2 public awareness programmes, and a wetland monitoring programmes are being implemented.
- 3) A workshop to establish a national wetland monitoring system was held in March 2002 in order to establish a three level monitoring system (national, provincial and local levels); the initial focus would be in the 21 Ramsar sites. Three have been established i.e. Dongting, Zhalong and Dalai Hu Ramsar Site,
- 4) It is proposed that the national system could be adapted to the AWI approach following consultation with the national wetland expert group.
- 5) China proposes to organise an AWI workshop in Beijing with Wetlands International to discuss this further.
- 6) China will undertake a pilot inventory, 3-4 sites covering different habitat types to be determined.
- 7) China has a budget to establish a database and GIS system for nature reserves, biodiversity and wetlands.

4.3. Lao P.D.R.

Reported by: Mr. Chanthone Phothitay, Living Aquatic Resources Research Centre, Ministry of Agriculture and Forestry.

- 1) An inventory was undertaken between 1990-1996 with the MRC. This inventory Included water quality and socio-economic interviews with local people in order to understand their use of plants, fish and other wetland wildlife.
- 2) During 1993-97 dolphin surveys were conducted in the wetlands in Sipandon area.
- 3) With support from European funds and Earth Island Institute, Laos has held a GIS course for dolphins. Post 1997, the Wild Bird Society of Japan funded a bird survey in 4 provinces.
- 4) IUCN and GEF have proposed biodiversity projects in the Attapu province. The linkage of these projects to the AWI will need to be identified.

Suggestion by Gordon Claridge : Need to look at peatlands in Southern Laos

4.4 Viet Nam

Reported by: Mr. Le Tien Phong, Sub-institute of Forestry, Inventory and Planning

- 1) Forest Inventory and Planning Institute (FIPI) is the national agency which primarily deals with forest inventory. Since Vietnam signed the Ramsar Convention more attention has been placed on wetland management and inventory.
- 2) The Ministry of Science, Technology and the Environment (MOSTE) is responsible for Ramsar Convention. However, sites are under the Ministry of Agriculture and Rural Development so this has caused administration problems.
- 3) FIPI undertakes planning for all national parks including wetlands. In 2001, a plan for the establishment of U Minh Thuong National Park (a unique peatland national park in Vietnam).
- 4) No national wetland inventories have been implemented in Vietnam. However, site-based inventories have been carried out. Inventories are usually carried out when a protected area is planned.
- 5) With the support of the MRC, an inventory of coastal wetland areas in the Mekong Delta of Vietnam was carried out, and a wetland classification system for the Mekong Delta was formulated. A case study was carried out at Tram Chin National Park and a database was established).
- 6) Currently FIPI is implementing a study to formulate a national wetland classification. As part of this study a wetland map is to be prepared.
- 7) FIPI, in cooperation with BirdLife International has set up a database for over 200 wetland sites.
- 8) Vietnam requires training on standardised methodology for conducting a national wetland inventory.

4.5. Malaysia

Reported by: Mr. Sivanesam Pillai, Ministry of Science, Technology and Environment

- 1) An inventory was prepared in 1987 but doesn't go beyond the shoreline. It does include corals to a certain extent. There is indication that some sites have been lost, but other wetland areas, notably man-made lakes, have been created.
- 2) A wetland inventory is needed and to Malaysia would like to use the AWI model, hoping that it will be the international standard and a way to share the data.
- 3) Collation of the currently available information is urgently needed.
- 4) The needs of the end-users of the inventory are important and needs to be emphasized.
- 5) Description of wetlands areas are needed even at Level 2 of the AWI. For policy makers more details are required e.g. information on mangroves etc.
- 6) Malaysia has plans to do an inventory this year using the AWI framework. The issue is more of how to do it. Malaysia requires assistance in developing the methodology and approach.

4.6. The Philippines

Reported by : Ms. Marlynn Mendoza, Protected Areas and Wildlife Bureau.

Activities with useful inputs to the inventory program

- 1) "National Priority Setting" in cooperation with Conservation International, identified and prioritized important wetlands for conservation. It was done with the participation of government and non-government organizations and supported by various funding agencies. It focused on level 4 (i.e. wetland sites) which included information on management issues and other on-going and concluded studies.
- 2) Coastal Resource Management Programme being done with USAID, and Coastal Environment Programme also identified important wetland areas
- 3) On-going assessment of Liguasan Marsh and this includes GIS based work.
- 4) Local governments have identified and established fish sanctuaries nation wide.

In wetland areas, a practical monitoring system developed by PAWB and NORDECO involving local people are being done.

On information sharing - Along with the Asean Regional Centre for Biodiversity Conservation (ARCBC), there are plans to establish a networking membership scheme with different institutions

Requirements to implement the inventory:

- Software and hardware needed by regional offices for their site database.
- Additional manpower needed for PAWB to gather more information, collate and maintain database for the programme.
- Training in inventory.

5.0 Feedback from other organisations

5.1 The ASEAN Regional Centre for Biodiversity Conservation (ARCBC)

Reported by: Dr. John MacKinnon

1. ARCBC was appreciative of being invited to participate in the workshop as it is within the mandate of ARCBC to make available information on biodiversity. ARCBC can also assist in developing tools and software. They can offer assistance in funding studies and research in wetlands. They could provide assistance in the following areas:
 - Training programmes – i.e. help to make training materials available. Creating a training resource centre of on-line training information, and providing guidelines and methods to get the information from the website.

- Designing databases
2. With regard to data sharing on the web, Dr. MacKinnon stressed that the first step was to identify where relevant information was available and then provide links to the various locations of the host institutions hosting the information. It is important to set up decentralised databases, with agencies collecting data and storing it. This would give the data custodians a vested interest in maintaining it.

5.2 ICLARM (The World Fish Centre)

Reported by: Dr. Magnus Torell

1. ICLARM made a presentation on a project to improve national legal and institutional cooperation framework and to increase local capacity to manage wetlands and their resources and environment in the Mekong River region. Their focus was on the economic valuation of wetlands and associated resources.
2. In Cambodia, current projects are focused on Stung Treng, Takeo and Siem Reap.

6.0 The Needs Assessment Questionnaire

Participants were requested to complete a needs assessment questionnaire. A copy of this questionnaire will be available on the AWI website (www.wetlands.org/awi). A more detailed Training Needs Assessment Questionnaire would be made available for download soon.

7.0 Conclusions:

The AWI Regional Workshop provided an opportunity to introduce the AWI to a wider audience of stakeholders, identify country interest, needs and plans and identify areas where further support is required. Through participation from other regional organisations, the workshop has also enabled the AWI to be more stakeholder driven. The support and interest expressed from this 1st regional workshop is a positive step towards the future development of the AWI initiative. The workshop concluded with the Phnom Penh Statement on Wetland Inventory (Annexe 4) and a speech by His Excellency Dr. Mok Mareth (Annexe 5), Minister of the Environment Cambodia pledging full support and endorsing the AWI initiative.

Acknowledgements:

This workshop was made possible through funding support from the Dutch Ministry of Foreign Affairs (DGIS) and the AEON Foundation, Japan. Wetlands International would also like to especially thank the Ministry of Environment, Cambodia for their cooperation and support in this initiative and assistance in organising this workshop.

Annexe 1: The AWI Regional Workshop Participants List.

