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Wetland Management and Monitoring: Adequacy of Ramsar information sheets for detecting change in ecological character

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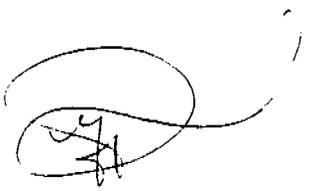
supervising scientist

Declaration

All work presented in this thesis is my own, unless otherwise indicated.



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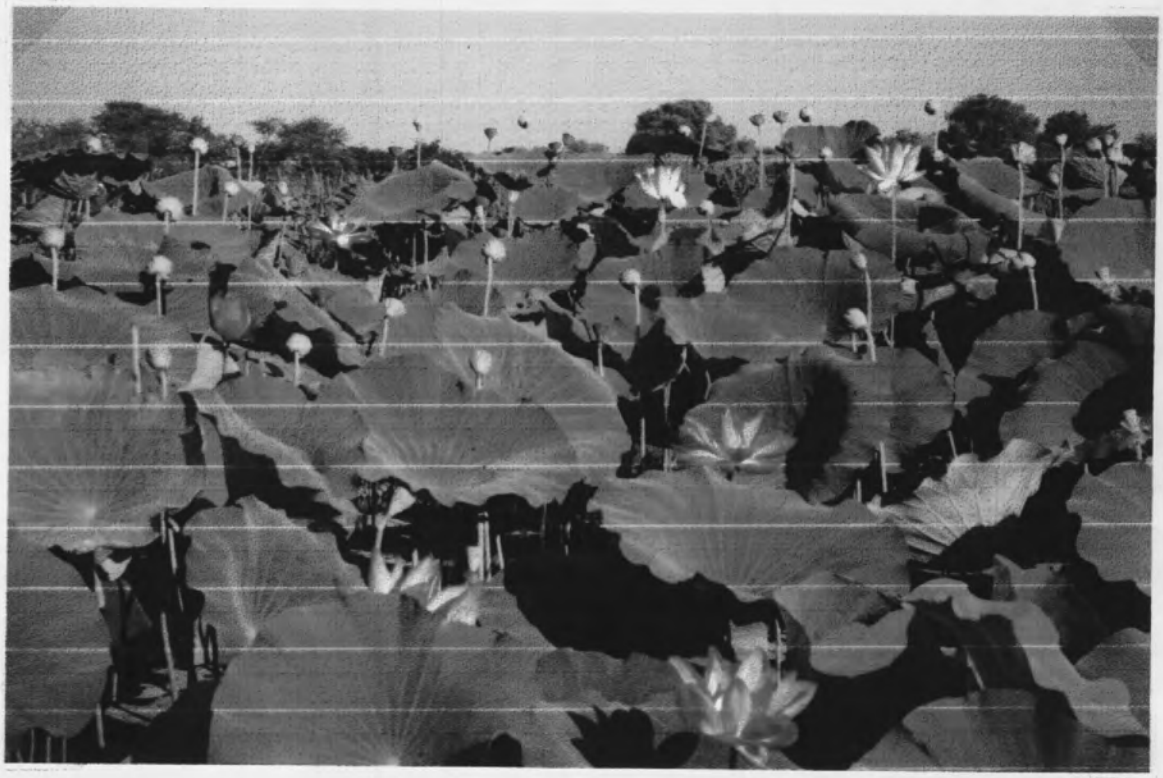
Wetland Management and Monitoring:

Adequacy of Ramsar Information Sheets for Detecting Change in Ecological Character



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Abstract

Selected Ramsar Information Sheets (RIS's) were examined to determine their adequacy for detecting changes in ecological character. Twenty nine RIS's were selected by Wetlands International for being the most complete and also to represent the seven Ramsar regions.

A semi-quantitative matrix was developed to examine whether the RIS's met the purpose for which they were initially designed. That is, whether they provided information on, and fulfilled criteria by which a wetland is considered internationally important. This information also provided a description of the wetland's ecological character. It was concluded that RIS's did provide a good general description of a wetland site, that is they appeared to fulfill the purpose for which they were designed.

Four additional matrices were compiled to examine whether the RIS's provided sufficient information for detecting changes in ecological character. The first two matrices recorded the values and threats occurring at each wetland. This information describes the individual components of ecological character, and indicates whether or not the 'processes' and 'functions' components of ecological character are adequately described.

The final two matrices were used to examine whether the selected RIS's supplied information on baseline data and monitoring for the values and threats listed. They indicated that, in general, information on baselines and monitoring was poorly addressed. In addition, baseline data was mainly qualitative with a few RIS's also supplying limited quantitative information. Future RIS's need to include the following if they are also to provide information on ecological change:

- sufficient parameters to describe baselines for individual values and threats;
- important details on parameters including: when the information was recorded (i.e. date, time, season); the location of the information recorded; the equipment utilized; who recorded the information; and for what purpose;
- a description of seasonal and natural variation in key baseline parameters;
- information on 'processes' and 'functions'; and
- a clear linkage of baseline information with values and threats to ensure that appropriate information is recorded.

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Acronyms

ERISS	Environmental Research Institute of the Supervising Scientist
RIS	Ramsar Information Sheet
IWRB	Wetlands International (formerly known as international Waterfowl and Wetlands Research Bureau)

1. Introduction

1.1 Objective

The primary objective of this project was to assess the usefulness of the Ramsar Information Sheet (RIS) as a means of providing a baseline or reference against which a change in ecological character of a wetland can be assessed. The RIS is a standardised document for recording Ramsar wetland data. This document is used in designating wetlands for inclusion on the 'Ramsar List of Wetlands of International Importance' (Article 2.1 of the Convention). The designation of at least one such wetland is necessary for a country's membership to the Ramsar Convention.

