Resolving peatland management and conservation dilemmas through implementation of the ecosystem approach

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Summary

The relevance is examined of the Ecosystem Approach (EA) to resolving the dilemmas of peatland management and conservation. This analysis is made against the backdrop of the exceptional features of peatland which includes the provision of benefits traditionally ignored in decision-making. Three cutting edge issues: climate change, water quality deterioration and poverty alleviation are used to set the context for consideration of each of the twelve principles underpinning the EA.

There is no shortage of comprehensive guidance for the integrated and 'sustainable' management of peatland resources. What is required now are more simple, easy to use, tools, based on hard scientific and other technical evidence, amenable to economic analysis and convincing to decision-makers.

Key index words: peatlands. Ecosystem Approach. climate change. water quality, poverty alleviation. Tools

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Introduction

If ever there was need to verify the range and strength of often highly conflicting views of peat then there is no better way than to look at the combined themes of the IPS scientific programme. They vary from ecology to economics, hydrology to forest management, energy production to carbon sequestration and greenhouse gas mitigation, heritage and culture to horticulture and agriculture, peat products for medicines and therapeutic treatments to use in environmental protection and their role in art. Interests vary globally from high latitude and oceanic peats to tropical peatlands. No other wetland type can bring together such interdisciplinarity and differences in stakeholder perspectives. Yet, if there is any lack of coherence stemming from the absence of a single focus, the opportunity is unparalleled to develop a more holistic and integrated approach to their conservation and management worldwide. It is in this context that I should like to explore the relevance of application of the Ecosystem Approach (EA) (*sensu* Convention on Biological Diversity) (CBD, 2003; Maltby, 1999a, 1999b; Smith and Maltby, 2003; Maltby, 2006).

The EA provides a methodological framework for achieving the most appropriate balance of the Convention's objectives; conservation of biological diversity, sustainable development and equitable sharing of the benefits of genetic resources. It acknowledges twelve underlying principles as well as five elements of guidance. Application of the EA to peatland management is a real challenge to the strength of the methodology but the test will be the success of sustainability in action.

Some exceptional characteristics of peatland

Peat and peatlands (including mires) comprise exceptional natural bodies of the Earth system. In combination there are a number of features of peat which confer a unique character that underpins the challenges of their most appropriate management:

- Peat accumulates over time usually from a non-peat starting point which may vary between extremes of open water and bedrock.
- Active accumulation has proceeded for more or less long periods of 'ecological' time extending to prehistoric dates but generally not continuously with 'geological' time. A minimum time period of 10^2-10^3 years is normally required for the development of peat as opposed to an organic matter layer. Some tropical peats have been dated as older than 40,000 years but their continuous accumulation throughout this time span is considered exceptional (Wust, 2007).
- Layers of surface accumulation are exposed to the atmosphere and ground level processes/impacts which capture environmental evidence in time synchronous bands datable through C14 and other techniques. The peat medium is an excellent preservative of organic and some other materials resistant to acidity.
- Formation, development and 'stability' is encouraged and maintained by a specific envelope of environmental conditions representing local and/or regional scale properties (c.f. templates of formation, Moore and

Bellamy, 1974). Peat can be found worldwide from tundra to tropics and temperate to arid environments.

- It is normal in the course of development for most peats to reach a stage where degradation becomes a natural process. (Tropical mangrove peats along subsiding coastlines may be a notable exception). Degradation may be manifest as a catastrophic geomorphological failure (e.g. bog burst) or as a more gradual process such as through accumulation above and beyond the immediate water table.
- Peat itself has a wide range of economic uses the majority of which involve alteration from its natural state. But undisturbed peat and peatlands also perform numerous 'ecosystem services' which are rarely attributed economic values.
- Peat bodies represent the highest densities of organic carbon per unit area of landscape of any contemporary ecosystem (Maltby and Immirzi, 1993; Page and Banks, 2007).
- Peat is highly sensitive and vulnerable to often subtle changes in hydrology and other environmental conditions resulting in often irreversible alteration.
- Peat supports unusual species with exceptional adaptations to the peat-forming environment and which may possess valuable pharmaceutical properties. Some of these species are the drivers of peat accumulation such as in active mires, but others may be just there and may have no genetic relationship to the development of the underlying peat (such as in much of Britain's *Calluna* moorland). Over time the vegetation composition tends to change as the peat mass changes. Both natural and human-induced processes lead to highly dynamic ecological relationships and succession.
- Degradation can be initiated and/or accelerated by both human activities (eg. land use, drainage) and by natural environment changes (e.g. acid rain, climate change). Degradation generally results in loss of carbon at rates orders of magnitude greater than any historic rate of fixation. This is especially true of tropical peat (Maltby and Immirzi, 1993) and is compounded by losses of other important functions (Table 1).