AUSTRALIA

Mr. John Lowry
GIS Officer
National Centre for Tropical Wetland Research
ERISS/NCTWR, Locked Bag 2, Jabiru, NT 0086,
Australia
Tel: +618-89829112
Fax: +618-89829103
JohnL@eriss.erin.gov.au
www.nctwr.org.au

Dr. Max Finlayson
President, Wetlands International &
Director, National Centre for Tropical Wetland
Research
ERISS/NCTWR, Locked Bag 2, Jabiru, NT 0086,
Australia
Tel: +618-89799711
Fax: +618-89792076
maxf@eriss.erin.gov.au
www.nctwr.org.au

CAMBODIA

Mr. Chay Samith
Ministry of Environment, Cambodia
No.48, Preah Sihanouk Street, Tonle Bassac,
Chamkarmon, Phnom Penh
Cambodia
Tel: +855-23721073
Fax: +855-23721073
moedncp@forum.org.kh

Mr. Chin Samouth
Programme Officer
Mekong River Commission
364 M.V. Preah Monivong, Phnom Penh, **Cambodia**
Tel: +855-23720979
Fax: +855-23720972
samouth@mrcmekong.org

Mr. Loeung Kesaro
Programme Officer
CDC-DANIDA Natural Resource and Environment
Programme
Building B, Room 15 and 16
Council for the Development of Cambodia
Government Palace, Sisowath Quay, Wat Phnom,
Phnom Penh
Tel: +855- 23- 981 197/ mobile: 012 828909
Fax: +855-23- 981 198
nre_ass@bigpond.com.kh

Mr. Mam Kosal
Director
Wetlands International - Lower Mekong Basin
Programme
P.O.Box 813, Phnom Penh, **Cambodia**
Tel: +855-23214910
Fax: +855-23214224
wetlands@bigpond.com.kh
www.wetlands.org

Mr. Marc Goichot
Coordinator, Living Mekong Initiative
WWF
#28, Street 9th Tonle Basac, Phnom Penh, Kingdom
of **Cambodia**
Tel: +855-23218034
Fax: +855-23211909
marcg@bigpond.com.kh

Mr. Meas Sophal
Ministry of Environment, Cambodia
No.48, Preah Sihanouk Street, Tonle Bassac,
Chamkarmon, Phnom Penh
Cambodia
Tel: +855-23218034
Fax: +855-23721073
moedncp@forum.org.kh

Prof. Ronald Davies
Consultant
Mekong River Commission
364,MV Preah Monivong, Phnom Penh, **Cambodia**
Fax: +023-720972
davies@mrcmekong.org

Ms. Thach
Office assistant
Wetlands International - Lower Mekong Basin
Programme
P.O.Box 813, Phnom Penh, **Cambodia**
Tel: +855-23214910
Fax: +855-23214224
wetlands@bigpond.com.kh
www.wetlands.org

Ms. Thary
Administrative assistant
Wetlands International - Lower Mekong Basin
Programme
P.O.Box 813, Phnom Penh, **Cambodia**
Tel: +855-23214910
Fax: +855-23214224
wetlands@bigpond.com.kh
www.wetlands.org

CHINA

Mr. Bao Daming
Division Chief
Division of Wetland Conservation, Dept of Wildlife
Conservation, Ramsar Convention Implementing
Office in SFA China
18, Hepingli Dongjie, Beijing. **P.R. of China**
Tel: +8610-84238531
Tel: +8610-84239209
baodaming@forestry.gov.cn
www.wetland.gov.cn

Mr. Chen Kelin
Director
Wetlands International - China Programme
Room 501, Grand Forest Hotel, No.3A, Beisanhuan
Zhonglu Road, Beijing 100029, **P.R. of China**
Tel: +8610-62058495 or 62377031
Fax: +861-62077900
wetgef@public.bta.net.cn

INDIA

Mr. Rajagopal Singh
Technical Officer
Wetlands International - South Asia Programme
A-127, 2nd Floor, Defence Colont, New Delhi 110024,
India
Tel: +9111-4629906 or 4691511
Fax: +9111-4629906
Wisaind@del2.vsnl.net.in
www.wetlands.org

JAPAN

Mr. Koji Tagi
Technical Officer
Wetlands International – Japan
402 Axes Nishi-shinjuku, Shinjuku-ku, Tokyo,
1600023, **Japan**
Tel: +813-53323362
Fax: +813-53323364
ktagi@aol.com

LAO P.D.R.

Mr. Chanthone Phothitay
Technical Officer
Living Aquatic Resources Research Centre, National
Agriculture and Forestry Research Centre
Ministry of Agriculture and Forestry, Phontong Road,
Chantha boury District, Vientiane Lao P D R
Tel: +856-21215015
Fax: +856-21214855
larrec@laonet.net , chanthone65@hotmail.com

MALAYSIA

Mr. Albert Salamanca
Assistant Scientist
ICLARM-The World Fish Centre
P.O.Box 500, GPO, 11600 Penang, **Malaysia**
Tel: +604-6261606, h/p:012-4572501
Fax: +604-6265530
a.salamanca@cgiar.org
www.iclarm.org

Mr. Alvin Lopez
Regional Technical Officer
Wetlands International
3A39, Block A, Kelana Centre Point, Jalan SS7/19,
47301, Petaling Jaya, Selangor, **Malaysia**
Tel: +603-78046770
Fax: +603-78046772
alvin@wiap.nasionet.net
www.wetlands.org

Mr. David Li Zuowei
Waterbird conservation officer
Wetlands International
3A39, Block A, Kelana Centre Point, Jalan SS7/19,
47301, Petaling Jaya, Selangor, **Malaysia**
Tel: +603-78046770
Fax: +603-78046772
david@wiap.nasionet.net
www.wetlands.org

Ms. Flora George
Secretary
Wetlands International
3A39, Block A, Kelana Centre Point, Jalan SS7/19,
47301, Petaling Jaya, Selangor, **Malaysia**
Tel: +603-78046770
Fax: +603-78046772
flora@wiap.nasionet.net
www.wetlands.org

Dr. Jonathan Davies
Technical Consultant
Wetlands International
22,SS19/1A, Subang Jaya, 47500, Petaling Jaya,
Selangor, **Malaysia**
Tel: +603-56331599, h/p:012-3958435
jondavies@pd.jaring.my

Ms. Lee Shin Shin
Project Officer – Asian Wetland Inventory
Wetlands International
3A39, Block A, Kelana Centre Point, Jalan SS7/19,
47301, Petaling Jaya, Selangor, **Malaysia**
Tel: +603-78046770
Fax: +603-78046772
sslee@wiap.nasionet.net
www.wetlands.org

Dr. Magnus Torell
Research Scientist/Project Leader
ICLARM-The World Fish Centre
P.O. Box 500, GPO 11600, Penang, **Malaysia**
Tel: +604-6261606
Fax: +604-6265530
m.torell@cgiar.org
www.iclarm.org

Mr. Murugadas TL
Technical Officer
Wetlands International-Malaysia Programme
3A31, Block A, Kelana Centre Point, Jalan SS7/19,
47301, Petaling Jaya, Selangor, **Malaysia**
Tel: +603-78061944
Fax: +603-78047442
muu@wiap.nasionet.net
www.wetlands.org

Mr. Sivanesam Pillai
Principal Assistant Director
Ministry of Science, Technology and Environment,
Conservation and Environmental Management
Division
Level 5, Block C5, Precinct 1, 62662, Putrajaya,
Malaysia
Tel: +603-88858030
Fax: +603-88892973
pillai@mastic.gov.my
www.mastic.gov.my

Dr. Taej Mundkur
Regional Programme Director (Asia)
Wetlands International
3A39, Block A, Kelana Centre Point, Jalan SS7/19,
47301, Petaling Jaya, Selangor, **Malaysia**
Tel: +603-78046770
Fax: +603-78046772
taej@wiap.nasionet.net
www.wetlands.org

NETHERLANDS

Mr. Gordon Claridge
Stationstraat 88, 5281 GG Boxtel, The **Netherlands**
Tel: +31411-616740
Fax: +31411-616742
austasia@compuserve.com

PHILIPPINES

Dr. John MacKinnon
EU Co-Director
ASEAN Regional Centre for Biodiversity
Conservation
P.O.Box 35015, College, Los Banos, Laguna 4031,
Philippines
Tel: +6349-5364042
Fax: +6349-5363173
jrm@laguna.net
www.arcbc.org.ph

