

## **Asian Wetland Inventory - A multiple stakeholder tool for inventory to enable assessment and monitoring of wetland biodiversity and wise use**

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### **Abstract**

Wetlands are critically important ecosystems that provide local and globally significant social, economic and ecological benefits. They have a multitude of functions, all of which provide services of inestimable value to society. Although wetlands in Asia support some of the world's most significant biodiversity and are a globally important resource for billions of people, their destruction and degradation continues unabated. In the last 50 years it is estimated that over 60% of all wetlands in the region have been degraded. With recent rapid population growth in Asia, there are serious water management problems throughout the region. These include diminishing water supplies, water contamination, accelerated erosion and sedimentation, groundwater depletion, flood damage and climate change.

Reliable knowledge is the basic resource on which all decisions concerning the conservation, management and wise use of wetlands should be made. Inventory, assessment and monitoring are vital components of effective wetland management. A wetland inventory can assist Governments and the public to identify wetlands of national and international importance and serve as a basis for prioritising conservation and development initiatives in conjunction with sustainable management of natural resources.

This paper briefly reviews the need for wetland inventory and discusses the approaches taken in development of a multiple stakeholder tool for wetland inventory. The Asian Wetland Inventory is developing a unique hierarchical approach for wetland inventory that would provide information to assist in the development of conservation actions and policies from regional to site management level.

### **Introduction**

Wetlands represent a large variety of inland and coastal habitats which share a common characteristic: namely land where saturation with water permanently, seasonally, daily or episodically, is the dominant factor determining their ecological character. Wetlands are critically important ecosystems that provide local and globally significant social, economic and ecological benefits. They have a multitude of functions, all of which provide goods and services of inestimable value to society. Wetlands provide many economic and ecological benefits - through wetland products, functions and attributes in the form of fisheries and shellfish, groundwater replenishment, maintenance of water tables for agriculture, forestry and pastoral activities, water storage and flood control, shoreline protection and stabilisation, climate change mitigation, sediment and nutrient retention, water purification, habitats for biodiversity and opportunities for recreation and tourism. They are of cultural and economic importance to many local and indigenous communities.

Although wetlands in Asia support some of the world's most significant biodiversity and are a globally important resource for billions of people, their destruction and degradation continues unabated. In the last 50 years it is estimated that over 60% of all wetlands in the region have been degraded. With recent rapid population growth in Asia, there are serious water management problems throughout the region. These include diminishing water supplies, water contamination, accelerated erosion and sedimentation, groundwater depletion, flood damage and climate change. According to the Stockholm Environment Institute, 48 countries in the world will suffer from acute water shortages by 2025. With global warming starting to have a significant influence on wetlands (Finlayson et al. 2002a) large scale flooding of coastal plains, such as those in China, India and Bangladesh could increase. Thus, improved water management is becoming increasingly essential for preventing or minimizing the consequences of large scale changes in the water regime of wetlands, many of which are already under pressure from other human activities.

Improved management of these habitats will depend upon, in part, the acquisition of reliable knowledge of wetland functions and the ecological processes that support those functions. In fact, reliable knowledge is the basic resource on which all decisions concerning the conservation, management and wise use of wetlands should be made and such knowledge can be collected in a wetland inventory.

Whilst an extensive wetland 'inventory' effort has occurred in the past two decades in particular, there has been little agreement on what constitutes an inventory and how (or if) it is distinct from a wetland directory (Finlayson 2001). Finlayson (1996) differentiated between a wetland inventory and a wetland directory as follows: 'A directory and an inventory are used to compile the same type of information but the former is limited to current information and may not be comprehensive. An inventory generally includes investigative steps to obtain more information and thereby presents a comprehensive coverage of sites'.

Wetland inventory provides a basis for making informed decisions concerning the conservation and wise use of wetlands. A wetland inventory can assist Governments and the public to identify wetlands of national and international importance and serve as a basis to prioritising conservation and development initiatives in conjunction with management of natural resources, in particular, water, fisheries, forestry and development of land for agriculture, industry and human settlement.