Some cutting edge issues

Several issues concerning peat conservation and management stand out as of sufficiently high profile that in addition to their scientific interests, they have captured the attention of governments, civil society, business and the media. They serve to illustrate the significance of resolving often major conflicts between use and 'non-use', benign neglect versus active restoration and political choices of investment. They are:

(1) Climate change
(2) Water quality deterioration
(3) Poverty alleviation

Table 1. Matrix showing the expected deterioration of natural functions of peatland for different land use conditions (Maltby and Immirzi, 1996)

Peatland type	Function/value								
	1	2	3	4	5	6	7	8	9
Peat swamp forest	x	x	x	x	x	x	x	x	x
Selective harvest, not drained	x	x	x	x	x	x	x	x	-
Selective harvest, drained	x	-	-	-	-	x	-	-	-
Degraded forest	x	-	-	-	-	x	-	x	-
Grass dominated peatland	x	x	x	-	x	-	-	-	-
Plantation	x	-	-	x	x	x	-	-	x
Cultivation	-	-	-	-	-	-	-	-	-
Aquaculture	-	-	-	-	-	-	-	-	-
Mined	-	-	-	-	-	-	-	-	-

Legend

1	Flood control	7	Nutrient retention
2	Groundwater recharge	8	Biomass export
3	Groundwater discharge	9	Microclimate control
4	Sediment trapping	x	Present
5	Erosion control	-	Reduced
6	Shoreline stabilization		

Peat and climate change

Whilst there will always be uncertainty over the precise numbers, there is at least general agreement that peat is a significant carbon store which has been building up over various periods of the 'anthropocense'. In many cases peat formation and accumulation has been a response to climate and in the northern hemisphere was triggered largely by postglacial warming that opened up the depressions and lake-rich landscapes which infilled with organic detritus. The wet Atlantic period further stimulated the growth of many so called terrestrial peats in high latitudes. Climatic fluctuations also account for variations in the accumulation of tropical peat (Wust, 2007). It is also true that particular environmental conditions such as high productivity exceeding decay rates reduced by the desiccating effects of perpetual winds (and possibly high salt levels) (Lewis Smith and Clymo, 1984) and subsiding coastal sediment may enable the accumulation of exceptional peat deposits (Maltby, 1986). But in other cases the trigger has been human activity – alteration of vegetation, changes in soil hydrology and increased acidity led to the development of extensive blanket peat often replacing mixed deciduous forest in upland Britain. So both past climate change and human actions have been forces which have initiated or accelerated peat formation and development. In the case of the latter, it means that non-peat forming ecosystems can occupy the same land surface where there is currently peat without the need to infer climate change – a fact previously vigorously exploited through afforestation and agricultural reclamation.

A second aspect of this relationship is that the peat store is intrinsically connected with the dynamics of greenhouse gases forcing further climate change. This has a number of dimensions:

(1) Peat locks up carbon which otherwise would cycle in the atmosphere – biomass pool but inevitably enhancing atmospheric CO_2 concentrations.
(2) The flux of methane from intact and 'natural' peat systems at particular stages of development may represent a contribution to greenhouse warming which exceeds any reduction achieved by carbon sequestration.
(3) In general peat systems will be greenhouse 'cooling' in the initial stages of development but may become 'greenhouse' warming in their later stages. This tendency is accelerated dramatically by any disturbance or change which accelerates the breakdown of the fixed carbon store eg. drainage, erosion, mining, burning.

