

A STRATEGIC APPROACH FOR CHARACTERISING WETLANDS: THE ASIAN WETLAND INVENTORY

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Abstract

The Asian Wetland Inventory (AWI) aims to develop a regionally, and globally, compatible and standard method for wetland inventory. The method has been developed in response to recent dissatisfaction with many wetland inventories and can support data collection at different scales and for different purposes. Some of these purposes are:

- 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.

The AWI builds on past inventory effort, most notably that undertaken in the mid-1980s, and abides by the recommendations made in the review of wetland resources conducted for the Ramsar Convention. It uses a hierarchical approach for collecting core data elements within a Geographic Information System (GIS) framework that enables data from disparate sources to be collated and combined. Outputs include map-based assessments at four levels of detail. The level of detail is related to the scale of the maps that are contained within a standardised GIS format.

The method provides an effective tool for collecting information for managing natural resources derived from or dependent on wetlands, and for meeting national obligations under international agreements. It uses a strategic and hierarchical approach to collect information and takes advantage of new technologies of data collection, storage and dissemination.

Introduction

Wetland inventory provides a basis for collecting reliable knowledge and providing information for taking decisions concerning the conservation and wise use of wetlands (Dugan 1990; Finlayson 1996). It also assists Governments to identify wetlands of importance and prioritize their conservation and development initiatives in conjunction with management of natural resources, in particular, water, fisheries and/or forestry. Further, there is a broad and growing consensus that wetlands are critically important ecosystems that provide local and globally significant social, economic and environmental benefits. Thus, an inventory can supply information for many purposes.

The Convention on Wetlands (Ramsar Convention) has promoted wetland inventory as a means to:

- identify the function and values of wetlands, including ecological, social and cultural values;
- establish a baseline for measuring future change in wetlands, their functions and values;
- identify where wetlands are, and which are the priority sites for conservation;
- provide a tool for planning and management at both practical and/or political levels; and
- allow comparisons between wetlands and management procedures at different levels of government and management (local, national and international) .

Contracting Parties to the Ramsar Convention have been encouraged to undertake and maintain national wetland inventories (http://www.ramsar.org/key_criteria.htm). A wetland inventory can also provide information to support national programs and reporting requirements for other international treaties, such as the conventions on biological diversity, migratory species, world heritage and climate change, as well as support regional strategies, such as the Asia-Pacific migratory waterbird conservation strategy (<http://ngo.asiapac.net/wetlands/mwbird.htm>).

The Asian Wetland Inventory (AWI) provides a tool for collecting information for managing natural resources derived from or dependent on wetlands, and for meeting national obligations under international agreements. The mechanism uses a strategic and hierarchical approach to collect information and takes advantage of new technologies of data collection, storage and dissemination. It builds on past inventory effort in Asia, most notably that undertaken in the mid-1980s (Scott 1989; Scott & Poole 1989) and abides by the recommendations made in the review of wetland resources and inventory conducted for the Ramsar Convention (Finlayson et al 1999).

Aims

The Asian Wetland Inventory (AWI) aims to develop a regionally, and globally, compatible and standard methodology for wetland inventory 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; and
- disseminate these analyses for wider consideration and use in sustainable development and conservation of wetland resources.

Method

The key features of the AWI are the production of maps and the collection and analysis of standardised categories of data within a hierarchical and scalar framework. The hierarchical framework provides a means to relate data/information that is collected at different scales for the various aims mentioned above. The framework provides a link between the mapping scales and the level of detail required. As it is not anticipated that the inventory will be undertaken as a single project the framework and data fields are standardised in order to maintain compatibility for collation of information from different projects.

Geographic coverage

The countries/territories that will be covered by the AWI will be determined using a geographical regionalisation based on river basins and major islands. In general it will include Russia eastwards of the Ural Mountains, and all countries/territories in central, eastern and south-eastern Asia. The exact boundaries will be presented on a map at a scale of between 1:10 000 000 to 1:5 000 000 and include major river basins and major islands.

