9th Meeting of the Conference of the Parties to the Convention on Wetlands (Ramsar, Iran, 1971)

"Wetlands and water: supporting life, sustaining livelihoods"

Kampala, Uganda, 8-15 November 2005

Ramsar COP9 DOC. 24
Information Paper
[English only]

Assessment tools contained within the Integrated Framework for Wetland Inventory, Assessment and Monitoring (IF-WIAM)

(see [COP9 DR1 Annex E])

1. This information paper has been prepared by Working Group 1 of the Scientific and Technical Review Panel (STRP) and the Secretariat to provide supporting information on wetland assessment for [COP9 DR1 Annex E] "An Integrated Framework for Wetland Inventory, Assessment and Monitoring (IF-WIAM)".

2. Each assessment tool currently included in the *Integrated Framework for Wetland Inventory, Assessment and Monitoring* is briefly described here, with standard headings and references for further information. These tools have variously been approved by previous decisions of the Conference of the Contracting Parties, are being considered for approval by Ramsar COP9, or in the case of detailed methodological guidance are being prepared by the STRP for publication as *Ramsar Technical Reports*.

3. The assessment tools are:

   A. Wetland Risk Assessment
   B. Environmental Impact Assessment (EIA)
   C. Strategic Environmental Assessment (SEA)
   D. Wetland Vulnerability Assessment (VA)
   E. Wetland Valuation
   F. Rapid Assessment of Biodiversity

A. Wetland Risk Assessment (derived from the Annex to Resolution VII.10)

Purpose

4. The Convention's Wetland Risk Assessment Framework provides a mechanism for predicting and assessing change in the ecological character of the sites included in the List of Wetlands of International Importance and other wetlands. It provides guidance on how

to predict and assess change in the ecological character of wetlands and promotes, in particular, the usefulness of early warning systems.

Description

5. The framework comprises a standardised model for wetland risk assessment, modified from a generalised ecological risk assessment paradigm. It outlines six steps:

6. ***Step 1 - Identification of the problem.*** This is the process of identifying the nature of the problem and developing a plan for the remainder of the risk assessment based on this information. It defines the objectives and scope of, and provides the foundation for, the risk assessment. In the case of a chemical impact, it would include obtaining and integrating information on the characteristics (for example, properties, known toxicity) and source of the chemical, what is likely to be affected, and how is it likely to be affected, and importantly, what is to be protected.

7. ***Step 2 - Identification of the adverse effects.*** This step evaluates the likely extent of adverse change or impact on the wetland. Such data should preferably be derived from field studies, as field data are more appropriate for assessments of multiple impacts, such as occur on many wetlands. Depending on the extent of adverse change and available resources, such studies can range from quantitative field experiments to qualitative observational studies. For chemical impacts, on-site ecotoxicological bioassays constitute appropriate approaches, whereas for changes caused by weeds or feral animals, on-site observation and mapping may be all that is required.

8. ***Step 3 - Identification of the extent of the problem***. This step estimates the likely extent of the problem on the wetland of concern by using information gathered about its behaviour and extent of occurrence elsewhere. In the case of a chemical impact, this includes information on processes such as transport, dilution, partitioning, persistence, degradation, and transformation, in addition to general chemical properties and data on rates of chemical input into the environment. In the case of an invasive weed, it might include detailed information on its entry into an ecosystem, rate of spread and habitat preferences. While field surveys most likely represent the ideal approach, use of historical records, simulation modeling, and field and/or laboratory experimental studies all represent alternative or complementary methods of characterising the extent of the problem.

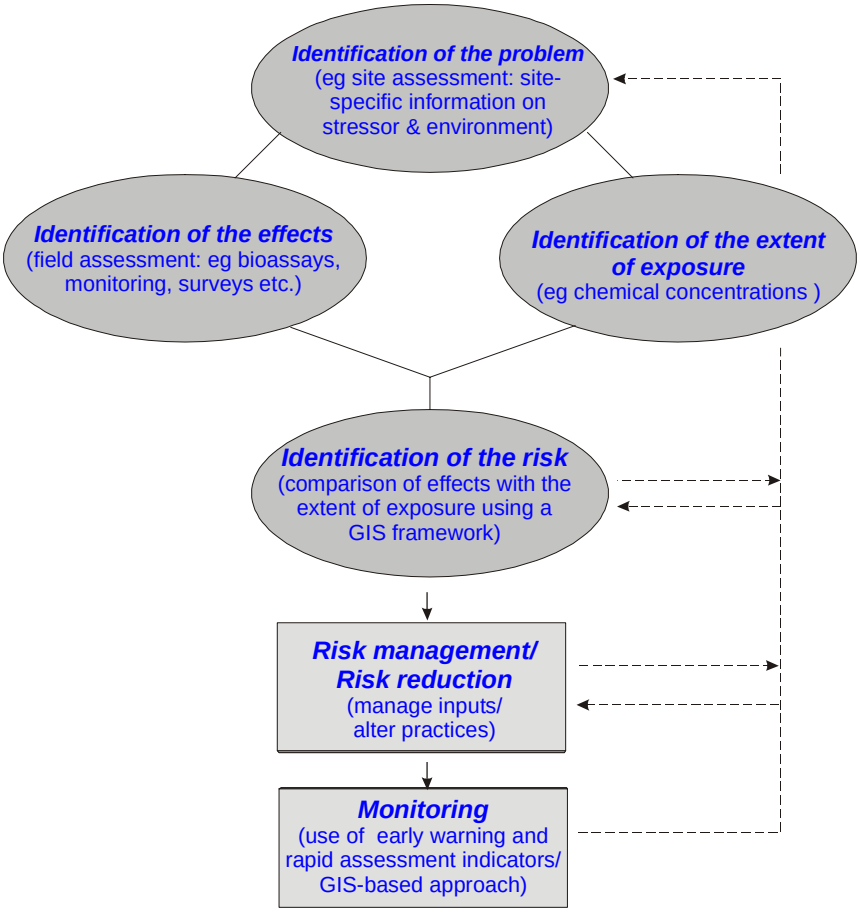
9. ***Step 4 - Identification of the risk***. This involves integration of the results from the assessment of the likely effects with those from the assessment of the likely extent of the problem, in order to estimate the likely level of adverse ecological change on the wetland. A range of techniques exists for estimating risks, often depending on the type and quality of the likely effects and their extent. A potentially useful technique for characterising risks in wetlands is via a GIS-based framework, whereby the results of the various assessments are overlaid onto a map of the region of interest in order to link effects to impact. In addition to estimating risks, such an approach would also serve to focus future assessments and/or monitoring on identified problem areas.

