Chapter 1

Introduction and conceptual framework

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This chapter introduces the integrated approach to wetland assessment. It argues for integration as an essential principle for understanding wetlands and their management and use. It discusses different approaches for integration, and advocates a conceptual and methodological framework for assessing wetlands in a fully integrated manner.

William Darwall/Darwin Integrated Wetland Assessment project

Introduction and conceptual framework

This section introduces the concept of integrated wetland assessment. It involves discussion of:-

- ✔ *Wetlands and their management*
- ✔ *The conventional practice of separate 'non-integrated' wetland assessment*
- ✔ *The need for an integrated assessment approach*
- ✔ *The principles of an integrated assessment (i.e. integrating biodiversity, valuation and livelihood approaches)*

F1 Purpose of the toolkit

This toolkit presents integrated biodiversity, economic and livelihood assessment methodologies to strengthen pro-poor approaches to wetland conservation. It outlines the steps in designing, preparing for and carrying out an integrated assessment. The toolkit also describes methods for analysing and presenting the information collected, using GIS maps and electronic databases in order to identify overlaps between threatened species and high human dependence, and to develop site-level action plans for pro-poor wetland conservation and sustainable use. Two case studies are documented to demonstrate how the toolkit can be applied in practice: Stung Treng Ramsar Site on the Lower Mekong in Cambodia, and Mtanza-Msona village on the Rufiji floodplain in Tanzania.

The toolkit is founded on the premise that an integrated approach to assessment is necessary in order to generate information that is practically useful, and policy relevant, for wetland planning and management. As both wetland values and threats encompass biological, ecological, economic and livelihood aspects, and wetland management responses must simultaneously address and react to each of these factors, a thorough understanding of all — and of the interlinkages and interconnectivity between them — is required.

The main components of integrated wetland assessment are seen as species- and habitat-based biodiversity assessment, economic valuation, and livelihoods analysis. Maps and databases provide useful tools to represent, analyse and share the information that integrated assessments yield, as it can inform both local and global conservation planning and action, and point to management and policy recommendations which support biodiversity conservation, sustain local livelihoods, and reduce poverty.

The toolkit describes a framework for assessment which consists of the following stages:

Stage 1: **Preparation and orientation, including clarifying stakeholders' management objectives:** recognising and balancing both conservation and development goals, and promoting a pro-poor approach to wetland management, is a process that requires broad consultation and awareness of a wide range of issues. Developing a shared vision across stakeholder groups based on mutual respect and understanding, and rooting the assessment in real-world management goals and objectives, are both essential to give purpose to the assessment process, and to identify relevant management and policy-related questions for the assessment to tackle

Stage 2: **Assessment:** documenting the state of wetland biodiversity, identifying development and conservation pressures and threats, and understanding past, current, and future management and policy responses. This requires the co-ordination of data collection, survey, and review, across all the relevant disciplines and methods

Stage 3: **Analysis, presentation and evidence-based engagement:** analysing the data generated to address needs for management and policy information; emphasising the interlinkages and connectivity between biodiversity, economic and livelihood factors, and to ensure that information is presented in a practical and policy-relevant form which is both appropriate and useful for planners and decision-makers in conservation and development sectors

The guiding principles supporting this toolkit are that wetland assessments should:

- Be **integrated** across disciplines and themes
- Be geared to address a particular **management** issue or question
- Generate information that can be used to improve support and improve **planning** of on-the-ground wetland management, and provide information to make better **decisions** about how to use and allocate investment funds, land, and resources in and around wetlands
- Work to **strengthen** existing wetland management process
- Serve to **sustain** wetland values, with a particular focus on ensuring the continued generation and equitable access to wetland goods and services, particularly for poorer and more vulnerable human groups

F2 Wetland ecosystems and their governance – supporting inclusive and informed decision-making

Wetlands are defined by the Ramsar Convention on 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."*

(Ramsar 2009)

Wetlands' distinctive ecological characteristics are central to their management challenges:

"Hydrological regime and topography are generally the most important determinants of the establishment and maintenance of specific types of wetland and wetland processes, creating the unique physicochemical conditions that make wetlands different from both deepwater aquatic systems and well-drained terrestrial systems. Hydrological conditions affect numerous abiotic factors, including nutrient availability, soil anerobiosis, and salinity in both coastal and inland wetlands, which in turn determine the biota that establish in a wetland. These biotic components can alter the hydrology and other physicochemical features of the wetland… [M]aintaining the hydrological regime of a wetland and its natural variability is necessary to maintain the ecological characteristics of the wetland, including its biodiversity."

(MEA 2005)

F2.1 Understanding and managing wetland landscapes

A wide range of wetland types can be distinguished:

a. Inland wetlands:

- Permanent and temporary rivers and streams
- Permanent lakes and reservoirs
- Seasonal lakes, marshes, and swamps including floodplains
- Forested wetlands, marshes, and swamps including floodplains
- Alpine and tundra wetlands
- Springs and oases
- Geothermal wetlands
- Underground wetlands, including caves and groundwater systems

b. Coastal wetlands

- Estuaries and marshes
- Mangroves
- Lagoons, including salt ponds
- Intertidal flats, beaches and dunes
- Kelp
- Rock and shell reefs
- Seagrass beds
- Coral reefs

(MEA 2005)

Wetlands are connected with the broader landscapes in hydrological and ecological terms, and also exist within a human context. There are links between wetland goods and services, the ecological and biological processes which support them, and socio-economic processes both on- and off-site. Additionally, socio-economic processes and forces both on- and off-site influence their status, use, and management.

The complexity of wetland landscapes thus involves interplay of several key factors (Figure 1):

- Hydrology and topography of the physical wetland
- Biodiverse wetland ecosystems
- Ecosystem services to human communities both local and more distant
- Local livelihood systems
- Policies, governance, institutions, and markets

Each of these elements needs to be understood in order to understand the overall management challenge.