The Asian Wetland Inventory (**AWI**) aims to develop a broadly supported standardised inventory protocol that can provide information for the assessment, evaluation and monitoring of wetlands. The **AWI** protocol builds on past inventory protocols that have been successfully developed for use elsewhere in the world (Finlayson *et al.* 1999). It is also based on the recommendations made in the global review of wetland inventory conducted by Wetlands International on behalf of the Ramsar Convention Bureau (Finlayson & Spiers 1999) and supports the provisions used in the Ramsar Convention framework for wetland inventory. In this paper, the need for wetland inventory is once again briefly revisited and role of the AWI as a multiple-stakeholder tool for wetland conservation and wise use is discussed.

### **Inventory, Assessment and Monitoring**

Before proceeding further we consider it is important to emphasise that wetland inventory, assessment and monitoring are different processes and require different categories of information. The distinctions between these procedures are often confused. The working definitions provided by Finlayson *et al.* (2001) are used here:

- Wetland Inventory:
  - the collection and/or collation of core information for wetland management, including the provision of an information base for specific assessment and monitoring activities.
- Wetland Assessment:
  - the identification of the status of, and threats to, wetlands as a basis for the collection of more specific information through monitoring activities.
- Wetland Monitoring:
  - Collection of specific information for management purposes in response to hypotheses derived from assessment activities, and the use of these monitoring results for implementing management. (Note that the collection of time-series information that is not hypothesis driven from wetland assessment should be termed *surveillance* rather than monitoring.)

### **The need for wetland Inventory**

The Ramsar Convention on Wetlands promotes wetland inventory as a tool for identifying the functions and values of wetlands, including ecological, social and cultural values. Finlayson & van der Valk (1995) also emphasize the value of wetland inventory for establishing a baseline for measuring future change in wetlands, for identifying their functions and services, for locating where wetlands are and which of these are the priority sites for conservation. Wetland inventory is also required for planning and managing wetlands at both practical and/or political levels and to enable comparisons between wetlands and management procedures to be made at different levels of government (local, national and international). In short, wetland inventory is not an end in itself, but rather an essential step in the decision-making process affecting land use, the conservation of natural resources and water allocation.

At the 2<sup>nd</sup> International Conference on Wetlands and Development (Dakar, Senegal, 10-14 November 1998), a workshop was held to review past and current projects, and to develop recommendations for further implementation of wetland inventory, assessment and monitoring (see Finlayson *et al.* 2001). Box 1 summarises some of the conclusions of this workshop. It was noted that the importance of wetland inventory and the need for standardised approaches has been called for at various international forums. Finlayson and Davidson (2001) summarized recommendations of some of the major conferences in the past 10 years for improved wetland inventory. The relevant conferences are listed below.

- Managing Waterfowl Populations (Matthews 1990) - IWRB, Astrakhan Russia (former USSR), 2-5 October 1989
- Managing Mediterranean wetlands and their birds for year 2000 and beyond (Finlayson *et al.* 1992) - IWRB, Grado, Italy, 3-10 February 1991

- Old world and new world wetlands (Mitsch 1994) - Intecol Wetland Conference, Columbus, USA, Sept 1992
- Waterfowl and Wetland Conservation in the 1990s - A global perspective (Moser et al 1993) - IWRB, St Petersburg Beach, Florida, USA, 12-19 November 1992
- International Conference on Wetlands and Development (Prentice & Jaench 1997) - Wetlands International, Kuala Lumpur, Malaysia 9-13 October 1995
- International Conference on Wetlands and Development (Finlayson et al 2001), Dakar, Senegal, 8-14 November 1998

Although there were numerous recommendations that arose from the conferences above, Finlayson and Davidson (2001) clearly stated there is little evidence that these have been widely implemented. They further noted that the development of methods for the MedWet Mediterranean wetland programme (Tomas Vives 1996) has contributed significantly to standardising techniques etc.