10. ***Step 5 - Risk management and reduction***. This is the final decision-making process and uses the information obtained from the assessment processes described above, and it attempts to minimise the risks without compromising other societal, community or

environmental values. In the context of the Ramsar Convention, risk management must also consider the concept of wise use and the potential effects of management decisions on this. The result of the risk assessment is not the only factor that risk management considers; it also takes into account political, social, economic, and engineering/ technical factors, and the respective benefits and limitations of each risk-reducing action. It is a multidisciplinary task requiring communication between site managers and experts in relevant disciplines.

11. ***Step 6 - Monitoring***. Monitoring is the last step in the risk assessment process and should be undertaken to verify the effectiveness of the risk management decisions. It should incorporate components that function as a reliable early warning system, detecting the failure or poor performance of risk management decisions prior to serious environmental harm occurring. The risk assessment will be of little value if effective monitoring is not undertaken. The choice of endpoints to measure in the monitoring process is critical. Further, a GIS-based approach will most likely be a useful technique for wetland risk assessment, as it incorporates a spatial dimension that is useful for monitoring adverse impacts on wetlands.

Model for wetland risk assessment



Case studies

Invasive species

Begg, G.W., van Dam, R.A., Lowry, J.B., Finlayson, C.M. and Walden, D.J. 2001. Inventory and risk assessment of water dependent ecosystems in the Daly basin, Northern Territory, Australia. Supervising Scientist Report 162, Supervising Scientist. Darwin, Australia.

Van Dam, R.A., Walden, D. and Begg, G.W. 2002. A preliminary risk assessment of cane toads in Kakadu National Park. Supervising Scientist Report 164, Supervising Scientist Division, Darwin, Australia.

Water allocation for environmental purposes

Walden, D., van Dam, R., Finlayson, M., Storrs, M., Lowry, J. and Kriticos, D. 2004. A risk assessment of the tropical wetland weed *Mimosa pigra* in northern Australia. Supervising Scientist Report 177, Supervising Scientist, Darwin, Australia.

Ramsar source material

Resolution VII.10 on www.ramsar.org/key_res_vii.10e.doc. The risk assessment framework is also included in Ramsar Wise Use Handbook 8, 2nd edition (2004) (www.ramsar.org/lib/lib_handbooks_e.htm).

Further reading:

van Dam, R.A. and Finlayson, C.M. 2004. Developing local capacity and ensuring relevance in risk assessment for tropical wetlands. *SETAC Globe*, February 2004, 36-38.

B. Environmental Impact Assessment (EIA) (derived from Ramsar Wise Use Handbook 11)

Purpose

12. Environmental impact assessment is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.

Description

13. Although legislation and practice vary around the world, the fundamental components of an environmental impact assessment would necessarily involve the following stages:

14. ***Step 1 – Screening.*** Screening to determine which projects or developments require a full or partial impact assessment study.

15. ***Step 2 – Scoping.*** To narrow the focus of the broad issues found to be significant during the screening stage. It is used to derive terms of reference (sometimes referred to as guidelines) for environmental impact assessment and enables the competent authority (or environmental impact assessment professionals in countries where scoping is voluntary) to:

- guide study teams on significant issues and alternatives to be assessed, clarify how they should be examined (methods of prediction and analysis, depth of analysis) and according to which guidelines and criteria;
- provide an opportunity for stakeholders to have their interests taken into account in the environmental impact assessment; and
- ensure that the resulting environmental impact statement is useful to the decision maker and understandable to the public.

16. ***Step 3 - Impact analysis and assessment***. This is an iterative process of assessing impacts, redesigning alternatives and comparison. The main tasks of impact analysis and assessment are:

    - refinement of the understanding of the nature of the potential impacts identified during screening and scoping and described in the terms of reference. This includes the identification both of indirect and cumulative impacts and of the likely causes of the impacts (impact analysis and assessment). Identification and description of relevant criteria for decision-making can be an essential element of this period;
    - review and redesign of alternatives; consideration of mitigation measures; planning of impact management; evaluation of impacts; and comparison of the alternatives; and
    - reporting of study results in a environmental impact statement.

17. Assessing impacts usually involves a detailed analysis of their nature, magnitude, extent and effect, and a judgment of their significance, i.e., whether the impacts are acceptable to stakeholders, require mitigation, or are just unacceptable. Biodiversity information available is usually limited and descriptive and cannot be used as a basis for numerical predictions. There is a need to develop or compile biodiversity criteria for impact evaluation and to have measurable standards or objectives against which the significance of individual impacts can be evaluated. The priorities and targets set in the national biodiversity action plan and strategy process can provide guidance for developing these criteria. Tools will need to be developed to deal with uncertainty, including criteria on using risk assessment techniques, precautionary approach, and adaptive management.

18. ***Step 4 – Identification of mitigation measures***. If the evaluation process concludes that the impacts are significant, the next stage in the process is to propose mitigation ideally drawn together into an "environmental management plan". The purpose of mitigation in environmental impact assessment is to look for better ways to implement project activities so that negative impacts of the activities are avoided or reduced to acceptable levels and the environmental benefits are enhanced, and to make sure that the public or individuals do not bear costs which are greater than the benefits which accrue to them. Remedial action can take several forms, i.e. avoidance (or prevention), mitigation (including restoration and rehabilitation of sites), and compensation (often associated with residual impacts after prevention and mitigation).

19. ***Step 5 – Making a decision***. Decision-making takes place throughout the process of environmental impact assessment in a incremental way, from the screening and scoping stages to decisions during data-collecting and analysis and impact prediction to making choices between alternatives and mitigation measures, and finally the decision between refusal or authorization of the project. Biodiversity issues should play a part in decision-