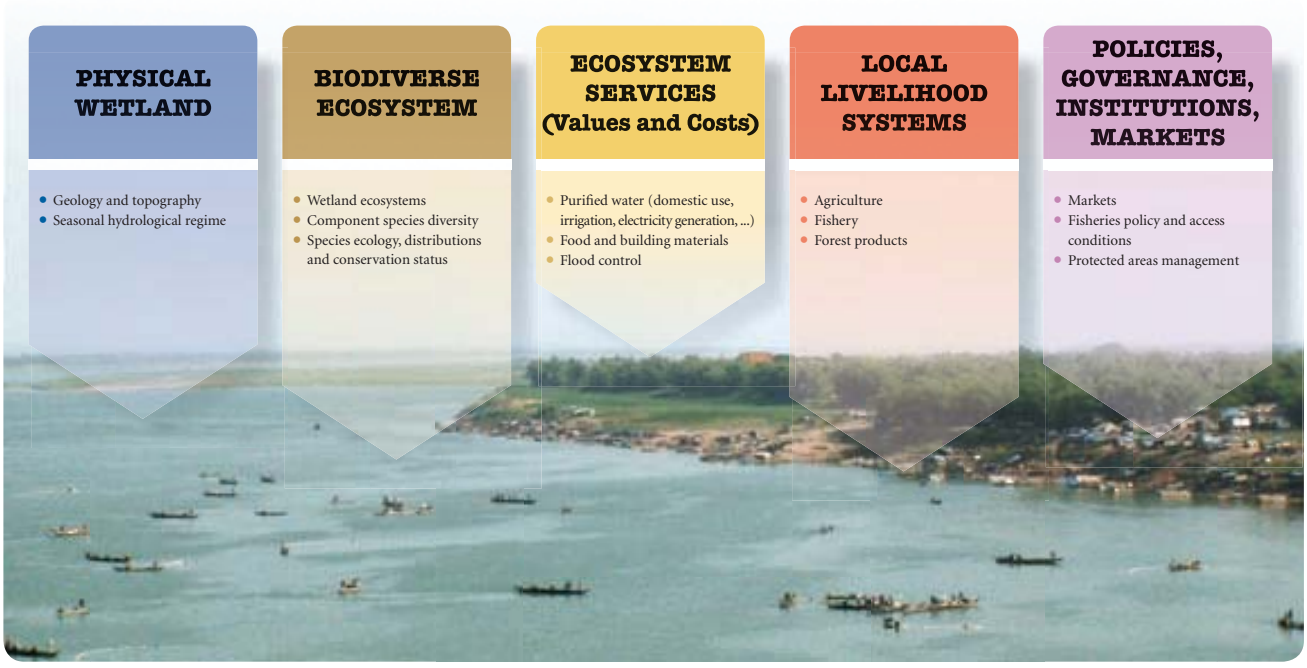

Figure 1: Interlinked aspects of a wetland landscape

BOX 1: THE ECOSYSTEM APPROACH TO WETLANDS

The ecosystem approach, as established and defined in the Convention on Biological Diversity, recognises the need for a holistic approach to wetland assessment and management. The ecosystem approach involves "*a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way*". It supports participatory planning guided by adaptive management to respond to the dynamic nature of ecosystems, in doing so involving all stakeholders and balancing local interests with the wider public interest. It advocates the decentralization of management to the lowest appropriate level, to achieve greater efficiency, effectiveness and equity.

These interlinkages and interconnectivity mean that the relationships and drivers that affect wetland status are extremely complex, concern both biophysical and socio-economic elements, and involve a series of interactions between them. Without simultaneously dealing with all of these elements it is neither possible to understand the conditions and status of a wetland within the broader physical and human landscape, nor to assess the likely outcomes and implications of different policy and management scenarios. Such integration reflects an ecosystem approach to wetland management (Box 1).

There are a number of wetland management scales relating both to the physical wetland hydrology, and also to national governance structures at different levels:

- The river basin level is the largest scale, and is likely to be regional, national or even international
- Site level may be defined by specific physical features, and/or convenience for management
- Local level refers to the settlement level and is the scale at which local people access and use the resource on a frequent basis

Wetlands provide a range of ecosystem services at these different scales, as detailed in Table 1.

F2.2 Threats to wetlands – addressing conservation and development trade-offs

Wetlands are one of the most threatened ecosystems (MEA 2005), reflecting the fact that there are many competing demands on the land and natural resources that comprise and surround wetlands. Although there is in most cases some level of trade-off between managing wetlands for conservation and for human development needs, there is also a need to understand the nature and magnitude of this competition, and to be able to balance the competing demands to generate

Table 1: Ecosystem services provided by or derived from wetlands

SERVICE CATEGORIES	SPECIFIC SERVICES	COMMENTS AND EXAMPLES
Provisioning	Food	production of fish, wild game, fruits, and grains
	Fresh water	storage and retention of water for domestic, industrial, and agricultural use
	Fibre and fuel	production of logs, fuelwood, peat, fodder
	Biochemical	extraction of medicines and other materials from biota
	Genetic materials	genes for resistance to plant pathogens, ornamental species, and so on
Regulating	Climate regulation	source of and sink for greenhouse gases; influence local and regional temperature, precipitation, and other climatic processes
	Water regulation (hydrological flows)	groundwater recharge/discharge
	Water purification and waste treatment	retention, recovery, and removal of excess nutrients and other pollutants
	Erosion regulation	retention of soils and sediments
	Natural hazard regulation	flood control, storm protection
	Pollination	habitat for pollinators
Cultural	Spiritual and inspirational	source of inspiration; many religions attach spiritual and religious values to aspects of wetland ecosystems
	Recreational	opportunities for recreational activities
	Aesthetic	many people find beauty or aesthetic value in aspects of wetland ecosystems
	Educational	opportunities for formal and informal education and training
Supporting	Soil formation	sediment retention and accumulation of organic matter
	Nutrient cycling	storage, recycling, processing, and acquisition of nutrients

Table 2: Example of compatible and incompatible management approaches for reconciling conservation and development of wetlands

CONSERVATION OBJECTIVES	MANAGEMENT APPROACH	DEVELOPMENTAL OBJECTIVES
• Conservation of wetland biodiversity and wetland-based livelihood species	✗ ***Incompatible approaches:***	• Maintenance of natural-resource-based livelihoods in the same area
	✗ *Strict protected area management*	• Supply power and water for irrigation
	✗ *Regulation of rivers*	
	✔ ***Compatible approaches:***	
	✔ *Maintaining river flows and flooding regimes*	
	✔ *Adaptive co-management working with local resource users*	
	✔ *Ecotourism*	

maximum benefits for both conservation and development, as illustrated in Table 2.

It is widely accepted that successful wetland management requires that conservation interests and development pressures be reconciled. There are many ways of attempting this reconciliation. Sometimes, trade-offs have to be made between conservation goals and development objectives that are incompatible. In other cases, conservation and development are mutually reinforcing. Whatever the relationship between conservation and development in an individual case, the resolution of management actions and policy debates requires information about both, and an understanding of the linkages between them (see Box 2 overleaf).

F3 Wetland assessment: improving upon conventional approaches

F3.1 Contextualizing wetland assessment within management issues

Wetland assessment is the process of determining and describing the status, characteristics, or worth of a particular wetland. It involves measuring certain variables which are considered important in conservation and/or development terms, and can be taken as indicators of the health of the wetland itself, its attributes, functions, and workings, of the goods and services that it generates, and of the human and natural processes it supports.

Wetland assessment does not normally take place in isolation, but is normally prompted by a particular management or policy issue that needs to be addressed, or a particular decision that needs to be made about the use of funds, land or other resources. The information generated by the assessment therefore aims to assist in understanding or dealing with this issue, or in making this decision. However academically interesting it is to know the status, characteristics or worth of a particular site, wetland assessment is not an end in itself. It is a means to an end; better and more informed conservation and development decision-making. It is the management or policy issue which determines the scope, objective and parameters of wetland assessment.

F3.2 The elements of wetland assessment

The different elements of wetland assessment have, traditionally, been seen as being distinct from each other, in jargon and approach, but also in their management focus and application:

Conservation planning is typically informed by data on biodiversity (for example on species distributions and abundance, habitat distribution and quality), and by information on threats to that biodiversity. In wetlands, these might include over-harvesting, conversion of floodplain and forest land for cultivation, or modification of rivers and floodplains through damming and drainage schemes.