Table 1. Summary findings from Friends of the Earth report Do not Disturb! Peatbogs and the Greenhouse Effect (Maltby et al, 1992)

<u>Scientific summary</u>

- Peatlands are substantial carbon pools
- Active peatbogs are a significant, although small, sink for CO_2
- Peatbogs may be releasing methane with a warming potential over and above their capacity to act as a sink for CO_2 . These methane emissions are the result of natural biochemical processes.
- Human disturbance of peatbogs has created a significant CO_2 source while reducing the methane source only fractionally.
- The peatland carbon source may be increased by the effects of climate warming.
- Mining of bogs for fuel or horticulture peat causes the most rapid carbon release.
- Planting trees on peatbogs does not prevent net emissions of greenhouse gases resulting From disturbance.

<u>Needs for Policy development</u>

Key criteria

- Protection of the global peatland resource would provide a significant contribution to minimisation of CO_2 releases to the atmosphere.
- Peatlands are extremely sensitive to human impact or climate change and are increasingly vulnerable to land use pressures.
- Peatlands are, in many respects, a 'common resource', the benefits of which can extend well beyond their physical boundaries.

Recommendations:

- Maintain peat carbon store, preserve or enhance other important social and wildlife benefits eg. flood control, water quality, fisheries, habitat through sustainable use (including protection or non-use).
- Apply wise use requirements of Ramsar.
- Determine full economic and environmental consequence of unwise use of world's peatlands.
- Raise public and political awareness of importance of peatlands

How can these objectives be achieved?

- Improve the policy, planning and institutional base
- Improve the science base
- Improve use, protection and conservation
- Improve international cooperation

There is now considerable interest in the management of peat to maximise carbon capture and reduce the flux of radioactively active gases. This is particularly the case of the uplands of northern England (see below). In the tropics, following earlier work by Maltby and Immirzi (1993), there is a growing argument to protect low latitude peatlands to minimise potential effects on climate (Page and Banks, 2007; Silvius and Diemont, 2007).

Elsewhere, the case has been proposed that alternative development of peatlands may actually contribute positively to carbon sequestration. Such is the situation allegedly with the oil palm oil lobby in Indonesia (Butler, 2007).

As early as 1992 a report for Friends of the Earth presented a summary of technical analysis of the role of peatlands in the dynamics of greenhouse gases and recommendations (Table 2) Despite overwhelming scientific assessments for nearly two decades, there has been insufficient reaction from governments to arrest the adverse consequences of peat loss for climate change.

Water quality deterioration

Wetlands in general are often regarded as significant contaminant filters resulting in the production of improved water quality. Disturbance of peatlands, however, can result in degradation of water quality with far reaching ecological and economic consequences.

Drainage for agriculture of large parts of the Florida Everglades has resulted in the release of phosphorus to levels well above background with far reaching ecological consequences (DeBusk *et al.,* 2001). Elevated phosphorous levels in the water had led to significant ecological changes downstream. In particular, the naturally oligotrophic ecosystem characterised by seagrass (*Cladium jamaicense*), and white water lily (*Nymphaea alba*), periphyton and floating algal mats in open water areas has been rapidly replaced by dense monospecific stands of cattail (*Typha domingensis*). The change represents a degradation of biodiversity including loss of fish, bird, amphibian and reptile habitats. The increased productivity, however, has resulted in an increase in organic matter production, possibly leading to increased peat accumulation at least in the short term (increased fire risk may counteract the increase longer term). One further possible impact of increased peat accretion, however, is the development of more strongly anaerobic conditions. These may be sufficient to lead to the methylation of mercury in the peat producing a soluble form that can enter the food chain. Autopsies of deaths of the endangered Florida panther have revealed toxic levels of mercury in the tissues, sufficient to have caused the death of at least one animal in 1989. The main source of mercury in the Panther diet is racoon which feed on fish and crayfish which in turn derive mercury from lower parts of the food web (bacteria/algae to zooplankton (Dunbar, 1994).

The changes in the Everglades induced by the deterioration of water quality have been the subject of prolonged legal actions, massive costs and financial commitments to restoration (exceeding $8 billion) which are beyond the capacity of most countries to contemplate. It remains to be seen whether the massive investment does more than delay the progressive decline in the character of the Everglades faced with the unrelenting increase in water demands from uncontrollable population influx.