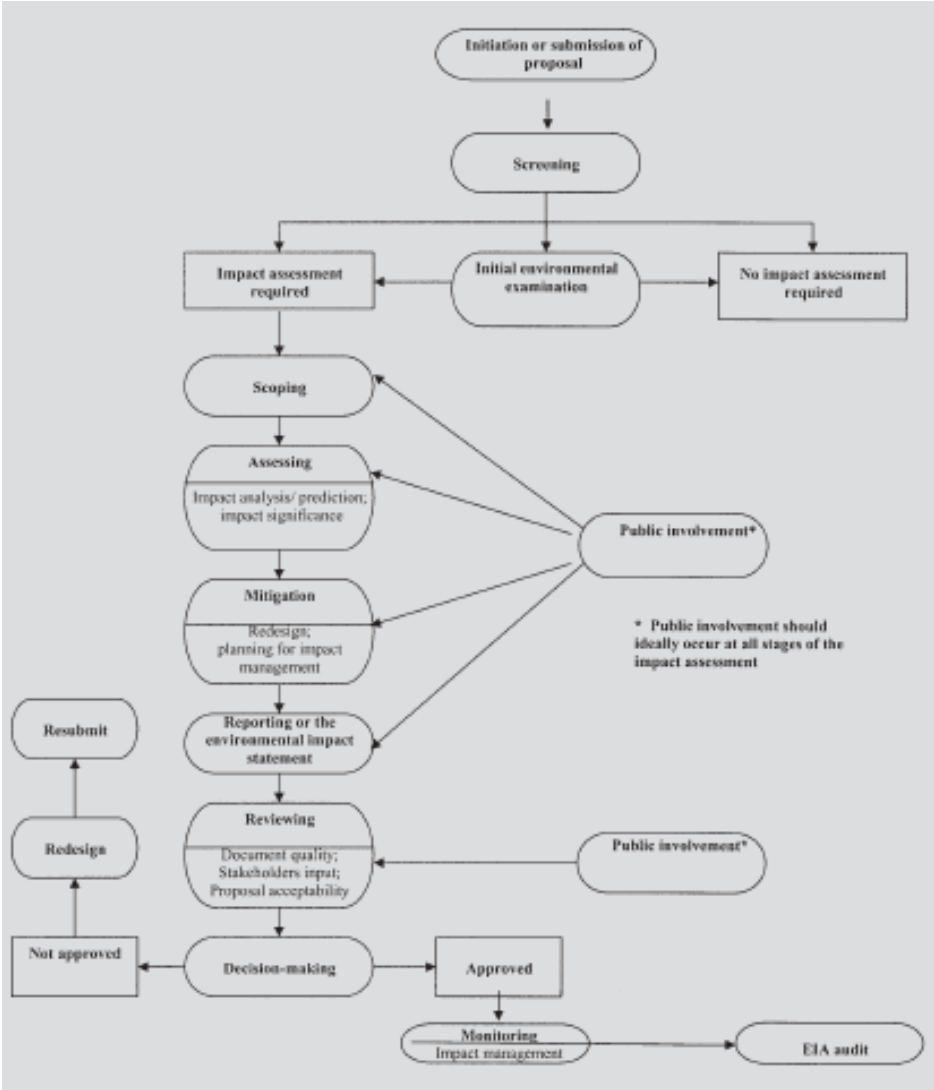
making throughout. This final decision is essentially a political choice about whether or not the proposal is to proceed, and under what conditions. If rejected, the project can be redesigned and resubmitted. It is desirable that the proponent and the decision-making body are two different entities.

20. The precautionary approach should be applied in decision-making in cases of scientific uncertainty about risk of significant harm to biodiversity. As scientific certainty improves, decisions can be modified accordingly.

21. ***Step 6 - Monitoring and evaluation***. Monitoring and auditing are used to see what actually occurs after project implementation has started. Predicted impacts on biodiversity should be monitored, as should the effectiveness of mitigation measures proposed in the environmental impact assessment. Proper environmental management should ensure that anticipated impacts are maintained within predicted levels, that unanticipated impacts are managed before they become a problem, and that the expected benefits (or positive developments) are achieved as the project proceeds. The results of monitoring provide information for periodic review and alteration of environmental management plans, and for optimising environmental protection through good practice at all stages of the project. Biodiversity data generated by environmental impact assessment should be made accessible and useable by others and should be linked to biodiversity assessment processes being designed and carried out under the Convention on Biological Diversity.

22. An environmental audit is an independent examination and assessment of a project's (past) performance, is part of the evaluation of the environmental management plan, and contributes to the enforcement of EIA approval decisions.

Flowchart of key steps in the environmental impact assessment procedure
(from UNEP/CBD/SBSTTA/7/13 and Ramsar Wise Use Handbook 11)



Ramsar source material

Ramsar Resolutions and Recommendations covering environmental impact assessment include:

- Resolution VIII.9. Guidelines for incorporating biodiversity-related issues into environmental impact assessment legislation and/or processes and in strategic environmental assessment' adopted by the Convention on Biological Diversity (CBD), and their relevance to the Ramsar Convention. (www.ramsar.org/res/key_res_viii.09_e.doc);
- Resolution VII.16. The Ramsar Convention and impact assessment: strategic, environmental and social. (www.ramsar.org/res/key_res_vii.16e.doc); and
- Recommendation 6.2. Environmental Impact Assessment. (www.ramsar.org/rec/key_rec_6.02e.doc).

The guidance on environmental impact assessment is covered by Ramsar Wise Use Handbook 11 "Impact Assessment", 2nd Edition (2004) (www.ramsar.org/lib/lib_handbooks_e.htm).

Further reading

Nooteboom, S. 1999. *Environmental assessments of strategic decisions and project decisions: interactions and benefits.* Ministry of Housing, Spatial Planning and the Environment of the Netherlands.

Treweek, J. 2001. *Biodiversity in development. Biodiversity and EIA for development cooperation: workshop conclusions.* EC/EU Tropical Biodiversity Advisors' Group, EU, DFID and IUCN.

International Association for Impact Assessment. 2005. Biodiversity in Impact Assessment. IAIA Special Publication Series No. 3.

C. Strategic Environmental Assessment (SEA) (derived from Ramsar Wise Use Handbook 11)

Purpose

23. Strategic environmental assessment is the formalized, systematic and comprehensive process of identifying and evaluating the environmental consequences of proposed policies, plans or programmes to ensure that they are fully included and appropriately addressed at the earliest possible stage of decision-making on a par with economic and social considerations. Strategic environmental assessment, by its nature, covers a wider range of activities or a wider area and often over a longer time span than the environmental impact assessment of projects.

24. Strategic environmental assessment might be applied to an entire sector (such as a national policy on energy, for example) or to a geographical area (for example in the context of a regional development scheme).

Description

25. The basic steps of strategic environmental assessment are similar to the steps in environmental impact assessment procedures, but the scope differs. Strategic environmental assessment does not replace or reduce the need for project-level environmental impact assessment, but it can help to streamline the incorporation of

environmental concerns (including biodiversity) into the decision-making process, often making project-level environmental impact assessment a more effective process. Strategic Environmental Assessment is designed to assess the potential impacts of policies, plans or programmes generally at national level.