Ms. Marlynn Mendoza
Supervising Ecosystem Management Specialist
Protected Areas and Wildlife Bureau
NAPWNC Compound, Quezon Avenue, Diliman,
Quezon City, **Philippines**
Tel: +632-9258950 or 9246031 to 35
Fax: +632-924 0109
mendoza@psdn.org.ph

RUSSIA

Dr. Alexander Solokha
Flyway Officer
Wetlands International-Russia Programme
Nikoloyamskaya Ulitsa, 19, Str.3, Moscow 109240,
Russia
Tel: +7095-7270939
Fax: +7095-7270938
asolokha@wwf.ru
www.wetlands.org

THAILAND

Mr. Asae Sayaka
Prog. Dev't Officer
Wetlands International-Thailand Programme
Prince of Songkla University, Faculty of
Environmental Management, P.O.Box 21, Si
Phuwanat (Post Office), Hat Yai 90113, **Thailand**
Tel: +6674-429307, h/p: 661-5411290
Fax: +6674-429307
sasae@ratree.psu.ac.th
www.wetlands.org

Khun Nirawan Pipitsombat
Senior Environmental Officer
Office of Environmental Policy and Planning, Ministry
of Science, Technology and Environment
60/1, Soi Pibulwattana 7, Rama Sixth Road, Bun
10400, **Thailand**
Tel: +662-2713251, h/p:661-3508105
Fax: +662-2798088
nirawan_p@hotmail.com
www.bdmthai.com

VIETNAM

Mr. Le Tien Phong
Technical Staff
Sub-Institute of Forestry Inventory and Planning
245/5 Banh Vantran, Tan Binh District, Ho Chi Minh
City
Vietnam
Tel: +848-8645364, h/p:091-3898352
Fax: +848-8642528
letienphong@yahoo.com

OTHERS

Mr. Jeff R. Straka
Volunteer, Wetlands International - Lower Mekong
Basin Programme
Tel: h/p: 012-786425
jrstraka@hotmail.com

Annexe 2: The Opening Speech by H.E. To Gary, Secretary of State for Environment, Ministry of Environment, Royal Government of Cambodia.

I welcome the chance to speak to all delegates present here for the Regional workshop on the Asian Wetland Inventory. Firstly, on behalf of the Royal Government of Cambodia, I would like to extend a warm welcome to all of you. We are also very grateful to Wetlands International for organizing a workshop and giving us the honor of hosting it. We are also most fortunate to have in our presence Dr. Max Finlayson who is the President of the Board of Directors of Wetlands International.

We are all aware that wetlands play a critically important role in the ecosystem and the conservation and wise use of these valuable ecosystems are of utmost importance. The Kingdom of Cambodia in particular has much to say about wetlands considering the fact that a major portion of the country constitutes a wetland. At certain times of the year, almost 30 % of Cambodia is covered by floodwaters and can be considered as wetland.

Keen to be part of the global initiative to conserve wetlands for her people and their biodiversity, Cambodia became the 116th contracting party of the Ramsar Convention on Wetlands on 23 October 1999. Since then, we have designated three Ramsar sites. They are Boeung Chhmar in Kampong Thom province, Stung Treng, and Koh Kapik in Koh Kong province. Boeung Chhmar is part of one of the most important wetland ecosystems in Cambodia-that is the Tonle Sap Lake or the Great Lake. To me, the Tonle Sap is the heart and soul of the people of Cambodia. From the days of the Great Angkor Kingdom (9th to 13th centuries), the lake's natural resources have supported large human settlements. Presently, about 3 million people in six provinces depend on the annual flooding patterns of the Great Lake and its floodplains for their livelihoods. This represents nearly 30% of our population. Given the importance of the Great Lake, a specific chapter in our National Environment Action Plan (1998-2002) has been dedicated to the Fisheries and Floodplain Agriculture in the Tonle Sap region and outlines a framework for sustainable management of the Tonle Sap.

Cambodia's wetlands are not only restricted within our boundaries. Natural areas like wetlands do not recognize political boundaries. Wetland and river basin management is a shared responsibility due to the fact that one of the world's longest rivers flows through our country. This is none other than the Great Mekong, which flows over 4,000 kilometers from the Himalayas through six nations down to the South China Sea. Therefore we share much of our wetlands and with our neighboring countries, which are all part of the Mekong Basin. We realize the importance of International co-operation in wetland conservation and wise use initiatives, therefore represented through the National Mekong Committee and the council; Cambodia is part of the Mekong River Commission (MRC). The Mekong River Commission was specifically set up with a mission to promote and coordinate sustainable management and development of water and related resources for the countries' mutual benefit and the people's well being.

Cambodia also joined the Convention on Biological Diversity in 1995. We have to follow the ideas of sustainable development and wise use for present and future generations. Cambodia depends on, and requires further, international support for integrated wetland management.

National planning needs to be based on sound knowledge and Cambodia realizes the need and importance for wetland inventory, especially in response to the resolution made at the Ramsar Convention on Wetlands. Therefore, through the kind financial assistance from Danida, we implemented a wetland inventory project with phase 1 being completed in 2000. We have plans to embark on phase 2 of the inventory project. We are grateful to Wetlands International and the Asian Wetland Inventory team for providing a final review of this proposal prior to our submission to Danida for phase 2 of the Inventory Project. We do hope that our proposal for implementing the inventory will be successful. In addition, we hope that the proposed Lower Mekong Basin Biodiversity Management project is considered for funding by UNDP-GEF and implemented in Stung Treng province in the future.

In summary, we are very pleased to host this landmark meeting, which offers an excellent opportunity for governments, NGOs and other sectors to cooperate in this regional wetland

inventory initiative as a means of conserving our common resources. We look forward to working closely with our neighboring nations in spearheading the Asian Wetland Inventory. We also look forward to working on other projects with Wetlands International and its partners and hope that you enjoy your visit to our country.

Thank you very much for your attention.

Annexe 3: Technical Papers/Abstracts

Wetland inventory: introduction

Max Finlayson

*National Centre for Tropical Wetland Research, Darwin, Australia
Ramsar Scientific and Technical Review Panel
Wetland Inventory & Monitoring Specialist Group*

Email: Max.Finlayson@ea.gov.au

Abstract

Previous wetland inventory has seen a concerted national and international effort to collate and collect information on wetlands. This has resulted in an impressive basic coverage of the distribution of major wetlands and major species, and identified the occurrence of main management problems on some sites, the presence of monitoring programs, and location of library material. It has also identified many common problems with wetland inventory - wetlands not well defined nor consistently classified; inaccurate and poorly recorded data; incomplete information; overly ambitious programs; inadequate publication and distribution; and a lack of standardised methods.

A Global review of wetland inventory in 1999 showed that the wetland information base - globally and regionally uneven, inaccurate, outdated, absent, or misplaced (lost!). In Asia some 23 countries had some level of inventory information with six having a National inventory covering 49 000 000 ha whereas global inventories recorded 63 200 000 ha of wetland present in Asia. There was poor information on coastal wetlands/reefs and artificial wetlands (aquaculture, salinas, reservoirs, wastewater treatment ponds). In response to this situation a framework for wetland inventory was proposed by the Ramsar Wetlands Convention to provide guidance for standardised and consistent approaches. The Asian Wetland Inventory (AWI) has been developed by Wetlands International from this framework.

The broad concepts developed by Wetlands International have received endorsement from the Standing Committee of the Ramsar Convention. The AWI team now proposes to develop the method fully and produce a technical manual and undertake a demonstration study in Hokkaido, Japan. It is further proposed to develop national and regional inventories using the globally, compatible and standard method provided by the AWI to:

- provide core data/information on Asian wetlands to support international conventions and treaties on wetlands, climate change, biodiversity, migratory species and desertification, and their implementation by Governments
- analyse long term trends in Asian wetlands and their natural resources
- enable regular revisions and updates of information on wetlands of national and international importance in Asia
- disseminate these analyses for wider consideration and use in sustainable development and conservation of wetland resources

The AWI will include a range of wetland types from those in inter-tidal and estuarine areas, lagoons, exposed reefs, mud flats, sand flats and salt marshes, mangrove forests; rivers and their floodplain marshes, tributaries and lakes; permanent and temporary freshwater marshes and reed beds; tropical peat swamps and freshwater swamp forests; and peat bogs and mires. This will be done by using a hierarchical map-based approach with core data elements identified for four levels of detail. The principal purpose of the AWI is to delineate/map the wetlands, taking in wetland habitats from the intertidal zone to the inland, and to display this on GIS-based maps. This will occur at different scales with the amount of detail dependent on the purpose of the inventory and the size and importance of the wetland. The core data

elements included in the AWI are given below. These are divided into core data fields for biophysical and managerial data.