In contrast, the overriding application and focus of *economic valuation* work has been in relation to assessing the costs and benefits of investment and development projects and programmes. Recently, economic valuation has however been added to the conservation toolkit. Although a large variety of methods are used and goals of valuation vary, in general valuation studies aim to derive an assessment of the value of the wetland site, per unit of wetland area, or for the species or biotic resources, or particular constituents of these. They are often used to highlight 'hidden' values – the contributions that biodiversity makes to livelihoods and the economy that are not accounted for in conventional economic analyses focussing on market-traded commodities and services. For example,

BOX 2: KEY MESSAGES OF THE MILLENNIUM ECOSYSTEM ASSESSMENT WETLAND SYNTHESIS

Wetland ecosystems (including lakes, rivers, marshes, and coastal regions to a depth of 6 meters at low tide) are estimated to cover more than 1,280 million hectares, an area 33% larger than the United States and 50% larger than Brazil. However, this estimate is known to under-represent many wetland types, and further data are required for some geographic regions. More than 50% of specific types of wetlands in parts of North America, Europe, Australia, and New Zealand were destroyed during the twentieth century, and many others in many parts of the world degraded.

Wetlands deliver a wide range of ecosystem services that contribute to human well-being, such as fish and fibre, water supply, water purification, climate regulation, flood regulation, coastal protection, recreational opportunities, and, increasingly, tourism.

When both the marketed and non-marketed economic benefits of wetlands are included, the total economic value of unconverted wetlands is often greater than that of converted wetlands.

A priority when making decisions that directly or indirectly influence wetlands is to ensure that information about the full range of benefits and values provided by different wetland ecosystem services is considered.

The degradation and loss of wetlands is more rapid than that of other ecosystems. Similarly, the status of both freshwater and coastal wetland species is deteriorating faster than those of other ecosystems.

The primary indirect drivers of degradation and loss of inland and coastal wetlands have been population growth and increasing economic development. The primary direct drivers of degradation and loss include infrastructure development, land conversion, water withdrawal, eutrophication and pollution, overharvesting and overexploitation, and the introduction of invasive alien species.

Global climate change is expected to exacerbate the loss and degradation of many wetlands and the loss or decline of their species and to increase the incidence of vector-borne and waterborne diseases in many regions. Excessive nutrient loading is expected to become a growing threat to rivers, lakes, marshes, coastal zones, and coral reefs. Growing pressures from multiple direct drivers increase the likelihood of potentially abrupt changes in wetland ecosystems, which can be large in magnitude and difficult, expensive, or impossible to reverse.

The projected continued loss and degradation of wetlands will reduce the capacity of wetlands to mitigate impacts and result in further reduction in human well-being (including an increase in the prevalence of disease), especially for poorer people in lower-income countries, where technological solutions are not as readily available. At the same time, demand for many of these services (such as denitrification and flood and storm protection) will increase.

Physical and economic water scarcity and limited or reduced access to water are major challenges facing society and are key factors limiting economic development in many countries. However, many water resource developments undertaken to increase access to water have not given adequate consideration to harmful trade-offs with other services provided by wetlands.

Major policy decisions in the next decades will have to address trade-offs among current uses of wetland resources and between current and future uses. Particularly important trade-offs involve those between agricultural production and water quality, land use and biodiversity, water use and aquatic biodiversity, and current water use for irrigation and future agricultural production.

Cross-sectoral and ecosystem-based approaches to wetland management — such as river (or lake or aquifer) basin-scale management, and integrated coastal zone management — that consider the trade-offs between different wetland ecosystem services are more likely to ensure sustainable development than many existing sectoral approaches and are critical in designing actions in support of the Millennium Development Goals.

Many of the responses designed with a primary focus on wetlands and water resources will not be sustainable or sufficient unless other indirect and direct drivers of change are addressed. These include actions to eliminate production subsidies, sustainably intensify agriculture, slow climate change, slow nutrient loading, correct market failures, encourage stakeholder participation, and increase transparency and accountability of government and private-sector decision-making.

The adverse effects of climate change, such as sea level rise, coral bleaching, and changes in hydrology and in the temperature of water bodies, will lead to a reduction in the services provided by wetlands. Removing the existing pressures on wetlands and improving their resiliency is the most effective method of coping with the adverse effects of climate change. Conserving, maintaining, or rehabilitating wetland ecosystems can be a viable element to an overall climate change mitigation strategy.

(MEA 2005)

Kong Kim Sreng/Darwin Integrated Wetland Assessment Project

Fisheries often play a key part of rural livelihoods, as shown here in Stung Treng Ramsar Site

crops and timber are typically included in studies of rural production and consumption, while non-timber forest products and locally used but non-traded resources are not included. Often, ecosystem services provided by forests and floodplains (e.g. local climate regulation, prevention of soil erosion, flood regulation etc.) are not valued either.

Livelihood analysis has developed from rural development research, and is applied in relation to development projects and programmes focused on promoting sustainable resource use and on reducing poverty and related conditions such as social exclusion and vulnerability. Local-level livelihood assessments focus on people's assets and capabilities, their livelihood strategies and activities, and their incomes and consumption levels, the aim being to help enhance these. There is also a strong focus on understanding the social, cultural, legal, and political structures and processes that constrain peoples' opportunities to improve their lives. Livelihoods analysis is often used to inform and guide development programmes (e.g. Livelihoods Connect; www.livelihoods.org).

The inevitable outcome of using these different assessment methods separately for wetlands is that wetland planning has been pulled in divergent directions by the different assessments rather than reconciling these different objectives through considering how to best to trade-off different options and seeking 'win-win' opportunities where possible. The MEA recognised that ecosystem approaches which better reconcile the divergent management goals for wetlands are increasingly important.

F3.3 'Non-integrated' approaches to wetland assessment

Although biodiversity assessment, economic valuation, and livelihood analysis techniques are each relatively well-developed, and have been extensively applied to wetlands, there have to date been few attempts to integrate them within the context of real-world management and policy issues. There remain very few, if any, examples of assessments which bring together biodiversity, economic, and livelihood elements under one framework. At best, a series of assessments are carried out separately and brought together only after data have been collected and a final analysis made. More commonly, a single aspect of wetland use or management is investigated in detail, and broad (and often uninformed) assumptions about other elements are made.

While there is widespread recognition that wetland planning and management should take account of both conservation and development objectives, often the approach to informing these activities is not integrated at all. A series of research questions are formulated, investigated and reported on separately by each discipline. It is only when the assessment, analysis and reporting have taken place that some effort is made to draw out combined conclusions and recommendations for management purposes (Figure 2). This section describes the way programme design, assessment of conservation and development issues and presentation of information is typically carried out in a non-integrated manner.