26. This is done through the following steps:

Step 1 – Initiation. Determine if there is a need for an Assessment.
Step 2 – Reviewing. Assess the relationship between the plan-proposal and other relevant policies, plans and programs of activity.
Step 3- Scoping. Identify alternatives and impacts to be assessed.
Step 4 - Impact assessment. Assess the evidence and predict environmental outcomes associated with alternatives being considered.
Step 5 - Outside Review. Seek input and advice from others, including other government agencies, independent experts, interest groups, and the public.
Step 6 – Documentation. Collect and present the information for reporting and further use as necessary.
Step 7 – Decision. Outline the outcome and initial thinking on impact assessment.
Step 8 – Identification. Identify information and monitoring requirements for project-level Environmental Impact Assessment.
Step 9 - Follow-up. What is required next, including implementation of mitigation ahead of project-level impact.

27. Strategic Environmental Assessment has developed at a slower pace than Environmental Impact Assessment and is only now starting to form around a consolidated and consistent approach. Public participation and consultation is included throughout the Strategic Environmental Assessment process and is required by law in some jurisdictions. Strategic Environmental Assessment is thus a process for decision-makers to review the environmental objectives and implications of their proposals and to ensure that they are compatible with other policies and planned initiatives. Plan-makers may be local authorities, government agencies and ministries, or other formal authorities and agencies responsible for policy-making and planning. In many jurisdictions, Strategic Environmental Assessment is more explicitly intended as a tool for promoting sustainable development. It offers support in the Ramsar context to implementation of the wise use concept, and to integrated water and wetland resources management.

Ramsar source material

28. Ramsar Resolutions and Recommendations covering environmental impact assessment include:

Resolution VIII.9. *Guidelines for incorporating biodiversity-related issues into environmental impact assessment legislation and/or processes and in strategic environmental assessment' adopted by the Convention on Biological Diversity (CBD), and their relevance to the Ramsar Convention.* (www.ramsar.org/res/key_res_viii.09_e.doc);
Resolution VII.16. *The Ramsar Convention and impact assessment: strategic, environmental and social.* (www.ramsar.org/res/key_res_vii.16e.doc); and Recommendation 6.2. *Environmental Impact Assessment.* (www.ramsar.org/rec/key_rec_6.02e.doc).
The guidance on strategic environmental assessment covered in Ramsar Wise Use Handbook 11 "Impact Assessment", 2nd Edition (2004) (www.ramsar.org/lib/lib_handbooks_e.htm), is

derived from "The Ramsar Convention and Impact Assessment (Athanas, A. & Vorhies, F.) 1999. Ramsar COp7 Technical Session IV (full text on: http://ramsar.org/cop7_doc_19.1_e.htm).

Further reading

Sadler, B. and R. Verheem 1996. *Strategic Environmental Assessment. Status, challenges and future directions.* Ministry of Housing, Spatial Planning and Environment, The Hague, The Netherlands.

South Africa 2000. *Strategic Environmental Assessment in South Africa. Guideline document.* Department of Environmental Affairs and Tourism, Pretoria, South Africa.

D. Wetland Vulnerability Assessment (VA) (from *Ramsar Technical Report*, in preparation)

Purpose

29. Vulnerability assessment determines the extent to which a wetland is susceptible to, or unable to cope with, adverse effects of climate change and variability and other pressures, such as changes in land use and cover, water regime, or over-harvesting and over-exploitation, and invasion by alien species. These pressures can act individually, cumulatively or synergistically.

Description

30. Vulnerability is determined at specific spatial and temporal scales and is a dynamic property as it changes depending on the local conditions, e.g., a system can be vulnerable at a particular time but may not be at other times (e.g., vulnerability to fire increases during dry seasons). Wetlands are vulnerable if they have low adaptive capacity and are highly vulnerable if they have low inherent capacity to cope with change, and/or there are few or no options to reduce impacts of pressures, and/or they are naturally sensitive to pressures (for example, due to their geographic location or socio-political situation). Vulnerability incorporates risk assessment (i.e., the extent of and exposure to a hazard) and is linked to the stability or resilience and sensitivity of a wetland, as well as capacity to cope with one or more hazard (Table 1).

Table 1: Relationship between sensitivity, resilience and vulnerability of a wetland

	Resilience	
	High	Low
Sensitivity		
high	*Vulnerable*	*Very vulnerable*
low	*Not vulnerable*	*Vulnerable*

31. The following characteristics apply to the concept of vulnerability assessment of wetlands:

    i) it is forward-looking and assesses the probability of a change in the condition of a wetland in the future relative to some benchmark (or baseline);
    ii) the change is caused by some risky event;

iii) it depends on a time horizon (i.e., the vulnerability can change depending on whether it is considered on a seasonal, annual or decadal basis); and
iv) the present condition of the system, its resiliency and sensitivity determine the future vulnerability.

32. Vulnerability assessment is a process and includes determination of the probability of a risky event occurring, the effect of this on the wetland, given its sensitivity and resiliency, development of risk reduction and management options to reduce adverse impacts, formulation of a desired outcome for the wetland, and monitoring and adaptive management to ensure that the response options achieve the desired outcome.

33. The framework below draws from the OECD state-pressure-impact-response model and the Millennium Ecosystem Assessment conceptual framework, as well as the case studies cited. The framework for vulnerability assessment includes:

34. ***Step 1 - Risk assessment & Risk perception***

- Delimiting the boundaries of the social and biophysical system (the wetland and connected landscapes) to be considered and explicitly including spatial, temporal limits.
- Identification of past and present drivers of change and existing hazards.
- Assessing the present condition and recent trends in the ecological character of the wetland (using metrics such as indicator species, functional groups, etc.).
- Carrying out a stakeholders analysis – the people involved in evaluating the potential responses and also affected by the potential changes in the system.
- Determining the sensitivity and resiliency including adaptive capacity of the wetland.
- Identifying the wetland and groups of people that are particularly sensitive to different pressures.
- Developing scenarios and storylines with the involvement of the stakeholders to the risk of possible drivers of change and the interaction between them that could lead to future changes.