Biophysical data:

- *Site name* - official name of site and catchment
- *Area and boundary* - size and variation, range and average values
- *Location* - projection system, map coordinates, map centroid, elevation
- *Geomorphic setting* - within the landscape, biogeographical region
- *General description* - shape, cross-section and plan view
- *Climate* – zone and major features
- *Soil* - structure and colour
- *Water regime* - depth, periodicity, flooding, source of water, groundwater
- *Water chemistry* - salinity, pH, colour, transparency, nutrients
- *Biota* - vegetation zones, animal populations, rare/endangered species

Managerial data:

- *Land use* in the river basin and/or coastal zone
- *Pressures* on the wetland, river basin and/or coastal zone
- *Land tenure and administrative authority* for the wetland, river basin and/or coastal zone
- *Conservation and management status* of the wetland including legal instruments, social-cultural traditions that affect management
- *Ecosystem goods and services* derived from the wetland including products, functions and attributes
- *Management plans and monitoring programs* in place and planned

These data will be collected using standardised methods and recorded using standardised data formats. In this manner a multi-level inventory of Asian wetlands can be compiled using compatible data fields and methods. The approach outlined therefore responds to the major criticisms of past wetland inventory at a global level and proposes a method that enables different purposes and needs to be satisfied through a standard but flexible framework.

Asian Wetland Inventory – The Manual

CM Finlayson

*National Centre for Tropical Wetland Research, Darwin, Australia
Ramsar Scientific and Technical Review Panel
Wetland Inventory & Monitoring Specialist Group*

Email: Max.Finlayson@ea.gov.au

Abstract

The wise use of wetlands depends on knowledge and information and the involvement of multiple stakeholders. The Asian Wetland Inventory (AWI) is a multiple stakeholder tool for collecting information on wetlands, including their resources. Thus, the AWI will support the wise use of wetlands across Asia. This will be done by identifying the functions and values of wetlands; establishing a baseline for measuring change in wetlands; identification of priority sites for conservation; by providing a tool for planning and management; and by allowing comparisons between wetlands at different levels.

Thus, the AWI will develop a regionally compatible and standard method to:

- provide core data/information on Asian wetlands to support international conventions and treaties on wetlands, climate change, biodiversity, migratory species, and their implementation by Governments
- analyse long term trends in Asian wetlands and their natural resources
- enable regular revisions and updates of information on wetlands of national and international importance in Asia
- **disseminate these analyses for wider consideration and use in sustainable development and conservation of wetland resources**

The principal purpose is to delineate/map wetlands in Asia, taking in habitats from the intertidal zone to the inland, and to display this on GIS-based maps. This will occur at four different scales with the amount of detail dependent on the purpose of the inventory and the size and importance of the wetland. The four scales of mapping being proposed enable different amount of detail to be gathered dependent on the specific purpose of the inventory.

Geographic regions	1:1 000 000 to 5 000 000
Wetland regions	1:250 000 to 1 000 000
Wetland complexes	1:50 000 to 250 000
Wetland sites/habitats	1:25 000 to 50 000

Wetland classification and description will be done using core data on water regimes, landform, vegetation and water quality. The multi-scalar approach will be undertaken as described below:

- *Geographic regions* - desk study to describe the geology, geomorphology and climate using existing maps and remotely sensed images.
- *Wetland regions* - desk study to identify and describe the landforms and water regimes of sub-regions.
- *Wetland complexes* - fieldwork and analysis to identify complexes of wetlands and their ecological character.

- *Wetland sites/habitats* - detailed field work and analysis to delineate and describe habitats within each complex. Include information on management issues and goods and service derived from the wetland.

In addition to describing core data sets for wetland description guidelines for data collection and entry using standardised data sheets (4 levels) will be provided. These will be available through a web page (www.wetlands.org/awi). A standardised Information system is also proposed and will incorporate an interactive, user-friendly relational database to store the inventory information, GIS datasets which contain the spatial information and which can be integrated and updated from the relational database, and a meta-database describing the inventory datasets and which is compatible with the protocols proposed by the Ramsar Wetlands Convention.

The AWI is currently under development and feedback on the approach is being sought from stakeholders. Advice and assistance in developing demonstration studies is also being sought.

Asian Wetland Inventory - Database and datasheets

J Lowry

National Centre for Tropical Wetland Research
Email: John.Lowry@ea.gov.au

Abstract

The methodology developed for the Asian Wetland inventory proposes the collection of inventory data at four scales, from major river basins through to wetland habitat. The manner in which the data is recorded and managed is an extremely important component of the AWI process. The quantity and detail of data recorded increases from the broad-scale, to the habitat-specific. To assist users complete the inventory process, a series of standardised datasheets have been developed for each level of inventory, describing the type of information that should be recorded. In addition, a MS Access-based database has been developed to record the different fields required for each level of inventory. Special attention has been made to ensure the 'user-friendliness' of the database, and to ensure integration with spatial datasets which will be used in the inventory process. While the current version of the database has been developed in English, future versions of the database will be developed in regional languages.

A Case Study on Implementation of the Asian Wetland Inventory

Koji TAGI

Wetlands International-Japan
Email: Ktagi@aol.com

Introduction

Hokkaido is the northern island of Japan, located between longitudes 139°20' East and 148°53' minutes East; and between latitudes 41°21' North and 45°33' minutes North. Hokkaido covers an area of approximately 83,000 km². Although this represents 22% of the land area of Japan, Hokkaido contains only 4.5% of the total population of Japan. It is the second largest island in Japan.

Hokkaido is surrounded by the Pacific Ocean to the south and east, the Sea of Japan to the south-west and the Sea of Okhotsk to the north. In the center of the island, there are volcanic mountain chains. Because of the harsh climate, especially in winter and the relative remoteness from the populated center of Japan, Hokkaido has remained comparatively undeveloped.

Hokkaido holds a wide variety of wetlands, including five Ramsar sites, namely the Akkeshiko Bekanbeushi Marshes, the Kiritappu Marshes, the Kushiro Marshes, Lake Utonai and Lake Kutcharo. In 1993, COP 5 of the Ramsar Convention was held at Kushiro. Because of the high level of local interest in wetlands, a wide variety of high quality information on the wetlands are available in Hokkaido through municipal governments, institutional organizations and local NGOs.

The Hokkaido Institute for Environmental Sciences (HIES) in particular maintains good information resources on wetlands in the island. HIES is a governmental institute of the Hokkaido Prefecture and has conducted and collected a number of environmental surveys on water and air pollutions, acid rain, global warming, water quality of lakes and rivers, monitoring of wildlife and vegetation and conservation of endangered species. The institute holds, for example, information of:

- Grid units of 100 x 100 meters mesh for land use;
- Grid units of 250 x 250 meters mesh for elevation; and
- Grid units of 1 x 1 kilometer mesh for distribution of flora and fauna, vegetation type, land tenure, geology, quantity of undulation, direction of inclinations, soil type, temperature, rainfall, snowfall and population as mesh data,
- 1: 50,000 – 1: 200,000 scale maps of coastal line, administrative boundary, roads, rivers, lakes, marshes, vegetation, national/nature parks, wildlife reserves and agricultural and forestry zones as vector data and
- LANDSAT, NOAA, aerial photos and topographical maps as raster data.

These information are all available in GIS format.