The Global Review of Wetland Resources and Priorities for Wetland Inventory (GRoWI) (Finlayson and Spiers 1999) was commissioned by the Ramsar Convention to assess the current global situation and need for wetland inventory. This can be seen as the first attempt to review gaps and means to audit existing effort and to provide further guidance on standardisation of techniques. GRoWI showed that the existing wetland inventory base was inadequate for assessing the distribution and different types of wetlands, the extent of likely impacts and vulnerability, the role of wetlands in climate change and the loss of wetland related economic and ecological values (Finlayson & Spiers 1999). The outcomes of this review led to renewed calls for standardisation of wetland inventory procedures whilst recognising the many purposes of inventory. This was formalized in resolution VII.20 from the 7<sup>th</sup> Meeting of the Conference of Contracting Parties of the Ramsar Convention. The Asian Wetland Inventory is one response to this call.

**Box 1: Conclusions about wetland inventory at the global level during the workshop at the 2<sup>nd</sup> International Conference on Wetlands and Development (Dakar, Senegal 1998) (Finlayson et al. 2001).**

1. There is extensive past, current and planned wetland inventory activity worldwide, but for global purposes the state of wetland inventory is best described as a dismal situation, with information particularly poor in Oceania, South and Central America, Africa, Asia and eastern Europe (although there are notable exceptions in these regions).
2. The coverage of most inventories is restricted (e.g. to only some wetland types, or to important sites only): comprehensive wetland inventory exists for very few countries. Some wetland habitats are particularly poorly covered by existing inventories.
3. As well as the global lack of basic comprehensive national wetland inventory information, wetland loss and degradation has not been adequately assessed, and information on economic values of wetlands has seldom been collected (and where it has is usually inadequate).
4. The purpose and use of wetland inventory activities is often unclear, and leads to over-ambitious and time-consuming wetland inventory programmes that lack focus and that have seldom produced the information required for management purposes.
5. Much of the wetland inventory information collected to date has been largely descriptive, and/or stored forms which cannot easily be manipulated to provide answers to fundamental questions such as the spatial extent of wetlands and how many wetlands exist.
6. Presentation of inventory data is often poor, and essential information such as the context, aims and objectives, dates, and methods are frequently omitted from inventory documentation and other outputs.
7. There are many different wetland inventory methodologies and techniques in use: a widely accepted basic standardised approach and standardised methodologies is not available. This creates difficulty in comparing information across national and international scales and limits global assessment of wetland extent, status, trends and management.
8. Some standard regional methodologies, notably that developed by MedWet for the Mediterranean region, are available and the MedWet tools are already being adapted for use in other parts of the world - there is good potential for further development of standards derived from MedWet and other available tools.
9. Complex wetland inventory data collection methods (such as information derived from satellite imagery and airborne video techniques) are increasingly frequently utilised, but are not always properly targeted, or used effectively.
10. Insufficient use of allied sources of information (e.g. waterbird, fisheries, water quality and agricultural information bases; and local peoples' information and knowledge) is made in most wetland inventory.

11. Dissemination of wetland inventory data is often very limited, with poor or restricted access, so that it is not readily accessible to those involved in the decision making process: improved access to data management tools, and the establishment of 'clearing house' mechanisms for wetland management information is needed.
12. Although wetland inventory is an essential prerequisite for wetland management, the methods used for most existing inventories will not, if repeated over time, yield monitoring information, since they do not collect the data elements necessary for monitoring.

### **The Asian Wetland Inventory**

The overall goal of the **AWI** is to establish a standardized, systematic and regionally applicable approach to and mechanism for an inventory of wetlands as a basis for sound planning, wise-use, sustainable management and monitoring of wetlands.

As in all wetland conservation and management programmes, the need for an integrated approach has been identified as being absolutely critical for the **AWI**. Since its advent in 1999 (with financial assistance from the Ministry of Environment Japan), the **AWI** has evolved into a regional conservation and development programme. The objectives of the AWI project are to provide an Asia-wide standard methodology for wetland inventory. Some of the main outcomes to be achieved through the AWI include:

- 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) integrated 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 techniques and skills required for implementation of the AWI at national and local level.
- Established national inventory programmes and databases in all participating nations.
- Established network of regional training programmes in wetland inventory
- A monitoring programme for regular revision and updating information on wetlands of national and international importance in Asia.