35. ***Step 2 - Risk minimisation or management***

- Identifying the wetland components and groups of people that would not have the ability to cope with the changes, often adverse, given their low present adaptive capacity and/or sensitivity.
- Developing response options that can minimise the risk of abrupt and/or large changes in the ecological character of the wetland (and thus maintaining the ecosystem services provided for people). In some cases, given the adaptive capacity, sensitivity and resiliency of the wetland, no further management response may be needed.
- Trade-off analysis to choose between potential response options and overcome constraints, such as institutional capacity and capability, information/data availability, and political and goverance requirements.
- Specifying the desired outcomes for the system as determined from an agreed baseline or reference condition, and taking into account the dynamic nature of many wetlands.

36. ***Step 3 - Monitoring and adaptive management***

- Incorporate monitoring throughout the steps in the framework and through structured analysis and learning from the results of the monitoring adapt management responses accordingly. This entails outlining the path most likely to procure the desired outcomes, and measuring indicators of success or otherwise.

Case studies

Bayliss, B., Brennan, K., Eliot, .I, Finlayson, M., Hall, R., House, T., Pidgeon, B., Walden, D. and Waterman, P., 1997. *Vulnerability assessment of predicted climate change and sea level rise in the Alligator Rivers Region, Northern Territory Australia.* Supervising Scientist Report 123, Supervising Scientist, Canberra, Australia.

Sharma, M., I. Burton, M. van Aalst, M. Dilley, and G. Acharya 2000. *Reducing Vulnerability to Environmental Variability: Background Paper for the Bank's Environmental Strategy.* The World Bank, Washington, D.C.,USA.

van Dam, R.A., Finlayson, C.M. and Watkins, D. (eds) 1999. *Vulnerability Assessment of Two Major Wetlands in The Asia-Pacific Region to Climate Change and Sea Level Rise.* Supervising Scientist Report 149, Darwin, Australia. 161 pp.

Ramsar source material

Gitay, H. in prep. Guidance on vulnerability assessment of wetlands to change in ecological character. *Ramsar Technical Report* (in preparation). Ramsar Convention Secretariat, Gland, Switzerland.

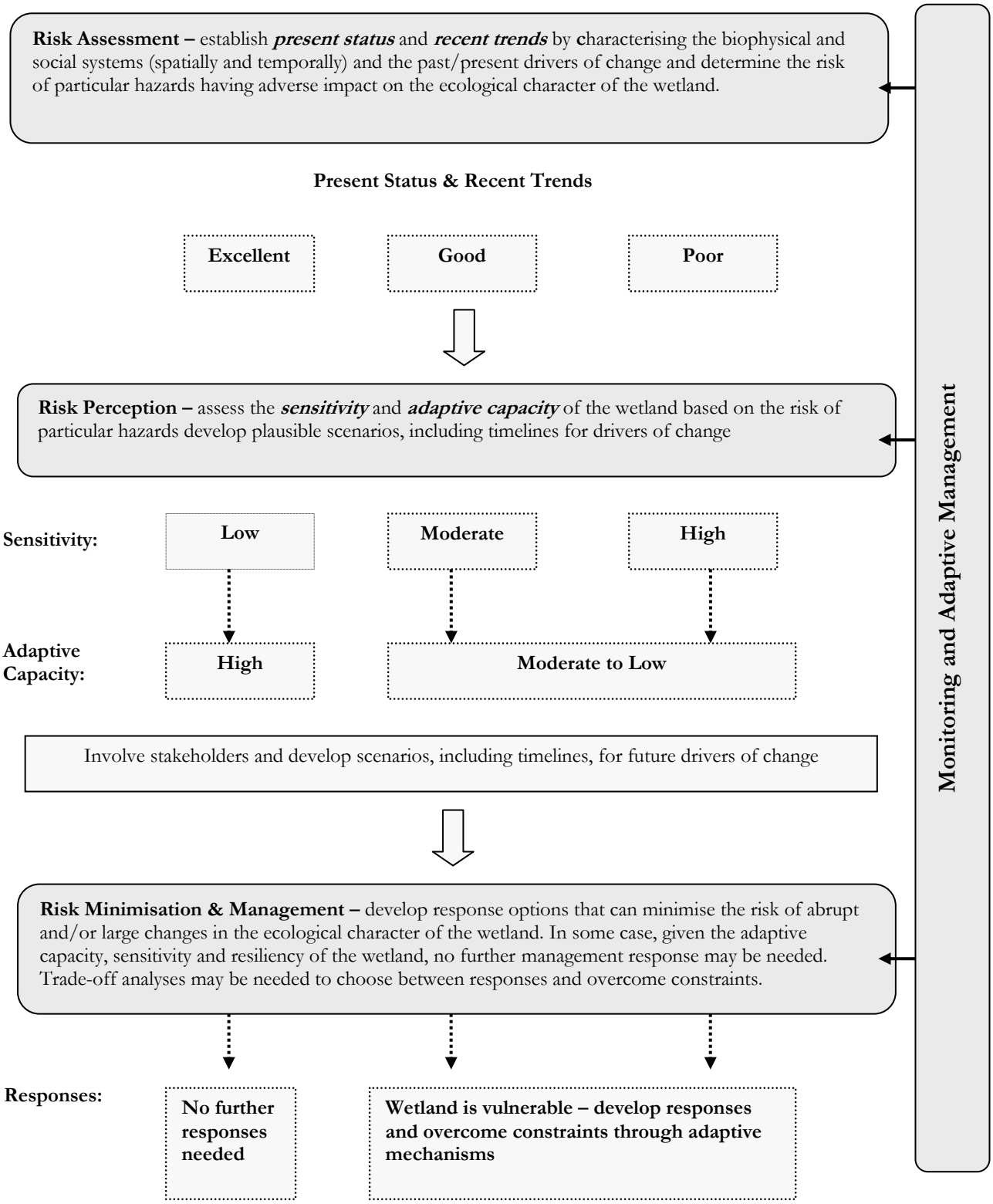
Further reading

Millennium Ecosystem Assessment. 2003. *Ecosystems and Human Well-being: A Framework for Assessment.* Island Press, Washington, D.C., 245 pp.

Downing, T. and Dougherty, B., 2004. *Toward a core methodology for climate vulnerability and adaptation.* Stockholm Environment Institute, www.vulnerabilitynet.org

A framework for wetland vulnerability assessment

(from Gitay in prep.. *Ramsar Technical Report*)



E. **Wetland Valuation** (Valuation of Wetland Services) (from *Ramsar Technical Report,* in preparation)

Purpose

37. Valuation provides information on the value (importance) of wetlands and their services to different stakeholders, so as to ensure that balanced decision-making occurs about competing uses of wetlands. Such information has often not fully been taken into account in the past when making decisions about economic development. Valuation has been defined by the *Millennium Ecosystem Assessment* as "The process of expressing a value for a particular good or service . . . in terms of something that can be counted, often money, but also through methods and measures from other disciplines (sociology, ecology and so on)".