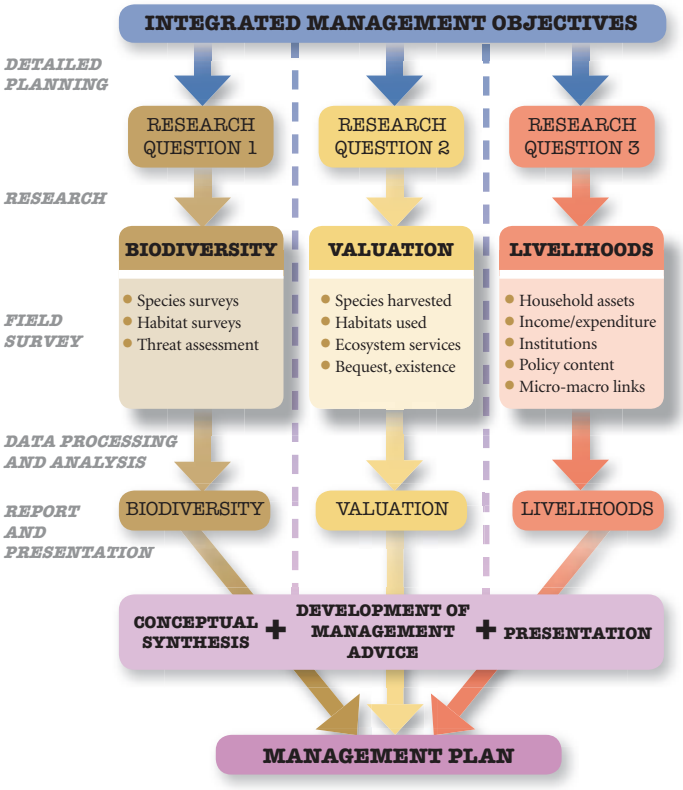

Figure 2: A 'non-integrated' approach to wetland assessment

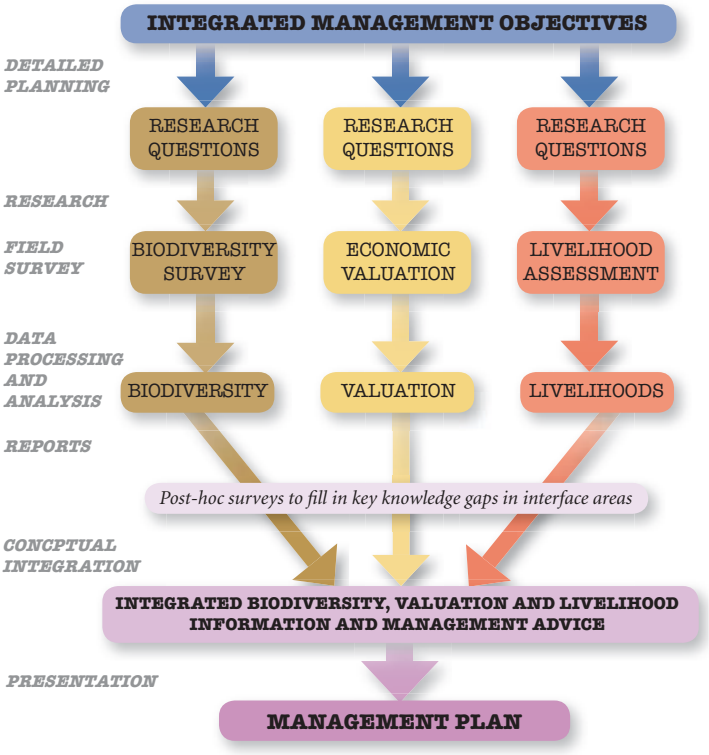

Figure 3: Integrating wetland assessments which are already under way as separate studies

Even though integrated conservation and development are often both incorporated into the overarching wetland management objective, and an assessment process is instigated in order to identify ways to achieve that goal, the different thematic elements of this assessment tend to remain separated. Individual specialists are commissioned to carry out studies on conservation and development issues, and the process may unfold as follows:

1. The specialists identify research questions pertinent to their particular expertise and terms of reference and then design assessment programmes to address these questions

2. For logistical reasons, the assessment processes do not often take place in parallel. They may take place at different times, perhaps in different localities, and with limited discussion between groups

3. Each group collects and analyses its own data and writes its own report, using its own specialist language and discipline-based standards and norms of good practice

4. Management advice is framed and presented in different ways; some reports make essential use of spatial mapping of some components of the biodiversity, livelihoods, and economic assessment. Other reports are largely text-based, while others use complex numerical analyses

5. The management group then has the task of drawing on these reports to assess different management options. At this point, gaps and discontinuities become apparent. Missed opportunities are belatedly spotted. Arguments over objectives ensue. Value judgments are made as to which report to give credence to in the case of disparities

6. It is discovered that no one has worked at the same spatial scale, and that the biodiversity survey team and livelihoods team disagree on the root causes of observed or perceived threats to diversity, and therefore on what management actions are needed to address them

7. Management then either decides it 'needs more research' to resolve the problems before any management action can be recommended, or it makes decisions based on subjective evaluation of the validity of different claims made in each separate report or by each disciplinary group

This lack of integration results in inefficient use of resources for assessment and analysis of information, erodes trust between conservation and development advocates, and puts the burden of conceptual integration and analysis on decision-makers. It also typically generates a series of confusing, unharmonized, and at the worst contradictory, sets of information and recommendations for decision-makers.

F4 Integrating when, how and by whom the assessment is carried out

This toolkit is founded on the guiding principle that if assessment is to be useful to real-world wetland management planning and decision-making, it must adopt an integrated approach; one which brings together biodiversity, economics and livelihood elements. As explained in the paragraphs below, this involves documenting — through assessment — the biological, ecological and socio-economic aspects of wetlands, along with their status, trends, and threats. To be effective, equitable and sustainable in practice, wetland management responses must be informed by an understanding of all of these elements, including their mutual causality and interconnectivity.

F4.1 Moving from thematic separation to integrated assessment

There are various degrees of integration. Although ideally a wetland assessment would be thematically integrated from its very conceptualization and design right through to the presentation of results to decision-makers, in many cases this

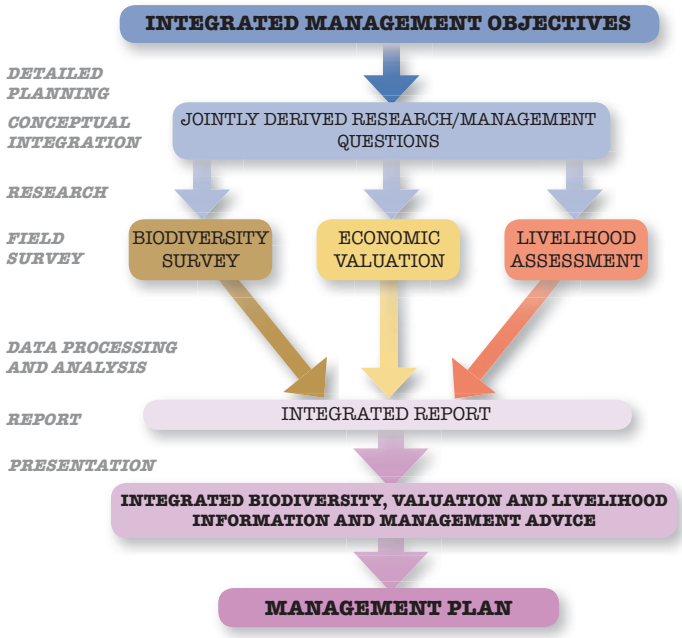

Figure 4: Integrating the work of separate field survey teams within a single assessment

is not possible. The assessment is taking place in a situation or context where prior work has been carried out, a programme or project is already under way, or a particular emphasis has already been placed on particular elements of wetland management and information needs. Below, we look at three levels of thematic integration in wetland assessment:

1. Integrating wetland assessments which are already under way as separate studies
2. Integrating the work of separate field survey teams within a single assessment
3. Carrying out an integrated assessment with an integrated survey team

Integration can take place by working with existing project teams to harmonize and synthesise the different components of their workplan (Figure 3). Here, even though separate studies of biodiversity, economic valuation, and livelihoods may have already been conducted — with separate objectives and methodological approaches — greater attention is placed on integrating the findings from these surveys prior to presenting them to management stakeholders. It may also be possible at this analytical stage to identify key gaps in knowledge, which may be found at areas of interface between disciplines, and develop targeted actions to fill these gaps. Although this leaves conceptual and analytical integration rather late in the programme planning cycle, at least it means that decision-makers and other interested parties are able to discuss results that have emerged from a process of consultation and cross-disciplinary testing.