In the UK, upland peat-dominated catchments are important for water supply. The water quality has declined in recent decades as a result of the increase in dissolved organic carbon (DOC) producing higher levels of colour. Removing colour is one of the largest recurrent water treatment costs (Worral *et al.,* 2003).

Investigations of the origins and explanation of the DOC/colour increase and ways of reducing levels before reaching the treatment works has been and continues to be a high research and operational priority of the water companies. There is still a significant gap in understanding the proximate cause of increased DOC release and colour generation. Drainage is generally considered to be a primary factor but other environmental changes such as acidification, burning, overgrazing and higher temperatures associated with climate change itself may all contribute separately or in combination. The fact that whilst the majority but not all peat dominated catchments exhibit progressive colour increases suggests that the explanation may be complex and linked to detailed biogeochemical processes such as those controlled by an enzyme-latch mechanism (Freeman *et al.,* 2001). The key question for science is whether or not the biogeochemical changes resulting from drainage or other effects are actually reversible and, if so, what are the most appropriate management techniques to achieve recovery. Experimental investigations have concentrated on the rehydration of peat achieved by the blocking of 'grips', originally dug to improve drainage for grazing or grouse management. There may be a time variable response leading initially to an actual increase in DOC followed after a year or so by a decline (Worrall *et al.,* 2003).

Current research at SWIMMER is currently focussed on the specific changes in enzymes associated with drainage and re-wetting to establish *inter-alia* the reversibility of enzyme-based reactions leading to enhanced breakdown of the peat.

Additional motives for peat/moorland rewetting includes maintenance of the carbon store and where possible increased sequestration as well as meeting biodiversity targets for habitat enhancement. These are firmly on the priority agenda of ecosystem managers including water utility companies and National Park authorities with potential benefit not only in water quality but also flood reduction, recreation, carbon offsetting and economic derivatives.

Poverty alleviation

One of the major drivers of change currently in tropical peatlands is to meet the basic human desire to escape poverty and improve well-being. This has been a prime directive underpinning the transmigration programme of Indonesia but has been no less a driver at more local scales in Malaysia, Vietnam and Africa. There is strong anecdotal, if not always empirical, evidence that especially the deep peats of South East Asia are not well suited to individual farming enterprises. Even highly capitalised schemes such as the mega-rice project of Kalimantan have failed completely in meeting their intended objectives whilst almost certainly contributing significantly to other environmental problems including enhanced carbon release, haze, coastal water quality as well as biodiversity loss. Most development schemes that are considered successful politically and/or economically have an 'industrial' bias such as logging and palm oil production. Unfortunately, only relatively small proportions of the return from such ventures usually go to the 'local' population. Most of the income generated goes to investors far distant from the peatland and the issue of improved well-being of communities and specifically poverty alleviation often remains unaddressed. There are highly complex relationships among human communities and the biophysical environment of peatlands. The involvement of multiple government agencies and a wide range of often conflicting policy directives add to the challenge of attaining optimum solutions for management (Fig. 1).

Enhanced well-being of human communities is a legitimate goal for peatland management but this cannot be at greater costs to other communities or if it is only very temporary in nature. Achieving specific human aspirations without compromising the perpetuation of wider public benefit is probably the greatest challenge facing those responsible for decisions which affect peatlands. Recent innovative thinking around new mechanisms to meet the needs and aspirations of tropical peat-based communities are examined by Silvius and Diemont (2007), whilst an aspect of the clearly perceived political reality in Indonesia at least, is summarised by Silpola (2007).

Implementing the principles of the Ecosystem Approach

The twelve principles of the EA provide a collective framework within which it is possible to shape the considerations for the sound management of the globe's peatland resource.

The objectives of management of land, water and living resources are a matter of societal choice

There are at least four visions of peat futures, both historic and current:

(1) To exploit and/or convert to a different state
(2) To 'maintain' but utilise as far as possible 'sustainability'
(3) To 'protect'
(4) To restore and enhance to the extent feasible.

Whilst there is often a degree of overlap and compromise between these aims, they represent the views of different sectoral 'stakeholder' perspectives. Rarely do decisions affecting peatlands represent a well-informed and carefully considered view of wider societal benefits and priorities. The explanation is often reasonable – ranging from a balanced energy or native conservation policy to poverty alleviation among the landless and rural poor. Yet the outcomes may be unforeseen, unintended and disastrous both offsite as well as onsite.