1.2 Aims and Scope of the Research

The following aims were necessary to achieve the primary objective of this project:

- to determine whether the RIS met the purpose for which it was initially designed. That is to describe Ramsar sites and provide criteria by which wetlands are considered internationally important.
- to list and examine the information supplied in the RIS in regard to threats and values of each wetland;
- to assess whether or not the threats will adversely affect the uses and/or ecological values of the wetland;
- to ascertain details of any existing monitoring programs which address the values and threats listed at each wetland; and
- to analyse whether the site description provides sufficient information to describe either a baseline or reference condition for the wetland in relation to values and threats.

And, from this information,

- to assess the adequacy of RIS for providing the baseline/reference information against which a change in ecological character can be determined.

A knowledge base of information relating to the Ramsar Convention was initially developed from extensive library, electronic and World Wide Web database searches. Further information relating to ecological character resulted from the analysis of twenty nine RIS's. Theses were selected for both their completeness, and in order to represent a number of sites from each of the seven Ramsar regions.

The first analysis in this document, described in section two, is concerned with determining whether the RIS meets the purpose for which it was initially designed, (i.e. to describe Ramsar sites and provide criteria by which a wetland is considered internationally important). This was achieved by comparing the information categories contained within the RIS against the guidelines and explanatory notes using a semi-quantitative matrix analysis.

Contracting Parties to the Ramsar Convention are required to list at least one wetland as internationally important and to maintain the ecological character of the listed wetland. The second analysis, described in section three of this document, explores the adequacy of the RIS guidelines in displaying and determining changes in ecological character. This is achieved through the use of four, two-dimensional matrices which list key components of ecological character including values and the threats at each wetland. The matrix analysis provides a means of assessing whether the RIS can be used to detect a change in ecological character. This is achieved by providing information on monitoring and baseline data for each of the values and threats at the selected wetlands. The information obtained should assist the better management of Ramsar wetlands, particularly with respect to the development of monitoring guidelines.

1.3 The Ramsar Convention

The Convention on Wetlands of International Importance especially as Waterfowl Habitat is more commonly known as the Ramsar Convention. It was named after the small Iranian town where the initial meeting of the Convention was held in 1971. Currently, the Convention has signatories from over one hundred different nations of the world, and over eight hundred wetland sites are included on the Ramsar List of Wetlands of International Importance (James, 1996; Davis, 1994; Matthews, 1993; Stone, 1996; James & Phillips, 1995).

The Ramsar Convention provided one of the first modern instruments for the conservation of wetlands on a global scale. It is defined in the Ramsar Convention Manual (Davis 1994, p1), as, "the intergovernmental treaty which provides the framework for international cooperation for the conservation and wise use of wetland biomes".

Initial concerns for the conservation of wetlands resulted from declining waterfowl populations in Europe and North America in the 1960's as a product of excessive hunting activities. Further investigation into the diminishing waterfowl numbers also discovered the impact humans were having on the entire ecology of wetlands through drainage, pollution and unsuitable land use. As a result the Ramsar goals evolved to encompass the protection of the entire wetland ecosystem (Matthews, 1993; Davis, 1994; James & Phillips, 1995).

Wetlands are one of the most threatened habitats in the world. This is largely due to their importance, in general, being poorly documented and understood. Historically, wetlands were considered to be unsightly wastelands that encouraged the breeding of pests, parasites and diseases, resulting in them having little value to society. As such they have often been used as dumping grounds for pollutants and are considered unproductive unless drained and used for agriculture. As a result of this, wetlands in developed countries have disappeared, leading to the loss of groundwater reserves, shoreline erosion and a loss of many useful plants and animals (Matthews, 1993; Kingsford, 1997).

The main concerns for the establishment of the Ramsar Convention related to the protection and conservation of wetlands and their resources, as well as the need to develop international agreements to achieve successful protection and

conservation. International agreement between Contracting Parties is particularly important when considering migratory flyways of birds, catchment areas extending into the boundaries of neighbouring countries, and the different breeding grounds that might be required for the lifecycles of fish and other organisms (Stone, 1996; Davis, 1994).

Why wetlands are important

Wetlands are one of the most productive environments in the world providing a large range of benefits not only to the plants and animals that inhabit them but also to the health, safety and welfare of people who live in or adjacent to them. The conservation of wetland ecosystems and the protection of wetland habitats, wildlife and endangered species is necessary to protect their related functions, values and attributes. This is vital for maintaining ecological processes for future generations as well as to conserve the migration and breeding grounds contained within the wetland habitats. (Mitsch & Gosselink, 1986; Matthews, 1993; Davis, 1994).

Many important functions are provided by wetlands, including:

- water storage;
- storm protection and flood mitigation;
- shoreline stabilization and erosion control;
- groundwater recharge - the movement of water from the wetland down into the underground aquifer;
- water purification, retention of nutrients and retention of sediments;
- retention of pollutants, and
- stabilization of local climatic conditions, particularly rainfall and temperature (Davis, 1994).

In addition to the above, wetlands also assist in providing economic benefits to different people in different ways, including;

- fisheries;
- agriculture;
- timber production;
- wildlife resource;
- transport; and
- recreation and tourism opportunities (Davis, 1994).

Wetlands are also important for supporting the biodiversity of many plants and animals unique to these environments, as well as for maintaining cultural heritage and local traditions (Matthews, 1993; Davis, 1994).

How the Ramsar Convention functions

The day to day administration of the Convention activities is carried out by a permanent secretariat referred to as the Convention Bureau, whose headquarters are located in Gland, Switzerland. A work outline and business plan is prepared each year to address the general programmes approved at the Conference of Contracting Parties for that triennium (Matthews, 1993; Davis, 1994).