On April 2001, Wetlands International-Japan, which has been receiving annual financial support from the Ministry of Environment Japan, decided to implement a pilot study of the AWI. Major objectives of this project are:

- To demonstrate the usefulness of the AWI information sheet and manual on Level 1-2, which have been revised after the 1st training workshop, using existing wetland information in Hokkaido;

- Review the revised information sheet and manual through the process of the data completion; and
- Producing a sample CD-ROM for visualizing the AWI database system.

A wide variety of geographic information – such as topographic and floral data - is publicly accessible through web sites. However, the scale and detail contained within this information in many cases is limited making it necessary to source information directly from specific agencies such as HIES. Since HIES permitted the use of their wetland data, Wetlands International-Japan has started translation of the Hokkaido data to the AWI format as a pilot project, using the AWI information sheet and manual.

For producing maps, ESRI's © ArcView 8.1 was used while IBM © Homepage Builder 2001 was used for filling up the information sheet with html files.

Level 1

The World Resource Institute's geographic region map identifies Hokkaido as one independent geographic region and assigns it a code of Hk.

In Level 1, there is a requirement for four basic categories of information to be recorded. These are

1. Geology
 2. Climate
 3. Ecoregion
 4. Vegetation
1. Geological information in Hokkaido was obtained through the Centre for Global Environmental Research of the National Institute for Environmental Studies and web site of Hokkaido Geology Guide.
 2. Climatic information is available on the web site of FAO's Global Climate Maps. The text information is quoted from, for example, the web site of Hokkaido Government.
 3. Original source of the ecoregion boundaries is from WWF. There are four types of ecoregions in Hokkaido.
 4. Vegetation is available from several sources. Although the map is originally copied from WWF, HIES's information is also used to fill up the text.

Level 2

In level 2, Hokkaido is delineated with four sub-basins and 6 costal regions. Zone 1 Kushiro's ISO code is Ks. In Level 2, there is a requirement to record five categories of information. These are:

1. Geographic Location;
2. Climatic Characteristics;
3. Physical Features;
4. Biological Features; and
5. Jurisdiction.

Geographic locations are may be obtained from an atlas – or a GIS. Using ArcView 8.1 to view datasets enables latitude and longitude may be easily identified and calculated. Using programming scripts supplied with ArcView, it is possible to calculate and identify the centroid of the the region.

The Climate Zone is again found from the Koeppen Climate Classification Map on FAO's web site.

Original records of annual precipitation in Hokkaido was obtained from the Geological Survey Institute Japan (GSI). HIES processed Hokkaido's GIS data from GSI's information with additional information. Calculation of the precipitation's range is easily done with ArcView. Similar works were done for temperature.

Altitudinal range including maximum and minimum elevation is calculated by ArcView with HIES's information. Area, length and width measurements may be easily calculated using the measuring and area calculation capabilities of the ArcView software package.

Geological information and land tenure were supplied by HIES.

Unfortunately, hydrological information is not available at the moment. This information will be recorded later.

Information from HIES was used to produce a vegetation map.

To complete the jurisdictional section, various information sources are used through web sites.

At moment, only information for Zone 1 (Kushiro) is filled up. Information for the rest of the zones will be completed within a month and the Level 1-2 information will be presented as a sample AWI data in the CD-ROM together with revised manual text and data sheets. The CD-ROM will be distributed among related countries and used to introduce the AWI system.

Next Step

Following recent discussions with the Ministry of Environment, Wetlands International-Japan has decided to continue the pilot project with HIES this year, focusing on Levels 3 and 4. The output will be produced as a CD-ROM and distributed at the COP 8 of the Ramsar Convention.

Using Spatial Tools to assist with Wetland Management and Decision Making

J Lowry

National Centre for Tropical Wetland Research
Email: John.Lowry@ea.gov.au

Abstract

Recent developments in remote sensing and geographical information system (GIS) technologies are providing valuable tools to assist with the inventory, monitoring and management of wetlands. Within the context of the Asian Wetland Inventory, a variety of remote sensing platforms and sensors are now able to provide a range of image-based products ranging from the catchment-scale, through to the habitat scale. Integrating these datasets with a GIS increases the number of potential applications available to the user. Subject to the spatial, spectral and temporal resolution of the imagery being used, potential applications of this technology could include mapping the dynamics and condition of specific vegetation communities over time. A recent study of a wetland habitat in Kakadu National Park over a time period of 21 years successfully identified changes in *Melealeuca* community density across the habitat, and demonstrated the cost-effectiveness of the process of studying the habitat through remote sensing and GIS technologies.

Inventory as a baseline for risk assessment of wetlands in the Daly basin in the Northern Territory, Australia.

J Lowry

National Centre for Tropical Wetland Research
Email: John.Lowry@ea.gov.au

Abstract

The Environmental Research Institute of the Supervising Scientist was recently commissioned to undertake an inventory and risk assessment of wetlands in the Daly basin in the Northern Territory of Australia. From the outset, the project relied on the use of remotely sensed and Geographic Information System (GIS) data, which was analysed and queried on a desk-top GIS system. By integrating data from different sources, and using a geomorphic classification system it was possible to rapidly map, and classify the distribution of wetlands in the 20 000 km² basin. The GIS-derived interpretations of wetland distribution were validated through ground and air-based surveys which were themselves performed in a more efficient manner through the use of the compiled GIS information. The compilation and validation of the wetland inventory enabled the project to undertake the risk assessment phase. This was done by integrating potential landuse information, and determining the type and extent of wetlands which would be threatened by the existing and proposed landuses in the basin.

WETLAND INVENTORY, ASSESSMENT AND MONITORING: AN INTRODUCTION

Jonathan Davies

Email: Jondavies@pd.jaring.my

Abstract

Wetlands remain poorly known and undervalued ecosystems, yet they provide many benefits such as direct uses (e.g. fisheries, water supply), functions (e.g. flood control, groundwater recharge) and attributes such as biodiversity. Often, information is lacking on wetlands, yet it is essential for the wise management of these ecosystems. Wetland inventory and assessment is the process by which this information is gathered and evaluated.

The aim of this paper is to provide a broad introduction to the process of which wetland inventory, assessment and monitoring are parts. The terms “inventory” and assessment” are often used interchangeably, yet they are two different activities in the same process. Wetland inventory is the activity through which information is gathered. Assessment is the activity which evaluates the information obtained. From the collection of the relevant information and its evaluation, management of the wetland can be implemented. During the management phase, monitoring is an important activity and may be defined as, “Regular collecting of information on the site using characteristics of the site or its catchment which, for which any change may produce a negative impact on the site”.

Information should be collected in a “top down” manner, starting off with the river basin/catchment, then focusing down on the sub-catchment, the wetland site or complex and finally the habitats contained within the wetland. Data should be collected in a standardised manner and should be directed primarily towards that which is relevant to subsequent management. This includes basic geographical, physical, chemical and biological information, with emphasis on data relating to the benefits that the wetland provides and the threats operating on the wetland.

The data collected should be easily accessible, in such a form as to be easily interpreted and to be easily up-dated. As such, the information should be held in a computerised database linked to a GIS.

The Med Wet project, a regional initiative in inventory of the countries surrounding the Mediterranean Sea, and the Asian Wetland Inventory project, are briefly discussed as examples of standardised wetland inventory projects.

1. INTRODUCTION

Sufficient, relevant, up-to-date data are a prerequisite for the effective management of all types of ecosystems including wetlands, yet there is still insufficient information on wetlands in the Asian region upon which to base sound management (Finlayson & Davidson 2001). Thus, there is a need for activities involving the collection and interpretation of information on wetlands for management purposes.

The first attempt at compiling information on wetlands in a systematic manner was with the Directory of Asian Wetlands (Scott 1989). The information collated was focused mainly on the biological importance of wetlands, especially for bird populations.