Definition of wetlands

Wetlands in Asia include many types of natural and constructed habitats (Scott 1989; Watkins & Parish 1999). Further, there has been a long history of difficulty with wetland definition (Finlayson & van der Valk 1995). One definition that has gained worldwide recognition and acceptance is that used by the Ramsar Convention. In line with our aims it is important that we take note of the Ramsar definition. However, for the practical purposes of data collection we propose to refocus this definition to exclude truly marine ecosystems. As such a wetland will be defined as:

"Areas of marsh, fen, peat land or water, either natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including all inter-tidal areas above the low water mark."

Classification of wetlands

Recent analyses and reviews of wetland classification have underlined the need to overcome major inconsistencies in many existing wetland classifications (Semeniuk & Semeniuk 1995, 1997). Finlayson & Davidson (1999) have concluded that robust and consistent classification based on landform and water features is required. This would encompass the two fundamental features that determine the existence of all wetlands, regardless of their climatic setting, soil type, vegetation cover, or origin. Any such classification can be extended by the addition of descriptors for salinity, vegetation cover, shape and size. The AWI uses such an approach and derives the classification from the data collected during the inventory.

Wetland delineation

A principal purpose of the AWI is to delineate and map the wetland resource in Asia, taking in wetland habitats across the intertidal zone to the inland, and to display this information on GIS-based maps. This will be done at different scales with the amount of detail being dependent on the explicit purpose of the inventory and the size and importance of the wetland. Thus, a hierarchy of four scales of mapping is being used:

- 1 Geographic regions with a map at a scale of 1:5 000 000 to 1:10 000 000
- 2 Wetland regions with maps at a scale of 1:250 000 to 1:1 000 000
- 3 Wetland complexes with maps at a scale of 1:100 000 to 1:250 000
- 4 Wetland habitat with maps at a scale of 1:25 000 to 1:50 000

This hierarchical approach, shown in Figure 1, allows for a strategic assessment of information needs in relation to spatial scales.

Wetland description

Wetland descriptions will be nested within the hierarchy of scales shown above and undertaken in conjunction with relevant institutes and agencies to identify information sources. The usefulness of existing information will need to be assessed and used as a basis for determining the extent of further analysis and data collection, including fieldwork. The descriptions will be undertaken as follows:

- i) desk study to describe the geographic regions (river basins and major islands);
- ii) desk study to identify the wetland regions within each geographic region;
- iii) fieldwork and analysis within each wetland region to identify the wetland complexes and their ecological characteristics;
- iv) fieldwork and analysis to delineate and describe wetlands within each wetland complex.

Data sheets

The hierarchy of wetland descriptions will be undertaken using specific data sheets. The data fields within each data sheet represent the core information that is required at each level of the hierarchical framework.

Level 1 Data Sheet – geographic regions (river basins and major islands)

The Level 1 data sheet will be accompanied by a GIS-based map of the geographic regions (river basins and major islands) at a scale of 1:5 000 000 to 1:10 000 000. Each region will be described by a discrete name and a code taken from the name of the major river or island within the region. This will be accompanied by a general description of the main geologic, climatic and vegetation zones.

Level 2 data sheet - wetland regions

Data collection at Level 2 focuses on each of the wetland regions (sub-basins) identified within each of the geographic regions determined by the Level 1 mapping and will be accompanied by a GIS-based map of the wetland regions at a scale of 1:250 000 to 1:1 000 000. Wetland regions will be determined on the basis of the landforms and water regime within each geographic region and their location defined using geographical coordinates and a GIS-derived centroid.

The primary characteristics of the wetland region are described using standardised terms and measures for the:

- geographic location (standard geographical co-ordinates)
- climatic characteristics (specific climatic zones/features)
- altitudinal range (minimum and maximum heights above (or below) the local height datum)
- area and size (length, width)
- geologic characteristics (specific geological zones/features)
- water regime (extent of inundation by floods and/or tides)
- vegetation (specific vegetation zones/features)
- jurisdiction (national and local administration units)

Level 3 data sheet – wetland complexes

This will provide a detailed inventory of the specific wetland complexes identified within each wetland region and be accompanied by a GIS-based map at a scale of 1:100 000 to 1:250 000. Data collection for wetland complexes will require substantially more fieldwork and analysis using maps and imagery of appropriate scales and provide a core data set of the main features of the wetland complexes.