Examples are legion of the adverse consequence of inappropriate peat development ranging from the tundra to the tropics and from euoceanic to arid environments. Yet strict protection may be entirely inappropriate in the case of

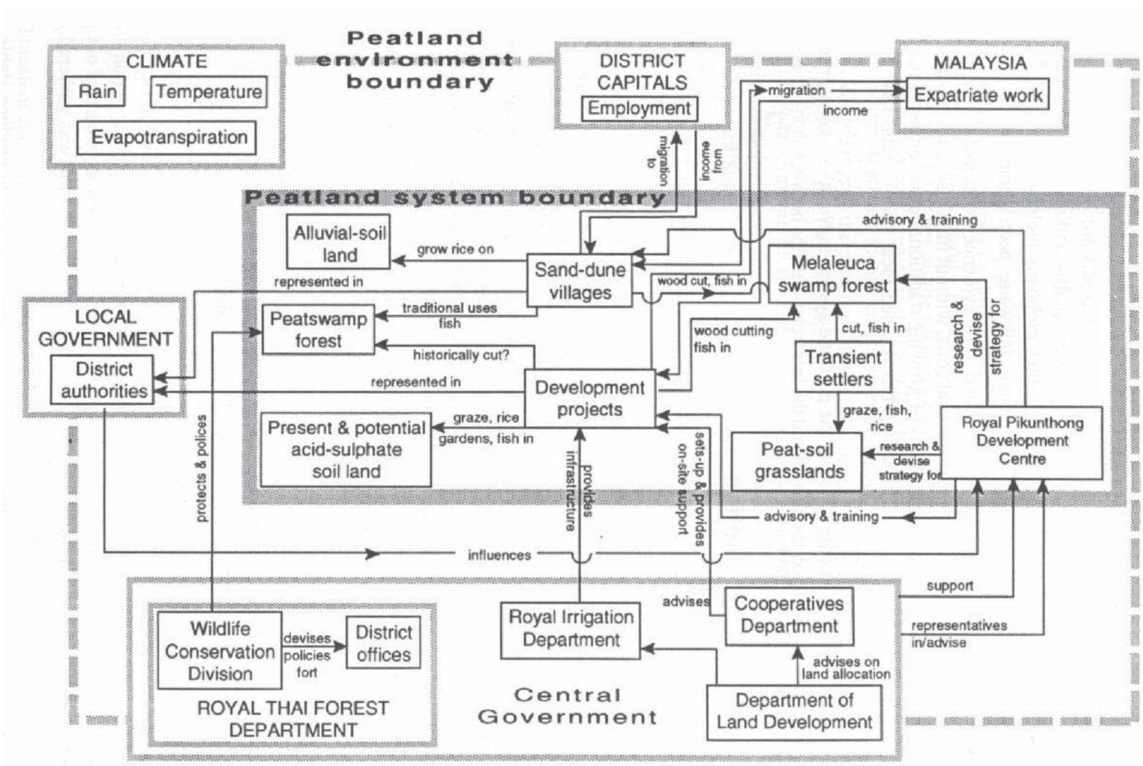

Figure 1. Matrix showing the expected deterioration of natural functions of peatland for different land use conditions (Maltby and Immirzi, 1996)

supporting traditional communities and livelihoods. Restoration may draw down funds better applied to other environmental and/or social priorities.

We need better mechanisms to ensure societal choice is made for the right reasons. These include the intrinsic values of peatlands and both the tangible and intangible benefits which can be derived from them in a fair and equitable way (CBD, 2003).

These will be underpinned by a stronger science and evidence base (Maltby, 2006), education and awareness and environmental economic accounting.

Managemen should be decentralised to the lowest appropriate level

Decisions crucial in the management of peatlands are often made remotely and by interest–groups who are insufficiently informed about local conditions and consequences of inappropriate actions. Involvement of local committees and consultation with other vested interests helps to minimise adverse outcomes and can better balance local concerns with the wider public 'good'. The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation and use of local knowledge (CBD, 2003).