Partial integration of biodiversity, economic, and livelihoods assessment (Figure 4) ideally takes place right from the start of integrated programmes – by asking questions that are not restricted simply to conservation concerns, or to development concerns, but relate to both. In cases where programmes are yet to begin, a fully integrated assessment can be designed as an integral part of the programme cycle. This may also be suitable as a method where a project or programme has completed an initial phase and is about to begin another. While this model has the advantage that disciplinary teams understand each others' aims and develop a joint strategy for assessment, there is the disadvantage of a lack of field-level co-ordination and exchange of expertise. This misses opportunities for insight (for example in joint focus groups conducted with biodiversity and livelihoods experts) as well as the chance to build trust and understanding among survey personnel from different disciplines and viewpoints. This model also misses the opportunity for time-saving and reduction of interviewer fatigue through collecting all the relevant information during a single visit to a site or community.

The fully integrated model which we recommend (Figure 5) has the advantage that exchange of ideas takes place at all stages – from defining objectives, through carrying out fieldwork, to data analysis and presentation. Its disadvantages may include the time and effort it takes to plan and conceptualize, and the intellectual and professional demands it places on participants. This model

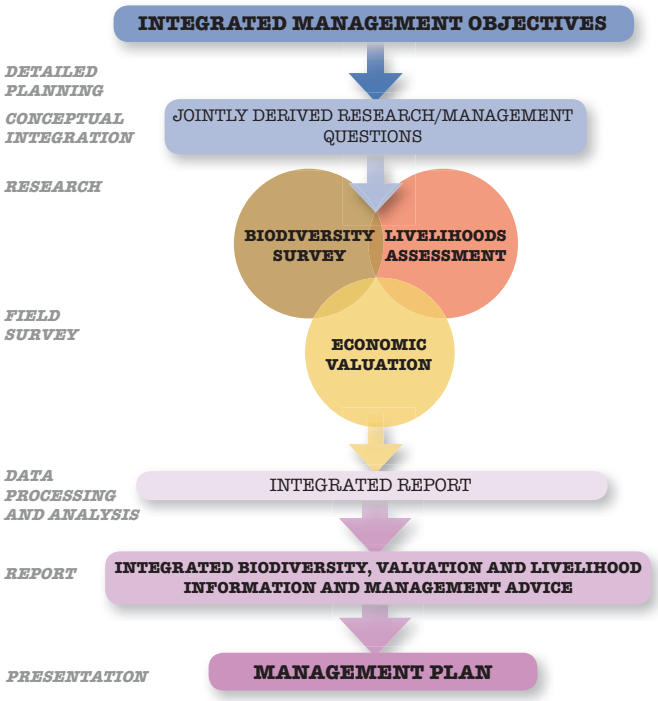

Figure 5: Carrying out an integrated assessment with an integrated survey team

helps wetland conservation and development stakeholders to move away from a situation where they are making decisions on the basis of a series of biodiversity assessments, economic valuations, and social development reports that have been carried out by different groups of people, who were commissioned separately by programme or project planners, did not consult one another, worked in different places and at different times to each other, using different methods, analytical tools and scales of working, and who were each able to provide only a part of the information required, leaving gaps which had to be filled by information derived from guesswork, inapplicable generalizations or vested interests.

F4.2 Strengthening equitable, pro-poor approaches

The Millennium Ecosystem Assessment *Ecosystems and human well-being: Wetlands and water synthesis* (MEA 2005; www.millenniumassessment.org) recognised that wetland degradation and loss affects the poorest the worst. A pro-poor focus recognises that poor people not only lack the basic necessities of life, they also lack power and control over their lives and the decisions that affect them. It thus aims to take specific consideration of these needs, and to ensure that any activity carried out in wetlands should not negatively impact on the status of the poor – and wherever possible should attempt to improve it. In order to incorporate an understanding of the specific needs and status of the poor, and their links to wetland ecology and biology within broader livelihood and economic processes, information is needed about all of these factors and forces. An integrated approach to wetland assessment allows and supports pro-poor concerns to be integrated into on-the-ground management and planning, and ensures that the needs of poorer and more vulnerable groups are adequately represented and reflected.

F5 Conceptual integration in what is being assessed

F5.1 Integrated assessment: understanding and acting on the links between ecosystem services and human well-being

At the most basic conceptual level, an integrated assessment involves assessing the three main aspects of the wetlands interaction with human society:

- the ecosystem (and the physical conditions that support it), through biodiversity assessment (and background physical assessment)
- the value of the ecosystem services wetlands provide
- consideration of wetlands' role in local people's well-being through a livelihood assessment. Note that the human management and use of wetlands involves a policy and governance context, and this must also be assessed as a related aspect of the livelihood assessment

The integrated approach is illustrated in Figure 6.

This basic conceptual approach can be elaborated to provide a detailed 'map' for full integrated assessment, as shown in Figure 7. Section II of this toolkit provides data collection tools according to this structure: Chapter 3 provides Physical Wetland and Biodiverse Ecosystem assessment tools; Chapter 4 covers Local Livelihood Systems assessment and Institutions, Governance and Markets assessment; and chapter 5 provides tools for Economic Valuation of Ecosystem Services.

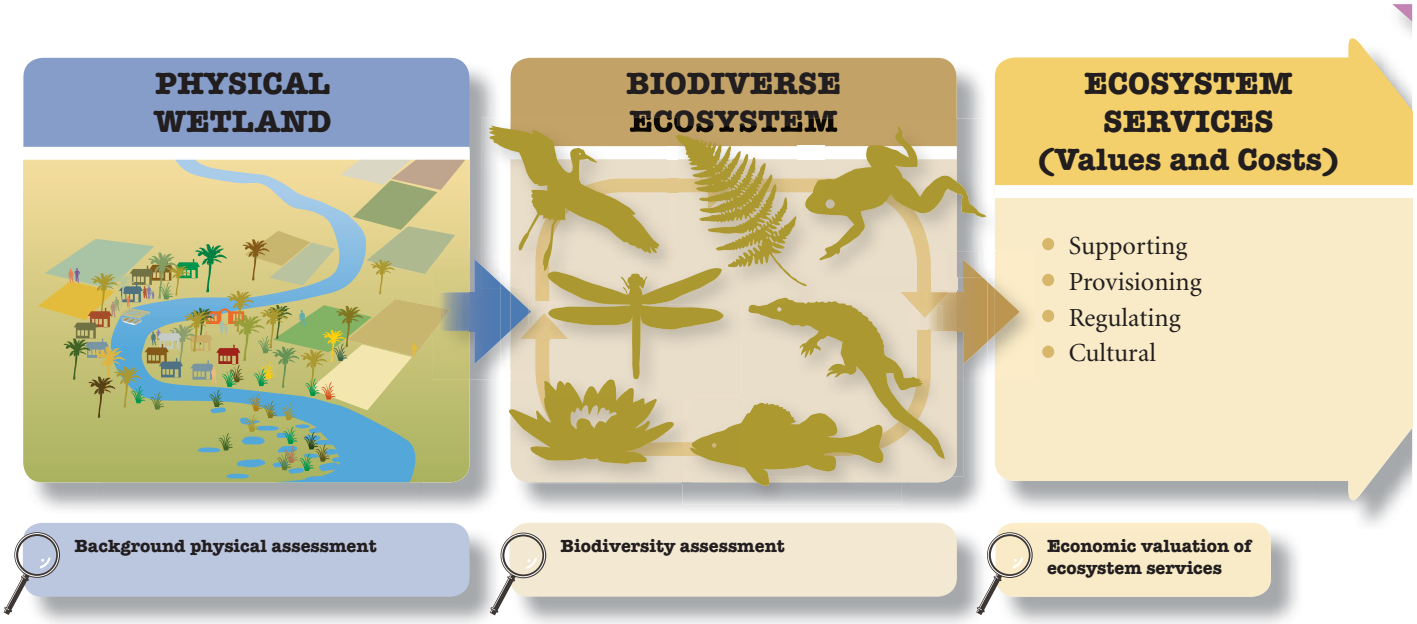

Figure 6: Integrated assessment of the links between wetland ecosystems, their ecosystem services and human well-being