Many national wetland inventories in the Asian region have been published in the last decade or so which pioneered systematic and relevant data collection on wetlands, but the data collected were fairly limited, with an emphasis on identifying wetlands of importance for conservation purposes rather than for their importance for direct uses and for functions and

services. The scope and the detail of data collected were also limited fundamentally by lack of funds and trained manpower.

Most of these inventories were published as printed documents, not in electronic format, which makes updating very difficult and time-consuming. This is understandable since electronic formats such as databases and GIS were not user friendly.

With the ever-increasing recognition that wetlands are important ecosystems and that they require sound management, a need has been recognised for a more systematic, comprehensive approach to wetland inventory (Finlayson & Davidson 2001). The development of more "user-friendly" databases and GIS means that this information can be easily held, interpreted and updated.

This paper gives a brief introduction to the activities involved in wetland inventory, assessment and monitoring, with an emphasis on inventory and assessment; and briefly describes two examples of wetland inventory projects: the Mediterranean Wetland Initiative (MedWet) and the Asian Wetland Inventory programme (AWI).

The generally accepted Ramsar definition of wetlands is used throughout this paper: "Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres."

2. WETLAND INVENTORY, ASSESSMENT AND MONITORING – THE PROCESS

The diagram below (Fig. One) shows the process of wetland inventory, assessment and monitoring and the activities involved.

These terms should be defined since the terminology is often confused - the terms inventory and assessment are often used interchangeably, but they refer to different stages in the process:

- ❑ **Inventory:** The activity of gathering information on wetlands and their catchments to produce a listing of sites. The information is collected in a standardised manner and includes location, size, physical, chemical and biological features, human activities, protection/management status, threats and benefits provided by the wetlands.
- ❑ **Assessment:** To assess something is to judge the worth or importance of it, in this case, the activity involves evaluating the information gathered on wetlands to judge their value. The end result may be a prioritised list of wetlands in terms of their importance. Wetlands are normally assessed in terms of the benefits they provide and the threats which are operating on them.
- ❑ **Monitoring:** This is an activity which is carried out during the management phase. It is the regular collection of information on the wetland or its catchment which is targeted at variables which may negatively affect the wetland. Examples are monitoring human activities in the catchment, monitoring the level of resource exploitation within the wetland etc.

Thus, simply put, data are collected, these data are assessed/analysed and used in management. A monitoring programme is developed within the management regime to monitor any potential deleterious changes in the variables affecting the wetland and also to monitor the effectiveness of management. Monitoring is a tool whereby the management regime can be modified to take into account any change in variables operating within the wetland or its catchment.

STEP IN PROCESS	MAJOR ACTIVITIES
PREPARATION/ PLANNING	Rationale, objectives, scope, time and funds available. Data sheets, data collection methods, wetland classification scheme and wetland assessment methods should be finalised. Liaison with stakeholders, identification of inventory team. Development of database/GIS
INVENTORY	
DESK STUDY	Review of previous information on the wetlands, map and photo procurement
PREPARATION FOR FIELD WORK	Specific planning for fieldwork: Timing of survey. Contacting and liaising with government agencies, local communities, NGOs. Arrange logistics: places to stay, transport. Pilot testing and validation of methodology
FIELDWORK	Ensure all necessary data collected on wetland inventory forms
PRESENTATION OF DATA	Data held in database and linked GIS
ASSESSMENT	Interpretation of data: evaluation of wetlands mainly in terms of their values and the threats facing them.
OUTPUTS	Published of draft document with ranking of wetlands for their importance and urgency for management with justification. Workshop with stakeholders to fine-tune results. Development of action plan. Development of monitoring programme.
IMPLEMENTATION: MANAGEMENT & MONITORING	

Figure One: Overview of the wetland inventory, assessment and monitoring process

2.1 PREPARATION

It is essential to adequately prepare for a wetland inventory. The rationale and objectives for the project must be established first. Usually the rationale is that wetlands are valuable ecosystems, but are being destroyed and degraded rapidly and that there is a lack of relevant data on which to base sound management. A well-thought out rationale is essential to attract funding for the project.

Inventory objectives normally are to:

- ☐ Identify the type, location and size of wetlands,
- ☐ To collect data relevant to management in a standard systematic manner,
- ☐ To establish a baseline for the subsequent monitoring programme.

Preparation also involves developing a framework within which the project will be carried out-funds have to be secured; and standard data collection sheets, a wetland classification system and a standard wetland assessment methodology need to be finalised.

Most wetland classification systems in use at the moment are based on that of the Ramsar Bureau which in turn was derived from Cowardin's wetland and deepwater habitat classification for the United States (Cowardin et al. 1979). These classifications start off from the major wetland systems (lacustrine, palustrine, riverine, estuarine and marine) and then use hydroperiod, land form, substrate and vegetation to subdivide these major systems.

However, a modified classification systems is being developed which classifies wetlands initially by a combination of landform type and hydroperiod (Finlayson, pers.comm.) This type of classification is more logical in that landform and hydroperiod are the fundamental determinants of wetland character.

A computerised database, if possible linked to a GIS should also be developed, with the database fields being complementary to the fields in the filed data collection sheets for ease of input.

It is also necessary to identify stakeholders in the project and collaborating partners.

Stakeholders include:

Relevant government agencies concerned with natural resource management, research institutions,/universities, NGOs, funding agencies, local government units at wetland sites and local communities living in and around the wetlands.

2.2 COLLECTING THE INFORMATION: THE INVENTORY PHASE

As a guiding rule, collection of information should not be solely aimed at the wetland sites. It is also necessary to collect information on the river basin/catchment area in which the wetland lies, and the sub catchment. This is desirable for two major reasons:

1. Wetland sites are greatly influenced by the nature of the catchment and human activities within it.
2. Collection of data at the catchment and sub catchment level avoids needless repetition of data on wetlands within the same catchment/subcatchment. Wetlands can then be grouped together by catchment/river basin since they are hydrologically linked to each other and most likely share similar water quality characteristics.

The inventory team should be assembled at this stage – it should ideally be multi-disciplinary, with the members drawn from the disciplines of geography/geology/soils; hydrology; socio-economics and ecology. All members should be familiar with rapid assessment techniques in their disciplines: e.g. rapid rural appraisal for the socio-economics member. A database/GIS expert should also be present.

It is also desirable, before embarking on the major part of the information gathering, to test the methodology and fine tune it.

2.2.1 DESK STUDY

This is an activity which is often not carried out comprehensively before collecting data in the field. Desk study; i.e., review of previously published information, can be a great help in identifying where there are large gaps in the information base and it will give an idea of the basic characteristics of the wetlands to be surveyed. There are four main sources of information:

1. Written publications and reports
2. Maps
3. Remote images: photographs, both aerial and ground shots and satellite images
4. Expert opinion: it is useful to consult people who have been to the sites to be surveyed since they can provide much useful information on features of the wetland on and logistical considerations such as accessibility of the area and the best season for surveys.

Collection of this data is also useful because there should be an indication of how the wetlands have changed since these sources became available. As part of the desk study, all

relevant information should be held in one place for ease of access – thought should be given to setting up a resource centre for wetland information.

A start can be made on filling in the data collection form at this stage with information gathered from the desk study; e.g. geology, soils, climate, location, area, and socio-economic and management information.

2.2.2 FIELD SURVEY

Timing

An important consideration for field survey is the timing of the field survey. For example, what time of year would be best to get the most information from the visit? In many floodplains, most often habitats may be under water at certain times of the year making description of habitats well nigh impossible. How is access influenced by the seasons/ Is it easier during the wet or the dry season? Are there any migratory species that use the area? If so, it would be desirable that the survey coincide with the peak migratory period.

With wetlands that have a seasonally variable water regime, it may be best to make at least two visits in a year – one at minimum water level and one at high water.

The data collection sheet

As mentioned before, a standard wetland data collection sheet should be used in the field. This shows the core data that needs to be collected. The core data is the minimum data that need to be collected in order to characterise the wetland, to establish its benefits and to provide information for subsequent management.