Every three years representatives of the member states meet at the Conference of the Contracting Parties to review, promote and implement the Convention. The Conference provides a forum for discussion and allows the presentation of workshops, overview of papers, abstracts, and national reports. To facilitate the way in which the Convention works, decisions are adopted in the form of Resolutions and Recommendations. Resolutions include decisions relating to the operation of the internal functioning of the Convention, while Recommendations are expressions by the Conference to the Contracting Parties, other States, or organizations to see certain actions carried out (Matthews, 1993; Davis, 1994).

The Contracting Parties of the Ramsar Convention have adopted many mechanisms through the Resolutions and Recommendations made at subsequent Conferences. These are used to interpret and improve the implementation of the Convention (Kingsford, 1997). Those mechanisms considered to be important in the implementation of the Ramsar Information Sheets (RIS) include: criteria and guidelines for identifying wetlands of international importance; the global classification system of wetland types; and the guidelines for wise water use. A brief discussion of these key documents follows.

1.3.1 Criteria for identifying wetlands of international importance

The Convention text requires Contracting Parties to designate at least one wetland within its territory to the 'List of Wetlands of International Importance' upon joining the Convention. The Convention text (Article 2.2) goes on to further state that wetlands should be selected for their, "international significance in terms of ecology,

botany, zoology, limnology or hydrology" (Davis 1994, p46). The criteria for identification of wetlands and the guidelines for their application were developed to assist the Contracting Parties in assessing the suitability of wetlands for inclusion on the list (Davis 1994; Ramsar Convention Bureau, 1996a).

The criteria originated from a Conference organized by Wetlands International (IWRB) at Heiligenhafen, Germany in 1974 (Matthews, 1993; Smart, 1974). Further development and refinement of the criteria and guidelines resulted from resolutions of subsequent meetings of the Contracting Parties at Sardinia in 1980, Canada in 1987, Switzerland in 1990, and Australia in 1996 (Matthews, 1993; Davis, 1994; Ramsar Convention Bureau, 1996a).

Currently, for a wetland to be identified as being of international importance it must meet at least one of the following:

1. Criteria for representative or unique wetlands;
2. General criteria based on plants or animals;
3. Specific criteria based on waterfowl; and
4. Specific criteria based on fish (Ramsar Convention Bureau, 1996a).

1.3.2 Classification system for wetland type

The Convention text (Article 1.1) broadly defines wetlands as, "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 " (Davis 1994, p3).

Additional information on the description of wetlands is provided in Article 2.1 of the Convention, which states that a wetland "may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands" (Davis 1994, p3). This allows wide coverage of a variety of habitat types to be incorporated into the Convention (Ramsar Convention Bureau, 1994).

A coded system was developed by the Bureau as a more appropriate means of recording wetland type on the RIS. This allows the rapid identification of wetland habitats represented at each site. The Montreax Convention of 1990, approved Recommendation C.4.7 that provides a broad framework of wetland types under the following three main headings: Marine/Coastal, Inland Wetlands, and "Man-Made" wetlands. For larger sites this enables the recording of a variety of habitats within

them, so as to provide a better understanding of the processes that might be taking place (Ramsar Convention Bureau, 1990a)

1.3.3 Guidelines for the implementation of wise use of water

The Convention text (Article 3.1) requires Contracting Parties to formulate and implement their planning to promote the wise use of wetlands in their region. A workshop on the wise use of wetlands was established at the third meeting of the Contracting Parties at Regina, Canada in 1987. After extensive debate a definition of 'wise use' and a set of guidelines for its implementation were developed and adopted under Recommendation C.3.3 (Ramsar Convention Bureau, 1987; Davis, 1994; Davis, 1993).

The definition for the "wise use" of wetlands:

> "is their sustainable utilization for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem" (Davis 1994, p61).

The term 'sustainable utilization' of a wetland is further defined as:

> "Human use of a wetland so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations" (Davis 1994, p61).

'Natural properties of the ecosystem' are further defined as:

> "Those physical, chemical and biological components, such as soil, water, plants, animals and nutrients, and the interactions between them" (Davis 1994, p61).

In this way the definition defines conservation in terms of the management of biospheres for human use rather than saving wetlands for the conservation of plants and other animals. This provides an economic argument to deter governments, especially those in developing countries, from degrading or draining wetlands (Matthews, 1993; Davis, 1993).

The guidelines also provide five groups of action for the establishment of comprehensive national wetland policies. The following gives a brief overview of these actions:

1. improvement of institutional and organizational arrangements to facilitate a coordinated approach on a national scale;
2. addressing aspects of legislation and government policies including mechanisms to assist in the implementation of wise use practices;
3. increasing the knowledge and awareness of wetlands through inventories, monitoring, research, training and education;
4. to review, in a national context, the priorities of every wetland site; and
5. address the problems at particular sites with regard to ecological aspects, human activities and management plans (Matthews, 1993; Smart & Canters, 1991; Davis, 1993).

1.4 The Ramsar Information Sheet (RIS)

The Ramsar Information Sheet (RIS) was designed to provide a standardized format for recording Ramsar site data and to provide criteria by which a wetland is considered internationally important. Contracting Parties that designate wetlands for the 'List of Wetlands of International Importance' are expected to complete an RIS and provide a site map so that information may be recorded on the Ramsar database (Davis, 1994; Ramsar Convention Bureau, 1990b).