Ecosystem managers should consider the effects of their activities on adjacent and other ecosystems

Historically, the decisions concerning peatland management have rarely, if ever, taken into account offsite impacts. These can range from global through the contribution to greenhouse gases, to regional, such as effects on coastal ecosystems, and local, such as hydrology and water quality (Maltby, 1997). Both positive as well as negative impacts of management need better recognition. New ways of organisation for initiatives involved in decision making will be required and better cross sectoral arrangements within government will be essential. This may also require a fundamental rethink of how environmental costs and benefits are shared. The implications of this have been brought into sharp focus from estimation of the wider costs resulting from peat fires in South East Asia. (Tacconi, 2003).

Recognising potential gain from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:

(a) Reduce those market distortions that adversely effect biological diversity.
(b) Align incentives to promote biodiversity conservation and sustainable use.
(c) Internalise costs and benefits in the given ecosystem to the extent feasible.

The greatest threat to peat-based ecosystems and peatlands are in their replacement by alternative systems. This may be encouraged by market distortions which undervalue the functioning of the natural systems and provide perverse incentives and subsidies to favour conversion. It is imperative to apply state-of-the-art methodologies to better assess the full economic values of different peatland ecosystems based on their contribution to 'natural capital' and the flow of benefits both directly and indirectly to human populations.

Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach

Historically, the conservation view of peatlands has emphasised habitats, communities and species. Additionally, however, the maintenance of the integrity of peat and their ecosystems is a key requirement to ensure their resilience and capability to function and deliver a wide range of ecosystem services. It is relatively straightforward to demonstrate the winners and losers arising from actions which change structures and alter functioning. Ability to maintain function and adjust to natural perturbations is a basic property of sustainability.

Ecosystems must be managed within the limits of their functioning

It is necessary to understand the environmental and other conditions which limit the productivity and the functioning of peat-based ecosystems. Limits to or thresholds of functioning may be affected by external drivers or conditions maintained artificially by management (e.g. water table, grazing, burning). The precautionary principle should be adopted in management to ensure that the desired benefits of functioning are maintained.

The Ecosystem Approach should be undertaken at the appropriate spatial and temporal scales

For management of peatlands to be effective and fit for the purpose(s) intended, it is necessary to adopt appropriate scales of application.

It may help to define such scales through the recognition of 'problemsheds' such as related to the generation of smoke haze in South-East Asia, eutrophication of the Florida Everglades, or water colour in a particular river catchment.

Recognising the varying temporal scales and lay effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term

There is an inherent conflict between the tendency for humans to favour short term gains and immediate returns over longer term and/or future benefits. Once put in train it may be very difficult or impossible to reverse the effects of particular management actions. Establishment of drainage networks in peatlands may fall into this category with enzymatic changes in the peat resulting from even temporary aeration possibly irreversible even by subsequent reflooding.

Management must recognise that change is inevitable

Peatlands ecosystems develop and change over time due to autochthonous processes but are also beset by a complex of uncertainties and potential "surprises". Bog bursts may fall in the latter category initiating a new cycle of peat erosion. Erosion may also follow naturally the growth of the peat mass until it develops fissures which become gulleys and progressively dissect the peatland. Human-induced changes such as from pollution (e.g. acid rain) and climate change may result in currently unforeseen long term impacts. Management needs to be adaptive, responsive and timely but never assume that the ecosystem is in equilibrium.

The Ecosystem Approach should seek the appropriate balance, and integration of conservative end use of biological diversity

This principle advocates a flexible approach to conservation and use in which the choice does not necessarily be one to the exclusion of the other. Whilst protection and highly restricted uses may be necessary, in some cases it may be more appropriate to allow and even encourage certain uses. Rather than thinking in polarised terms from 'protected' to 'non-protected' (open for development and alteration) it is important to think in terms of a continuum where intensity and nature of use is related to peatland type, socio-economic context and its role in the delivery of ecosystem services. An overriding consideration is to maintain the essential values of these services and not compromising options or benefits for the future. In essence, it is to ensure 'wise use', restated recently as 'those uses of mires and peatlands for which reasonable people now and in the future will not attribute blame' (Joosten and Clarke, 2002).