- Geographic location;
- Climatic characteristics (specific data on average rainfall, temperature range, relative humidity, prevailing winds and evaporation);
- Geomorphic setting (terrain in which the wetland complex occurs);
- Erosional status (susceptibility of coastal wetland complexes to erosion);
- Altitudinal range (minimum and maximum heights above (or below) the local height datum);
- Spatial characteristics (surface area, length, width, and descriptor of size);
- Soil types (dominant soil types within the wetland);
- Water regime (seasonal and inter-annual depth and flows and the period of inundation and areal extent of flooding, and/or tidal inundation);
- Physico-chemical features (including temperature, salinity, acidity/alkalinity, transparency, nutrients);
- Biological features (vegetation assemblages, cover, faunal assemblages, special features such as those shown in the Ramsar criteria and IUCN red lists of threatened species);
- Wetland services and goods (functions, products and attributes derived from the wetland complex); and
- Jurisdiction (management agencies and/or landholders and the proportion of the area managed by each).

Level 4 data sheet – wetland habitats

This will provide a more detailed inventory of the individual wetland habitats identified within each wetland complex and be accompanied by a GIS-based map at a scale of 1:25 000 to 1:50 000. Data collection for wetland habitats will be more detailed and will provide more information on management and monitoring activities. This stage will require substantially more fieldwork and analysis using maps and imagery of appropriate scales. As such it will provide a core data set of the main features of the wetland habitats and their management. The former will include the categories presented in Level 3 augmented by additional information elements as identified by Finlayson et al (1999) and shown below:

- Biologic features (list all species of interest from different taxa – flora (angiosperms, gymnosperms, ferns, bryophytes), algae and cyanobacteria, fauna (vertebrates and invertebrates), and identify major assemblages or groups of particular interest);
- Land tenure (proportion of the wetland under specific land tenure);
- Land use (proportion of specific land uses within the catchment and the wetland)
- Management issues and threats (specific issues and threats to the wetland and its uses)

Information management

The information management system for the AWI is based on a computerised database engine with web, user/data interface and GIS capabilities. This will serve as the primary data management/storage/retrieval component of the project. Development of the system will be based on the Windows platform using MS Visual Basic and Access 97 software. The website (www.wetlands.org/inventory&/awi/default.htm) will serve as the main communication node for data collection, announcements and discussions and is maintained by Wetlands International – Asia Pacific.

At an initial stage the central database will be developed and maintained in English with limited bilingual support in data collection components. However, it is intended to develop support for multi-language functions. This flexibility will allow for future conversion of the database to other languages.

The data sheets described above provide a standardised format for recording the information obtained at each level of the AWI. These sheets will be available in a database format (Microsoft Access97) that will be used to add further information to the GIS. The map-based outputs will also be stored on the GIS.

Development of the AWI

The AWI has been developed primarily in response to reviews of information conducted on behalf of the Ramsar Convention (Finlayson et al 1999). At the same time it has been recognised that information supplied for wetland inventory can also be useful for many other national and international purposes. The latter includes analyses of wetland area, species diversity and wetland functions for climate change and biodiversity assessments, and land use management purposes. These broad considerations have driven the approach that is outlined in brief above. With support from the Japanese Ministry of Environment we have drafted a manual that details the data collection steps involved at each level of the hierarchy and assessed through a network of interested parties and individuals within Wetlands International. A web site has been developed and contact made with other parties undertaking wetland inventory.

On the basis of these steps the manual is being revised. As this is being completed we have initiated contact with wider interest groups and anticipate applying the methodology at various scales across Asia. An initial demonstration project is being developed in Hokkaido, Japan, with information mostly complete for levels 1-3. As the data collection and scales of analysis are nested and connected by common data recording themes it is not critical as to which level of analysis is conducted first. It is recognised that many parties will seek to undertake wetland inventory at the more detailed levels – as long as the data is geo-referenced and stored in compatible data formats it could potentially be incorporated in the AWI. The details of these formats needs further attention, but we propose that this is undertaken in conjunction with field-based inventory analyses.

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Figure 1: The four tiered hierarchy being used in the Asian Wetland Inventory (adapted from a diagram developed by Ben Bayliss and using information for tier one supplied by the World Resources Institute).