The RIS resulted from Recommendation C.4.7 of the Montreux Convention, Switzerland in 1990, and also provided explanatory notes and guidelines to assist Contracting Parties in completing the data sheets. Furthermore, Resolution C.5.3 of the Kushiro Conference, Japan in 1993, reaffirmed the requirement of an RIS and site map to be completed once a wetland is designated to the Ramsar List (Davis, 1994; Ramsar Convention Bureau, 1993, Ramsar Convention Bureau, 1990c). The explanatory notes and guidelines were further updated in 1996, at the Brisbane

Convention in Australia to provide additional details on the following:

- a working definition for ecological character and change in ecological character;
- guidelines for describing and maintaining the ecological character at Ramsar sites;
- improvements to guidelines for the RIS;
- a framework for designing an effective wetland monitoring programme; and
- guidelines for implementing the Montreux Record (Ramsar Convention Bureau, 1996b; Ramsar Convention Bureau, 1996c).

The database for storing the RIS information was established in 1990, and is maintained by the Convention's partner organisation, Wetlands International, in the Netherlands. It enables the list to be easily maintained and updated and facilitates a rapid response to inquiries. It also provides essential data on national inventories of wetlands. Once an RIS has been designated to the list it is allocated a code for easy identification.This comprises of: the number of the Ramsar region it belongs to, followed by the first few letters of the country name, and it ends with a numbering sequence as shown in Table 2 (Davis, 1994; Matthews, 1993).

As shown in Table 4 the RIS is comprised of thirty categories, commencing with general information on the wetlands name, area, and location, followed by more detailed information concerning conservation measures, threats, disturbances, and values. The explanatory notes and guidelines alert the Contracting Parties to the type and amount of information required for each of the categories, and, where necessary, the required units. Additional and more detailed information referred to in the guidelines includes documentation on: the criteria for identifying wetlands of international importance; the classification system for wetland type; and guidelines for the implementation of the wise use of water (Davis, 1994; Davis (ed.), 1993; Ramsar Convention Bureau, 1990b).

The information on the data sheets is required to be updated through national reports at the triennial meetings of the Conference. As some of the Contracting Parties may not have the resources or data required to complete the RIS they are requested to pay particular attention to the sections on conservation measures, functions and values, and criteria for designation (Davis, 1994; Ramsar Convention Bureau 1990b).

1.5 Ecological Character

The requirement of Article 3.2 of the Ramsar text, requests Contracting Parties to inform the Convention at the earliest possible time if the ecological character of a wetland on the List has changed, is changing, or is likely to change as a result of human interference. The 'Montreux Record' was established in 1990 at Montreux, Switzerland to highlight wetland sites on the List, which displayed such change in ecological character (Davis, 1994; Ramsar Convention Bureau, 1996b & c; Ramsar Convention Bureau, 1990c).

Contracting Parties are required to conserve and protect their wetlands and to put into place remedial actions should a change in ecological character occur, especially when changes affect the characteristics for which they were selected as internationally important. Unfortunately, there were no mechanisms in place for Contracting Parties to identify what constituted ecological character and therefore a change in ecological character. The Conference at Kushiro, Japan in 1993, through Resolution C.5.2, emphasized the need for further studies into the complex Ramsar concepts of 'ecological character' and 'change in ecological character' to assist Contracting Parties in this matter (Ramsar Convention Bureau, 1993).

As a result, the Conference in Brisbane, Australia in 1996, produced an Annex to Resolution C.6.1 on ecological character, to assist Contracting Parties with the implementation of Article 3.2 of the Convention text. The Annex provided working definitions for ecological character and change in ecological character along with guidelines for describing and maintaining ecological character of listed sites. In addition, the Annex also provided guidelines for the operation of the Montreux Record. (Ramsar Convention Bureau, 1996b & c).

Ecological character is defined as:

> "the structure and inter-relationships between the biological, chemical, and physical components of the wetland. These derive from the interactions of individual processes, functions, attributes and values of the ecosystem(s) " (Ramsar Convention Bureau 1996c, p2).

The term 'change in ecological character' of a wetland is defined as

> "the impairment or imbalance in any of those processes and functions which maintain the wetland and its products, attributes and values" (Ramsar Convention Bureau 1996c, p2).

Descriptions of the individual components encompassing the attributes of ecological character taken from Resolution C.6.1 are outlined in Table 1 (Ramsar Convention Bureau, 1996b & c; Finlayson, 1996a).

Table 1. Definition of the individual components of ecological character.

ATTRIBUTES OF ECOLOGICAL CHARACTER	DEFINITION OF INDIVIDUAL ATTRIBUTES
Processes	Changes or reactions which occur naturally within a wetland ecosystem. These may be physical, chemical, or biological.
Functions	Activities or actions which occur naturally in wetlands as a product of the interactions between the ecosystem structure and processes e.g. flood water control; nutrient, sediment and contaminant retention; food web support; erosion controls; storm protection; and stabilization of local climatic conditions.
Values	The perceived benefits to society, either direct or indirect, that result from wetland functions. These values include human welfare, environmental quality and wildlife support.
Products	Generated by wetlands through interactions between the biological, chemical and physical components. These include: wildlife resources; fisheries; forest resources; forage resources; agricultural resources; and water supply.
Attributes	Features which may lead to certain uses or the derivation of particular products, but they may also have intrinsic, unquantifiable importance. These include biological diversity and unique cultural and heritage features.

The Annex to Resolution C.6.1 also provides minor modifications to the already existing guidelines and explanatory notes on the RIS. These modifications are designed to increase the value of information gathered in describing and assessing ecological character of listed sites. Therefore, they provide a basis by which a change in ecological character can be more readily recognized. In achieving this aim, point 2.1.9 of the Annex indicates that the guidelines should emphasize the importance of the following:

I. establishing a baseline by describing the functions, products and attributes of the site that gives it benefits and values of international importance. This is necessary because the existing Ramsar criteria do not cover the full range of wetland benefits and values which should be considered when assessing the possible impact of changes at a site;

II. providing information on human-induced factors that have affected or could significantly affect the benefits and values of international importance;

III. providing information on monitoring and survey methods in place (or planned) at the site; and,

IV. providing information on the natural variability and amplitude of seasonal and/or long-term "natural" changes (e.g. vegetation succession and episodic/catastrophic ecological events such as hurricanes) that have affected or could affect the ecological character of the site (Ramsar Convention Bureau, 1996b & c, Finlayson, 1996a).