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Following survey fieldwork in Stung Treng Ramsar Site, Cambodia, the combined assessment team jointly analysed the data that had been collected and presented their findings directly back to local stakeholders

A variety of conceptual models can be used to describe the interconnectivity between biodiversity, economic values, and livelihoods. The MEA (2005) provides a useful framework with which to describe these linkages – between the supporting, provisioning, regulating, and cultural services that wetland ecosystems provide, and the various constituents of human well-being which ensure security, basic materials for a good life, health, good social relations, freedom of choice and action.

While biodiversity assessment provides the means to establish the links between ecosystem health and the provision of particular goods and services, economic valuation expresses

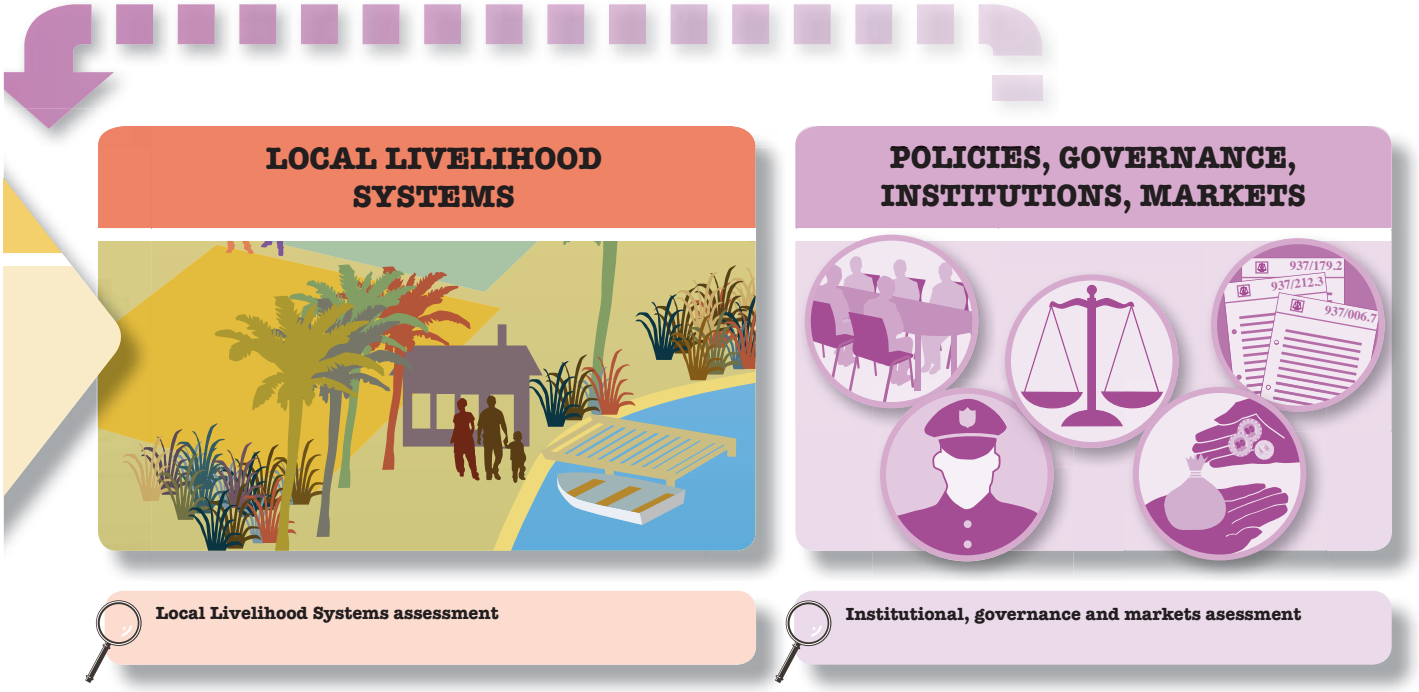

Figure 7: Integrated Wetland Assessment – conceptual approach

the economic significance of these services for human well-being, and livelihoods analysis describes the components of human well-being in relation to ecosystems and the economy. Together, an integrated approach to wetland assessment which incorporates all these elements enables the links between wetland ecosystems, livelihoods, economic productivity, and human well-being to be described, and the various institutions, policies, markets and other forces which moderate and shape these links to be understood.

F5.2 The merits of integrated assessment from the biodiversity perspective

Wetlands are unique ecosystems that often sustain a high level of biodiversity including many rare, endemic or threatened species. The physical characteristics of wetlands, which are the basis of the wetland ecosystems, are determined by a range of factors including topography and hydrological flow. Wetland species cover all trophic levels and are often dependent on intact habitats, being highly sensitive to environmental changes such as changes in water flows, and declines in water quality caused, for example, by pollution or sedimentation.

The sustainable management of a wetland requires maintenance of the seasonal hydrological regime and water flows. Changes to the physical conditions within a wetland, for instance from diversion of water or damming, can have potentially very serious impacts on biodiversity, ecosystem services, and local livelihoods, and understanding current and potential threats to a wetland site is key to developing an understanding of the status and threats to its biodiversity (Figure 8).

Arguments for biodiversity conservation based solely on the intrinsic value of species — with the possible exception of highly endangered, highly charismatic species — are rarely successful in influencing decision-makers and protecting wetland habitats. Evidence from integrated assessments that show the value of species in terms of livelihoods and economics is likely to strengthen the case for wetland conservation.

Taking an integrated assessment approach can improve understanding of the biodiversity present within a wetland in many ways. Much of biodiversity has direct value to humans, supporting people's livelihoods in numerous ways. For instance, humans depend on animals and plants for food, clean water