In terms of geographic coverage, the countries/territories that will be included within "Asia" will include those countries covered in the *Directory of Asian Wetlands* as well as those in Central Asia, Russia eastwards of the Ural Mountains and any countries/territories that fall within a contiguous geographical region (river basins and major islands). Thus, "Asia" is taken to include part or all of the following countries: - Russia (eastwards of the Urals), Japan, P.D.R of Korea, Republic of Korea, Mongolia, China, the Philippines, Vietnam, Cambodia, Lao P. D. R., Thailand, Malaysia, Singapore, Brunei, Indonesia (including West Papua), East Timor, Myanmar, Bangladesh, Bhutan, Nepal, India, Sri Lanka, Maldives, Khazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Afghanistan, Pakistan, Iran. It also includes some of those countries in western Asia, including Iraq, Saudi Arabia, Oman, Qatar, Kuwait, Bharain, UAE (United Arab Emirates), Yemen Arab Republic, Yemen, Azerbaijan, Armenia.

### **The AWI Methodology**

A principal purpose of the AWI is to delineate and map the wetland resources of Asia, taking into account wetland habitats from the intertidal zone to the uppermost reaches of all major river basins, and to store this information on a GIS (Finlayson *et al.* 2002b). This exercise is to be undertaken 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. The first two levels will provide the contextual basis for the inventory and provide the framework for further detailed wetland inventory and assessment. The third level will provide more information on core data attributes of wetland complexes and larger sites, while the fourth level will provide more information at the site/ habitat level. The hierarchy proposed is presented below (and illustrated in Figure 1).

- Level 1: Geographic regions with a map at a scale of 1:5 000 000 to 1:1 000 000

A broad-based geographical regionalisation of Asia developed on the basis of river basins. Region wide assessments of geology, land cover and climate will be included.

- Level 2: Wetland regions with maps at a scale of 1:1 000 000 to 1: 250 000

A broad, map-based, geographic inventory for each subregion of the identified river basin. On the assumption that wetlands within each subregion will share common characteristics, such as underlying geology, climate and rainfall, this will provide the baseline in which similar wetlands or "complexes" can be identified and categorised.

- Level 3: Wetland complexes with maps at a scale of 1:250 000 to 1:50 000

A detailed inventory of specific wetland "complexes" identified within each subregion. As each wetland complex will exhibit different hydrological features, such as rainfall, water flow, regulation and seasonality of inundation, similar information will be collected for all wetlands within a complex.

- Level 4: Wetland habitats with maps at a scale of 1:50 000 to 1:25 000

A site specific wetland inventory designed to identify all discrete wetland areas within each complex. Wherever possible, map-based representations will be compiled. Detailed information on each wetland will include ecological units (habitats and biodiversity usage), threats, conservation status, human uses and criteria fulfilled under Conventions.