2. RIS and Guideline Analysis

2.1 Introduction

The RIS were designed to provide a standardised format for the Contracting Parties to record site information and provide criteria by which wetlands are considered to be internationally important. A matrix analysis utilizing a subjective semi-quantitative scoring system was used to determine whether the RIS met the purpose for which they were originally designed and to examine the comprehensiveness and availability of the data.

2.2 Methods

2.2.1 Site selection

The analysis of RIS in this document does not seek to identify the response by Contracting Parties to using the RIS, rather, the analysis is related to the information contained within RIS. It is for this reason that sites were selected on the basis that they were good examples of an RIS which addressed the requirements of the current guidelines. This ensured that a representative sample of the data contained within the RIS was selected which may not have been achieved if a random selection of sites was undertaken.

Staff at the Convention's partner organization, Wetlands International, situated in the Netherlands, where the Ramsar database is maintained, assisted with the selection process. The RIS were selected not only for their completeness, but also to represent a number of sites from each of the seven Ramsar regions listed in Table 2.

A subjective analysis of the completeness of the data sheets was undertaken with those that appear to provide the most information being selected. Staff at Wetlands International in the Netherlands have advised that the following steps were followed for the selection process:

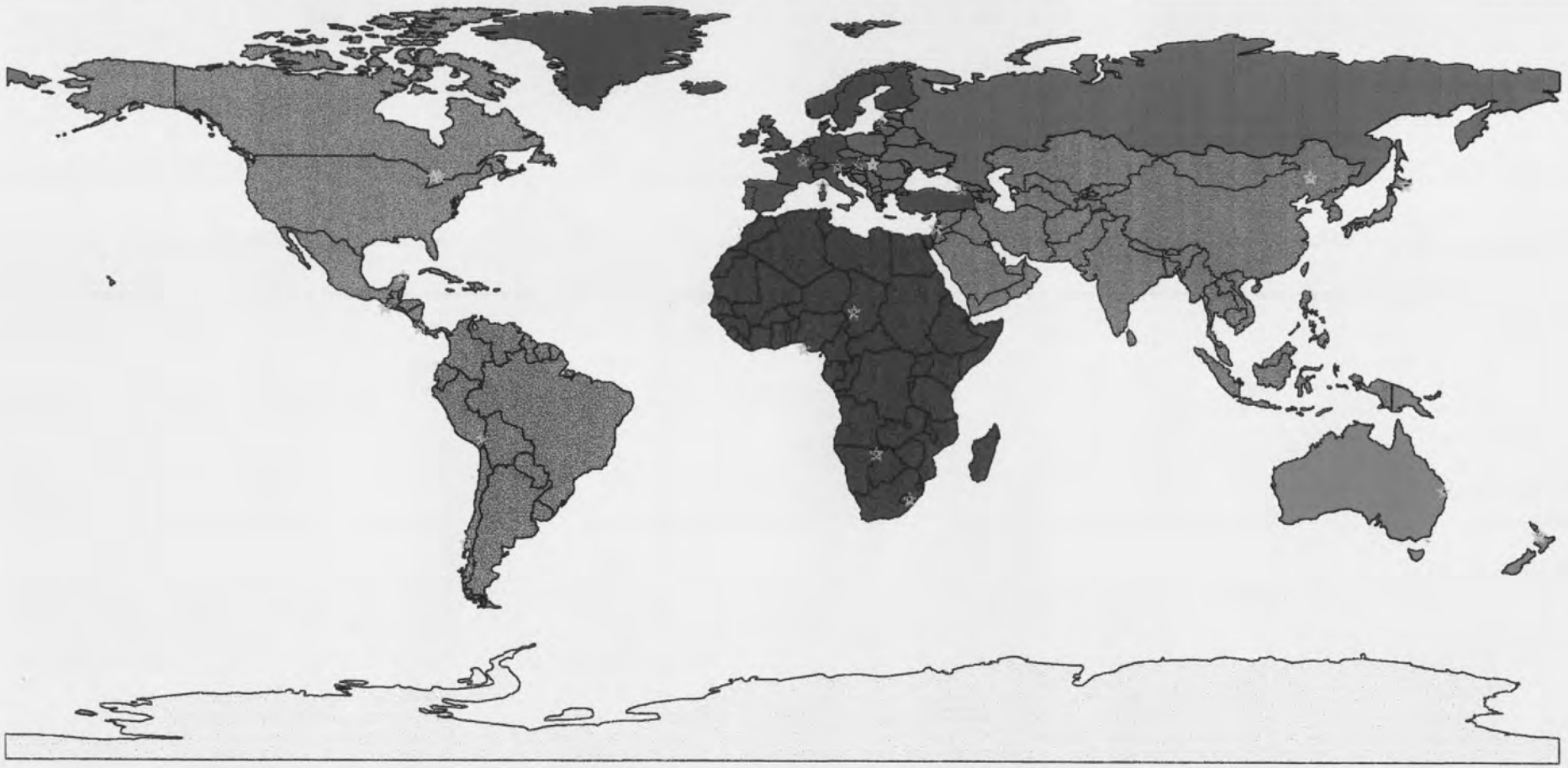
- records were selected for having data presented in the RIS format;
- the data set was filtered for RIS records supplying information on: criteria, wetland type, physical features, ecological features, land uses, threats, hydro-physical values, noteworthy fauna, noteworthy flora, and social/cultural values;

- this resulted in the production of a list entitled 'Prospective RIS Site Data for Testing Guidelines' giving details of the best RIS (Appendix 1);
- data sheets from these records were manually scanned for content volume e.g. all categories contained some written information, and those scoring the most highly in this regard were selected (unless there were other problems with parts of the data e.g. map was unavailable);
- these were listed for each region and country, and rated under the "initial assessment" column of the table entitled "RIS Assessment for Testing Ecological Character" (Appendix 2);
- initially manually selected sheets were re-scanned and a "final manual assessment" (see column of same name in Appendix 2) without a rating, was made. In some cases, RIS that were initially rated highly were discarded owing to some problem while others, less highly rated were selected.