Description

38. The five main steps in undertaking Valuation of wetlands are:

39. ***Step 1 - Analysis of policy processes and management objectives.*** Provide insight into the policy processes and management objectives to set the stage for a discussion about the kind of valuation needed (e.g., to assess the impact of past or ongoing interventions, or to analyse trade-offs of planned wetland uses (= partial valuation) or to determine the Total Value of the intact wetland). During this step it should be ascertained how values that are relevant to policy and management decisions can be generated.

40. ***Step 2 - Stakeholder analysis and involvement***. The main stakeholders should be identified, as the involvement of stakeholders is essential in almost all steps of the valuation procedure: i.e., to determine the main policy and management objectives, to identify the main relevant services and assess their value, and to discuss trade-offs involved in wetland use.

41. ***Step 3 - Function analysis (quantification of services) (what should be valued?).*** The wetland characteristics (processes and components) are translated into functions which provide specific services. These services should be quantified in appropriate units (biophysical or otherwise), based on actual or potential sustainable use levels.

42. ***Step 4 - Valuation of services (how to undertake the valuation ?).*** In this step, the benefits derived from the wetland services identified in step 3 are analysed. These benefits should be quantified in both the appropriate value-units (ecological, socio-cultural and economic indicators) as well as monetary values.

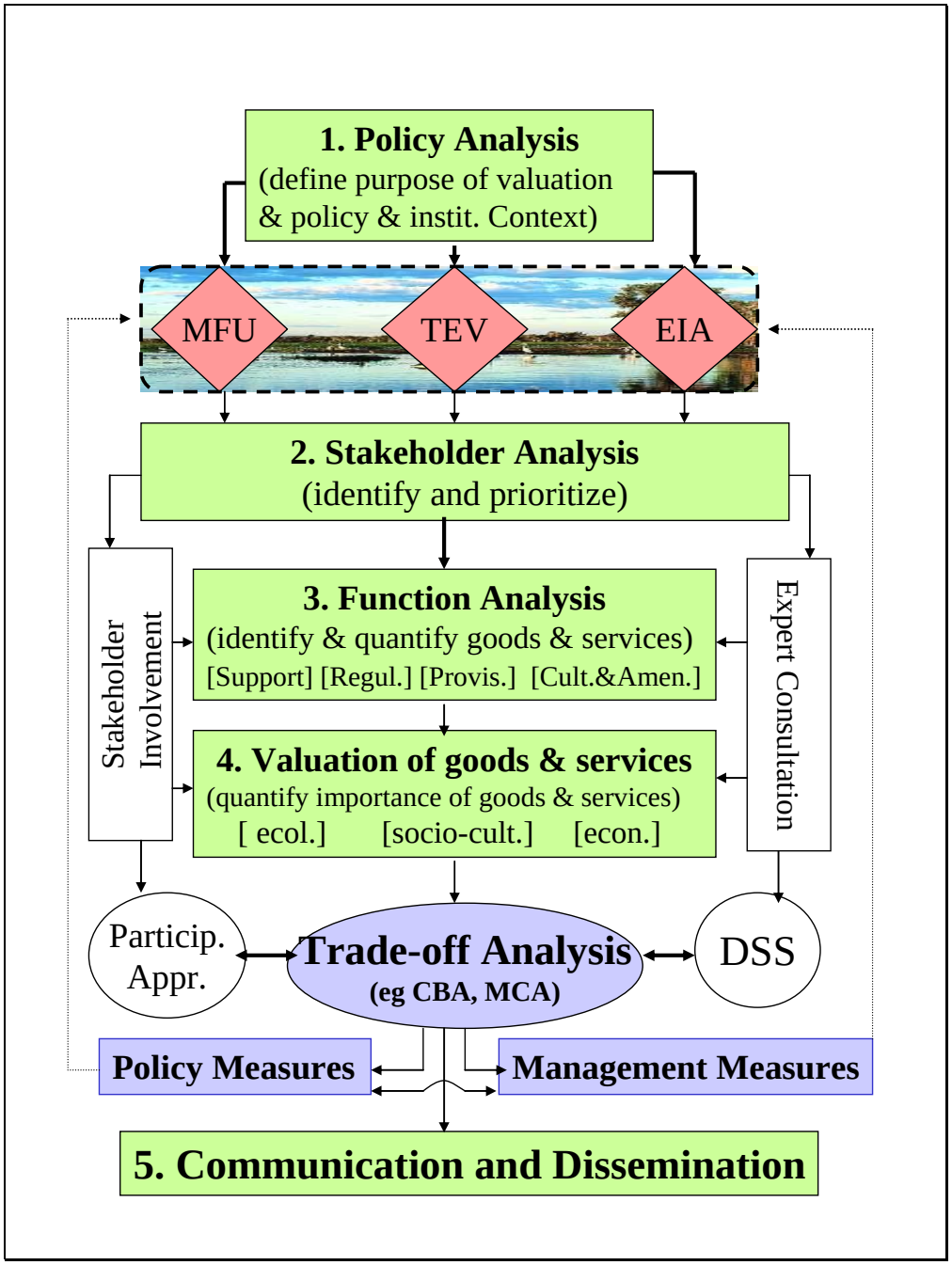
43. ***Step 5 - Communicating wetland values.*** To make the results of the valuation fully accessible to all the stakeholders and relevant decision-makers, communication and dissemination activities are essential. On-line support to these guidelines is provided through www.naturevaluation.org, which gives access to existing data bases, literature and case studies, and discussion platforms for exchange of information and experiences on valuation of wetland functions.

44. Although the valuation itself finishes with this last step, it is crucial that the information generated by the valuation is structurally integrated into decision-making instruments such

as multi-criteria analysis and cost-benefit analysis (see figure below). However, this is beyond the scope of the guidelines for undertaking the valuation itself.

Framework for integrated assessment and valuation of wetland services

MFU = multi-functional use; TEV – Total Economic Value; EIA = Environmental Impact Assessment; DSS = Decision-support System; CBA = Cost-benefit Analysis; MCA = Multi-criteria analysis



Case studies

Emerton, L., & Bos, E. 2004. *Value. Counting Ecosystems as an Economic Part of Water Infrastructure.* IUCN, Gland, Switzerland and Cambridge, UK.