The Ecosystem Approach should consider all forms of relevant information, including scientific and indigenous knowledge, innovation and practices

Much better knowledge of how natural peatland ecosystems function and the effects of human actions (including restoration efforts) is essential to underpin better decision-making. This is true for both high latitude as well as the generally less well known and understood peatlands of the tropics. Information from all sources is crucial if more effective ecosystem management strategies are to be introduced. This requires more sharing of data, transparency in motives and assumptions, leading to dialogue with all relevant stakeholders who may not be sufficiently aware of the information and views held by others.

The Ecosystem Approach should involve all relevant sections of society and scientific disciplines

Peatland management issues are invariably complex and decisions often are based on imperfect and/or inadequate information. There are many gaps in knowledge from disciplines or sectors other than those most directly involved in the determination of the activities which take place on the peatland. Implications for migratory fish and other species, effects on coastal ecosystem, socio-cultural relationships (e.g. family coherence), contribution to offsite costs and benefits are just a few areas where there may have been very limited if any real involvement from the wider scientific or sectoral interests in key decisions affecting peatlands.

Guidelines for peatland management

There is no shortage of sound advice and guidance provided recently at a variety of levels from technical to institutional: e.g. Maltby *et al.,* 1992; Safford and Maltby 1998; Joosten and Clarke, 2002; Bragg and Lindsay, 2003): and the Ramsar Convention – Guidelines for Global Action on Peatlands (GAPP).

Is it now certain that the world's peatlands will be more wisely used? The answer has got to be unclear. There are examples where the drivers are strongly positive. In the UK there is considerable interest in maintaining and regenerating peat systems in upland catchments. The prime motivations by stakeholders and investors are at least threefold:

(1) to increase carbon sequestration which can be used to offset the carbon footprint elsewhere.
(2) to reduce water colour and other contaminants (especially pathogens) affecting water quality and the costs of delivery of portable water.
(3) to re-establish habitats such as fen and grouse moor which contribute to biodiversity, the rural economy and quality of life.

Such interests are supported not so much by specific peatland policies but by other initiatives such as the 'sustainability' obligations of the water regulator (OFWAT), measures associated with catchment management planning and implementation of the European Water Framework Directive, Biodiversity Action Plan Targets and obligations stated in the plan of implementation of the World Summit on Sustainable Development (WSSD) as well as actions aimed at enhancing corporate social responsibility and gaining shareholder support for the conduct of major businesses.

The development of an integrated approach is now central to UK stated policy on securing a healthy natural environment and is captured in the Action Plan for Embedding an Ecosystem Approach (Defra, 2007). This is consistent with meeting the UK's obligations under important international agreements such as the CBD, Ramsar and the WSSD. It is furthermore aimed at fulfilling a commitment in the UK Sustainable Development Strategy to form the basis for a more strategic approach to policy-making and achievement of better-informed decisions about how to balance economic, environmental and social objectives. Restoration of peat bogs and the protection and enhancement of peat soils are both stated objectives of current policy.

On the other hand, there are negative drivers, generally at the global scale, which may have as yet far reaching consequences beyond those already documented especially for tropical peatlands, namely:

(1) Increased demand for biofuels
(2) Rapid rise in world food prices especially for grain.
(3) Pressures arising from the drive to improve human well-being and especially poverty alleviation
(4) Effects of progressive climate and other environmental changes.