This resulted in the selection of the twenty four RIS shown in Table 2 for analysis from the Ramsar database. Difficulties in translating the RIS for the Costa Rica site of Humedal Caribe Noreste resulted in it being excluded from the analysis. However, the example of an RIS and map in the Conventions manual comprising of a compilation of data from different sites was included in the analysis. In addition, the wetland site of Hortobagy in Hungary was large enough to warrant six individual RIS, bringing the total number of RIS for analysis to twenty nine. The wetland sites selected are represented on a global map in Figure 1, which also indicates the extent of the seven Ramsar regions.

Table 2 provides information on the country and name of each wetland site selected in addition to the site code assigned by the Bureau of the Ramsar Convention when a site is designated to the List.

Figure 1.0 Location of Ramsar wetland sites selected for this study



Ramsar Regions

- North America
- Neotropics
- Eastern Europe
- Africa
- Oceania
- Western Europe
- Asia
- N/A
- Selected Ramsar Wetland Sites

Table 2 Wetland sites included in the analysis of the Ramsar Information Sheets.

(For convenience the underlined section of the original site name will be used as an abbreviation throughout the document.)

REGION & COUNTRY	NAME OF SITE	SITE CODE
1. AFRICA		
BOTSWANA	Okavango Delta System	1BW001
COTE D'IVOIRE	Parc national d'Azagny	1CI001
SENEGAL	Delta du Saloum	1SE003
SOUTH AFRICA	Natal Drakensberg Park	1ZA013
2. ASIA		
CHINA	Xianghai	2CH001
ISRAEL	Hula Nature Reserve	2IL002
JAPAN	Kushiro-shitsugen	2JP001
3. EASTERN EUROPE		
HUNGARY	Hortobagy	3HU008
GEORGIA	Wetlands of Central Kolkheti	3GE001
LATVIA	Lake Engure	3LV001
SLOVAK REPUBLIC	Cicovske mrtve rameno	3SV003
4. NORTH AMERICA		
CANADA	Minesing Swamp	4CN034
CANADA	Matchedash Bay	4CN035
5. OCEANIA		
AUSTRALIA	Moreton Bay	5AU041
NEW ZEALAND	Whangamarino	5NZ003
NEW ZEALAND	Kopuatai Peat Dome	5NZ004
6. NEOTROPICS		
CHILE	Carlos Anwandter Sanctuary	6CL001
COSTA RICA	Humedal Caribe Noreste	6CS006
GUATEMALA	Manchon-Guamuchal	6GU002
PERU	Lago Titicaca (Peruvian sector)	6PE004
MEXICO	Ria Lagartos	6ME001
7. WESTERN EUROPE		
AUSTRIA	Rotmoos im Fuschertal	7AS008
FRANCE	Etangs de la Champagne humide	7FR002
FRANCE	Etang de Biguglia	7FR008

2.2.2 Semi - quantitative matrix analysis

A matrix analysis was undertaken for each RIS to determine whether it provided the relevant site data requested in the guidelines, along with the criteria, which identifies a wetland as internationally important. The left hand side of the matrix details the thirty information categories listed in the RIS with the reference number and abbreviated name of the individual wetlands being provided at the top of each column (Appendix 3).

A subjective semi-quantitative scoring system, presented in Table 3, was developed to closely follow the requirements set out in the "Information Sheet on Ramsar Wetlands (RIS): Explanatory Note and Guidelines" (Davis, 1994). This will be referred to in the scoring system as the RIS guidelines. These guidelines alert the Contracting Parties to the type and amount of information required for each of the categories, and, where necessary, the required units.

Additional and more detailed information referred to in the guidelines and utilized in this analysis includes: the criteria for identifying wetlands of international importance; classification system for wetland type; and guidelines for the implementation of the wise use of water (Ramsar Convention Bureau, 1990a; Ramsar Convention Bureau, 1996a; Davis, 1993l).

Table 3 The scoring system developed to determine whether the RIS's meet their original purpose.

SCORE	DESCRIPTION
5	Meets RIS guidelines.
4	Most of the RIS guidelines are addressed.
3	Some RIS guidelines are addressed.
2	General statement provided, but not in accordance with the RIS guidelines.
1	No information provided.

2.2.3 Manipulation of data

The completed data in Matrix 1 (Appendix 3) was then manipulated to demonstrate the percentage of overall compliance of each RIS to the guidelines. The results were then grouped into different percentage ranges as shown in Figure 2. The following formula applies:

$$\text{Overall compliance (\%)} = \frac{\text{Sum of values in each category for an individual RIS}}{\text{Max. score (5) x No. of categories (31)}} \times 100\ (\%)$$

In addition, the percentage compliance of the RIS to each individual category was also calculated. The results presented in Table 4 are approximate percentages resulting from the following formula.

$$\text{Compliance of RIS individual category (\%)} = \frac{\text{Sum of values of all the RIS for an individual category}}{\text{Max. score (5) x No. of RIS (29)}} \times 100\ (\%)$$

2.3 Results

The results of the semi-quantitative analysis of matrix one, presented in Figure 2, revealed that the twenty nine RIS selected for assessment adequately addressed the information provided in the guideline. The RIS are all within an eighty one to one hundred percent compliance range, with twenty three out of the twenty nine RIS being in the range of eighty six to ninety five percent compliance.