IIED, 1997. *Valuing the Hidden Harvest : Methodological approaches for local-level economic analysis of wild resources.* Sustainable Agriculture Research Series Volume 3, Number 4. Sustainable Agriculture Programme, IIED, London.

Stuip, M.A.M, Baker,C.J., and Oosterberg, W., 2002. *The Socio-economics of Wetlands.* Wetlands International and Riza, Wageningen, The Netherlands (35 pp)

Wilson, M.A. and S.R. Carpenter, 1999: *Economic Valuation of Freshwater Ecosystems Services in the United States 1971-1997*, Ecological Applications 9(3): 772-783.

Ramsar source material

de Groot, R. & Stuip, M. in prep. Guidelines for valuing wetland goods and services. *Ramsar Technical Report Series.* Ramsar Convention Secretariat, Gland, Switzerland.

Some brief guidance on economic valuation of wetlands is also included in Ramsar Wise Use Handbook 11 "Impact Assessment" (2nd Edition, 2004) (www.ramsar.org/lib/lib_handbooks_e.htm).

Further reading (see also www.naturevaluation.org for further sources and case studies)

Balmford,A., A.Bruner, P.Cooper, R.Costanza, S.Farber, R.E.Green, M.Jenkins, P.Jefferiss, V.Jessamy, J.Madden, K.Munro, N.Myers, S.Naeem, J.Paavola, M.Rayment, S.Rosendo, J.Roughgarden, K.Trumper and R.K.Turner, 2002. Economic Reasons for Conserving Wild Nature. *Science* Vol. 297:950-953

Barbier, E.B., M.C. Acreman and D. Knowler, 1996: *Economic valuation of wetlands; a guide for policy makers and planners.* Ramsar Convention Bureau, Gland, Switzerland.

Costanza,R., R.d'Arge, R.S.de Groot, et al., 1997. The Total Value of the World's Ecosystem Services and Natural Capital. *Nature* Vol 387:253-260.

de Groot, R.S., 1992. *Functions of Nature: evaluation of nature in environmental planning, management and decision-making.* Wolters Noordhoff BV, Groningen, the Netherlands (345 pp).

Emerton, L., & Bos, E. 2004. *Value. Counting Ecosystems as an Economic Part of Water Infrastructure.* IUCN, Gland, Switzerland and Cambridge, UK.

Millennium Ecosystem Assessment. 2003: *Ecosystems and human well-being: a framework for assessment.* Millennium Ecosystem Assessment. Island Press, Washington (www.millenniumassessment.org)

F. Rapid Assessment of Biodiversity (derived from [COP9 DR1 Annex E i.])

Purpose

45. Rapid assessment is a synoptic assessment of the species biodiversity of a wetland. It is often undertaken as a matter of urgency, in the shortest timeframe possible to produce reliable and applicable results.

46. Rapid assessment methods for wetlands are not generally designed to take into account temporal variance, such as seasonality, in ecosystems. However, some rapid assessment methods can be used in repeat surveys as elements of an integrated monitoring programme to address such temporal variance.

Description

47. Rapid assessment techniques are particularly relevant to the species level of the components of biological diversity. Other rapid assessment methods, including remote sensing techniques, can be applicable to the ecosystem/wetland habitat level, particularly for rapid inventory assessments, and it may be appropriate to develop further guidance on ecosystem-level rapid assessment methods. Assessments of the genetic level of biological diversity do not generally lend themselves to "rapid" approaches.

48. The guidelines for Rapid Assessments, developed jointly by the Convention on Biological Diversity and the Ramsar Convention, stress the importance of clearly establishing the purpose as the basis for design and implementation of the assessment. They also emphasize that before deciding on whether a new field survey using rapid assessment methods is necessary, a thorough review of existing knowledge and information should be undertaken, including information held by local communities. Subsequent steps are then presented in the form of a decision tree to facilitate the selection of appropriate methods to meet the purpose of the assessment. An indication of the categories of information which can be acquired through each of the rapid assessment methods is provided. Summary information on a range of appropriate and available methods suitable for each rapid assessment purpose is included, as is information on a range of different data analysis tools.

49. ***Step 1 – State the purpose and objective.*** State the reason(s) for undertaking the rapid assessment: why the information is required and by whom it is required. This will include determining the scale and resolution required to achieve the purpose and objective, subsequent identification of the core or minimum data sufficient to describe the location and size, and any special features of the wetland.

50. ***Step 2 - Review existing knowledge and information – identify gaps.*** Review available information sources and local knowledge (including scientists, stakeholders, and local and indigenous communities), using desk studies, workshops, etc., so as to determine the extent of knowledge and information available for inland water biodiversity in the region being considered. Include all available data sources

51. ***Step 3 - Study design.*** This includes a number of discrete components:

    a) **Review existing assessment methods, and choose appropriate method.** Review available methods, and seek expert technical advice as needed, to choose the methods that can supply the required information. A decision tree is available for assisting in the choice of appropriate field survey methods.

    b) **Establish a habitat classification system where needed.** Choose a habitat classification that suits the purpose of the assessment, since there is no single classification that has been globally accepted.

    c) **Establish a time schedule.** A time schedule is required for i) planning the assessment; ii) collecting, processing and interpreting the data collected; and iii) reporting the results.

    d) **Establish the level of resources required, assess the feasibility and cost-effectiveness that are required.** Establish the extent and reliability of the resources available for the assessment and make contingency plans to ensure that data are not

lost due to insufficiency of resources. Assess whether or not the programme, including reporting of the results, can be undertaken under the current institutional, financial and staff situation. Determine if the costs of data acquisition and analysis are within budget and that a budget is available for the programme to be completed. Where appropriate, plan a regular review of the programme.

e) **Establish a data management system and a specimen curation system.** Establish clear protocols for collecting, recording and storing data, including archiving in electronic or hardcopy formats. Ensure adequate specimen curation to enable future users to determine the source of the data, and its accuracy and reliability, and to access reference collections. At this stage it is also necessary to identify suitable data analysis methods. All data analysis should be done by rigorous and tested methods and all information documented. The data management system should support, rather than constrain, the data analysis, and should include a meta-database to: i) record information about the inventory datasets and ii) outline details of data custodianship and access by other users.