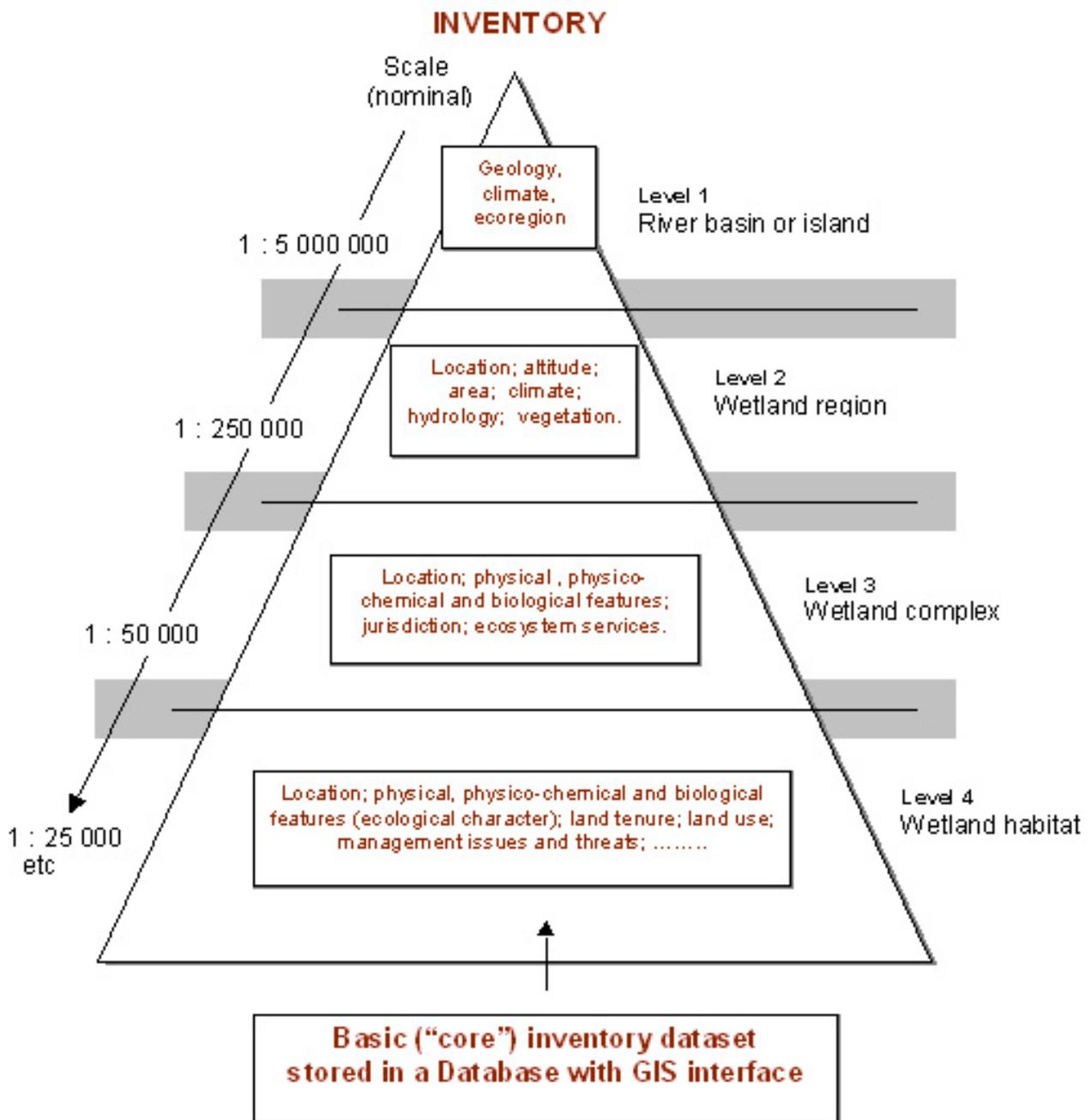


Figure 1: The hierarchical map-based approach used in the Asian Wetland Inventory

### **The Asian Wetland Inventory as a multiple stakeholder tool**

Reliable information acquired through wetland inventory will enable further assessment and monitoring of wetlands. In the realm of conservation and development, there exist a range of stakeholders with varying level of interest in the information that is required for the wise use and management of wetland resources. For example, the information requirements for wetland management and policy development may differ depending on the remit of the organisations involved. The interest of international organisations and conventions will also differ significantly from site management authorities. Some of the key stakeholders identified for the AWI are listed below.

#### 1. Conventions, organisations and initiatives operating at a global scale

- a. The Ramsar Convention on Wetlands has recognised wetland inventory is a tool for identifying the function and values of wetlands, including ecological, social and cultural values. It is required for establishing a baseline for measuring future change in wetlands, for identifying their functions and values; for locating where wetlands are, and which are the priority sites for conservation. This has been discussed earlier and formalized through various recommendations and resolutions (namely Resolution VII.20). Information from the AWI will also assist the Convention in providing more accurate and reliable estimates of the status overviews of wetlands.
- b. The United Nations Framework Convention on Climate Change (UNFCCC) - Wetland inventory can be an important tool to assess the extent of likely impacts and vulnerability of ecosystems to climate changes, evaluate the role of different wetland types in global cycles (e.g. tropical forested peat lands and the vast seasonally inundated savanna plains of Africa, Australia, Asia and South America); and appraise future losses of socio-economic and ecological values on humans and biodiversity.
- c. Other organizations and global initiatives operating at the global scale that could benefit from the AWI include other environmental conventions, International Development Agencies, the Millennium Ecosystem Assessment (MA), Global International Waters Assessment (GIWA), Man and Biosphere Programme (MaB), Global Peatland Initiative (GPI), Asian Waterfowl Census (AWC) and the Migratory Waterbird Conservation Strategy (MWCS).