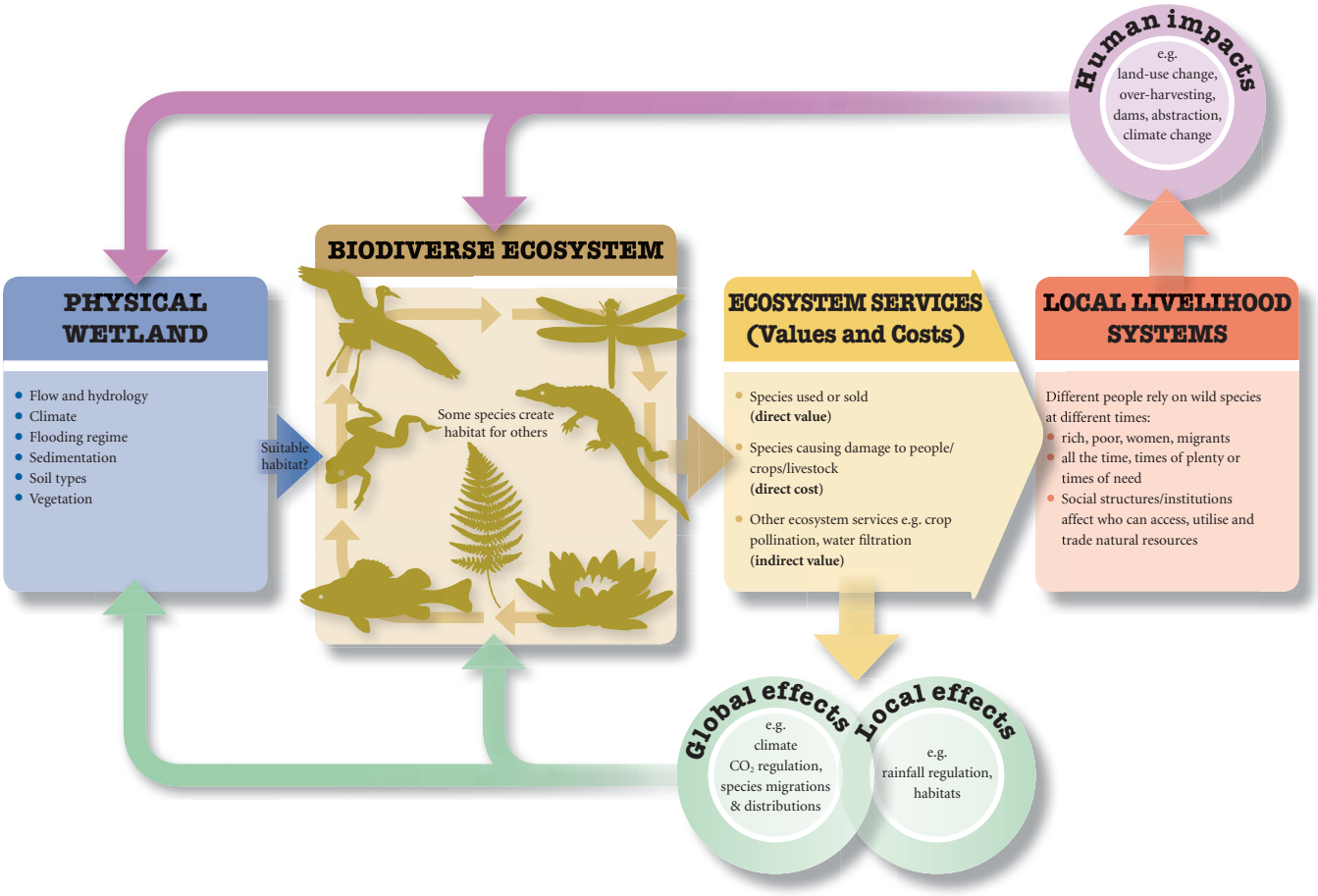

Figure 8: Ecosystem and species contributions to livelihoods, and how human impacts can in turn affect species

for drinking, wood or other plant-based fuels to cook and keep warm, and materials for building and making products such as clothes. The supply of most of these necessities is provided or influenced by biodiversity (both past and present), be it as insects pollinating crops, as forests providing wood, or as bacterial films purifying water.

Human activities and policies often result in the degradation and loss of biodiversity, for instance when dams are built for hydro-electric energy, or through unsustainable levels of utilization. Decisions over wetland resource use often neglect, or are uninformed by, the intrinsic value of the biodiversity lost, and the value that the biodiversity contributes and the people whose livelihoods were reduced or lost. Decision-makers therefore need to be better informed regarding the range of biodiversity present, its conservation importance, and its role in livelihoods and ecosystem service values. The aim of integrated biodiversity assessment is to strengthen arguments for the conservation of wetlands and their ecosystems, habitats, species and services, through the provision of fuller information on wetland biodiversity and values. This toolkit presents methods to provide this information to decision-makers. Wetland communities are often highly dependent on biodiversity; for example, fishing often provides essential food and income. Such communities are also particularly vulnerable to factors outside their control, as activities far upstream or downstream can affect fish populations and flooding regimes (e.g. Abell *et al.* 2007).

Biodiversity assessment involves assessing what biodiversity is present within a wetland, its distribution (location) and in some cases its threat status (especially for endemic or highly utilized species), as well as information such as the degree of utilization, which allows linkages to be made to livelihoods and economics analysis.

Deciding what biodiversity to assess within the assessment area will be a key decision in the planning stages of an integrated wetland assessment: it will usually be impractical — for reasons of time, skills, and resources — to attempt to survey all biodiversity within a site. Instead, biodiversity survey effort should be informed by the biodiversity, livelihoods and economics literature review and perhaps the pilot study within the survey site. Survey effort could, for example, be focused on endemic species (those found only within the survey area – probably relevant only for vary large wetlands or for very range-restricted species), and on those species of high economic or livelihood value. In practice, we suggest limiting survey effort to a small number of taxonomic groups such as fishes, birds, molluscs, dragonflies and damselflies, and aquatic plants (see section B1.2 for more information) which are generally easily surveyed, well known, utilized and indicative of ecosystem condition.

F5.3 The merits of integrated assessment from the economic valuation perspective

Economic valuation demonstrates and quantifies the value of the natural environment to human society, in particular here the value that wetland ecosystem services provide (Figure 9). Ecosystem products and other services have an objective importance within the local, regional, or national economy in the same way that for instance agricultural products from intensively managed terrestrial landscapes have. And, like agricultural production, wetland ecosystem services may be valued in

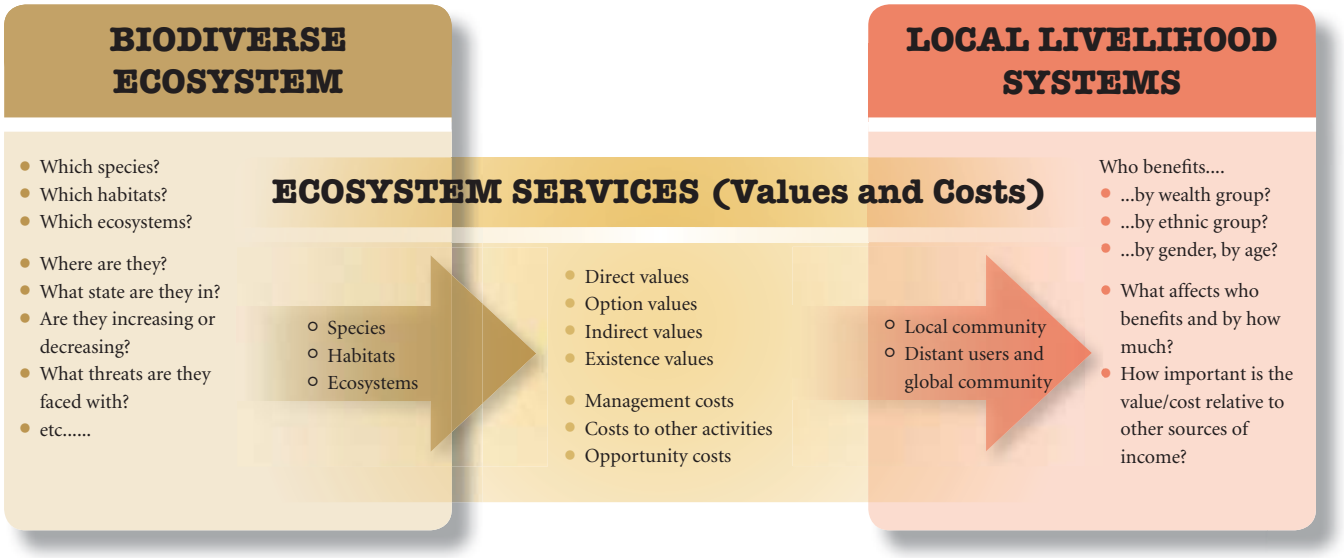

Figure 9: Assessing the services ecosystems provide through economic valuations

Gita Kasthala/Darwin Integrated Wetland Assessment Project

Sampling for freshwater molluscs during the Mtanza-Msona assessment

Kong Kim Sreng/Darwin Integrated Wetland Assessment Project

money terms. Yet, because many of the services are not traded, special methods are often needed to identify or estimate the values in money terms. Valuation has become increasingly important as it becomes recognised that not valuing the wide range of ecosystem services risks them being assumed to have no value.