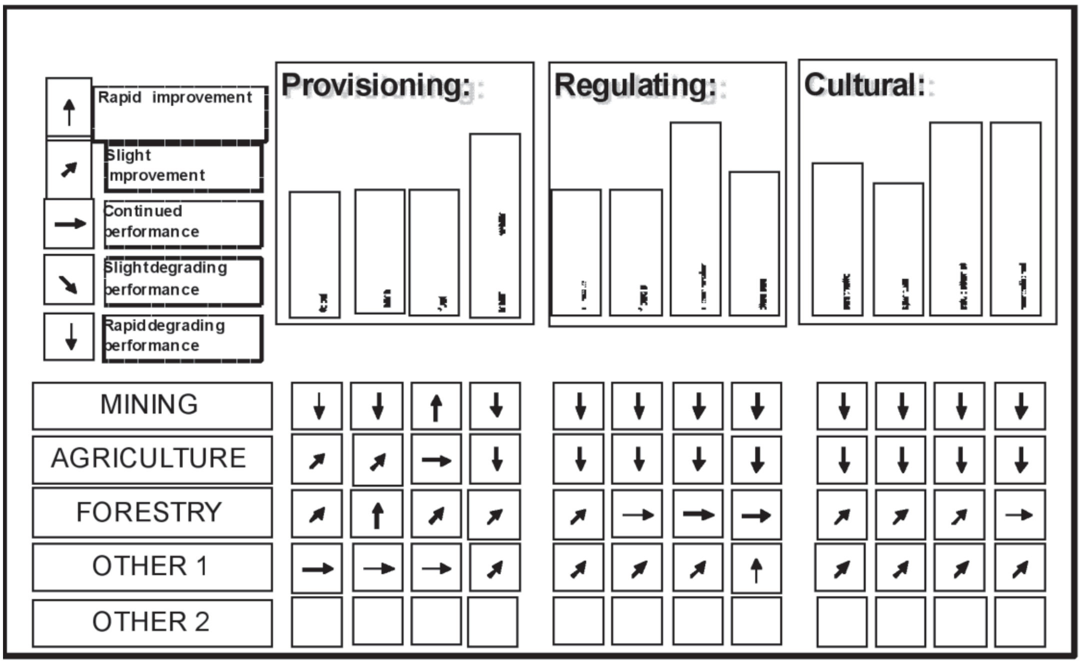

Figure 2. Template for a rapid checklist to assist in integrated management of peatlands (adapted from Millennium Assessment))

Whilst irreversible environmental changes may make it impossible to arrest the degradation of all peatlands, the apparently overriding impacts of external economic market forces may offer a less daunting challenge, given proper and full evaluation of the services provided by peatlands.

New tools to aid decision-making

Part of the problem resulting in inappropriate peat use is the lack of easy to use tools to assist decision-making. The numerous technical guidelines which exist already are comprehensive but difficult to use operationally. They require translation into much simpler practical tools. Figure 2 provides an example of how technical information about the services provided/affected by peatland use can be readily displayed to provide politicians and managers with a clear impression of the consequences of alternative decisions and policies.

This approach builds on the Millennium Assessment model and lends itself to conversion to an economic or socio-economic comparator which can be used through multicriteria analysis or other stakeholder filters to arrive at better decisions for peatland conservation and management.

SWIMMER has been working on this type of approach also in the context of the Ecosystem Services and Poverty Alleviation Study in South Asia (ESPASSA) programme funded by the UK DFID and NERC, (www.espassa.org). This has provided some examples of ways in which socio-economic analyses can be integrated with scientific understanding of ecosystem status and trends in order to determine the likely impacts of ecosystem change on various dimensions of poverty. Analysis within this work has emphasised the importance of institutional and policy arrangements in affecting degradation.

This was illustrated very well in the case of the rapidly diminishing peatlands of Southern Thailand (Fig. 1). Inappropriate peatland development in the tropics may be a short-term panacea for the immediate relief of individual poverty, but unless it can maintain the economic levels of return that will sustain the improved well-being of local communities, there can be no argument to support it when the wider benefits of conserving the resource are taken into account. The final solution can only be the pursuit of alternative development options and that requires innovative and imaginative thinking among policy makers.

The future

There are many different possible futures for the globe's peatland resource. Significant areas in the developed world have been degraded but considerable effort is now focussed on at least their partial restoration. Some will argue that this is only after generations of inappropriate use and the realisation of short-term wealth or benefits that may have been created. There is particular attention now on the tropics and especially South-East Asia where the adverse consequences of peatland development are only too clear – environmentally, socially and economically. A more holistic and integrated approach to management, as embodied within the Ecosystem Approach, is essential. But the challenge is how to achieve this in practice. Influence on political decision-making is essential.

It is in this context that provision of a strong scientific and socio-economic evidence base is an essential prerequirement. Easy to understand tools which demonstrate clearly the technical and economic outcomes of choices and actions will go some way towards providing the 'ultimate' managers of peatland ecosystems with the means of achieving more desirable outcomes than their continued loss.

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