Data are normally collected under the following headings:

GEOGRAPHICAL

Name
Location
Climate
Altitude
Area

PHYSICAL AND CHEMICAL

Landforms/geomorphology
Geology
Soils
Origin
Hydrology (inflows, outflows, hydroperiod)
Water Quality

WETLAND BENEFITS *

Direct Uses
Functions/Services
Attributes (e.g. biodiversity, cultural values)

LAND USE AND HUMAN ACTIVITY IN CATCHMENT

THREATS TO THE WETLAND AND CATCHMENT

MANAGEMENT INFORMATION

Land tenure/ownership
Agencies involved in management and resource use
Conservation and other management measures

REFERENCES/SOURCES OF DATA AND RESOURCE PERSONS

The above is a summary of the information to be collected during the inventory phase. It should be remembered that the information is collected at several levels from the catchment focusing down on the habitats within the wetland and data sheets are needed for each level since the exact type of information and the level of detail will vary at the different levels.

** The benefits of wetland have been divided into three types according to Claridge (1991).*

The term direct uses refers to aspects of a wetland which are harvested directly such as fishes, timber and water. These direct uses are easy to quantify in economic terms.

Functions (also called services) are those aspects of a wetland which are beneficial to humans such as flood control, shoreline stabilisation etc. Although these functions may have a great economic value; e.g. a marsh may prevent flood damage and associated economic costs downstream by reducing flood peaks, they are harder to quantify in economic terms than direct uses.

Attributes are those aspects of a wetland which do not necessarily have an economic value, but which are valued by society, or some sectors within society. Examples are cultural and spiritual values associated with sites; and biological attributes such as species richness, rarity, endemism etc..

2.2.3 POST-SURVEY PHASE: PRESENTATION OF THE DATA

A published document should be produced showing the results of the inventory as a bare minimum. However, it is desirable to enter the information into a computerised database, from which data can be easily used for interpretation purposes and which will be easy to up-date on a regular basis. Moreover, for the accurate delineation and location of wetlands, it is essential that good, large-scale maps of the wetlands and the catchments be produced. Ideally a GIS should be linked to the database to show the data in spatial form and to facilitate the interpretation of the data.

2.3 ASSESSMENT

After the data have been collected and presented in an easily accessible form, the wetlands can be evaluated for their "importance". Importance usually means evaluation in terms of the degree of benefits that wetlands provide; e.g. biological importance, socio-economic importance and provision of functions/services. The degree of threat is also important to evaluate.

The actual methodology used in assessment varies. Most of the techniques used are fairly subjective in their approach since there may be a lack of quantitative data, at least initially, on which to base objective decisions.

- Multi-criteria evaluation techniques have been used to assess the ecological importance of sites (e.g. Spellerberg 1992). Criteria to be used are first selected. These may include biological criteria such as species richness, species diversity, habitat diversity, habitat distribution, and presence of rare, endangered and endemic species. Other criteria normally include socio-economic importance (value for direct uses), importance for functions, the degree of threat, degree of disturbance and management viability. For each criterion, a range of scenarios is given; e.g. for degree of disturbance, these could range from undisturbed through slightly disturbed, moderately disturbed to heavily disturbed/degraded. Points are allocated to each scenario, with undisturbed sites having a higher points allocation. Similarly, for the

criterion of species richness, those sites with higher species richness will score more points than those with poor species richness. Spellerberg (1992) gives several examples of these multi-criteria evaluation methods. The end result would be a comparative ranking of sites in terms of their importance for direct uses, functions and attributes, the degree of threat and management viability.

- ❑ Indicators may also be used to assess a wetland's importance. Biological indicators; e.g. bird species richness may be used as a rapid indicator of a site's biodiversity value and degree of disturbance. Degree of intactness is also a good indicator of ecological importance.
- ❑ Other indicators have been used to assess the importance of some functions and services provided by wetlands (e.g. Larson et al. 1989). For example simple indicators can be obtained from maps and/or field surveys to assess the potential importance of a wetland for flood control. The reader is referred to Larson et al. (1989) for more details.
- ❑ Expert opinion is another option for assessment, with a range of experts familiar with the sites giving their advice on the important wetlands.

However, there is no substitute for good quantitative data which can be tested statistically to produce an objective listing of important wetlands, but it should be realised that the amount of data available on most Asian wetlands precludes this for the time being.

A GIS helps enormously in interpreting the location, area and distribution of habitats and is therefore very important in identifying rare and endangered habitats.

2.4 OUTPUTS OF THE ASSESSMENT PHASE

At the end of this phase, it is useful to convene a workshop in order to discuss the results and fine-tune them. This workshop should include all stakeholders, including local community representatives.

The output of this phase should be a listing of wetland sites prioritised for their importance. This means that the most important wetlands in terms of the three categories of benefits should be ranked in relation to each other. Wetlands should also be ranked according to the type and degree of threat operating on them. This is very important since urgent management measures can then be directed towards important wetlands which are under the greatest threat of destruction or degradation.

2.5 MANAGEMENT AND MONITORING

The ultimate goal of the inventory and assessment process should be sound management of wetlands. What type of management regime is recommended for a particular wetland depends on the results of the assessment phase. For example, some wetlands may be found to have a very high value in terms of direct uses such as fisheries utilised by local people. In this case, the emphasis would be on development of a fisheries management plan to safeguard the fishery resource for local people, with the Fisheries Department being the lead agency. In other cases, a site may be found to have a very high biodiversity with several rare or endangered species. This site is more appropriate to be designated as a protected area with the conservation agency as the lead agency.

As mentioned before, monitoring is not just a regular collection of data which were gathered in the initial inventory exercise. Monitoring is a targeted activity and monitors those variables which may cause changes in the wetland and the benefits it provides. Any monitoring programme should provide feedback into a management plan so that management actions can be taken to minimise any negative impacts identified through monitoring. For example, hydroperiod (the water regime and how it varies seasonally) is one of the fundamental determinants of the character of a wetland. Any change in the hydroperiod will cause a dramatic change in the character of the wetland e.g. the vegetation. Therefore, any activities which may cause a change in the hydroperiod should be monitored closely. As a first step, base line data on the hydroperiod such as monitoring of water levels seasonally should be gathered. Monitoring of development plans and activities such as river flow modification in the catchment of the wetland would also be needed. It should be noted that monitoring in this case can be proactive; i.e. by monitoring plans and by seeking to be involved in the planning process, one can have a say in the decision-making process to minimise or remove any adverse effects before they occur.

Other examples of common monitoring programmes are those which look at levels of resource utilisation in the wetland such as exploitation of fishery resources. By monitoring the intensity of fishing (e.g. catch data, numbers of fishermen and numbers and types of gears), one can devise management strategies to ensure that resource utilisation is on a sustainable basis and that the fishery resources are available in undiminished quantity in future years.

3. EXAMPLES OF WETLAND INVENTORY PROJECTS

1. Mediterranean Wetland Initiative (MedWet)

This is a regional project launched in 1991, the first objectives of which were to assess the existing information on Mediterranean wetlands in order to identify gaps and assess the methodologies used; and to develop a standard methodology for wetland inventory in the Mediterranean region (Costa et al. 2001). The first stage was a three-year preparatory project to develop a standard set of tools to be used in the inventory process. These tools consisted of a reference manual, sets of inventory data sheets, a habitat description system and a computerised database to hold the information. Information in this project is collected at three levels: at the catchment level, the wetland site level and the habitat level.

There are three major phases to the MedWet project: review of existing information, simple inventory and then detailed inventory (Costa et al. 1996). The review of existing information was seen as a necessary prerequisite for the simple and /or detailed inventory phases. If resources are limited initially; a simple inventory may be undertaken first, with the production of simple maps for each wetland and filling in of information gaps identified from the review. As more resource become available, a detailed inventory can be undertaken with the production of detailed maps, ideally using a GIS and compilation of detailed information on each site. This phase is particularly important for developing a management regime for individual wetlands and providing a baseline for monitoring programmes. If sufficient resources are available from the start, a detailed inventory can be carried out straight away after the review phase.