#### 2. Organisations and initiatives operating at a regional scale

At the regional level stakeholders that could benefit from the AWI include supra-national organisations concerned with trans-boundary wetland management issues. In Asia an example is the Mekong River Commission (MRC) that is currently looking at conservation and development activities/initiatives in the Mekong region. The AWI is particularly useful given the river basin/ catchment approach that it adopts in undertaking wetland inventory. Whilst wetland inventory in the Mekong basin may be carried out by individual national authorities we anticipate that the information will be useful at a basin-wide scale for further natural resource management.

One of the major environmental issues currently affecting Asia, particularly Southeast Asia is the occurrence of haze resulting from forest fires, including peatlands. The Association of Southeast Asian Nations (ASEAN) is attempting to address this regional problem through implementation of a Regional Haze Action Plan (RHAP). Through the utilisation of remote sensing, the AWI could function as an effective tool for the inventory of peatlands. This would provide useful information for assessment and monitoring activities that is crucial for wetland management purposes.

#### 3. Organisations and initiatives operating at the national level

At the national level, relevant stakeholders will include identified government agencies responsible for wetland conservation and management, research institutions and non-governmental organisations. The AWI provides a framework for planning and implementing national wetland inventories. Some nations currently host national wetland databases (e.g. Indonesia). The AWI process promotes data collection in a standardised approach. In addition to facilitating the collection of new information (referred to as core data), the AWI will capitalise on existing information that provides the core data for the inventory. The AWI will also function as a stimulus in establishing standardised national wetland databases.

#### 4. Organisations and initiatives operating at the site level.

Stakeholders at the wetland site level include district planning authorities, site management bodies and local people who are directly or indirectly associated with the wetland site. Wetlands provide numerous goods and services (see Table 1), both tangible and intangible. These are not only of local importance, but many goods and services of wetlands are of regional and global significance as well. Level 3 and 4 of the manual will provide standard guidance for inventory at the site level. Based on the information obtained through site level wetland inventory, further assessment and monitoring activities will contribute to sound management of wetlands.

Table 1: Goods and services derived from wetlands

<b>Goods and services</b>	<b>Influence</b>
Climate change mitigation – through regulation of global carbon cycles.	Regional and global
Freshwater supplies – through groundwater / aquifer recharge.	Local and regional
Freshwater supplies & drought relief – through water storage and streamflow regulation.	Local and regional
Means of water transport .	Local and regional
Toxicant removal, water quality improvement & agricultural production – through sediment accretion.	Local and regional
Erosion control, storm protection & coastal defence – through shoreline / bank stabilisation.	Local and regional
Flood peak reduction & erosion control – through flood attenuation.	Local and regional
Water quality improvement – through denitrification, pathogen removal and waste assimilation.	Local and regional
Agricultural (crop) production & pasture production – through impeding drainage of soil.	Local
Energy requirements – through peat formation.	Local
Biological diversity – through food chain support.	Local, regional and global.
Harvestable resources (eg fisheries; timber; reeds etc); recreational opportunities (ecotourism); educational opportunities (life sciences) & cultural values – through habitat creation and food chain support.	Local

#### **Conclusion :**

The AWI is a positive response to the various calls for wetland inventory in particular the Convention on Wetlands. The benefits are not only local or regional but global. Stakeholders have much to benefit will play an important role in ensuring the success of this effort. Therefore, the need for active government participation and inter-governmental cooperation is vital to ensure the success of this initiative.

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