A variety of methods can capture both the obvious values, such as the value of timber sold for export, and the hidden values, such as the water purification services provided by wetlands.

Integration is important because conventional valuation studies rarely tease out the *species composition* of the resources valued, nor do they often separate out *who* receives the value. Disaggregating biodiversity and livelihoods information can allow the incorporation of non-monetary values into a wetland assessment, such as the conservation value of particular species which may be locally or globally threatened, and the importance of natural resources to the poorest members of society, who often form the particular focus of development agendas.

F5.4 The merits of integration from the livelihoods perspective

Wetland human communities are typically heavily dependent on the wetland resources present for their livelihoods, in terms of fisheries, irrigation water, and gathering of other wetland products. Changes in the quantity or quality of those wetland resources or in people's access to them may seriously affect people's livelihoods. The governance and institutional context of the wetland management is critical here for understanding the current status of the resource and any contests over its control, and for determining the possibility of influencing management and the capacity to implement improved management assessments.

Conventional livelihood analysis usually documents this natural resource use and the factors which affect access to resources, noting also local perceptions of change in resource availability and causes of those changes. This information can feed into development processes which may improve resources access and management, involving for instance facilitating institutions such as local fishing associations, which can report illegal harvesting activities or lobby against threats such as dams or prawn farms.

Integrated assessment, involving gathering related biodiversity information and *economic valuation* can add value to this process in a number of ways. Identifying the species which make up the resources may help to design more sustainable harvesting strategies, based on knowledge of life cycles

and migration patterns. Species surveys will help to identify threatening processes, such as invasive species or diseases affecting harvested species, and identifying species' distributional ranges allows the management of individual species resources. Documenting the species present provides baseline data with which future changes in species can be compared; if local people notice that some species are disappearing, scientific evidence can be used to back this up. Additionally, threatened species can be used to enlist the support of conservation organisations, who may be able to offer advice, funding or political influence.

The main benefit of putting an economic value on resource use is that quantifying the value of resource use allows the financial benefits of proposed developments to be weighed up against the loss of income that may result.

Figure 10 shows the Sustainable Livelihoods Framework (adapted to take into account the need for more detailed information on biodiversity and its economic values.

This framework is described in more detail in section L2.

Further reading

Borrini-Feyerabend, G., Pimbert, M., Farvar, M.T., Kothari, A., and Renard, Y. 2004. *Sharing Power: Learning by Doing in Co-management of Natural Resources throughout the World*. IIED and IUCN. Available at: www.iapad.org/sharing_power.htm

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The Ramsar Handbooks for the Wise Use of Wetlands, 3rd edition. Available from: www.ramsar.org/lib/lib_handbooks2006_e.htm

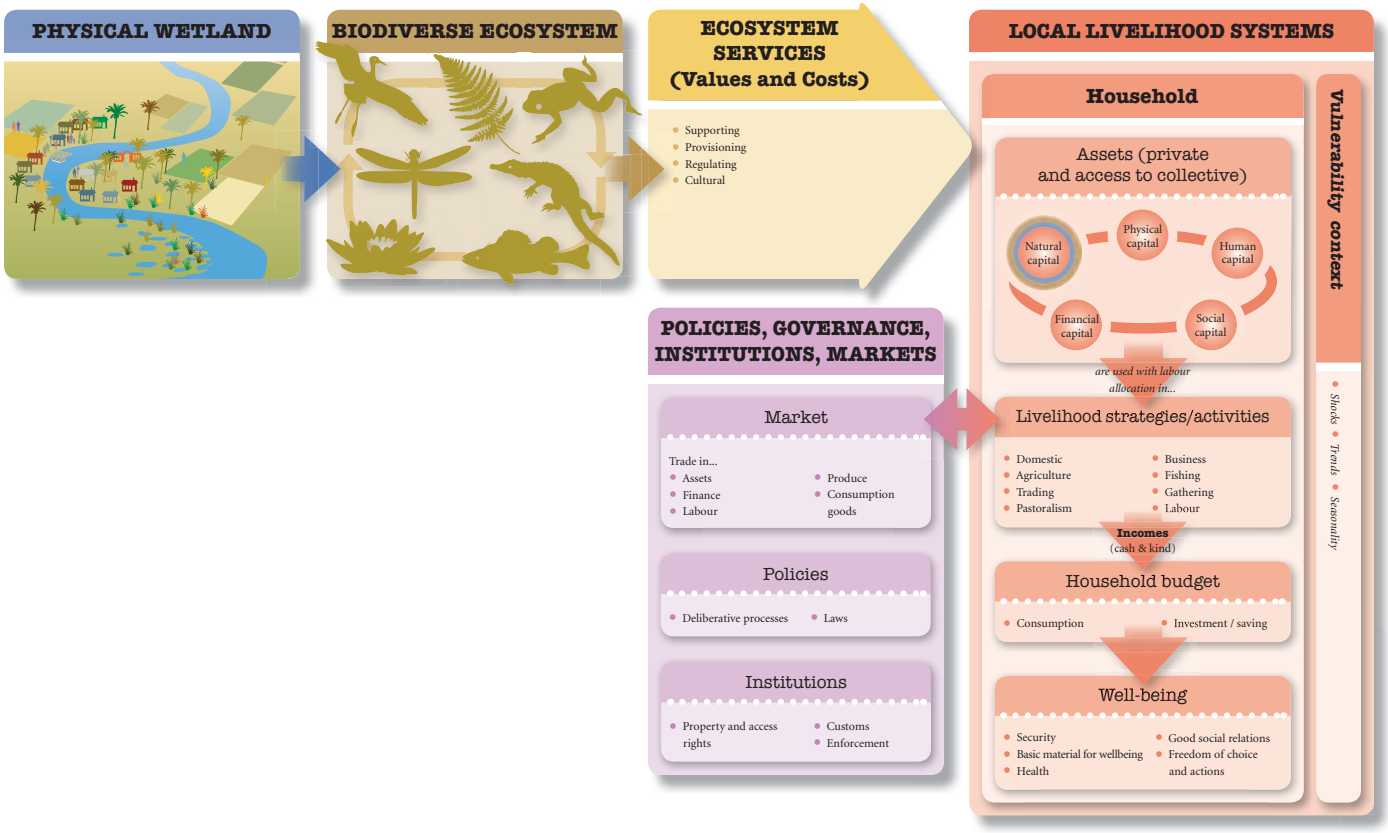

Figure 10: Adapted Sustainable Livelihoods Framework illustrating how biodiversity and economic valuation information can contribute to improved understanding of local livelihood systems (after Springate-Baginski and Blaikie 2007)