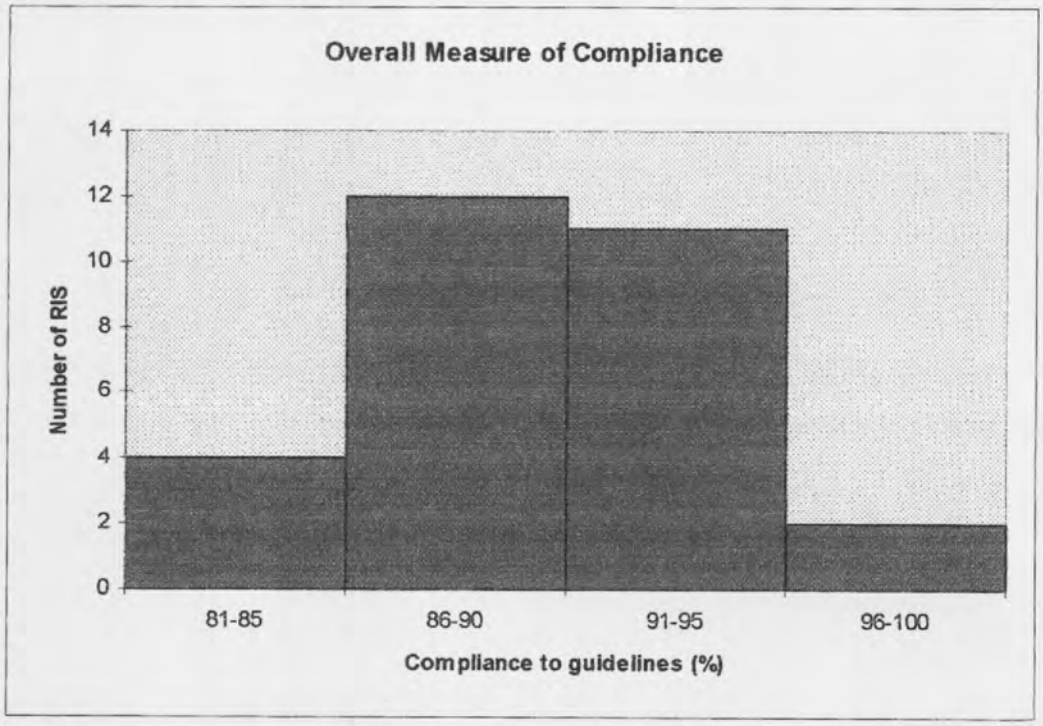


Figure 2 The number of RIS within different percentage ranges of overall compliance to the guidelines.

Further analysis revealed that the individual categories within the RIS also achieved a high level of compliance with the guidelines, ranging from sixty six percent to one hundred percent compliance (Table 4).

Table 4 indicates that twelve of the thirty one categories fell into the ninety six to one hundred percent compliance range. These included: country; date; reference number; name of wetland; area; altitude; land tenure/ownership of (a) site (b) surrounding area; current land use (a) site (b) surroundings/catchment; conservation measures taken; current scientific research and facilities; current conservation education; and management authority.

As shown by Table 4 the percentage compliance range which received the next highest number of categories was the eighty one to eighty five percent range, with seven categories. The following were included in this percentage range: name and address of compiler; wetland type; ecological features; disturbances and threats; hydrological and biophysical values; noteworthy flora; and bibliographical references.

The category to receive the lowest score of sixty six to seventy percent, was map of site (Table 4).

Table 4 Percentage of RIS's complying with requirements of the guidelines for each of the RIS categories.

COMPLIANCE %	CATEGORIES WITHIN THE RIS
66-70	• Map of site
71-75	• Date of Ramsar designation
76-80	• General location
81-85	• Name and address of compiler • Wetland type • Ecological features • Disturbances and threats • Hydrological and biophysical value • Noteworthy flora • Bibliographical references
86-90	• Physical features • Social and cultural values • Noteworthy fauna • Jurisdiction
91-95	• Geographical coordinates • Overview of site • Conservation measures proposed but not yet implemented • Current recreation tourism • Reasons for inclusion (criteria)
96-100	• Country • Date • Reference number • Name of wetland • Area • Altitude • Land tenure/ownership of (a) site (b) surrounding area • Current Land use (a) site (b) surroundings/catchment • Conservation measures taken • Current scientific research and facilities • Current conservation education • Management authority

2.4 Interpretation of Results

The RIS were designed to provide a standardised format for recording Ramsar site data and to provide criteria by which a wetland is considered internationally important. The results indicate, that, overall the RIS selected for this analysis adequately address the original guidelines of the Ramsar manual. In addition, a more detailed examination of the percentage compliance of each individual category contained within the RIS showed a broader level of compliance, ranging from sixty six percent to one hundred percent.

The categories scoring the highest level of compliance of ninety one to one hundred percent were often less subjective, requiring a more factual response than other categories. The language utilized in the guidelines for these categories is clear and concise often only providing one or two sentences to deliver an unambiguous message. It is apparent when examining the categories of: country, date, reference number, name of wetland, area, altitude, land tenure/ownership, and management authority that a factual response is required.

In general, other categories in the same compliance range, such as current scientific research and facilities, and current conservation education, were filled out well and received a high score. However, as the requested information requires the compiler to give a 'current' account of details in these categories, it is possible that no research, education or facilities are currently being conducted or are available. Therefore, a response such as, 'no educational programs are currently underway' (Kopuatai) or 'no research to date' (Matchedash) received similarly high scores to Manchon and Titicaca which gave detailed accounts of scientific research, educational programs and facilities at their wetland. This may have attributed to the high overall compliance of these categories.