After the three year preparatory phase, the methodology was tested in pilot studies in five countries and refined. Subsequently, the methodology had been used to develop wetland inventories in most of the Mediterranean countries. An important point here is that the methodologies are not "set in stone" but are continually being refined and improved as more and more experience is gained in their use.

2. Asian Wetland Inventory (AWI) programme

The “Global review of wetland resources and priorities for wetland inventory” (Finlayson & Davidson 1999), carried out by Wetlands International on behalf of the Ramsar Convention, concluded that the existing information base for Asian wetlands was inadequate. As a result of this, the AWI was launched in 1999 with the endorsement of the Ramsar Convention. The AWI aims to develop a standardised protocol for wetland inventory across the Asian region. Information is collected at four levels: 1. River basin, 2. Sub basin, 3. Wetland site or complex and 4. Habitat. Thus, attention is focused down progressively from the catchment level to the habitat level. Information from the top two levels can be used in overall land use planning whilst information collected at levels 3 and 4 can be used for site specific management of wetland sites and complexes. The information gathered is to be held in a computerised database linked to a GIS. At present, the tools are being developed, including a manual, data sheets, a database and GIS. Pilot testing of the protocol will begin in the near future.

CONCLUSION

There are several ingredients for a successful wetland inventory and assessment project – there must be adequate preparation of the methodology and pilot testing; there should be an extensive period of desk study prior to collection of new information from field surveys; a multi-disciplinary team should be used and there should be adequate time allocated to assessment of the information collected. Any envisaged wetland inventory and assessment project should conduct a review of previous projects to benefit from their experiences and to build on them.

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Annexe 4:

The Phnom Penh Statement on Wetland Inventory, 9th April 2002

Wetlands International and the Ministry of the Environment, Kingdom of Cambodia have organised a regional workshop to promote the Asian Wetland Inventory (AWI) programme in Phnom Penh, Cambodia between 8 and 9 April 2002.

Thirty-two participants including government representatives from Cambodia, China, Lao P.D.R., Malaysia, Philippines, Thailand and Vietnam, the Mekong River Commission, **ASEAN Regional Centre for Biodiversity Conservation (ARCBC)**, Danish International Development Agency (Danida), ICLARM – The World Fish Centre, Swedish International Development Agency (SIDA), World Wide Fund for Nature (WWF)-Indochina, National Centre for Tropical Wetland Research (NCTWR), Australia and Wetlands International participated in the workshop. The workshop was funded by the Dutch Ministry of Foreign Affairs (DGIS) and AEON Foundation.

The workshop aimed to:

1. Introduce the need for wetland inventory and the Asian Wetland Inventory to a wider range of identified stakeholders and to identify stakeholder interest.
2. Demonstrate the AWI technical tools and present case studies.

The workshop recognised:

- The importance of inventories of wetlands as information bases for the wise use and conservation of wetlands.
- The need for a standardized methodology and reporting process for wetland inventory.
- The identification and involvement of multiple stakeholders and users of inventory information.
- The need to build national/sub-national capacity to implement wetland inventory and ensure long-term sustainability of inventory activities at the national level.
- Importance of improving networking amongst government agencies, institutions and organisations concerned with biodiversity and wetland inventory and management to facilitate access to available information and technologies.
- The importance of developing national inventories in national languages to ensure greater accessibility and ownership.
- The need to incorporate suggestions made in the workshop so that it caters to national and regional needs
- The need for financial assistance to countries in the region for the immediate implementation of the AWI, including for training and capacity building.

The workshop requested for Wetlands International to complete the manual and to take steps to formally accept the Asian Wetland Inventory as a regional approach for wetland inventory.

Wetlands International and its partners aim to respond to requests on a case-by-case basis to provide:

- Additional information on the AWI and linkages to other wetland/biodiversity inventory initiatives.
- Assistance in review/development of proposals for implementation of national wetland inventories.
- Advising on potential funding sources to implement the AWI at the national level.
- Technical advice and skills required to undertake the development and implementation of the inventory at the national/sub-national level.
- Technical advice required to develop and undertake demonstration of the AWI model at the pilot scale.
- Assistance in implementation of the AWI at the national/sub-national level.

Annexe 5: Closing speech by H.E. Dr. Mok Mareth, Minister, Ministry of Environment, Royal Government of Cambodia.

It is a great pleasure to be given the chance to address you, the participants, at the conclusion of this regional workshop on the Asian Wetland Inventory. Many of you have come from other countries in the region to participate in this workshop and I am confident that you are all now more aware of this important regional initiative and will be able to support it in your own country as we are planning to do in Cambodia.

We are all very aware that wetlands play a critically important role in the landscape and the conservation and wise use of these valuable ecosystems are of utmost importance. As mentioned by HE To Gary in his opening speech, the Kingdom of Cambodia in particular has a large interest in wetlands. This is due to the fact that a major portion of the country constitutes a wetland. At certain times of the year, almost 30 % of Cambodia is covered by floodwaters and can be considered as wetland. A majority of our people is dependent on wetlands directly or indirectly to obtain their food, be it rice or fish. Therefore knowing more about these resources and conserving these wetlands is critical for our very survival.

I trust that your discussions in the past two days have been productive and you now have sufficient knowledge to encourage others to participate in this initiative. As the Asian Wetland Inventory is a trans-boundary program we are hopeful that the Mekong River Commission can collaborate closely and assist in developing our national inventory programs. Cambodia supports this initiative and is seeking funding from Danida to implement our national component of the program. We encourage other countries to likewise develop their own national components.

We are pleased to join with the Ministry of Environment Japan, the Foreign Ministry of the Netherlands, and the Standing Committee of the Ramsar Wetlands Convention and formally endorse the Asian Wetland Inventory. It is an innovative and important initiative and we congratulate Wetlands International for developing the program and offer our appreciation at being asked to participate.

In offering our endorsement we are aware that the Asian Wetland Inventory has been specifically developed for use in Asia. It is based on international best practice and guidelines, but has been specifically directed towards data collection and management in Asia. It is not a concept that has been imported and adapted – it is home grown. This is an important point and we are proud to be associated with this effort. We also expect that the innovative and user-friendliness of the approaches in the Asian Wetland Inventory will provide a global model for wetland inventory that others will follow. We are proud to have been involved at this early stage of the initiative.

So my distinguished participants, you have been here for the past few days because you realise the importance of wetland ecosystems in providing inestimable benefits to mankind through their goods and services and their important functions. Wise use of wetlands is what we are all striving to achieve for the benefit of all mankind now and for future generations. In order to achieve wise use through effective conservation and management of wetlands, we need reliable information. Through wetland inventory, we can obtain this information to further enable assessment and monitoring of wetlands. This, as I have already said, is very important in Cambodia.

By now you are all aware that the Asian Wetland Inventory is response to the call by contracting parties to the Convention on Wetlands for a standardised, systematic approach to wetland inventory. Through Resolution VII.20, Contracting Parties of the Ramsar Convention called on participating governments to collaborate with Wetlands International to review and further develop existing models for wetland inventory. We are most privileged to actively be part of this initiative and hope that not only our neighbours but all other nations will also join and support Wetlands International and the Ramsar Convention.

In this workshop there has been mention of the need to manage our wetlands wisely and to do this now. So the challenge I would like to pose to all of you present here is – when you go

home do not forget what you have learnt here. Remember this workshop in our capital city and support the wise use and inventory of Asian wetlands. We look forward to your support and at the 8th Meeting of the Conference of the Parties to the Ramsar Convention in Spain, November 2002, we will join Wetlands International in formally launching the Asian Wetland Inventory. We invite all other governments to actively participate in this ceremony. In advance, I would like to thank you for your support.

Thank-you for being here and thank-you to the staff of Wetlands International for arranging this meeting. We look forward to seeing you again and working with you on the Asian Wetland Inventory and other initiatives to conserve our common heritage.