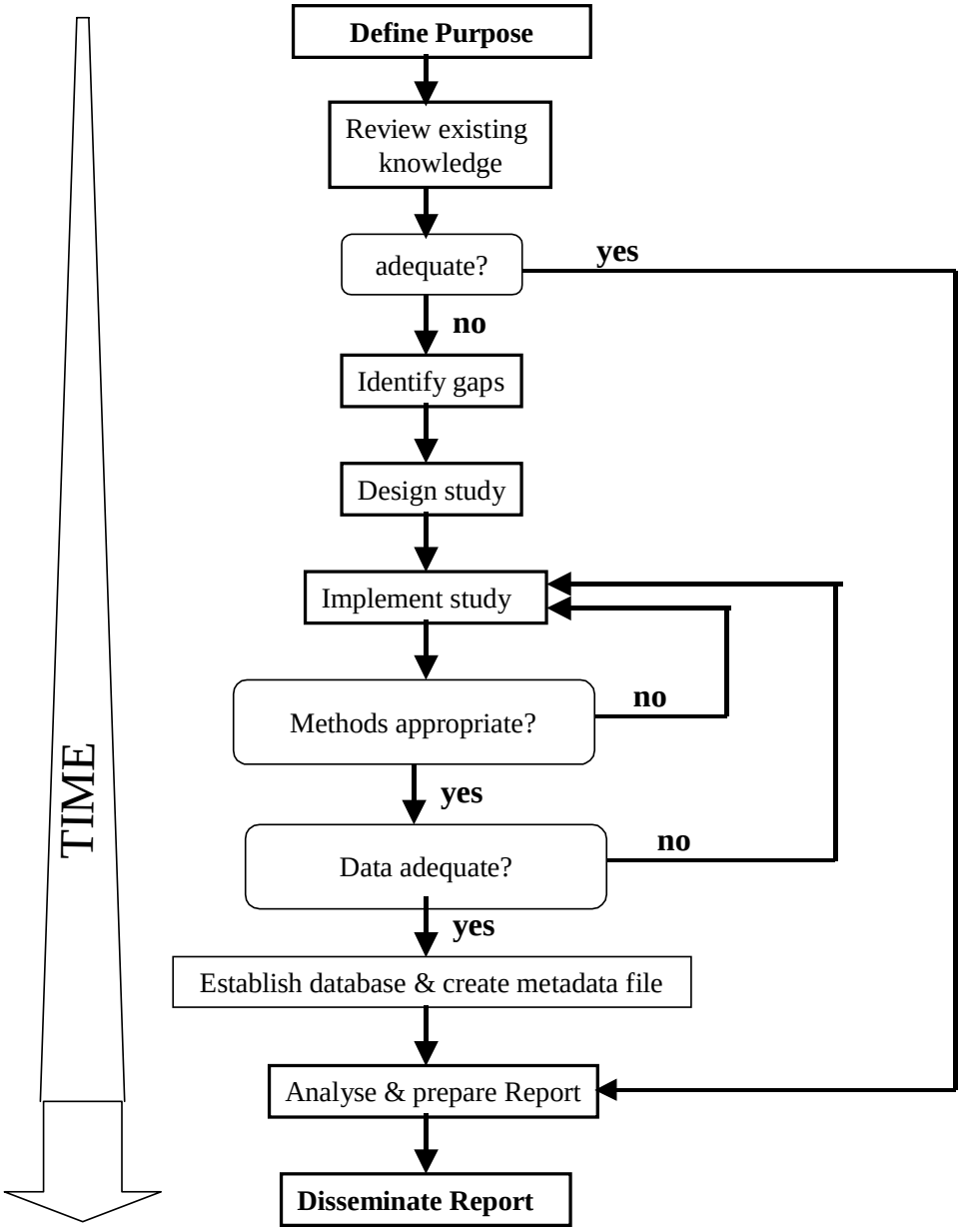
f) **Establish a reporting procedure.** Establish a procedure for interpreting and reporting all results in a timely and cost effective manner. The reporting should be succinct and concise, indicate whether or not the objective has been achieved, and contain recommendations for biodiversity management action, including whether further data or information is required.

g) **Establish a review and evaluation process.** Establish a formal and open review process to ensure the effectiveness of all procedures, including reporting and, when required, supply information to adjust the assessment process.

52. ***Step 4 - Perform study and include continuous assessment of methodology.*** Undertake the assessment and ensure that it is tested and adjusted as necessary. Details of all methods and changes in the method, including specialist equipment being used, should be recorded. The training needs of staff involved should be assessed and steps taken to provide them with the necessary skills. The means of collating, collecting, entering, analysing and interpreting the data should also be confirmed and documented. In particular, ensure that any remote sensing can be supported by appropriate "ground-truth" survey.

53. ***Step 5 - Data assessment and reporting.*** Establish a formal and open review process to ensure the effectiveness of all procedures, including reporting and, when required, supply information to adjust or even terminate the program. Results should be provided in appropriate styles and level of detail to local authorities, local communities and other stakeholders, local and national decision-makers, donors and the scientific community. If the purpose of the assessment was not achieved it is necessary to return to Step 3 above.

Summary of key steps in applying the CBD/Ramsar conceptual framework for rapid assessment



54. A decision tree is available to enable the selection of appropriate biodiversity assessment methods, based on a structured framework of selection criteria. These are organized in a progression of the most important factors of biodiversity assessment of wetlands. The tree begins with the most basic and broad elements of an assessment, and it advances through progressively more selective criteria. Eventually a general framework of the necessary assessment should emerge, taking the amalgamated form defined by its purpose, output

information, available resources, and scope. The idea is to meld informational parameters, like output and purpose, with logistical parameters such as time frame, available funding, and geographical scope, in order to present a realistic assessment model and determine what methods are available for its implementation.

55. The decision tree provides three general purposes corresponding to five specific purposes, which will determine the assessment type. The five specific **assessment types** used in the decision tree are: ***inventory assessment, specific-species assessment, impact assessment, indicator assessment, economic resource assessment.*** Once the purpose and assessment type have been determined, the decision tree leads users through a matrix of more specific components of a biological diversity assessment.

Case studies

De Pauw N. & Hawkes H.A.. 1993. Biological monitoring of river water quality. *Proc. Freshwater Europe Symp. on River Water Quality Monitoring and Control.* Aston University, Birmingham. p. 87-111.

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Ramsar source material

[COP9 DR1 Annex E i.] Guidelines for the rapid assessment of inland, coastal and marine wetland biodiversity.

Initial guidance on rapid assessment of biodiversity is provided in Ramsar Wise Use Handbook 8 "Managing Wetlands" (2nd Edition", 2004) (www.ramsar.org/lib/lib_handbooks_e.htm).

Further reading

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