There appears to be a general trend towards categories requiring more detailed information as the level of compliance reduces. In addition, the guidelines may require a subjective response, which can be difficult to quantify. Three of the categories, which scored between an eighty one and eighty five percent compliance, included: disturbances and threats; ecological features; and hydrological and biophysical values.

The guidelines for the category on disturbances and threats contained a substantial amount of material, commencing with a broad request of details regarding changes in land use and major development projects leading to more specific examples of what should be addressed such as drainage or siltation. The guidelines further request, where possible, the distinction between internal and external threats and information on exotic species and why they were introduced. This information does not appear to be as clear and concise as the guidelines provided for the categories scoring high levels of compliance. There are perhaps, too many requests for detailed information in this category, which make it confusing. Although much data is requested the type of responses required are often subjective. This allows the inclusion of threats which are considered to be important to the individual compiling the RIS, while other important threats may be omitted. An example of this occurs in the RIS for Wangamarino, which does not list the recreational activity of duck shooting to be a threat. This appears to contradict information in the noteworthy fauna category on endangered species, which states that the Brown Teal (*Anas aucklandica chlorotis*) is one of the five rarest ducks in the world and is endemic to the area. Shooting ducks in this area would result in the disruption of breeding habitat of this species and possibly death of individual ducks by hunters who are inexperienced at distinguishing between different duck species.

The category on ecological features required a brief description of the main habitats and vegetation types including dominant species and any zonation, seasonal variations and long-term changes. The RIS for Morton supplied two full pages of information for this category which, when examined closely, only provided a few sentences of relevant information covering only some of the guidelines requested. Although a number of RIS's for this category supplied information on most of the requirements in the guidelines, not many were successful in fulfilling all the requirements. The outcomes of this category may be attributed to the individual's lack of understanding of what was required when compiling the RIS. The compiler may have become confused by the use of unfamiliar terminology, especially where language barriers existed. In addition, the requested information may not exist or be readily available, especially in countries where resources are scarce, thus resulting in only a partial completion of the guideline requirements. It may also be possible that

the guidelines ask for details that are generically difficult to obtain, such as those related to long-term changes.

Similarly, the guidelines for hydrological and biophysical values provide a description and examples, which include: the recharge and discharge of groundwater, flood control, sediment trapping and maintenance of water quality. A number of RIS including Saloum and Hortobagy (3HU008d1), provided a general statement that was not in accordance with the guidelines. Saloum supplied information on a storm breaking a littoral strip, and Hortobagy (3HU008d1) indicated that micro-formations and soil development processes were significant areas for research. This information was not required for this category and does not adequately provide a description of the hydrological functions or biophysical values of the wetland as set out by the RIS guidelines. The poor responses to this category may have resulted from confusion regarding what information was actually required, especially if the guidelines do not follow a consistent pattern.

The lowest level of compliance (a score of sixty six to seventy percent) was achieved by the category requesting a map of the site. The information requested in the guidelines is detailed and extensive and includes: scale, date, geographical coordinates, a compass bearing, the boundary of the Ramsar site, topographical information, main roads and other notable features. Azagny and Saloum were the two maps to receive the lowest scores with the exception of Xianghai which did not supply a map. These maps were photocopies of a selected area taken from larger maps, which were designed for other purposes. Most of the requirements of the guidelines were missing and it was extremely difficult to ascertain any information from them. This was because basic descriptive information such as: a key for describing symbols, border of the wetland, and notable features were missing. The only RIS's which provided all the information required in the guidelines were Manchon, Kolkheti and the example. These maps appear to have been constructed for the sole purpose of providing information for the RIS's and therefore, clearly address all the requirements in the guidelines. They go further by also producing a map which is easy to read and is not crowded with information that is not required. Contracting Parties may not always have the required resources to provide a specific map to describe their wetland, however, the analysis indicates maps produced in this way provide information that is clearer and more informative.

The Ramsar Bureau recognizes that not all Contracting Parties will have the resources or data to complete an RIS and they are therefore requested to concentrate their efforts on the sections concerning conservation measures, function and values, and criteria for designation (Davis, 1994; Ramsar Convention Bureau 1990b). It is interesting to note that the RIS guidelines in the Convention's manual only request the code to be given for the criteria against which they are considered internationally important. The instructions are clear and give examples such as 1(a), 2(b), with information also being supplied on where to find the criteria. Although some RIS provide even more detail than was required such as Hula and Engure, others including Minesing and Okavango, have provided a paragraph on why the wetland should be included on the list but did not provide the requested codes. In addition, the RIS for Cicovske did not supply any details at all.

2.5 Conclusion

Overall, the RIS selected for evaluation, met the purpose for which they were originally designed. That is, they successfully provided a standardized format for recording Ramsar site data on the Ramsar database, and criteria by which a wetland is considered to be internationally important. As a consequence, the ecological character has also been described through the details provided in the criteria and other categories.

The examination of the compliance of individual categories indicates that those with the highest level of compliance are less subjective, require a factual response and deliver information in a clear and concise manner. The guidelines for the categories at the lower end of the compliance range tend to require information that is subjective and open to interpretation from the individual compilers. The guidelines for these categories may often require specific and detailed information to be recorded. This information may not be readily available, especially in countries that lack the appropriate resources to obtain the data in the first place. There could also be concerns regarding the ability of the compiler in comprehending the type of information required, especially if unfamiliar terminology is used or where language barriers exist.

Therefore, if the guidelines are to be utilized successfully they need to be written in such a way request that the information provided is in a clear and concise manner that is not ambiguous or confusing to the compiler.

A closer examination of the attributes that make up the components of ecological character (listed in Table 1) is described in section three of this study.